Research Internships @RBU

Our university is offering **Research Internships** to the students of **VIII semester BE**. These internships are designed to enhance the knowledge of the students and to provide them a professional research experience. The selected interns are required to work full time on the project for one full semester under the supervision of faculty guides and are exempted from regular VIII semester classes. However, these students are required to complete the applicable winter term and/or all other perquisites mentioned by their department.

The following internships are available to the students by the concerned faculty guides who will work as Principal Investigators (PI). For detailed information regarding these projects the students are requested to contact the concerned guide.

The students who are interested in these Research Internships are requested to contact the respective faculty guides **on or before 24th December 2025.**

Following internships are available:

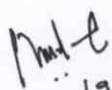| SN	Name of Project	Faculty Guide	View Details
1	Deep Learning Framework for Early Detection of Retinal Disorders Using Fundus Images.	Dr. A. Khurshid Dr. Khushboo Khurana	P1
2	Smart Microplastic Detection System Using Sensor Technology and Artificial Intelligence	Dr. Anju Gupta	P2
3	ML-Powered Disease Detection in Rice and Soybean using IoT-Enabled Imaging	Dr. Anju Gupta	P3
4	Design and development of Electrolyte-gated-FET for analyte detection.	Dr. N.P. Narkhede / Jitendra B. Zalke	P4
5	Preparation of voice signal data-set for emotion detection from voice for Indian regional languages.	Dr. Rajesh B Raut	P5
6	Flexible UWB Microstrip Antenna for On-Body WBAN Applications	Dr. Pallavi Parlewar	P6
7	Linearly Flared Enhanced Antipodal Vivaldi Antenna	Dr. Pallavi Parlewar	P7
8	Antenna based sensor for determining dielectric properties of liquids.	Dr. Ankita Hitesh Harkare	P8
9	Design of Reconfigurable Linear Feedback Shift Register	rof. D. D. Shrivastava	P9
10	Portable Assistance Device for Blind and Visually Challenged People	Dr. Jagdish D. kene	P10
11	Object Detection in Remote Sensing Images Using Reflectance Information and Machine Learning Techniques	Dr. Rohini S. Ochawar	P11
12	Object detection from remote sensing images using machine learning algorithms	Dr. Rohini S. Ochawar	P12

13	PlayBoard: Real-Time IoT Score and Event Display System	Deepak Khushalani, (PI) Saket Kanetkar	P13
14	Design and development of biosensor for disease detection.	Dr. Jitendra B. Zalke	P14
15	Design and development of machine learning assisted point-of-care device for biomedical application.	Dr. Jitendra B. Zalke	P15
16	Deep Learning-based Image enhancement for low-dose medical imaging	Dr. Khushboo Khurana and Prof. Gulrukh Nazneen	P16
17	Cognitive Load Detection Using EEG Signals	Prof. Leena Rokde , Dr. Pravin Sonsare	P17
18	Automated Mineral, Soil and Dairy Food Composition Analysis Using CNNs and Spectral Imaging Techniques	Dr M. B. Chandak	P18
19	Happiness Index Survey Platform for Schools and Communities	Dr. Nitin Narkhede	P19
20	Non-Invasive Brainwave Sensing Device Using Single-Channel EEG Headband	Dr. Nitin Narkhede	P20
21	Protein Secondary Structure Prediction Using Pretrained Transformer Models and Deep Learning.	Dr. Rushali Dontulwar	P21
22	Adaptive Temporal Contrastive Pretraining (ATCP) for Financial Fraud Detection Using Heterogeneous Temporal Graph Neural Networks	Prof. Shraddha Ghodeswar, Dr. Pravin Sonsare	P22
23	Thyroid Disease Detection and Classification	Dr. Shubhangi Neware	P23
24	Deepfake Image and Video Detection	Dr. Shubhangi Neware	P24
25	Energy Prediction for Electric Vehicle (EV) Charging Networks	Dr. Supriya Gupta Bani	P25
26	Machine Learning–Enabled IoT Framework for Smart Grid Performance Optimization	Dr. Supriya Gupta Bani	P26
27	Renewable Energy Generation Prediction Using Machine Learning and Intelligent Forecasting Models	Dr. Supriya Gupta Bani	P27
28	Energy-aware Resource Allocation in Cloud Data Centres Energy Prediction Models for Virtual Machine (VM) Migration	Dr. Supriya Gupta Bani	P28
29	Adsorptive treatment of wastewater using batch / column study.	Dr. Tripti Gupta	P29
30	Application of 3D printing technology for the development of customized products	Dr. Yogesh V. Deshpande (PI)	P30
31	Modelling and optimization of aircraft material for sustainable development	Dr. Yogesh V. Deshpande (PI) & Dr. Yogesh Joshi (Co-PI)	P31

32	Drone-Based Precision Crop Health Monitoring & Yield Prediction using Multispectral Imaging and Machine Learning	Dr. Rashmi Welekar (PI) & Dr. Sourabh Prabhat (Co-PI)	P32
33	AI-Based Digital Twin System for Predictive Healthcare Monitoring Using Wearable Bio-signal Data	Dr. Rashmi Welekar (PI) & Dr. Sourabh Prabhat (Co-PI)	P33
34	Vision-Transformer-Based Smart Traffic Violation Detection & Road-Safety Analytics Using CCTV and Edge-AI	Dr. Rashmi Welekar (PI) & Dr. Sourabh Prabhat (Co-PI)	P34
35	Anti-Suicide Alert System using Sensors and Machine Learning	Dr. Suresh Balpande (PI) & Dr. Nisarg Gandhewar (AICS) , Dr. Gajanan Nikhade (Mechanical Engg) (Co-PI)	P35
36	Machine Learning Prediction of Soil Organic Carbon Using EC and Moisture Data	Dr. Suresh Balpande (PI) & Dr. Suraj Butoliya (Co-PI)	P36
37	Smart Portable Soil pH Detection System Using Arduino/ESP32 and ML Models	Prof. Suresh Balpande (PI) & Dr. Shubham Anjankar (Co-PI)	P37
38	Development of Artificial Intelligence based Smart Classrooms	Prof. Suresh Balpande	P38
39	Development of an interface module for detecting adulterants in fruits.	Prof. Suresh Balpande (PI) & Dr. Amit Pimpalkar (Co-PI)	P39
40	Prediction of electrical characteristics of novel semiconductor devices using Machine Learning	Dr. Rashmi Welekar (PI) & Dr. Chithraja Rajan (Co-PI)	P40
41	A Machine Learning approach to predict sensitivity of a Bio-TFET Biosensor	Dr. Rashmi Welekar (PI) & Dr. Chithraja Rajan (Co-PI)	P41
42	A Machine Learning approach to Predict Electrical Characteristics of a Low power RFET	Dr. Rashmi Welekar (PI) & Dr. Chithraja Rajan (Co-PI)	P42
43	AI-Powered Materials Discovery: Predict Crystal Structures 100× Faster	Dr. Rashmi Welekar (PI) & Dr. Chithraja Rajan (Co-PI)	P43
44	Medical Diagnosis Prediction through a Neuro-Symbolic Approach	Dr Nisarg Gandhewar (PI) & Dr Amit Pimpalkar (Co-PI)	P44
45	Object Detection Using Spiking Neural Network	Dr Nisarg Gandhewar (PI) & Dr Amit Pimpalkar (Co-PI)	P45
46	mRNA Vaccine Optimization Using Reinforcement Learning	Prof. Pranali R. Dandekar	P46
47	A deep neural network architecture developed to enhance and restore low-resolution images for improved perceptual quality and accuracy.	Prof. Pranali R. Dandekar	P47

48	A Comparative Study of Computation vs. Accuracy Trade-Off in Generative for medical image processing	Prof. Priya Parkhi	
49	Medical Image anomaly detection using Generative AI	Prof. Priya Parkhi	
50	Autonomous Hypothesis-Driven Agentic AI Enabled Deep Multi-Omics Modelling of Tumour Biology	Dr. Amit Pimpalkar (PI) & Dr. Nisarg Gandhewar (Co-PI)	
51	Discovering Data Analytics for Predictive Safety Solutions and Applications using AI	Dr. Amit Pimpalkar (PI) & Dr. Nisarg Gandhewar (Co-PI)	
52	A Data-Driven Framework for Accurate Identification and Classification of DNA Sequences in Human Genomics	Dr. Amit Pimpalkar (PI) & Dr. Nisarg Gandhewar (Co-PI)	
53	A Decision Support System for Automated Hearing Loss Diagnosis Using EEG and AEP Signals	Dr. Amit Pimpalkar (PI) & Dr. Suresh Balpande (Co-PI)	
54	A System for Condensing and Simplifying Textual Information using Natural Language Approach in Regional Language	Dr. Amit Pimpalkar	
55	Intelligent Handover Decision Algorithm for Future HetNets Using Machine Learning Techniques	Dr. Yogesh Thakre	
56	Automated Tagging of Software Engineering Textual Data Using Deep Learning Models	Dr. Yogesh Thakre	
57	Natural Language Command-Line Interface for Secure Automation	Dr. Rashmi Welekar (PI) & Dr. Charanjeet Dadiyala (Co-PI)	
58	Understanding Human Emotions Through Facial Micro-Expressions Using AI	Dr. Charanjeet Dadiyala (PI) & Dr. Rashmi Welekar (Co-PI)	
59	AI-Driven Multi-Modal Testing and Security Prioritisation for Large-Scale Codebases	Dr. Charanjeet Dadiyala	
60	Comparative Analysis of Machine Learning Algorithms for Predicting Heating and Cooling Loads in Residential Buildings	Dr. Charanjeet Dadiyala (PI) & Prof. Neha Tirpude (Co-PI)	
61	Lightweight Statistical Detection of Adversarial Inputs in Security Machine-Learning Systems	Prof. Dev Mukherjee	
62	Feasibility Study of Post-Quantum Cryptographic Algorithms on Resource-Limited Devices	Prof. Dev Mukherjee	
63	Evaluating Prompt-Injection and Jailbreak Vulnerabilities in Large Language Models	Prof. Dev Mukherjee	
64	Sports video analysis and event detection	Prof, Kaushik Roy	

65	Detection and Tracking of player movements in team sports using Hybrid Deep learning Algorithms	Prof, Kaushik Roy	P65
66	AI-Driven Career Guidance and Dynamic Progress Monitoring System for Personalized Skill Development and Employability Enhancement	Prof, Kaushik Roy	P66
67	AI-Based Fault Prediction in Cloud Infrastructure	Prof, Kaushik Roy	P67
68	Urban heat island mapping with Land Surface Temperature (LST)	Dr. Aarti Karandikar	P68
69	Agricultural stress monitoring using hyperspectral signatures	Dr. Aarti Karandikar	P69
70	Deep Learning–Driven Clinical Decision Support System for Early Identification of ROP in Preterm Neonates	Dr. Aarti Karandikar	P70
71	Advancements in Cyber-Physical Systems: Enhancing Interconnectivity and Security	Dr. A. V. Chandak	P71
72	Social Media Analysis for Adverse Events Detection for enhanced Cosmetovigilance	Neha Tirpude & Dr. Charanjeet Dadiyala	P72
73	AI-Powered Climate Control Platform for Industrial Decarbonization and Waste Management	Dr. Purshottam J. Assudani	P73
74	Smart Waste Management System with IoT and Generative AI	Dr. Purshottam J. Assudani	P74
75	AI-Powered Adaptive Learning Platform for Competitive Exam Preparation	Dr. Purshottam J. Assudani	P75
76	Smart GauRaksha: IoT-Based Intelligent Cow Collision Avoidance System	Prof. Rasika M. Rewatkar	P76
77	Secure Model Aggregation in Federated Learning for Sensitive Healthcare Data	Sruthi Nair	P77
78	Agentic AI for Context-Aware Clinical Entity Recognition	Sruthi Nair	P78
79	PrivLogDetect: Privacy-Preserving Encrypted Log Anomaly Detection using Homomorphic Machine Learning	Prof. Vikas R. Gupta	P79
80	Detecting Synthesized and Manipulated Speech Using Audio-Forensic Deep Models	Prof. Vikas R. Gupta	P80
81	Automated Identification of AI-Generated Text Using Deep Neural Architectures	Dr. Lokesh M. Heda	P81
82	Advanced Neural Fusion Methods for Detecting Abusive and Hate Content	Dr. Lokesh M. Heda	P82
83	Damage Characterization of composite plate under low velocity impact using AI and ML techniques.	Dr. Deepali M. Kotambkar	P83
84	Use of Blockchain Technology for Mitigating Hunger Management	Dr. D.S. Adane	P84

85	Smart Bio-Sensing Application Using Machine Learning for Real-Time Analysis	Dr. M. A. Hasamnis	P85

Dr. D. S. Adane
Director R&D

Dr. R. S. Pande
Vice Chancellor

Research Internship @RBU

Session: 2025-26

Project Proposal for Research Internship

School: School of Computer Science and Engineering

and School of Electrical & Electronics Engineering

Department: Computer Science and Engineering and ENCS

1. Name of the Principal Investigator (PI), Department	Dr. A. Khurshid, ENCS Dr. Khushboo Khurana, CSE
Place of Work/Department	CSE
Title of the Project	Deep Learning Framework for Early Detection of Retinal Disorders Using Fundus Images.
Brief description of the project	Developing efficient model for deployment on edge device for detecting retinal diseases using fundus images. Diseases such as diabetic retinopathy, glaucoma, and age-related macular degeneration may be detected. The project will involve image preprocessing, segmentation, feature extraction, and classification using lightweight deep learning models for example EfficientNet, MobileNet. The system aims to accurately identify abnormalities and support ophthalmologists in early diagnosis and large-scale screening.
Expected outcomes of the project	• An automated disease-detection model capable of classifying fundus images into normal and various disease categories. • Dataset collection, handling class imbalance. • Preprocessing and enhancement pipeline for improving image quality. • Trained deep learning model. • Model optimization for deployment on edge/ resource constraint devices by performing quantization and pruning. • Further deployment on requisite hardware.
Possible learning outcomes for the interns	• Understanding fundamentals of medical imaging • Hands-on experience with image preprocessing techniques • Skill development in deep learning, particularly lightweight models • Experience with medical datasets

	• Model evaluation and validation techniques for imbalanced medical data.

Requirements from the interns	
UG / PG Program (Branch)	UG from CSE, CSE (AIML), CSE (Data Science), EC, ENCS.
Discipline	
Technical background (eg. Courses that should have been done, topics that should have been known)	Deep Learning basics
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Python, PyTorch or TensorFlow/Keras, TensorFlow Lite (now LiteRT)

Dr. A. Khurshid, ENCS

Dr. Khushboo Khurana, CSE

Name and Signature of PI & Co-PI   **Name & Signature of Head of Department**

Research Internship @RBU

Session: 2025-26

Project Proposal for Research Internship

School: Electrical and Electronics Engineering

Department: Electronics Engineering

2. Name of the Principal Investigator (PI), Department	Dr. Anju Gupta, Department of Electronics Engineering
Place of Work/Department	Biomedical Sensors Laboratory, Biomedical Sensors Laboratory, Department of Biomedical Engineering
Title of the Project	Smart Microplastic Detection System Using Sensor Technology and Artificial Intelligence
Brief description of the project	Microplastics (<5 mm) have become a major global concern due to their presence in drinking water, food chains, and human tissues. Conventional laboratory-based detection techniques are expensive, time-consuming, and require advanced equipment. This project aims to develop a low-cost, portable, and intelligent microplastic detection system by integrating: ➢ Optical/chemiresistive sensing for microplastic particle identification ➢ Image acquisition using ESP32-CAM / USB microscopic imaging ➢ AI-based classification models (CNN, MobileNet, YOLO-lite) to detect, count, and categorize microplastics ➢ Embedded system processing for real-time analysis ➢ Mobile/Cloud dashboard for visualization of results This interdisciplinary project bridges biomedical electronics, embedded systems, and computer intelligence to create a field-deployable environmental health device.
Expected outcomes of the project	➢ A working prototype of a sensor-based microplastic detection system ➢ An AI model capable of identifying and quantifying microplastics from images ➢ A calibrated optical/chemiresistive sensing module for water quality analysis

	➢ A mobile/desktop interface showing detection results ➢ A research paper / conference publication based on the developed system ➢ Potential for patent filing and product commercialization
Possible learning outcomes for the interns	➢ Understanding microplastic detection mechanisms and biomedical relevance ➢ Hands-on experience with optical sensors, chemiresistive sensors, and imaging modules ➢ Building embedded systems using Arduino / ESP32 ➢ Training and deploying AI/ML models for image classification ➢ Signal and image processing fundamentals ➢ Development of mobile/web dashboards for data visualization ➢ Experience in scientific documentation, research methodology, and prototyping

Requirements from the interns	
UG / PG Program (Branch)	➢ Biomedical Engineering ➢ Electronics and Communication Engineering (ECE) ➢ Computer Science / Artificial Intelligence / Data Science ➢ Electrical Engineering ➢ Electronics and Computer Science ➢ Civil Engineering
Discipline	
Technical background (eg. Courses that should have been done, topics that should have been known)	Students should have basic knowledge of: ➢ Sensors and transducers ➢ Basics of Arduino / ESP32 ➢ Digital image processing ➢ Machine learning / neural networks (basic understanding) ➢ Analog and digital electronics ➢ Programming fundamentals (Python / C / C++)
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments	1. Programming: Python, C/C++, Arduino IDE 2. AI/ML: TensorFlow / PyTorch basics, image classification 3. Signal & image processing: Filtering, segmentation, feature extraction 4. Tools: MATLAB/OpenCV, Jupyter Notebook 5. Laboratory Skills: Basic handling of optical sensors, microscope/ESP32-CAM setup

such as CRO, Electron Microscope etc.)	6. Documentation: Report writing, data analysis, presentation skills

Dr. Anju Gupta

Name and Signature of PI & Co-PI   **Name & Signature of Head of Department**

Research Internship @RBU

Session: 2025-26

Project Proposal for Research Internship

School: Electrical and Electronics Engineering

Department: Electronics Engineering

3. Name of the Principal Investigator (PI), Department	Dr. Anju Gupta, Department of Electronics Engineering
Place of Work/Department	Third Floor, Electronics Engineering
Title of the Project	ML-Powered Disease Detection in Rice and Soybean using IoT-Enabled Imaging
Brief description of the project	This project aims to develop a machine learning–based disease detection system for two major Indian crops: Rice and Soybean. Using IoT-enabled camera modules, leaf images will be collected directly from farms and stored securely on the cloud. These images will be used to train and evaluate multiple deep learning models—including CNN, EfficientNet, and Vision Transformer architectures—to accurately identify crop diseases such as Rice Blast, Bacterial Leaf Blight, Brown Spot, Soybean Rust, Bacterial Pustule, and Downy Mildew. A mobile application will be developed using Flutter, allowing farmers to capture an image of a plant and receive instant disease identification, confidence score, and recommended treatment steps. The system will be validated across different climate zones to ensure robustness. The goal is to achieve ≥90% accuracy and F1-score with real-world usability.
Expected outcomes of the project	➢ A labeled and pre-processed dataset of healthy and diseased rice and soybean leaf images. Three trained ML models per crop (CNN, EfficientNet, ViT) achieving ≥90% accuracy. ➢ A functional cross-platform mobile app providing instant disease diagnosis. ➢ A field-validation report demonstrating performance across diverse agro-climatic regions. ➢ A scalable and farmer-friendly decision-support system for early crop disease detection.

Possible learning outcomes for the interns	➢ Hands-on experience in image preprocessing, annotation, and dataset creation. ➢ Understanding and implementation of CNN, EfficientNet, and Vision Transformer models. ➢ Practical exposure to hyperparameter tuning, performance evaluation, and model optimization. ➢ Experience in building and integrating ML models with a mobile application. ➢ Knowledge of IoT image acquisition workflows and cloud storage techniques. ➢ Experience working on a real field-based agricultural AI problem.

Requirements from the interns	
UG / PG Program (Branch)	B.Tech (Electronics and Computer science, Engineering, Electronics & Communication Engineering, CSE, AI/ML, or related fields, Biomedical engineering)
Discipline	Electronics and Computer science, Engineering, Electronics & Communication Engineering, CSE, AI/ML, or related fields, Biomedical engineering
Technical background (eg. Courses that should have been done, topics that should have been known)	➢ Basics of Machine Learning and Deep Learning ➢ Image Processing and Computer Vision ➢ Python Programming ➢ Understanding of CNN architectures ➢ Basics of IoT and cloud storage
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	1. Programming in **Python**, familiarity with **TensorFlow** 2. Image annotation, preprocessing, and dataset management 3. Ability to train and evaluate machine learning models 4. Mobile app development experience (Flutter preferred) 5. Understanding of IoT devices and cloud data workflows

Dr. Anju Gupta   Dr. N.P. Narkhede

Name and Signature of PI & Co-PI   Name & Signature of Head of Department

Research Internship @RBU
Session: 2025-26
Project Proposal for Research Internship
School: School of Electrical and Electronics Engineering
Department: Electronics Engineering

4. Name of the Principal Investigator (PI), Department	Dr. N.P. Narkhede / Jitendra B. Zalke
Place of Work/Department	Centre for Microsystems
Title of the Project	Design and development of Electrolyte-gated-FET for analyte detection.
Brief description of the project	Development of Electrolyte-gated-FET based biosensors for detecting human body analytes such as glucose, urea, cholesterol, etc. These sensors leverage the high sensitivity and selectivity of bio-functionalized field-effect transistors to provide rapid, accurate, and non-invasive analyte detection. The focus is on integrating advanced materials and fabrication techniques to create portable, cost-effective, and reliable diagnostic tools for real-time health monitoring and disease management.
Expected outcomes of the project	Research Publication
Possible learning outcomes for the interns	Intern will learn to design low-cost screen-printed paper / PCB based Electrolyte-gated-FET biosensor, its characterization, and analysis for detection of various human body analytes like Glucose/Urea/Albumin.

Requirements from the interns	
UG / PG Program (Branch)	UG Program (ENCS/E&C/Biomedical Engineering)
Discipline	ENCS/E&C/Biomedical Engineering
Technical background (eg. Courses that should have been done, topics that should have been known)	Basics of Electronics
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Basics of Electronics

Name and Signature of PI & CO-PI   **Name & Signature of Head of Department**

Research Internship @RBU

Session: 2025-26

Project Proposal for Research Internship

School: <u>Electrical and Electronics Engg</u>   Department: <u>ECE</u>

1) Dr. Rajesh B Raut

5. Name of the Principal Investigator (PI), Department	Dr. Rajesh B Raut
Place of Work/Department	Department of ECE
Title of the Project	Preparation of voice signal dataset for emotion detection from voice for Indian regional languages.
Brief description of the project	Human emotions play a crucial role in communication, influencing decision-making, behavior, and interactions. With the rise of intelligent systems, understanding emotions from speech especially in Indian Regional Languages has become important in various fields such as customer service, healthcare, and human–computer interaction. This project focuses on creating a dataset first and then building a deep learning–based system that automatically detects emotions from voice recordings. By analyzing speech features and learning patterns in audio signals, the model identifies emotions like happy, sad, angry, fear, surprise, and neutral. Deep learning enables end-to-end feature extraction and classification, making emotion recognition more accurate and robust.
Expected outcomes of the project	Outcomes: 1) Dataset creation 2) Publication in indexed journal
Possible learning outcomes for the interns	After completion of the project intern will learn to: 1) Create dataset 2) Understand Speech Processing Concepts 3) Apply Feature Extraction Techniques 4) Build and Train Deep Learning Models 5) Work with Real-World Speech Datasets 6) Perform Model Evaluation

Requirements from the interns

UG / PG Program (Branch)	UG
Discipline	Electronics and Computer Science/ Electronics and Communication Engg./ Electrical Engg.
Technical background (eg. Courses that should have been done, topics that should have been known)	Digital Signal Processing Machine learning
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Basic Programming Skills Signal Processing Basics Fundamentals of Machine Learning Basics of Deep Learning/ Neural Networks

2)Dr. Pallavi Parlewar

6. Name of the Principal Investigator (PI), Department	Dr. Pallavi Parlewar Department of Electronics and Communication Engineering(ECE)
Place of Work/ Department	Department of ECE
Title of the Project	Flexible UWB Microstrip Antenna for On-Body WBAN Applications
Brief description of the project	Design of a compact, flexible Ultra-Wideband (UWB) antenna (3.1-10.6 GHz) for Wearable Body Area Networks (WBAN). The project ensures stable on-body performance and minimizes electromagnetic absorption to guarantee patient safety. This project focuses on mainly 3 objectives: 1.Flexibility & Miniaturization: Achieve stability underbending (R=25 mm) using fractal-slotted patch designs on flexible substrates. 2.On-Body Stability: Maintain full UWB bandwidth (S11 < -10 dB) with minimal frequency shift (less than 10%) when in contact with a human body phantom. 3.Safety & Integrity: Optimize the design for low SAR (below 1.0 W/kg) and verify signal quality via Time-Domain analysis (Group Delay/Fidelity Factor)
Expected outcomes of the project	SCOPUS INDEX RESEARCH PAPER
Possible learning outcomes for the interns	1.Advanced proficiency in EM simulation (HFSS/CST) for flexible structures. 2.Expertise in UWB Time-Domain Analysis (Group Delay, Fidelity Factor). 3.Deep understanding of SAR compliance and safety techniques (DGS/HIS).
Requirements from the interns	

UG / PG Program (Branch)	B.Tech (ECE)
Discipline	Electromagnetics
Technical background (eg. Courses that should have been done, topics that should have been known)	Electromagnetic Fields, Antenna & Wave Propagation
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific Laboratory equipments such as CRO,Electron Microscope etc.)	Basic familiarity with simulation software like **ANSYS HFSS/ CST**

3) Dr. Pallavi Parlewar

7. Name of the Principal Investigator (PI), Department	Department of Electronics and Communication Engineering(ECE)
Place of Work/Department	Department of ECE
Title of the Project	Linearly Flared Enhanced Antipodal Vivaldi Antenna
Brief description of the project	To design, simulate, and study a compact Ultra-Wideband (UWB) antenna that works within the FCC-allocated frequency range of **3.1 GHz to 10.6 GHz**, it is specifically optimized for biomedical uses like non-invasive sensing, microwave imaging, or wireless body area networks (WBAN)
Expected outcomes of the project	RESEARCH PAPER
Possible learning outcomes for the interns	1. Proficiency in electromagnetic simulation tools (HFSS/CST). 2. Deep understanding of antenna parameters and transmission lines.

Requirements from the interns	
UG / PG Program (Branch)	B.Tech (ECE)
Discipline	Electromagnetics
Technical background (eg. Courses that should have been done, topics that should have been known)	Electromagnetic Fields, Antenna & Wave Propagation

Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Basic familiarity with simulation software like **ANSYS HFSS**

Research Internship @RBU

Session: 2025-26

Project Proposal for Research Internship

School: Electrical and Electronics Engineering

Department: Electronics and Communication ENgineering

8. Name of the Principal Investigator (PI), Department	Dr. Ankita Hitesh Harkare
Place of Work/Department	ECE, RBU Nagpur
Title of the Project	Antenna based sensor for determining dielectric properties of liquids.
Brief description of the project	The project focuses on low cost antenna based sensor which will be designed to determine the permittivity of liquids and determine the adulteration in it. The antenna sensor is aimed to be designed in S-band and the design optimization using machine learning/deep learning algorithms.
Expected outcomes of the project	1 Paper Publication in flagship Conference/Journal 2 Design Patents
Possible learning outcomes for the interns	Knowledge will be gained in the field of Antenna design. Sensor based application which can be utilized in core domain. Independent learning related to the field.

Requirements from the interns	
UG / PG Program (Branch)	Knowledge of Electromagnetics, CST/HFSS Software.
Discipline	Electronics and Communication
Technical background (eg. Courses that should have been done, topics that should have been known)	Electromagnetics, Waveguides and Antenna, Knowledge of Sensor nodes.
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Knowledge of CST/HFSS Software. Knowledge of Machine Learning Algorithms. Knowledge to use VNA.

Dr. (Mrs) A.H. Harkare   Dr.(Mrs) R.S. Ochawar

Name and Signature of PI & Co-PI   Name & Signature of Head of Department

Prof. D. D. Shrivastav

9. Name of the Principal Investigator (PI), Department	Prof. D. D. Shrivastava
Place of Work/Department	Department of Electronics and Communication
Title of the Project	Design of Reconfigurable Linear Feedback Shift Register
Brief description of the project	A Linear Feedback Shift Register (LFSR) is an extensively utilized piece of hardware used in a variety of digital circuits and systems for various applications. It forms a fundamental block when it comes to providing security to the circuits or testing the circuits in terms of cryptography and test pattern generation respectively. LFSR also finds utility in image cryptography. Overall, an LFSR has exhaustive applications in today's security demanding circuits and systems. The project aims to design a reconfigurable LFSR to enhance the versatility of the circuit. The main objective is to make LFSR more adaptable, augmenting the security features it offers and providing a low-power solution.
Expected outcomes of the project	The outcome of the project can be summarized as: a. Design of low-power reconfigurable LFSR b. Performance and comparative analysis of the proposed and existing LFSR designs c. Research paper publication or a patent
Possible learning outcomes for the interns	The outcome of the Internship can be summarized as acquisition of the following skills/learning/attainments: a. Intern will learn to design circuit using Verilog b. Intern will learn to implement design on FPGA c. Intern will learn about the various analysis that can be performed to evaluate the a design d. Intern will learn to perform analysis on the data/results gathered from the implemented design e. Intern will learn the process of experimentation and data analysis as applied to the project f. Intern will develop technical writing skills

Requirements from the interns	
UG / PG Program (Branch)	UG (EC)
Discipline	Electronics and Communication Engineering
Technical background (eg. Courses that should	Intern must have completed basic courses related to following topics:

have been done, topics that should have been known)	a. Digital Circuits b. Verilog HDL
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	A basic idea of following is expected: a. Basic module writing using Verilog HDL b. Designing and Simulating modules on Xilinx

1) Dr. J. D. Kene

10. Name of the Principal Investigator (PI), Department	Dr. Jagdish D. kene
Place of Work/Department	Electronics and Communication Engineering
Title of the Project	*Portable Assistance Device for Blind and Visually Challenged People*
Brief description of the project	Blind people can be able to use assistive technology which includes screen readers, refreshable braille displays and digital screen magnification to interact with high-tech products. Instead of using a mouse to navigate around the screen, people who are blind use a system of key commands to get to where they need to go. These assistive technologies are either software or devices that can help the people who are blind or visually impaired to read printed material like newspapers, books, electricity bills, important noticesor to surf the web.
Expected outcomes of the project	Patent or Scopus paper
Possible learning outcomes for the interns	Student gain the knowledge of Embedded system and able to learn the machine learning applications.

Requirements from the interns	
UG / PG Program (Branch)	UG or PG
Discipline	Electronics and Communication Engineering Electronics and Computer Science Engineering
Technical background (eg. Courses that should have been done, topics that should have been known)	Students should have the knowledge of Microcontrollers and machine language.
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Programming, handling specific laboratory equipments such as CRO

4) Dr. Rohini Ochawar

11. Name of the Principal Investigator (PI), Department	Dr. Rohini S. Ochawar, Electronics and Communication Engineering (PI)
Place of Work/Department	Electronics and Communication Engineering (ECE)
Title of the Project	"Object Detection in Remote Sensing Images Using Reflectance Information and Machine Learning Techniques"
Brief description of the project	This project focuses on detecting objects from high-resolution remote sensing images by combining reflectance information with machine learning techniques. The approach uses satellite-derived reflectance values to distinguish different surface features based on their spectral behavior, enabling accurate separation of targets such as rooftops, solar panels, vegetation, and built-up areas. Machine learning algorithms are then applied to these reflectance features to improve detection accuracy and reduce false classifications. The study aims to develop a reliable, data-driven framework for automated object detection that can support applications in urban mapping, renewable energy assessment, and environmental monitoring.
Expected outcomes of the project	• Accurate Automated Object Detection System: Development of a reliable machine learning–based framework capable of automatically detecting objects such as solar panels, rooftops, vegetation, and built-up structures from high-resolution remote sensing images using reflectance information. • Reflectance-Based Feature Understanding: A clear understanding of how different surface materials behave spectrally, enabling precise differentiation between objects based on their reflectance characteristics rather than only visual appearance. • Reduced Manual Intervention: Significant reduction in manual digitization and visual interpretation efforts through automated detection, saving time and improving consistency in large-area analysis. • Improved Detection Accuracy:

5) Dr. Rohini Ochawar

12. Name of the Principal Investigator (PI), Department	Dr. Rohini S. Ochawar, Electronics and Communication Engineering (PI)
Place of Work/Department	Electronics and Communication Engineering (ECE)
Title of the Project	"Object detection from remote sensing images using machine learning algorithms"
Brief description of the project	This project focuses on the automatic detection of objects from high-resolution remote sensing images using machine learning algorithms. The aim is to develop an accurate and efficient method to identify objects like rooptop structures in urban areas, which is essential for applications such as solar energy potential assessment, urban planning, and infrastructure monitoring. The model is to be trained on labeled satellite images to learn the visual and spectral features of rooftops and distinguish them from surrounding land cover. By automating the detection process, the project can reduces manual effort, improve mapping accuracy, and supports large-scale rooftop analysis for sustainable development and smart city applications.
Expected outcomes of the project	2. Development of an automated and reliable system for detecting rooftops from high-resolution remote sensing images using machine learning techniques. 3. Improved estimation of rooftop area, supporting applications such as solar panel installation planning and urban infrastructure assessment. 4. Enhanced efficiency and consistency in rooftop detection compared to traditional manual methods. 5. Contribution toward sustainable urban development and better utilization of rooftop spaces for green energy generation.

9)Dr. D. G. Khushalani (EC), S. Kanetkar (Phy. Edu.)

School: <u>SEEE and SHS</u>

Department: <u>Electronics & Communication and Physical Education</u>

13. Name of the Principal Investigator (PI), Department	Deepak Khushalani, Electronics and Communication (PI) Saket Kanetkar, Physica l Education (CO-PI)
Place of Work/Department	Electronics and Communication & Physical Education
Title of the Project	"PlayBoard: Real-Time IoT Score and Event Display System"
Brief description of the project	The PlayBoard project aims to design and develop an IoT-powered display system for real-time management of sports events at our **RBU**. The system enables wireless control and instant updates of scores, team names, and event details on an electronic display board using an Internet of Things (IoT) architecture. A microcontroller (such as NodeMCU or **ESP32**) serves as the core controller, connected to an LED display module. The device receives data from a web or mobile application interface, where authorized users (referees, event coordinators, or scorekeepers) can input and update scores or announcements. The data is transmitted via Wi-Fi and displayed instantly, ensuring accuracy, speed, and ease of operation during sports events. This system eliminates the need for manual scoreboard updates and promotes automation, connectivity, and smart event management. It can be scaled for multiple sports and customized for use in our university.
Expected outcomes of the project	A) Working Prototype to be utilised at the university B) Design or Utility Patent In regards to the above two following functionalities should be achieved by the students in the working prototype - A fully functional IoT-based display board capable of showing real-time sports scores, event names, and announcements. - Seamless wireless communication between the control interface and display unit using Wi-Fi or cloud connectivity. - A user-friendly control application for authorized users to update and manage event information easily. - Reduced manual effort and minimized errors in score updating during fast-paced sports events. - Scalable architecture that can be customized for different types of sports or integrated into larger sports management systems.

	• Demonstration of IoT's potential in enhancing automation and efficiency in sports event management.
Possible learning outcomes for the interns	By working on the PlayBoard: Real-Time IoT Score and Event Display System project, interns will gain hands-on technical and professional experience in multiple areas of electronics, programming, and IoT system design. The key learning outcomes include: 1) **IoT System Development Skills** 2) **Embedded Systems Knowledge** 3) **Cloud and App Integration** 4) **Circuit Design and Hardware Prototyping** 5) **Team Collaboration and Project Management** 6) **Problem-Solving and Innovation**

Requirements from the interns	
UG / PG Program (Branch)	UG Students
Discipline	Electronics and Communication
Technical background (eg. Courses that should have been done, topics that should have been known)	1. Internet of Things (IoT) Fundamentals 2. Microcontroller Programming 3. Electronics and Circuit Design 4. Display Technology 5. Networking and Cloud Integration 6. Software Development and Interface Design 7. Testing and Documentation
Sports Background	1. Played any game/sports 2. Basic Knowledge about the rules and regulation and scoring pattern in games/sports
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	• Programming: C/C++ for Arduino; basic Python or MicroPython for IoT control. • IoT & Networking: Understanding Wi-Fi communication, MQTT/HTTP protocols, and cloud integration (Firebase/Blynk). • Electronics: Interfacing displays, sensors, and controllers; basic circuit design and prototyping. • Laboratory Skills: Handling Digital Multimeter (DMM), CRO, and other basic testing instruments. • Analytical Skills: Logical reasoning, troubleshooting, and optimizing data flow in embedded systems. • Software Tools: Arduino IDE, Proteus/Tinkercad for simulation, and mobile/web apps for IoT control.

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School: School of Electrical and Electronics Engineering
Department: Electronics Engineering

14. Name of the Principal Investigator (PI), Department	Jitendra B. Zalke
Place of Work/Department	Centre for Microsystem
Title of the Project	Design and development of biosensor for disease detection.
Brief description of the project	Design and development of sensors based on electrochemical, electrochemiluminescence, or chemiresistive principles for the detection of diseases such as tuberculosis, Alzheimer's, breast cancer etc. These sensors aim to provide highly sensitive and specific detection through advanced material engineering and signal analysis. The focus is on creating innovative, cost-effective, and portable diagnostic tools that enable early detection and improved disease management, contributing to better healthcare outcomes.
Expected outcomes of the project	Research Publication
Possible learning outcomes for the interns	Intern will learn to design low cost paper / PCB based sensor design based on electrochemical / electrochemiluminescence / chemiresistive method its characterization, testing and analysis for detection of disease like Tuberculosis/ Alzheimer etc.
Requirements from the interns	
UG / PG Program (Branch)	UG Program (ENCS/E&C/Biomedical Engineering)
Discipline	ENCS/E&C/Biomedical Engineering
Technical background (eg. Courses that should have been done, topics that should have been known)	Basics of Electronics
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Basics of Electronics

Name and Signature of PI   **Name & Signature of Head of Department**

Research Internship @RBU
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School: School of Electrical and Electronics Engineering
Department: Electronics Engineering

15. Name of the Principal Investigator (PI), Department	Jitendra B. Zalke
Place of Work/Department	Centre for Microsystem
Title of the Project	Design and development of machine learning assisted point-of-care device for biomedical application.
Brief description of the project	The project focuses on designing and developing a point-of-care sensor/device to measure concentrations of glucose, albumin, and urea in biological samples. The device will integrate advanced biosensing technologies with machine learning algorithms to enhance detection accuracy and reliability. By combining sensor outputs with predictive analytics, the system aims to provide real-time, precise quantification of these biomarkers, which are critical for monitoring metabolic and renal health. This approach ensures a user-friendly, portable, and efficient solution suitable for clinical and remote healthcare settings, enabling timely diagnosis and personalized treatment. The integration of AI empowers the device for continuous improvement and adaptability.
Expected outcomes of the project	Research Publications
Possible learning outcomes for the interns	Intern will learn to design low cost paper / PCB based sensor, its testing and analysis. Integration of AI/ML with biosensor.
Requirements from the interns	
UG / PG Program (Branch)	UG Program (ENCS/E&C/Biomedical Engineering)
Discipline	ENCS/E&C/Biomedical Engineering.
Technical background	Basics of Electronics, Python, basics knowledge of Machine Learning and various algorithms used in ML.
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Basics of Electronics / Programming Language / Knowledge of AI/ML Libraries and algorithms.

Name and Signature of PI   **Name & Signature of Head of Department**

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School of Computer Science and Engineering

Department: Computer science and Engineering

16. Name of the Principal Investigator (PI), Department	Dr. Khushboo Khurana and Prof. Gulrukh Nazneen
Place of Work/Department	Computer Science and Engineering
Title of the Project	Deep Learning-based Image enhancement for low-dose medical imaging
Brief description of the project	Medical images captured in low-light or sub-optimal illumination conditions often contain uneven brightness, noise, and region-specific visibility degradation. Conventional enhancement techniques either apply global correction leading to over-enhancement or fail to improve diagnostically relevant structures. Existing systems do not address the challenge of low-light sub-region enhancement. To address this issue, a region-adaptive enhancement approach is required that can automatically detect low-light sub-regions and selectively enhance them without altering well-lit anatomical structures.

Expected outcomes of the project	1. Dataset Collection and Preprocessing
	2. Model Training and Development: Development of a region-adaptive deep learning model capable of detecting and enhancing low-light sub-regions without altering well-lit anatomical structures. Training of the model using the prepared dataset to achieve targeted improvements in PSNR/SSIM and structural clarity specific to low-light regions.
	3. Trained Deep Learning Model (Final Output)
	    • Delivery of a fully trained enhancement model that automatically identifies low-light patches and selectively enhances them, producing clinically reliable outputs with preserved textures.
	    • Model validated against baseline enhancement techniques, demonstrating measurable improvements in visibility, edge preservation, and diagnostic clarity.
	4. Classification / Evaluation Module

	• Implementation of a classification or assessment module (e.g., lesion visibility classifier, quality score predictor) to quantify the improvement in diagnostic features after enhancement. • Evaluation of enhanced images using performance metrics such as CNR, EPI, and expert-based grading to confirm clinical relevance.
Possible learning outcomes for the interns	• Skills in Image Processing & Algorithm Development • Understanding of Multi-Format Medical Imaging • Hands-On Experience with Low-Light Detection Techniques • Model Development and Training Proficiency • Applied Machine Learning & Deep Learning Skills

Requirements from the interns	
UG / PG Program (Branch)	CSE/ CSE (Data Science), CSE(AIML)
Discipline	Machine Learning / Deep Learning
Technical background (eg. Courses that should have been done, topics that should have been known)	Machine Learning/ Deep Learning
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Deep Learning / python Libraries

Dr. Khushboo Khurana and Prof. Gulrukh Nazneen   Dr. Preeti Voditel
Name and Signature of PI & Co-PI   **Name & Signature of Head of Department**

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School :_Computer Science and Engineering

Department : Computer Science & Engineering

17. Name of the Principal Investigator (PI), Department	Prof. Leena Rokde , Dr. Pravin Sonsare
Place of Work/Department	Computer Science & Engineering
Title of the Project	Cognitive Load Detection Using EEG Signals
Brief description of the project	Cognitive load detection using EEG aims to measure the mental effort a person uses during a task by analyzing brainwave patterns. EEG provides real-time insights into attention, working memory, and mental fatigue. However, accurately identifying cognitive load is challenging due to EEG noise, individual variability, and non-stationary signals. Developing robust models can help create adaptive learning, monitoring, and decision-support systems.
Expected outcomes of the project	The project is expected to develop an accurate EEG-based model that can classify different levels of cognitive load. It will identify key brainwave features linked to mental effort and produce a reliable processing pipeline for cognitive load monitoring.
Possible learning outcomes for the interns	1) **Understand EEG signal acquisition, preprocessing, and feature extraction techniques.** 2) **Gain hands-on experience with machine learning/deep learning models for cognitive load classification.**
Requirements from the interns	
UG / PG Program (Branch)	UG (B.Tech CSE , AIML , DS)
Discipline	Computer Science & Engineering
Technical background (eg. Courses that should have been done, topics that should have been known)	Machine Learning, Deep Learning, Python programming
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	**Machine Learning Skills:** Model building, training, validation, and performance evaluation. **Analytical Skills:** Ability to interpret EEG patterns, reason theoretically, and analyze data trends.

Dr. Pravin Sonsare , Prof. Leena Rokde   **Dr. Priti Voditel**

Name and Signature of PI & Co-PI   **Name & Signature of Head of Department**

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Department: Computer Science and Engineering

18. Name of the Principal Investigator (PI), Department	Dr. M. B. Chandak, Computer Science and Engineering
Place of Work/Department	Computer Science and Engineering
Title of the Project	Automated Mineral, Soil and Dairy Food Composition Analysis Using CNNs and Spectral Imaging Techniques
Brief description of the project	• This project aims to design and develop an automated solution for evaluating the composition and quality of Mineral, soil and dairy food samples using Convolutional Neural Networks (CNNs) and spectral imaging techniques. • The system will introduce a real-time, non-destructive, and accurate method for assessing key quality parameters, enabling improved agricultural decision-making and food safety monitoring. • The work also contributes to developing a more sustainable and environment-friendly evaluation process.

Expected outcomes of the project	• Deep learning-based prediction models for estimating important quality indicators such as:
	   ○ **For Dairy:** Fat %, Protein %, Lactose %, Moisture, Total Plate Count, etc.
	   ○ **For Soil: pH**, Nitrogen/Phosphorus/Potassium (NPK), Organic Carbon, Moisture, etc..
	• A real-time analysis prototype providing instant results through a user-friendly application interface.
	• Improved accuracy and efficiency compared to traditional laboratory testing.
	• Creation of a dataset consisting of spectral images for further research..

Possible learning outcomes for the interns	• Ability to preprocess and analyze spectral imaging data using machine learning tools. • Hands-on experience in designing and training CNN models for regression and classification tasks.

	• Development of a functional software interface for quality assessment. • Exposure to real-world applications in Agriculture and Food Quality Control domains.

Requirements from the interns	
UG / PG Program (Branch)	UG [CSE and Allied Branches]
Discipline	CSE and Allied branches
Technical background (eg. Courses that should have been done, topics that should have been known)	Machine Learning, Neural Networks, Image Processing Fundamentals
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Python programming, familiarity with frameworks such as TensorFlow / PyTorch, basic data analytics

Dr. M. B. Chandak [PI]

Dr. A. R. Raipurkar [Co-PI]

Name and Signature of PI & Co-PI   Name & Signature of Head of Department

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Project Proposal for Research Internship

School: Electrical & Electronics Engineering

Department: Electronics Engineering

19. Name of the Principal Investigator (PI), Department	Dr. Nitin Narkhede Electronics Engineering
Place of Work/Department	Electronics Engineering and RTMNU, Nagpur campus
Title of the Project	Happiness Index Survey Platform for Schools and Communities
Brief description of the project	This project aims to design and develop a digital platform that measures Happiness Index levels among students, teachers, or community members using a structured, research-backed survey framework. The system will include customizable questionnaires, anonymous data entry, automatic scoring, and real-time dashboards. The project focuses on understanding well-being parameters such as emotional state, social support, academic/work stress, environment satisfaction, and personal habits. The platform will help institutes and communities identify areas needing attention to improve overall well-being.
Expected outcomes of the project	The project will deliver a fully functional Digital Happiness Index Survey Platform capable of collecting anonymous responses, calculating individual and group happiness scores, and presenting results through an interactive dashboard. The system will include a customizable questionnaire based on well-being indicators, an automated scoring engine, graphical visualization of trends, and options to export reports for administrative or research use. A pilot implementation with real user data, along with complete technical documentation covering design, development, and deployment, will form the final outcome of the project.

Possible learning outcomes for the interns	Understanding of Happiness Index frameworks and social well-being indicators.
	Skills in designing online survey forms and data collection workflows.
	Backend development for scoring algorithms and data storage.
	Skills in frontend dashboard creation using graphs and visualization libraries.
	Exposure to user experience (UX) design for social-impact digital platforms.
	Hands-on experience with hosting, deployment, and testing of web applications.

Requirements from the interns	
UG / PG Program (Branch)	Computer Science Engineering Information Technology Electronics Engineering
Discipline	Sensors, Instrumentation, Biomedical Physics
Technical background (eg. Courses that should have been done, topics that should have been known)	Basics of Web Technologies (HTML/CSS/JS) Database concepts (SQL / NoSQL) Fundamentals of data collection and storage Basic statistics (for scoring calculations)
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Frontend skills (HTML/CSS/JS, Bootstrap/Tailwind) Backend skills (Node.js / Python Flask / PHP) Basic database handling (MySQL / Firebase / MongoDB) Simple data visualization (Charts.js / D3.js) Ability to design intuitive UI/UX for survey platforms Good documentation and testing practices

Dr. Nitin Narkhede

Name and Signature of PI & Head of Department

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School: Electrical & Electronics Engineering

Department: Electronics Engineering

20. Name of the Principal Investigator (PI), Department	Dr. Nitin Narkhede Electronics Engineering
Place of Work / Department	Electronics Engineering and RTMNU, Nagpur campus
Title of the Project	Non-Invasive Brainwave Sensing Device Using Single-Channel EEG Headband
Brief description of the project	This project focuses on designing a low-cost, non-invasive EEG headband using dry electrodes to measure basic brainwave patterns such as alpha and beta waves. The device will use simple analog filtering and amplification to capture and display real-time electrical activity from the forehead.
Expected outcomes of the project	A working EEG headband capable of non-invasive acquisition of brainwave signals Ability to capture, process, and display real-time EEG signals on a PC/mobile interface Implementation of signal-processing algorithms Software that can classify mental states such as: • Relaxed (Alpha-dominant) • Focused/Alert (Beta-dominant) • Drowsy (Theta-dominant) Basic ML model or rule-based classifier can be included. Portable & User-Friendly Design Validation & Performance Analysis

Possible learning outcomes for the interns	Understanding of EEG signal physiology and electrode systems
	Experience with analog filters, amplifiers, and noise reduction
	Skills in microcontroller-based data acquisition
	Hands-on understanding of non-invasive biosensing principles

Requirements from the interns	
UG / PG Program (Branch)	Electronics and Computer Science, Electronics and Communication, Biomedical, Computer Science
Discipline	Sensors, Instrumentation, Biomedical Physics
Technical background (eg. Courses that should have been done, topics that should have been known)	Basic circuits, op-amps, filtering, bio-signal basics, programing
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Breadboarding, soldering, microcontroller basics, oscilloscope use, programming, interfacing

Dr. Nitin Narkhede

Name and Signature of PI & Head of Department

Research Internship @RBU

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Project Proposal for Research Internship

Department: Computer Science and Engineering & Emerging Technologies

21. Name of the Principal Investigator (PI), Department	Dr. Rushali Dontulwar, Department of Computer Science and Engineering
Place of Work/Department	Department of Computer Science and Engineering, Ramdeobaba University
Title of the Project	Protein Secondary Structure Prediction Using Pretrained Transformer Models and Deep Learning.
Brief description of the project	This project aims to develop a deep learning model that predicts the secondary structure of proteins from their amino acid sequences. By leveraging pretrained models for sequence embedding, the model will classify each amino acid into one of three or eight structural categories. The model will be trained on publicly available protein datasets, such as CB513 and PDB, and evaluated using metrics like Q3 and Q8 accuracy. The goal is to enhance the accuracy and efficiency of secondary structure prediction, which plays a crucial role in protein function analysis, drug discovery, and understanding diseases related to protein misfolding. The project will involve preprocessing protein sequences, fine-tuning pretrained models, and evaluating the model's performance on test datasets.
Expected outcomes of the project	The project predicts protein secondary structures with high Q3 and Q8 accuracy using pretrained models.
Possible learning outcomes for the interns	- Understand protein structures and biological data preprocessing. - Build and evaluate deep learning models for sequence classification. - Explore feature engineering techniques like PSSM and embeddings. - Strengthen problem-solving, coding, and research documentation skills

Requirements from the interns	
UG / PG Program (Branch)	UG

Discipline	CSE and allied branches
Technical background (eg. Courses that should have been done, topics that should have been known)	Machine Learning and Deep Learning
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Programming in Python

Dr. Rushali Dontulwar
Name and Signature of PI & Co-PI

Dr. Preeti Voditel
Name & Signature of Head of Department

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School: Computer Science and Engineering   Department: CSE

22. Name of the Principal Investigator (PI), Department	Prof. Shraddha Ghodeswar, Dr. Pravin Sonsare
Place of Work/Department	CSE, RBU, Nagpur
Title of the Project	Adaptive Temporal Contrastive Pretraining (ATCP) for Financial Fraud Detection Using Heterogeneous Temporal Graph Neural Networks
Brief description of the project	This project focuses on developing ATCP, a self-supervised framework for fraud detection on evolving transaction graphs. It leverages temporal contrast, relational contrast, and graph augmentations to improve performance under limited labels.
Expected outcomes of the project	Functional ATCP framework - Improved fraud detection accuracy - Ablation analysis of all components - Reproducible codebase + draft paper
Possible learning outcomes for the interns	- Hands-on GNN and temporal modeling experience - Data pipeline creation for dynamic graphs - Model evaluation and ablation studies - Research documentation and paper preparation
Requirements from the interns	
UG / PG Program (Branch)	B.Tech (CSE, AIML, DS, IT)
Discipline	Computer Science & Engineering
Technical background (eg. Courses that should have been done, topics that should have been known)	Machine learning basics, Python, familiarity with GNNs (preferred)
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Modular coding, dataset handling, evaluation metrics, documentation

Dr. Pravin Sonsare, Prof. Shraddha Ghodeswar   Dr. Priti Voditel

PI & Co-PI   H.O.D., CSE

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School: Computer Science and Engineering

Department: Department of Computer Science and Engineering

23. Name of the Principal Investigator (PI), Department	Dr. Shubhangi Neware, Assistant Professor, CSE
Place of Work/Department	Department of Computer Science and Engineering
Title of the Project	Thyroid Disease Detection and Classification
Brief description of the project	Thyroid disease detection involves identifying disorders such as hypothyroidism and hyperthyroidism by analyzing medical indicators. It typically uses patient data like TSH, T3, T4 levels, ultrasound images, and clinical symptoms. Machine learning and diagnostic models help classify normal vs. abnormal thyroid function. These models learn patterns from large medical datasets to improve accuracy and early diagnosis. Early detection supports timely treatment and helps prevent severe health complications.
Expected outcomes of the project	Patent Filling OR Research Paper
Possible learning outcomes for the interns	**Understanding Medical Indicators:** Learn how thyroid-related parameters (TSH, T3, T4, ultrasound features) influence clinical diagnosis. **Data Preprocessing Skills:** Gain experience in cleaning, normalizing, and preparing medical datasets for machine learning. **Model Building & Evaluation:** Develop skills in training classification models (e.g., SVM, Random Forest, Neural Networks) to detect thyroid disorders. **Feature Engineering:** Understand how to extract meaningful features from lab results or medical images to improve prediction accuracy. **Performance Analysis:** Learn to evaluate models using metrics such as accuracy, F1-score, sensitivity, specificity, and ROC curves. **Deployment Skills:** Gain exposure to deploying ML models using web frameworks or cloud platforms for real-world use.

	Domain Knowledge: Understand the clinical importance of early thyroid disease detection and its impact on patient health. **Ethical Handling of Health Data:** Learn about data privacy, anonymization, and responsible use of sensitive medical information.
Requirements from the interns	
UG / PG Program (Branch)	B. Tech Computer Science and Engineering B. Tech Computer Science and Engineering (Allied branches)
Discipline	Computer Science and Engineering
Technical background (eg. Courses that should have been done, topics that should have been known)	Machine Learning/Deep Learning
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Python Programming Computer Vision Libraries

Dr. Shubhangi Neware

Assistant Prof. CSE

Principal Investigator (PI)

Dr. Preeti Voditel

HOD,CSE

Research Internship @RBU

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School: Computer Science and Engineering

Department: Department of Computer Science and Engineering

24. Name of the Principal Investigator (PI), Department	Dr. Shubhangi Neware, Assistant Professor, CSE
Place of Work/Department	Department of Computer Science and Engineering
Title of the Project	Deepfake Image and Video Detection
Brief description of the project	Deepfake image and video detection involves identifying media that has been artificially manipulated using AI techniques such as GANs. It analyzes visual and auditory inconsistencies like unnatural facial expressions, irregular blinking, mismatched lighting, or audio-lip sync errors. Advanced detection systems use machine learning models to spot subtle artifacts left during synthesis. Techniques include pixel-level analysis, frequency domain analysis, and deep neural networks trained on large fake–real datasets. These methods help prevent misinformation, protect privacy, and enhance digital media security.
Expected outcomes of the project	Patent Filling OR Research Paper
Possible learning outcomes for the interns	**Understanding Deepfake Technologies:** Gain knowledge of GANs, autoencoders, and other AI models used for generating deepfakes. **Hands-on Experience with Detection Models:** Learn to build, train, and evaluate deep learning models for fake-media detection. **Feature Extraction & Analysis:** Develop skills in identifying visual artifacts, frequency inconsistencies, and spatiotemporal cues in images and videos. **Dataset Handling:** Learn to preprocess, annotate, and manage large multimedia datasets for training and testing. **Practical Implementation Skills:** Gain proficiency in Python, OpenCV, TensorFlow/PyTorch, and video processing libraries. **Model Evaluation & Benchmarking:** Understand metrics like accuracy, precision–recall, ROC curves, and cross-dataset generalization.

	Ethical & Security Awareness: Learn about misinformation prevention, digital forensics, and the ethical implications of deepfake technology. **Collaborative Project Skills:** Improve teamwork, documentation, version control (Git), and project deployment practices.
Requirements from the interns	
UG / PG Program (Branch)	B. Tech Computer Science and Engineering B. Tech Computer Science and Engineering (Allied branches)
Discipline	Computer Science and Engineering
Technical background (eg. Courses that should have been done, topics that should have been known)	Machine Learning/Deep Learning
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Python Programming Computer Vision Libraries

Dr. Shubhangi Neware   Dr. Preeti Voditel

Assistant Prof. CSE   HOD,CSE

Principal Investigator (PI)

Research Internship @RBU

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Project Proposal for Research Internship

School: Computer Science and Engineering, Ramdeobaba University
Department: Department of Data Science, CSE-DS

25. Name of the Principal Investigator (PI), Department	Dr. Supriya Gupta Bani Department of Data Science, CSE-DS Ramdeobaba University Nagpur
Place of Work/Department	Department of Data Science, CSE-DS Ramdeobaba University Nagpur
Title of the Project	Energy Prediction for Electric Vehicle (EV) Charging Networks
Brief description of the project	The rapid growth of Electric Vehicles (EVs) has led to increasing demand on EV charging networks, creating challenges in power distribution, peak load management, and infrastructure planning. To maintain stability, efficiency, and user satisfaction, energy providers require accurate predictions of charging demand across different locations and times. This project aims to develop a **data-driven energy prediction system** for EV charging networks using historical charging logs, vehicle arrival patterns, user behaviour, weather conditions, and grid parameters. Machine Learning and Deep Learning–based time-series forecasting approaches (such as ARIMA, LSTM, GRU, Prophet, XGBoost) will be explored to forecast short-term and long-term energy requirements.
Expected outcomes of the project	Identification of **key factors influencing EV energy consumption**, such as time-of-day usage, seasons, and traffic behaviour. - Comparative analysis of ML and DL models with performance evaluation metrics (MAE, RMSE, MAPE). - A functional prediction tool or dashboard for **real-time or day-ahead EV charging demand forecasting**. - A potential **research publication** in Patent/SCOPUS/SCl-indexed journals or conferences.

Possible learning outcomes for the interns	- Understanding of EV charging ecosystem and smart-grid energy distribution. - Skill development in **time-series analysis and forecasting techniques**. - Hands-on experience with data collection, cleaning, and feature engineering. - Experience working with ML/DL models like LSTM, GRU, Random Forest, XGBoost. - Knowledge of evaluation metrics and model optimization.

Requirements from the interns	
UG / PG Program (Branch)	UG/PG Branch (CSE and allied branches)
Discipline	Computer Science and Engineering
Technical background (eg. Courses that should have been done, topics that should have been known)	Machine learning, Deep Learning, Matplotlib, Seaborn
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipment's such as CRO, Electron Microscope etc.)	Excel, Matlab, Python, TensorFlow/PyTorch, Sklearn, Jupyter

Dr. Supriya Gupta Bani

Name and Signature of PI & Co-PI

Dr. Aarti Karandikar

Name & Signature of Head of Department

Research Internship @RBU

Session: 2025-26

Project Proposal for Research Internship

School: Computer Science and Engineering, Ramdeobaba University
Department: Department of Data Science, CSE-DS

26. Name of the Principal Investigator (PI), Department	Dr. Supriya Gupta Bani Department of Data Science, CSE-DS Ramdeobaba University Nagpur
Place of Work/Department	Department of Data Science, CSE-DS Ramdeobaba University Nagpur
Title of the Project	Machine Learning–Enabled IoT Framework for Smart Grid Performance Optimization
Brief description of the project	The increasing complexity of modern power systems has led to the emergence of **intelligent grids**, which integrate digital technologies, IoT sensors, and Machine Learning (ML) to improve grid reliability, efficiency, and sustainability. Intelligent grids rely heavily on real-time data such as voltage, current, frequency, load variations, environmental conditions, and equipment health. This project aims to develop an **ML–IoT integrated framework** that optimizes intelligent grid performance using continuous sensor data. IoT devices deployed across the grid collect real-time data, which will be processed, cleaned, and analyzed using Machine Learning and advanced analytics techniques. The framework will focus on predicting load fluctuations, identifying anomalies, detecting equipment faults, forecasting energy demand, and supporting automated decision-making for grid stability.
Expected outcomes of the project	- Forecasting models for **energy demand and load behaviour**. - Performance comparison of various ML algorithms on grid data. - A prototype or dashboard showing real-time grid insights using IoT–ML integration.

	• Potential **research publication** in SCOPUS/SCl-indexed journals related to smart grids and IoT.
Possible learning outcomes for the interns	Hands-on learning of ML algorithms for prediction, classification, and anomaly detection. Knowledge of edge computing, cloud IoT platforms (AWS IoT, Azure IoT, Thing Speak). Skills in data pre-processing, time-series analysis, and dashboard creation. Ability to design an end-to-end intelligent grid decision-support system.

Requirements from the interns	
UG / PG Program (Branch)	UG/PG Branch (CSE and allied branches)
Discipline	Computer Science and Engineering - Data Science
Technical background (Eg. Courses that should have been done, topics that should have been known)	Machine learning, Deep Learning, Matplotlib, Seaborn
Specific skill set (Eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipment's such as CRO, Electron Microscope etc.)	Excel, Matlab, Python, TensorFlow/PyTorch, Sklearn, Jupyter

Dr. Supriya Gupta Bani

Name and Signature of PI & Co-PI

Dr. Aarti Karandikar

Name & Signature of Head of Department

Research Internship @RBU

Session: 2025-26

Project Proposal for Research Internship

School: Computer Science and Engineering, Ramdeobaba University

Department: Data Science, CSE-DS

27. Name of the Principal Investigator (PI), Department	Dr. Supriya Gupta Bani Department of Data Science, CSE-DS Ramdeobaba University Nagpur
Place of Work/Department	Department of Data Science, CSE-DS Ramdeobaba University Nagpur
Title of the Project	Renewable Energy Generation Prediction Using Machine Learning and Intelligent Forecasting Models
Brief description of the project	Renewable energy sources such as solar, wind, and hydro are becoming essential components of modern power systems. However, their inherently variable and weather-dependent nature creates challenges for grid stability, load balancing, and energy planning. This project aims to develop **predictive models** capable of forecasting renewable energy generation using real-time and historical data. The project will involve the collection and pre-processing of datasets such as solar irradiation, wind speed, temperature, humidity, past power generation, and grid load.
Expected outcomes of the project	Development of **multiple forecasting models**, including ML and DL-based approaches. Identification of key factors influencing renewable energy generation. Comparative study and **performance evaluation** of prediction models. A **working prediction system or dashboard** demonstrating real-time or day-ahead energy forecasting. A publishable **research paper** in SCOPUS/SCl-indexed journals or conferences.
Possible learning outcomes for the interns	Understanding of **time-series forecasting techniques** and renewable-energy modelling. Hands-on experience in **data pre-processing, feature engineering, and cleaning weather datasets**

Requirements from the interns	

UG / PG Program (Branch)	UG/PG Branch (CSE and allied branches)
Discipline	Computer Science and Engineering
Technical background (eg. Courses that should have been done, topics that should have been known)	Machine learning, Deep Learning, Information retrieval
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipment's such as CRO, Electron Microscope etc.)	Excel, Matlab, Python, TensorFlow/PyTorch, Sklearn, Jupyter

Dr. Supriya Gupta Bani

Name and Signature of PI & Co-PI

Dr. Aarti Karandikar

Name & Signature of Head of Department

Research Internship @RBU

Session: 2025-26

Project Proposal for Research Internship

School: Computer Science and Engineering, Ramdeobaba University

Department: Data Science, CSE-DS

28. Name of the Principal Investigator (PI), Department	Dr. Supriya Gupta Bani Department of Data Science, CSE-DS Ramdeobaba University Nagpur
Place of Work/Department	Department of Data Science, CSE-DS Ramdeobaba University Nagpur
Title of the Project	Energy-aware Resource Allocation in Cloud Data Centres Energy Prediction Models for Virtual Machine (VM) Migration
Brief description of the project	Cloud data centres consume a significant amount of energy due to extensive computing, storage, and networking operations. Inefficient allocation of virtual machines (VMs) and static resource provisioning often lead to energy wastage, increased operational costs, and reduced system performance. This project focuses on designing **energy-aware resource allocation strategies** and developing **energy prediction models for VM migration** in cloud environments. Using real workload traces, system metrics, and virtualization data, we aim to build ML-based models capable of predicting energy consumption patterns during VM allocation, consolidation, and live migration.
Expected outcomes of the project	ML-based **prediction models** for estimating energy usage during VM migration and workload variations. Identification of factors influencing energy consumption in cloud data centers. Performance comparison of different algorithms based on energy savings, migration overhead, and SLA violations. Prototype or dashboard showing **energy forecasting and recommended VM allocation strategies**. Possibility of a **research publication** in cloud computing or energy-efficient systems journals/conferences.
Possible learning outcomes for the interns	Hands-on experience with **resource allocation, load balancing, and VM migration techniques**.

	Practical exposure to building **machine learning models for energy prediction**. Knowledge of energy efficiency challenges in large-scale data centers. Skills in analyzing real cloud workload traces and system metrics.

Requirements from the interns	
UG / PG Program (Branch)	UG/PG Branch (CSE and allied branches)
Discipline	Computer Science and Engineering
Technical background (eg. Courses that should have been done, topics that should have been known)	VM logs, CPU usage, memory utilization, and energy consumption parameters.
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipment's such as CRO, Electron Microscope etc.)	Experience with cloud simulation tools (CloudSim / GreenCloud / iFogSim).

Dr. Supriya Gupta Bani

Name and Signature of PI & Co-PI

Dr. Aarti Karandikar

Name & Signature of Head of Department

Research Internship @RBU
Session: 2025-26
Project Proposal for Research Internship
School:_School of Engineering Sciences_   Department: _Civil_

29. Name of the Principal Investigator (PI), Department	Dr. Tripti Gupta, Department of Civil Engg.
Place of Work/Department	Environmental Engg Lab, Civil Department
Title of the Project	Adsorptive treatment of wastewater using batch / column study.
Brief description of the project	Present research proposal is about adsorptive treatment of wastewater using cost effective adsorbents. The research work will propose an ideal technology to utilize and convert agricultural solid waste into valuable product in the form of adsorbent for the removal of contaminants from wastewater under aqueous phase. The research work will mainly focus on results of experimental work related to batch / column study. Experimental batch/column studies will assist to evaluate contaminant removal efficiency and explore the adsorbent's potential as an eco-friendly alternative to conventional treatment methods.
Expected outcomes of the project	1. Performance comparison with traditional treatment processes. 2. Recommendations for practical application and process optimization. 3. Publication in reputed journals /conferences/book chapters.
Possible learning outcomes for the interns	The learning outcomes for the interns are expected to have: 1. Understanding of sustainable wastewater treatment and its environmental benefits. 2. Opportunities for research publications or IPR activities.
Requirements from the interns	
UG / PG Program (Branch)	UG - B.Tech Civil, PG – M.Tech Civil Engg / Environmental Engg.
Discipline	Environmental Engg, Civil Engineering
Technical background (eg. Courses that should have been done, topics that should have been known)	Environmental Engg. I / Environmental Engg. II / Solid Waste Management / Environmental Impact Assessment / Environmental Pollution/ Rural Sanitation / Sanitary Systems
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Ability to use lab equipment such as spectrophotometer, hot air oven, muffle furnace, weighing balance, distilled water plant, pH meter, water quality analyzer etc.

Dr. Tripti Gupta   **Dr. Rajendra Khapre**

Name and Signature of PI   Name & Signature of Head of Department

Research Internship @RBU

Project   Proposal for

Research Internship

Department: Mechanical Engineering

30. Name of the Principal Investigator (PI), Department	Dr. Yogesh V. Deshpande (PI) Department of Mechanical Engineering, RBU (**Mob No: 9096192751**)
Place of **Work/Department**	Vertical milling centre, CIIIT, RBU, NAGPUR Workshop, Department of Mechanical Engineering, RBU, Nagpur
Title of the Project	**Application of 3D printing technology for the development of customized products**
Brief description of the project	➢ 3D printing can be used to create personalized models. **3D printing**, commonly known as **Additive manufacturing (AM)**, is an emerging technology that is rapidly transforming manufacturing processes worldwide. This revolutionary method creates 3-dimensional objects by successively layering materials under computer control. 3D printing involves layering materials like **plastics, composites, or bio-materials** to create objects that range in shape, size, rigidity, and colour. Compared to traditional subtractive techniques, 3D printing offers immense **design flexibility**, **reduced waste**, and the ability to produce **complex geometries.** ➢ The project aims to combine the **versatility and customization capabilities of 3D printing** with the need for a practical **solution, contributing to** different consumers. For more information regarding previous publication, pl refer https://www.scopus.com/authid/detail.uri?authorId=57201073732
Expected outcomes of the project	➢ Customization and Ergonomic Design ➢ Functional Prototype of product ➢ Rapid Prototyping and Design Iterations
Possible learning outcomes for the interns	The possible learning outcomes for the interns are as follows: ➢ Understanding 3D Printing Technology ➢ Product Design and CAD Software ➢ To patent/publish the research results in SCI/SCOPUS indexed journals

Requirements from the interns	
UG / PG Program	UG/PG

Discipline	Any branch of Engineering
Technical background (eg. Courses that should have been done, topics that should have been known)	No restriction, only elementary knowledge is required.
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipment's such as CRO, Electron Microscope etc.)	No restriction, only elementary knowledge is required.

Dr. Yogesh V. Deshpande (PI)   Dr. Vishal Shukla

Department of Mechanical Engineering, RCOEM   Name & Signature of Head of
Department

Ramdeobaba University, Nagpur

Research Internship @RBU
Session: 2025-26
Project Proposal for Research Internship
School: School of Engineering Sciences
Department: Mechanical Engineering

31. Name of the Principal Investigator (PI), Department	**Dr. Yogesh V. Deshpande (PI)** Department of Mechanical Engineering, RBU (**Mob No: 9096192751**) **Dr. Yogesh Joshi (Co-PI) (Mob: 8669105408)** Department of Mechanical Engineering, RBU
Place of Work/Department	CIIIT, RBU, NAGPUR & Workshop, RBU, Nagpur
Title of the Project	**Modelling and optimization of aircraft material for sustainable development**
Brief description of the project	➢ **Enhancing the materials used in aircraft design** to improve sustainability, performance, and environmental impact. ➢ To create **computational models that simulate and predict the behavior of different materials** under various operating conditions, ensuring they are optimized for **efficiency, safety, and minimal ecological footprint.** For more information regarding previous publication, pl refer https://www.scopus.com/authid/detail.uri?authorId=57201073732
Expected outcomes of the project	➢ Optimized Aircraft Material Selection and Sustainability Assessment ➢ Material Performance Modeling ➢ Weight Reduction and Fuel Efficiency
Possible learning outcomes for the interns	The possible learning outcomes for the interns are as follows: ➢ Understanding Material Selection for Aerospace Applications ➢ Hands-On Experience with Computational Modeling ➢ Optimization Algorithms and Techniques ➢ To patent/publish the research results in SCI/SCOPUS indexed journals

Requirements from the interns	
UG / PG Program	UG/PG
Discipline	Any branch of Engineering

Technical background (eg. Courses that should have been done, topics that should have been known)	No restriction, only elementary knowledge is required.
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipment's such as CRO, Electron Microscope etc.)	No restriction, only elementary knowledge is required.

Dr. Yogesh V. Deshpande (PI)   Dr. B. K. Patle

Department of Mechanical Engineering, RCOEM   Name & Signature of Head of
Department

Dr. Yogesh Joshi (Co-PI)

Department of Mechanical Engineering, RCOEM

Research Internship @RBU

Session: 2025-26

Project Proposal for Research Internship

School: School of Computer Science & Engineering

Department: Department of Artificial Intelligence & Cyber Security (AICS)

32. Name of the Principal Investigator (PI), Department	Dr. Rashmi Welekar, Department of AICS
Name of the Co-Principal Investigator (Co-PI), Department	Dr. Sourabh Prabhat Tiwari, Department of AICS
Place of Work/Department	Department of Artificial Intelligence & Cyber Security (AICS)
Title of the Project	Drone-Based Precision Crop Health Monitoring & Yield Prediction using Multispectral Imaging and Machine Learning
Brief description of the project	The project focuses on drone-based remote sensing for analysing crop health using multispectral and thermal imagery. Vegetation indices such as NDVI, GNDVI, SAVI and Red-Edge will be extracted to detect early crop stress, nutrient deficiency and disease. AI/ML models will correlate aerial image features with ground-truth agronomic parameters for precision farming decisions.
Expected outcomes of the project	Development of a prototype decision-support platform for farmers. **Other Outcomes:** Patent, SCI / Scopus Publications, dataset creation, product development
Possible learning outcomes for the interns	Knowledge of drone handling, aerial imaging, remote-sensing analysis, vegetation index computation, GIS mapping, ML/DL model development, and field-level deployment.

Requirements from the interns	
UG / PG Program (Branch)	UG or PG
Discipline	Any Branch (AI-ML / CSE / ECE / Agriculture preferred)
Technical background (eg. Courses that should have	Basics of Machine Learning, Image Processing, Remote Sensing

been done, topics that should have been known)	
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Python, OpenCV, GIS tools (QGIS/ArcGIS), Pix4D / Agisoft. Interns should have basic knowledge of Machine Learning and Image Processing, with interest in remote sensing and agriculture analytics. Skills in Python, OpenCV, and GIS tools (QGIS/ArcGIS) are preferred.

Name and Signature of PI & Co-PI

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Co-Principal Investigator

Name & Signature of Head of Department

Research Internship @RBU

Session: 2025-26

Project Proposal for Research Internship

School: School of Computer Science & Engineering

Department: Department of Artificial Intelligence & Cyber Security (AICS)

33. Name of the Principal Investigator (PI), Department	Dr. Rashmi Welekar, Department of AICS
Name of the Co-Principal Investigator (Co-PI), Department	Dr. Sourabh Prabhat Tiwari, Department of AICS
Place of Work/Department	Department of Artificial Intelligence & Cyber Security (AICS)
Title of the Project	AI-Based Digital Twin System for Predictive Healthcare Monitoring Using Wearable Bio-signal Data
Brief description of the project	This project develops a digital-twin-based real-time health monitoring system using biosensor data (ECG, SpO$_2$, HRV, body temperature, sleep cycle & stress indicators). ML/DL forecasting models will predict risk of cardiac events, hypertension spikes, and fatigue-based emergencies and provide personalised alert recommendations.
Expected outcomes of the project	Prototype Digital-Twin dashboard and mobile application. **Other Outcomes:** Patent, SCI / Scopus Publication, product prototype
Possible learning outcomes for the interns	Time-series AI modelling, biomedical signal processing, wearable IoT sensor integration, cloud dashboard development, real-time health analytics.

Requirements from the interns	
UG / PG Program (Branch)	UG or PG
Discipline	Any (CSE / AI-ML / Biomedical / ECE preferred)
Technical background (eg. Courses that should have been done, topics that should have been known)	Machine Learning, IoT sensors, Data Analytics
Specific skill set (eg. Programming,	**Python, TensorFlow / PyTorch, Android/Web development, data visualization**. Interns must understand

theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	ML/DL basics and time-series data analysis, with familiarity in IoT wearable sensors. Hands-on skills in Python, TensorFlow/PyTorch, and Android/Web dashboard development will be beneficial.

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Research Internship @RBU

Session: 2025-26

Project Proposal for Research Internship

<u>**School:**</u> **School of Computer Science & Engineering**

<u>**Department:**</u> **Department of Artificial Intelligence & Cyber Security (AICS)**

34. Name of the Principal Investigator (PI), Department	Dr. Rashmi Welekar, Department of AICS
Name of the Co-Principal Investigator (Co-PI), Department	Dr. Sourabh Prabhat Tiwari, Department of AICS
Place of Work/Department	Department of Artificial Intelligence & Cyber Security (AICS)
Title of the Project	Vision-Transformer-Based Smart Traffic Violation Detection & Road-Safety Analytics Using CCTV and Edge-AI
Brief description of the project	The project aims to build an AI-driven real-time traffic monitoring and violation detection system using CCTV video streams and Edge-AI hardware. Vision Transformer and YOLO-based models will detect helmet violation, triple-riding, signal jumping, overspeeding and wrong-lane driving. The system will generate automated alerts and analytics dashboards.
Expected outcomes of the project	Prototype Edge-AI smart CCTV system deployment. **Other Outcomes:** Patent, SCI/Scopus Publications, commercialization potential
Possible learning outcomes for the interns	Object detection & tracking, dataset annotation, edge-AI optimization, automation analytics dashboard development.

Requirements from the interns	
UG / PG Program (Branch)	UG or PG
Discipline	Any Branch (CSE / AI-ML / ENCS / EE preferred)

Technical background (eg. Courses that should have been done, topics that should have been known)	Machine Learning, Image/Video Processing
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	**Python, TensorFlow/PyTorch, OpenCV, Jetson Nano / Raspberry Pi.** Interns should have knowledge of Machine Learning and Computer Vision fundamentals. Skills in Python, OpenCV, YOLO/ViT models, and edge deployment (Jetson / Raspberry Pi) are preferred.

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Name & Signature of Head of Department

Research Internship @RBU, Nagpur

School: CSE   **Department: AICS**

Project Proposal for Research Internships

Session 2025-26

35. Name of Principal Investigator (PI)	Dr. Suresh Balpande
Name of Co-PI	**Dr. Nisarg Gandhewar (AICS) , Dr. Gajanan Nikhade (Mechanical Engg)**
Title of the Project	Anti-Suicide Alert System using Sensors and Machine Learning
Domain	IoT-Based Smart Systems, Safety product
Brief description of the project	The Anti-Suicide Alert System uses sensors and behavioural/activity monitoring devices to identify unusual or high-risk patterns indicative of suicidal tendencies. Machine learning algorithms analyse these patterns in real time to detect potential danger. Upon detection, the system sends alerts to caregivers or healthcare professionals, enabling timely intervention.
Expected outcomes of the project	The concept will be transformed into a product. This approach would be highly beneficial for society. **Other outcomes:** Patent, research publications and copyright(s).
Possible learning outcomes for the interns	• **IoT system design and development**, including architecture planning and device connectivity. • **Sensor integration and calibration** for accurate behavioural and physiological data acquisition. • **Machine learning techniques for behaviour analysis**, including model training, validation, and deployment. • **Real-time alerting and notification system development** using mobile or cloud-based platforms. • **Cloud and IoT communication technologies** for secure data transmission, storage, and visualization.

Requirements from the interns	
UG / PG Program	ANY
Discipline	ANY
Technical background	Interns shall have hands-on experience in ML and IoT system development, and data analytics for human safety.
Specific skill set	Sensor Interfacing, Machine Learning, Sensor Calibration techniques.

Date: 04.12.2025

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Dr. Nisarg Gandhewar
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Dr. Gajanan Nikhade
Dept of Mechanical Engg.
Co-Principal Investigator

Research Internship @RBU, Nagpur

School: CSE   Department: AICS

Project Proposal for Research Internships
Session 2025-26

36. Name of Principal Investigator (PI)	Dr. Suresh Balpande
Name of Co-PI	**Dr. Suraj Butoliya (Chemistry)**
Title of the Project	Machine Learning Prediction of Soil Organic Carbon Using EC and Moisture Data
Domain	Agriculture
Brief description of the project	This dataset will be developed for a portable system designed to determine the concentration of nutrients, including organic carbon, in soil.
Expected outcomes of the project	The concept will be transformed into a tangible output. This approach would be very advantageous for agriculturalists. **Other outcomes:** Patent, and research publications
Possible learning outcomes for the interns	Interns will gain hands-on experience in soil analysis, data collection, and ML models. They will learn to develop, and process datasets related to soil nutrient levels, enhance their skills in analytical techniques, and understand the integration of colorimetric data for agricultural applications. Additionally, interns will improve their problem-solving and research documentation skills.

Requirements from the interns	
UG / PG Program	UG or PG
Discipline	ANY BRANCH
Technical background (eg. Courses that should have been done; topics that should have been known)	EC sensor, NIR sensors or color sensors, reflectance spectrum Machine learning regression model
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipment such as CRO, Electron Microscope etc.)	A student should ideally be familiar with embedded systems, sensors, signal processing, programming, and basic machine learning to implement this project successfully.

Date: 04.12.2025

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Principal Investigator

Dr. Suraj Butoliya
Department for Chemistry
Co-Principal Investigator (Co-PI)

Head of Department

Research Internship @RBU, Nagpur

School: CSE   Department: AICS

Project Proposal for Research Internships

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37. Name of Principal Investigator (PI)	Prof. Suresh Balpande
Name of Co-PI	**Dr. Shubham Anjankar (ENCS)**
Title of the Project	Smart Portable Soil pH Detection System Using Arduino/ESP32 and ML Models
Domain	Agriculture
Brief description of the project	This system would be useful to determine soil pH. The pH of the soil, which may be connected to the concentration of main nutrients, might be established with the help of ML approach.
Expected outcomes of the project	The concept will be transformed into a tangible thing. This approach would be very advantageous for agriculturalists. **Other outcomes:** Patent, and research publications
Possible learning outcomes for the interns	Interns will gain hands-on experience in integrating machine learning models with hardware controllers like Arduino/ESP32. They will learn to design and develop IoT-based systems, analyse sensor data, and apply machine learning techniques. The project will also enhance skills in prototyping, system calibration, and data interpretation.

Requirements from the interns	
UG / PG Program	UG or PG
Discipline	Any
Technical background (eg. Courses that should have been done; topics that should have been known)	Arduino/ESP32, Machine learning and Programming
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipment such as CRO, Electron Microscope etc.)	Arduino programming, Colour Sensor interfacing, Machine Learning techniques, data analysis, Model training, and validation for real-time applications will be valuable.

Note: Preliminary design and other processes are ready.

Date: 04.12.2025

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Principal Investigator

Prof. Shubham Anjankar
Dept of Electronics and Computer Science
Co-Principal Investigator

Head of Department

Research Internship @RBU, Nagpur

School: CSE   Department: AICS

Project Proposal for Research Internships

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38. Name of Principal Investigator (PI)	Prof. Suresh Balpande
Title of the Project	Development of Artificial Intelligence based Smart Classrooms
Domain	Automation
Brief description of the project	This project leverages AI to transform traditional classrooms into intelligent, and automated spaces. It integrates technologies like facial recognition for attendance, and AI-driven analytics to monitor and control various devices. By streamlining classroom management, the solution enhances efficiency and creates an interactive, tech-driven learning environment.
Expected outcomes of the project	Patent, research publications and copyright(s).
Possible learning outcomes for the interns	Research interns working on Artificial Intelligence-based classroom automation can gain hands-on experience in AI model development, integration with IoT devices, and real-world problem-solving. They will enhance their skills in data processing, automation techniques, and deploying intelligent systems in educational settings.

Requirements from the interns	
UG / PG Program	UG or PG
Discipline	Any branch
Technical background (eg. Courses that should have been done, topics that should have been known)	Research interns should have skills in AI techniques such as computer vision, knowledge of Controllers boards, Vision sensor interfacing, and Machine learning.
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Proficiency in programming (Python, TensorFlow) and experience with IoT integration for smart systems are essential for implementing Artificial Intelligence-based solutions

Date: 04.12.2025

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Principal Investigator

Head of Department

Research Internship @RBU, Nagpur

School: CSE   **Department: AICS**

Project Proposal for Research Internships

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39. Name of Principal Investigator (PI)	Dr. Suresh Balpande
Name of Co-PI	Dr. Amit Pimpalkar
Title of the Project	Development of an interface module for detecting adulterants in fruits.
Domain	Agriculture, Food safety
Brief description of the project	The project focuses on developing an interface unit and an Android application to detect adulterants in fruits. It uses sensors and processing circuit to analyse fruit quality and provide real-time results. The system aims to ensure food safety by identifying contaminants efficiently. Interns will work on hardware integration, app development, and data processing.
Expected outcomes of the project	Idea would be converted to product. This product would be very useful for customers, fruit merchants, and other allied agriculture businesses. **Other outcomes:** Patent/ copyright(s), research publications in SCI/Scopus journal
Possible learning outcomes for the interns	Research interns working on the project will gain hands-on experience in system design, sensor integration, and mobile application development. They will develop skills in data acquisition, real-time analysis, and user-friendly interface creation. Additionally, the project enhances problem-solving abilities and fosters a deeper understanding of food safety technologies.

Requirements from the interns	
UG / PG Program	UG or PG
Discipline	ANY BRANCH
Technical background (eg. Courses that should have been done; topics that should have been known)	The research internship requires a strong technical background in embedded systems, and Android application development. Proficiency in programming languages is essential. Knowledge of sensors and data acquisition systems, along with experience in signal processing and machine learning, is highly desirable.
Specific skill set	Android application development, and sensor interfacing. Knowledge of data acquisition, signal processing, and programming languages

Date: 04.12.2025

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Principal Investigator

Dr. Amit Pimpalkar
Dept of AICS
Co-Principal Investigator

Head of Department

Research Internship @RBU

Session: 2025-26

Project Proposal for Research Internship

School: Computer Science and Engineering   **Department:** AICS

40. Name of the Principal Investigator (PI), Department	Dr. Rashmi Welekar, Department of AICS
Name of the Co-Principal Investigator (PI), Department	Dr. Chithraja Rajan, Department of AICS
Place of Work/Department	Department of AICS
Title of the Project	Prediction of electrical characteristics of novel semiconductor devices using Machine Learning
Brief description of the project	• Collect a diverse dataset comprising essential parameters for low-power semiconductor devices. • Apply feature selection and preprocessing techniques to clean and normalize the dataset. • Employ machine learning algorithms to train a predictive model on the refined dataset. The resulting model can then forecast the electrical characteristics of semiconductor devices under different operational conditions.
Expected outcomes of the project	Paper publications, patent, and conference presentations
Possible learning outcomes for the interns	Semiconductor technology and machine learning

Requirements from the interns	
UG / PG Program (Branch)	UG/PG
Discipline	CSE /ECE/EN/ECS/
Technical background (eg. Courses that should have been done, topics that should have been known)	Digital Electronics, Machine Learning
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Python Programming, Soft Skills: Act promptly with new findings and punctuality to follow timeliness.

Dr. Rashmi Welekar   Dr. Rashmi Welekar

Dr. Chithraja Rajan *chithri*
Name and Signature of PI & Co-PI   **Name & Signature of Head of Department**

Research Internship @RBU

Session: 2025-26

Project Proposal for Research Internship

School: Computer Science and Engineering   **Department:** AICS

41. Name of the Principal Investigator (PI), Department	Dr. Rashmi Welekar, Department of AICS
Name of the Co-Principal Investigator (PI), Department	Dr. Chithraja Rajan, Department of AICS
Place of Work/Department	Department of AICS
Title of the Project	A Machine Learning approach to predict sensitivity of a Bio-TFET Biosensor
Brief description of the project	• Collect a diverse dataset comprising essential parameters for low-power Bio-TFET. • Apply feature selection and preprocessing techniques to clean and normalize the dataset. • Employ machine learning algorithms to train a predictive model on the refined dataset. The resulting model can then forecast the sensitivity characteristics of Bio-FET under different operational conditions.
Expected outcomes of the project	Paper publications in SCIE, patent, and conference presentations
Possible learning outcomes for the interns	Learning semiconductor technologies, ML algorithms, python coding and research paper writing skills.

Requirements from the interns	
UG / PG Program (Branch)	UG/PG
Discipline	CSE /ECE/EN/ECS/
Technical background (eg. Courses that should have been done, topics that should have been known)	Digital Electronics, Machine Learning
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Python Programming, Soft Skills: Act promptly with new findings and punctuality to follow timeliness.

Dr. Rashmi Welekar   Dr. Rashmi Welekar

Dr. Chithraja Rajan *chithri*

Name and Signature of PI & Co-PI   **Name & Signature of Head of Department**

Research Internship @RBU

Session: 2025-26

Project Proposal for Research Internship

School: Computer Science and Engineering   **Department:** AICS

42. Name of the Principal Investigator (PI), Department	Dr. Rashmi Welekar, Department of AICS
Name of the Co-Principal Investigator (Co-PI), Department	Dr. Chithraja Rajan, Department of AICS
Place of Work/Department	Department of AICS
Title of the Project	A Machine Learning approach to Predict Electrical Characteristics of a Low power RFET
Brief description of the project	• Collect a diverse dataset comprising essential parameters for RFET. • Apply feature selection and preprocessing techniques to clean and normalize the dataset. • Employ machine learning algorithms to train a predictive model on the refined dataset. The resulting model can then forecast the electrical characteristics of RFET under different operational conditions.
Expected outcomes of the project	Paper publications in SCIE, patent, and conference presentations
Possible learning outcomes for the interns	Semiconductor technology, machine learning algorithms, python coding and research paper writing skills.

Requirements from the interns	
UG / PG Program (Branch)	UG/PG
Discipline	CSE /ECE/EN/ECS/
Technical background (eg. Courses that should have been done, topics that should have been known)	Electronic Devices and Circuits (EDC) and Machine Learning (ML)
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Python Programming, Soft Skills: Act promptly with new findings and punctuality to follow timeliness.

Dr. Rashmi Welekar   Dr. Rashmi Welekar

Dr. Chithraja Rajan *chithri*
Name and Signature of PI & Co-PI   **Name & Signature of Head of Department**

Research Internship @RBU

Session: 2025-26

Project Proposal for Research Internship

School: Computer Science and Engineering   **Department:** AICS

43. Name of the Principal Investigator (PI), Department	Dr. Rashmi Welekar, Department of AICS
Name of the Co-Principal Investigator (PI), Department	Dr. Chithraja Rajan, Department of AICS
Place of Work/Department	Department of AICS
Title of the Project	AI-Powered Materials Discovery: Predict Crystal Structures 100× Faster
Brief description of the project	• Discovering new materials for batteries and quantum computers requires testing hundreds of atomic arrangements with expensive quantum simulations, costing weeks and $5K-20K per material. • We'll train AI models on 1.5 million known materials to predict which structures will be stable before running simulations, achieving 10-100× speedup. • Students will build deep learning models (transformers, graph neural networks), validate with quantum calculations, and create a unified database. • Real-world impact: accelerate clean energy materials from years to months.
Expected outcomes of the project	ML models with >80% accuracy, 1,000+ validated materials, open-source Python package, 1-2 publications in top journals. Demonstrate 10-100× cost reduction. Present at major conferences. First systematic approach combining multi-database reconciliation, physics-informed ML, and uncertainty quantification.
Possible learning outcomes for the interns	Master deep learning (PyTorch, transformers, graph NNs), quantum simulations (DFT), materials databases (Materials Project, JARVIS), API development. Publish papers, present at conferences. Rare AI+science skill combination (high industry demand). Strong portfolio for heigher studies and job. Transferable to drug discovery, climate tech.

Requirements from the interns

UG / PG Program (Branch)	UG/PG
Discipline	CSE /ECE/EN/ECS/
Technical background (eg. Courses that should have been done, topics that should have been known)	Digital Electronics, Machine Learning
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Python Programming, Soft Skills: Act promptly with new findings and punctuality to follow timeliness.

Dr. Rashmi Welekar   Dr. Rashmi Welekar

Dr. Chithraja Rajan *chithi*
Name and Signature of PI & Co-PI   **Name & Signature of Head of Department**

Research Internship @RBU
Session: 2025-26
Project Proposal for Research Internship
School: Computer Science & Engineering   Department: AICS

44. Name of the Principal Investigator (PI), Department	Dr Nisarg Gandhewar, Department of AICS
Name of the Principal Investigator (CO-PI), Department	Dr Amit Pimpalkar, Department of AICS
Place of Work/Department	Department of AICS
Title of the Project	Medical Diagnosis Prediction through a Neuro-Symbolic Approach
Brief description of the project	Diagnosis prediction is a critical task in healthcare, where timely and accurate identification of medical conditions can significantly impact patient outcomes. Traditional machine learning and deep learning models have achieved notable success in this domain but often lack interpretability which is a crucial requirement in clinical settings. Here main objective is to explore the use of neuro-symbolic methods, specifically Logical Neural Networks (LNNs), to develop explainable models for diagnosis prediction.
Expected outcomes of the project	Paper Publication, Conference presentation
Possible learning outcomes for the interns	• Exploration of emerging field Neuro Symbolic AI. • Research paper writing.

Requirements from the interns	
UG / PG Program (Branch)	UG/PG
Discipline	CSE and Allied Branches
Technical background (eg. Courses that should have been done, topics that should have been known)	Machine Learning, Deep Learning, Neural Network
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Python, Tensorflow, Pytorch

Name and Signature of PI & Co-PI   **Name & Signature of Head of Department**

Research Internship @RBU

Session: 2025-26

Project Proposal for Research Internship

School: Computer Science & Engineering   Department: AICS

45. Name of the Principal Investigator (PI), Department	Dr Nisarg Gandhewar, Department of AICS
Name of the Principal Investigator (CO-PI), Department	Dr Amit Pimpalkar, Department of AICS
Place of Work/Department	Department of AICS
Title of the Project	Object Detection Using Spiking Neural Network
Brief description of the project	Spiking neural networks (SNNs) are emerging as a promising evolution in neural network paradigms, offering an alternative to conventional convolutional neural networks (CNNs). One of the most effective methods for SNN development is the CNN-to-SNN conversion process. However, existing conversion techniques are hindered by long temporal durations or inference latencies, which negatively impact the accuracy of the converted networks. Additionally, the application of SNNs in object detection tasks remains largely under-explored.
Expected outcomes of the project	Paper Publication, Conference presentation
Possible learning outcomes for the interns	• Exploration of emerging field Spiking Neural Network. • Research paper writing.

Requirements from the interns	
UG / PG Program (Branch)	UG/PG
Discipline	CSE and Allied Branches
Technical background (eg. Courses that should have been done, topics that should have been known)	Machine Learning, Deep Learning, Neural Network
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Python, Tensorflow, Pytorch

Name and Signature of PI & Co-PI   **Name & Signature of Head of Department**

Research Internship @RBU

Session: 2025-26

Project Proposal for Research Internship

Department of Artificial Intelligence and Cyber Security

46. Name of the Principal Investigator (PI), Department	Prof. Pranali R. Dandekar
Place of Work/Department	**Department of AICS**
Title of the Project	mRNA Vaccine Optimization Using Reinforcement Learning
Brief description of the project	Develop a reinforcement-learning agent that redesigns mRNA sequences, including codon choices, UTRs, and regulatory motifs to maximize predicted protein expression and stability while minimizing problematic secondary structures.
Expected outcomes of the project	Integration of RNA structure-prediction tools (ViennaRNA/EternaFold) with reinforcement learning policy models. Novel methodology treating mRNA as an interactive, manipulable environment for dynamic optimization. Multi-objective reward functions balancing expression, MFE, GC%, and immunogenicity parameters. Advances next-generation vaccine engineering, building on breakthroughs in post-COVID mRNA technology
Possible learning outcomes for the interns	Image processing, Deep learning, Machine Learning,

Requirements from the interns	
UG / PG Program (Branch)	**UG / PG**
Discipline	Computer Science Engineering & Emerging Technology, Information Technology,
Technical background (eg. Courses that should have been done, topics that should have been known)	Image processing, Deep learning, Machine Learning
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Programming in Python,

Name and Signature of PI & Co-PI   Name & Signature of Head of

Department

Prof. P. R. Dandekar   Dr. R. Welekar

Research Internship @RBU

Session: 2024-25

Project Proposal for Research Internship

Department Computer Science, Engineering, and Emerging Technologies

47. Name of the Principal Investigator (PI), Department	Prof. Pranali R. Dandekar
Place of Work/Department	**Department of AICS**
Title of the Project	A deep neural network architecture developed to enhance and restore low-resolution images for improved perceptual quality and accuracy.
Brief description of the project	The projects aim to build a model which would be implemented for processing low resolution images and also help in quality enhancement of the same.
Expected outcomes of the project	Image Denoising Image Quality Enhancement Optimized Resolution Face Tracking Facial Recognition To compare proposed methods with the super resolution method, which will improve accuracy? This system would be very useful for Surveillance by face recognition systems in public places
Possible learning outcomes for the interns	Image processing, Deep learning, Machine Learning,

Requirements from the interns	
UG / PG Program (Branch)	UG / PG
Discipline	Computer Science Engineering & Emerging Technology, Information Technology,
Technical background (eg. Courses that should have been done, topics that should have been known)	Image processing, Deep learning, Machine Learning
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Programming in Python,

Name and Signature of PI & Co-PI   Name & Signature of Head of

Department

Prof. P. R. Dandekar   Dr. R. Welekar

Research Internship @RBU

Session: 2025-26

Project Proposal for Research Internship

Department: Artificial Intelligence and Cyber Security(AICS)

48. Name of the Principal Investigator (PI), Department	Prof. Priya Parkhi Department of Computer Science & Engineering
Place of Work/Department	Department of Computer science & Engineering(AICS), Ramdeobaba University Nagpur
Title of the Project	A Comparative Study of Computation vs. Accuracy Trade-Off in Generative for medical image processing
Brief description of the project	Medical anomaly detection is essential for early diagnosis of conditions such as diabetic retinopathy, cancer, and brain lesions, and recent generative AI methods—particularly Variational Autoencoders (VAE), Generative Adversarial Networks (GAN), and Diffusion Models—have demonstrated strong capability in learning normal anatomical structures and identifying pathological deviations. However, these models differ widely in computational cost, training stability, inference time, and accuracy. This project aims to systematically evaluate the trade-off between computational complexity and diagnostic performance across VAE-, GAN-, and Diffusion-based approaches for medical image anomaly detection, identifying architectures best suited for real-time diagnostics, resource-constrained environments (such as edge devices or low-GPU setups), and high-accuracy clinical applications. The work will involve model implementation, benchmarking, hyperparameter tuning, and comprehensive evaluation on retinal, OCT, and MRI datasets.
Expected outcomes of the project	A comparative performance analysis of VAE, GAN, and Diffusion models based on: • Accuracy, AUC, FID, PSNR • Computational cost (GFLOPs, time per epoch, inference latency, VRAM usage) Identification of the most efficient model for specific diagnostic constraints. A reproducible pipeline for medical anomaly detection using generative models

Possible learning outcomes for the interns	The learner will be able to: • Technical skill in Medical Learning like Preprocessing Medical Images(eg, Normalization, resizing and augmentation) • Implementing advanced segmentation pipeline using Pytorch, Tensoorflow or other deep learning framework • Training and fine tuning model with large-scale, multidimensional medical datasets. • Employing hyperparameter optimization techniques to improve performance • Utilizing GPU for faster model training and deployment

Requirements from the interns	
UG / PG Program (Branch)	UG/PG(CSE and allied Branches)
Discipline	Computer Science and Engineering
Technical background (eg. Courses that should have been done, topics that should have been known)	Machine Learning, Deep Learning
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Python Programming

Priya parkhi

Name and Signature of PI & Co-PI   Name & Signature of Head of Department

Research Internship @RBU

Session: 2025-26

Project Proposal for Research Internship

Department: Artificial Intelligence & Cyber Security

49. Name of the Principal Investigator (PI), Department	Prof. Priya Parkhi Department of Computer Science & Engineering
Place of Work/Department	Department of Computer science & Engineering, Ramdeobaba University Nagpur
Title of the Project	Medical Image anomaly detection using Generative AI
Brief description of the project	Medical image segmentation is a critical process in healthcare enabling precise explanation of anatomical structure, abnormalities or region of interest in medical image such as CT scan, MRI ,X-ray. Integrating generative AI into this task addresses challenges and unlock new possibilities. Medical images contain complex and overlapping structures. Generative AI model such as VAE,GAN , diffusion model etc can learn complex pattern and accurate segment these structure
Expected outcomes of the project	Model should be capable of segmenting medical image with improve precision, IoU and Dice score
Possible learning outcomes for the interns	The learner will be able to: • Technical skill in Medical Learning like Preprocessing Medical Images (eg, Normalization, resizing and augmentation) • Implementing advanced segmentation pipeline using Pytorch, Tensoorflow or other deep learning framework • Training and fine tuning model with large-scale, multidimensional medical datasets. • Employing hyperparameter optimization techniques to improve performance • Utilizing GPU for faster model training and deployment

Requirements from the interns	
UG / PG Program (Branch)	UG/PG(CSE and allied Branches)
Discipline	Computer Science and Engineering
Technical background (eg. Courses that should have been done, topics that should have been known)	Machine Learning, Deep Learning
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Python Programming

Priya parkhi

Name and Signature of PI & Co-PI   Name & Signature of Head of Department

Research Internship @RBU

Session: 2025-26

Project Proposal for Research Internship

School: CSE   Department: CSE (AICS)

50. Name of the Principal Investigator (PI), Department	Dr. Amit Pimpalkar, **CSE (AICS)**
Name of the Co-Investigator (PI), Department	Dr. Nisarg Gandhewar, **CSE (AICS)**
Place of Work/ Department	**CSE (AICS)**
Title of the Project	Autonomous Hypothesis-Driven Agentic AI Enabled Deep Multi-Omics Modelling of Tumour Biology
Brief description of the project	This project will develop and apply advanced Agentic AI frameworks to tackle a central challenge in modern oncology: integrating and interpreting complex multi-omics data. Cancer arises from intertwined genomic, transcriptomic, proteomic, and metabolomic changes, yet understanding how these layers interact remains difficult. Although high-throughput technologies provide rich molecular profiles, conventional computational approaches struggle with the scale, noise, and heterogeneity of such datasets. To address this, the project will design AI agents capable of autonomously analysing multi-omics data, generating and testing hypotheses, and collaborating to build unified models of tumour biology. By mimicking key aspects of scientific inquiry, these agents aim to reveal novel biomarkers, identify actionable molecular pathways, and deepen our systems-level understanding of cancer mechanisms and therapeutic vulnerabilities.
Expected outcomes of the project	The expected outcomes of the project include: 1. **Integrated Multi-Omics Intelligence:** Creation of Agentic AI systems capable of unifying genomic, transcriptomic, proteomic, and metabolomic data into coherent, interpretable models, overcoming current barriers of scale and heterogeneity. 2. **Discovery of Novel Biomarkers:** Identification of previously unrecognised diagnostic and prognostic biomarkers through autonomous hypothesis generation and systematic exploration of complex molecular patterns. 3. **Actionable Biological Insights:** Mapping of critical molecular pathways and mechanistic drivers of tumour progression and

	therapeutic resistance, providing new targets for intervention and supporting precision oncology strategies.
	4. **AI-Driven Scientific Workflows:** Establishment of a reproducible, agent-based framework that mimics scientific reasoning, enabling automated hypothesis testing, model refinement, and collaborative analysis, ultimately accelerating discovery across cancer research.
Possible learning outcomes for the interns	Interns will have the opportunity to enhance a wide range of skills, including: 1. Research and critical thinking 2. Improve on their technical skills and languages proficiency 3. Writing and verbal communication 4. Develop their teamwork and leadership skills 5. Understanding the workplace and organizational concepts

Requirements from the interns	
UG / PG Program (Branch)	UG or PG
Discipline	Computer Science & Engineering, MCA, Biomedical Engineering, Electronics Engineering, Electronics & Computer Science, Electronics & Communication Engineering, Electronics Design Technology
Technical background (eg. Courses that should have been done, topics that should have been known)	Data Structures and Algorithms, Machine Learning techniques, Data Analytics, Web Technologies Interns should also set cognitive development goals for themselves, focusing on learning and applying new knowledge and skills related to the project's domain.
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	• Proficiency in programming, particularly in Python, and experience with machine learning libraries (e.g., PyTorch, TensorFlow, Scikit-learn). • A solid understanding of large language models, Agentic AI, foundational AI models and oncology is highly desirable • Excellent analytical and problem-solving skills, with the ability to think creatively and work independently. • A solid understanding of molecular biology, genomics, or cancer biology is a plus • Front-end technologies like HTML, CSS, and JavaScript would be beneficial.

Dr. Amit Pimpalkar   **Dr. Rashmi Welekar**
Name and Signature of PI   Name & Signature of Head of Department

Dr. Nisarg Gandhewar
Name and Signature of Co-PI

Research Internship @RBU

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Project Proposal for Research Internship

School: CSE   Department: CSE (AICS)

51. Name of the Principal Investigator (PI), Department	**Dr. Amit Pimpalkar, CSE (AICS)**
Name of the Co-Investigator (PI), Department	**Dr. Nisarg Gandhewar, CSE (AICS)**
Place of Work/ Department	**CSE (AICS)**
Title of the Project	Discovering Data Analytics for Predictive Safety Solutions and Applications using AI
Brief description of the project	The project aims to develop a mobile application that utilizes machine learning, deep learning and wearable devices to enhance women's safety and prevent violence against women, cybercrime, online harassment, and cyberbullying. Wearable devices such as Google Glass, Fitbit, and iWatch will be used to collect data, which will be analyzed using machine learning, deep learning techniques to identify patterns and make predictions about behaviour. The project's complexity is moderate, and the applicants will learn principles and basic skills for conducting research, skills for paper and patent writing, and gain knowledge in machine learning, deep learning and Android programming.
Expected outcomes of the project	The expected outcomes of the project include: 1. Predictive Safety Solutions: An AI-powered women's safety app can help prevent sexual harassment, violence, and molestation by collecting, recognizing, and interpreting patterns to provide users with pre-generated reports. For example, the app can evaluate different routes to a destination based on previously collected data and suggest the safest route. 2. Women's Health and Safety: AI can provide innovative solutions to the unique challenges faced by women, including tools for women's health and safety, career guidance and skill-building platforms, financial and business management solutions for women entrepreneurs, and education and learning resources for girls and women. AI-powered solutions can also help reduce gender inequality in various areas such as healthcare, education, and employment.

	3. Femtech Companies: There are notable AI-powered companies working in the field of femtech, using artificial intelligence to transform women's health. These companies use AI to provide real-world data and insights on women's and reproductive health, pre-diagnose fertility-related illnesses, endometriosis, breast cancer, and more.
Possible learning outcomes for the interns	Interns will have the opportunity to enhance a wide range of skills, including: 1. Research and critical thinking 2. Improve on their technical skills and languages proficiency 3. Writing and verbal communication 4. Develop their teamwork and leadership skills 5. Understanding the workplace and organizational concepts

Requirements from the interns	
UG / PG Program (Branch)	UG or PG
Discipline	Computer Science & Engineering, MCA, Biomedical Engineering, Electronics Engineering, Electronics & Computer Science, Electronics & Communication Engineering, Electronics Design Technology
Technical background (eg. Courses that should have been done, topics that should have been known)	Data Structures and Algorithms, Machine Learning techniques, Data Analytics, Cyber Security, Mobile Applications Interns should also set cognitive development goals for themselves, focusing on learning and applying new knowledge and skills related to the project's domain.
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Android/IOS Programming, Python Programming, Database Systems Front-end technologies like HTML, CSS, and JavaScript would be beneficial.

Dr. Amit Pimpalkar
Name and Signature of PI

Dr. Rashmi Welekar
Name & Signature of Head of Department

Dr. Nisarg Gandhewar
Name and Signature of Co-PI

Research Internship @RBU

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Project Proposal for Research Internship

School: CSE   Department: CSE (AICS)

52. Name of the Principal Investigator (PI), Department	**Dr. Amit Pimpalkar, CSE (AICS)**
Name of the Co-Investigator (PI), Department	**Dr. Nisarg Gandhewar, CSE (AICS)**
Place of Work/ Department	**CSE (AICS)**
Title of the Project	A Data-Driven Framework for Accurate Identification and Classification of DNA Sequences in Human Genomics
Brief description of the project	Identifying and classifying DNA sequences is a crucial task in genomics analysis. Deep learning models have shown great potential in this area, with various architectures being proposed to improve accuracy and efficiency. The research should introduce an innovative framework, the Efficient model, for identifying and classifying DNA sequences in genomics research. Using the hierarchical learning capabilities of AI model autonomously extracts intricate features from raw DNA sequences, capturing local and global patterns critical for genomic understanding.
Expected outcomes of the project	The expected outcomes of the project include: 1. The primary goal would be to achieve higher accuracy in identifying and classifying DNA sequences compared to existing models. This could be demonstrated through rigorous evaluation on benchmark datasets and comparisons with state-of-the-art models. 2. The model should exhibit robust generalization capabilities, performing well on diverse datasets and under various conditions. 3. Demonstrate the model's ability to autonomously extract hierarchical features from raw DNA sequences. This could involve showcasing its capability to capture local patterns (e.g., motifs) and global patterns (e.g., genomic structures) that are essential for a comprehensive understanding of genomics. 4. Demonstrate the practical utility of the model in real-world genomics applications. This could include its use in disease diagnosis, drug discovery, or other areas of genomic research. 5. Publish the findings in reputable scientific journals or conferences to contribute to the academic knowledge base in genomics learning.

Possible learning outcomes for the interns	Interns will have the opportunity to enhance a wide range of skills, including: 1. Research and critical thinking 2. Improve on their technical skills and languages proficiency 3. Writing and verbal communication 4. Develop their teamwork and leadership skills 5. Understanding the workplace and organizational concepts
Requirements from the interns	
UG / PG Program (Branch)	UG or PG
Discipline	Computer Science & Engineering, MCA, Biomedical Engineering, Electronics Engineering, Electronics & Computer Science, Electronics & Communication Engineering, Electronics Design Technology
Technical background (eg. Courses that should have been done, topics that should have been known)	Data Structures and Algorithms, Machine Learning techniques, Data Analytics Interns should also set cognitive development goals for themselves, focusing on learning and applying new knowledge and skills related to the project's domain.
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Python Programming, Database Systems Front-end technologies like HTML, CSS, and JavaScript would be beneficial.

Dr. Amit Pimpalkar
Name and Signature of PI

Dr. Rashmi Welekar
Name & Signature of Head of Department

Dr. Nisarg Gandhewar
Name and Signature of Co-PI

Research Internship @RBU

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Project Proposal for Research Internship

School: CSE   Department: CSE (AICS)

53. Name of the Principal Investigator (PI), Department	**Dr. Amit Pimpalkar, CSE (AICS)**
Name of the Co-Investigator (PI), Department	**Dr. Suresh Balpande, CSE (AICS)**
Place of Work/ Department	**CSE (AICS)**
Title of the Project	**A Decision Support System for Automated Hearing Loss Diagnosis Using EEG and AEP Signals**
Brief description of the project	This project focuses on developing a decision support system for the early detection and classification of hearing loss using advanced artificial intelligence (AI) techniques. By analyzing Electroencephalogram (EEG) signals and Auditory Evoked Potentials (AEPs), the system identifies patterns linked to different types and degrees of hearing loss. The framework leverages machine learning algorithms to enhance diagnostic accuracy, offering clinicians a reliable, non-invasive, and automated solution. It aims to improve early intervention by providing real-time insights and reducing diagnostic ambiguity. This innovative approach bridges neuroscience and AI, revolutionizing how auditory impairments are detected and managed in clinical and research settings.
Expected outcomes of the project	The expected outcomes of the project include: 1. Enhanced Diagnostic Accuracy: The system will provide precise identification and classification of hearing loss types, reduce misdiagnoses and improve patient outcomes. 2. Early Detection Capabilities: By analyzing subtle changes in EEG and AEP signals, the system will enable the early identification of hearing impairments, facilitating timely interventions. 3. Automated and Scalable Solution: The AI-driven framework will offer a fully automated, efficient, and scalable diagnostic tool suitable for diverse clinical settings.

Possible learning outcomes for the interns	Interns will have the opportunity to enhance a wide range of skills, including: 1. Research and critical thinking 2. Improve on their technical skills and languages proficiency 3. Writing and verbal communication 4. Develop their teamwork and leadership skills 5. Understanding the workplace and organizational concepts
Requirements from the interns	
UG / PG Program (Branch)	UG or PG
Discipline	Computer Science & Engineering, MCA, Biomedical Engineering, Electronics Engineering, Electronics & Computer Science, Electronics & Communication Engineering, Electronics Design Technology
Technical background (eg. Courses that should have been done, topics that should have been known)	Understanding of signal acquisition, filtering, and analysis techniques, especially for EEG and AEP signals. Experience in working with time-series data, Fourier transforms, wavelet analysis, and feature extraction. Basic understanding of auditory physiology, EEG, and evoked potentials. Skills in handling noisy data, artefact removal, and normalization techniques. Machine Learning techniques, Data Analytics
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Proficiency in Python, MATLAB, or R for data analysis and model implementation. Hands-on experience with EEG/AEP data processing tools (e.g., EEGLAB, MNE-Python).

Dr. Amit Pimpalkar
Name and Signature of PI

Dr. Rashmi Welekar
Name & Signature of Head of Department

Dr. Suresh Balpande
Name and Signature of Co-PI

Research Internship @RBU

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Project Proposal for Research Internship

School: CSE   Department: CSE (AICS)

54. Name of the Principal Investigator (PI), Department	**Dr. Amit Pimpalkar, CSE (AICS)**
Place of Work/ Department	**CSE (AICS)**
Title of the Project	A System for Condensing and Simplifying Textual Information using Natural Language Approach in Regional Language
Brief description of the project	The project aims to develop a system that can condense and simplify textual information in regional languages using natural language processing techniques. The system will use text summarization and simplification techniques, as well as the analysis of discourse-level aspects of syntactically rewriting text. The system will practice various natural language processing techniques, including clause and appositive identification and attachment, pronoun resolution, and referring-expression generation. The project will not only lead to the development of a system that condenses and simplifies textual information but also improves comprehension for language learners and enhances topic detection and characterization in the regional language. The project will involve the use of front-end development, database management, collaboration and communication, and project management methodologies.
Expected outcomes of the project	1. The project can develop a system that condenses a given document into a required size while preserving the information contained in the original source document. 2. The system can reduce the grammatical complexity of the text while retaining its information content and meaning, making it more accessible to a wider audience. 3. Shorter, simpler sentences and a consistent format can make the content more comprehensible for language learners. 4. The project can develop a methodology to represent textual documents as probabilities of words and discover thematic information, leading to improved topic detection and characterization.

Possible learning outcomes for the interns	Interns will have the opportunity to enhance a wide range of skills, including: 1. Research and critical thinking 2. Improve on their technical skills and languages proficiency 3. Writing and verbal communication 4. Develop their teamwork and leadership skills 5. Understanding the workplace and organizational concepts

Requirements from the interns	
UG / PG Program (Branch)	UG or PG
Discipline	Computer Science & Engineering, MCA, Electronics & Computer Science
Technical background (eg. Courses that should have been done, topics that should have been known)	Data Structures and Algorithms, Machine Learning techniques Interns should also set cognitive development goals for themselves, focusing on learning and applying new knowledge and skills related to the project's domain.
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Python Programming Front-end technologies like HTML, CSS, and JavaScript would be beneficial.

Dr. Amit Pimpalkar
Name and Signature of PI

Dr. Rashmi Welekar
Name & Signature of Head of Department

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Ramdeobaba University, Nagpur
Research & Development Cell

Research Internship @RBU
Session: 2025-26
Project Proposal for Research Internship
Department: Artificial Intelligence & Cyber Security

55. Name of Principal Investigator (PI)	Dr. Yogesh Thakre
Place of Work/Department	Artificial Intelligence & Cyber Security
Title of the Project	Intelligent Handover Decision Algorithm for Future HetNets Using Machine Learning Techniques
Brief description of the project	Despite their benefits, ultra-dense HetNets face a major challenge of frequent handovers (FHO), leading to increased ping-pong events and radio link failures, which significantly degrade network performance. To address this, an intelligent ML-based handover decision mechanism is essential for improving accuracy, reducing unnecessary handovers, and enhancing overall system efficiency in next-generation wireless networks.
Expected outcomes of the project	An improved Handover decision algorithm will be developed by using an ML concept. MATLAB and Python can be used to simulate and analyse the performance of 5G HetNet systems. The performance analysis will be compared with the existing ML and non-ML algorithms. **Outcome:** research publications (SCI/SCOPUS/ESCI)
Possible learning outcomes for the interns	Machine learning, Networking and protocols

Requirements from the interns	
UG / PG Program	UG
Discipline	Computer Science and Engineering
Technical background (eg. Courses that should have been done; topics that should have been known)	Machine Learning techniques, Website interface
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipment such as CRO, Electron Microscope etc.)	Machine Learning, Computer Network, Python Language

Dr. Yogesh Thakre
Name and Signature of PI & Co-PI

Dr. Rashmi Welekar
Name & Signature of Head of Department

Research Internship @RBU
Session: 2025-26
Project Proposal for Research Internship
Department: Artificial Intelligence & Cyber Security

56. Name of the Principal Investigator (PI), Department	Dr. Yogesh Thakre
Place of Work/Department	Artificial Intelligence & Cyber Security
Title of the Project	Automated Tagging of Software Engineering Textual Data Using Deep Learning Models
Brief description of the project	Software engineering produces vast textual data combining code, jargon, and natural language, posing challenges in classification and tagging on platforms like Stack Overflow. To address this, models using CNNs (with and without skip connections) and LSTMs were developed for automated tagging.
Expected outcomes of the project	Idea would be converted to web application which will provide better accuracy and scalable solution. **Outcome:** research publications (SCI/SCOPUS/ESCI)
Possible learning outcomes for the interns	Machine learning, deep learning, Android application/Web application development

Requirements from the interns	
UG / PG Program (Branch)	UG
Discipline	Computer Science & Engineering (CS/AIML/DS)
Technical background (eg. Courses that should have been done, topics that should have been known)	Machine Learning techniques, Deep Learning, Python Programming,
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Natural Language Processing, Mathematics & Statatics

Dr. Yogesh Thakre   Dr. Rashmi Welekar
Name and Signature of PI & Co-PI   Name & Signature of Head of Department

Research Internship @RBU

Session: 2025-26

Project Proposal for Research Internship

School: Computer Science and Engineering   Department: AICS

57. Name of the Principal Investigator (PI), Department	PI : Dr. Rashmi Welekar Co-PI : Dr. Charanjeet Dadiyala
Place of Work/Department	Department of Artificial Intelligence and Cyber Security
Title of the Project	Natural Language Command-Line Interface for Secure Automation
Brief description of the project	This project idea creates an intelligent desktop automation system that leverages natural language processing, LLM-based reasoning, MCP-driven tool orchestration, and pseudo-terminal (PTY) execution. The system enables users to perform complex system operations—including file management, application launching, network operations, browser operations, web searches and multi-step workflows—through simple conversational instructions. Therefore, there is a need for a secure, efficient, and accessible system that democratizes system-level automation for both technical and non-technical user
Expected outcomes of the project	1. Natural language system control for all users 2. Automation boosts productivity by up to 80% 3. Validation ensures secure, error-free execution 4. Built-in learning improves command-line skills
Possible learning outcomes for the interns	• Apply NLP and LLMs to real system automation tasks • Implement secure validation for safe command execution • Integrate tools into cohesive orchestration workflows

Requirements from the interns	
UG / PG Program (Branch)	B.Tech. CSE
Discipline	Cyber Security
Technical background (e.g. Courses that should have been done, topics that should have been known)	- CS and programming fundamentals - Operating Systems - Computer Networks - Cybersecurity
Specific skill set (e.g. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	- Programming - Theoretical reasoning & problem-solving - System & CLI use - Cybersecurity & AI integration

PI   : Dr. Rashmi Welekar   **Dr. Rashmi Welekar**
Co-PI : Dr. Charanjeet Dadiyala   **Head of Department**

Research Internship @RBU

Session: 2025-26

Project Proposal for Research Internship

School: Computer Science and Engineering   Department: AICS

58. Name of the Principal Investigator (PI), Department	PI: Dr. Charanjeet Dadiyala Co-PI: Dr. Rashmi Welekar
Place of Work/Department	Department of Artificial Intelligence and Cyber Security
Title of the Project	Understanding Human Emotions Through Facial Micro-Expressions Using AI
Brief description of the project	This project aims to build an AI system that can understand what a person is really feeling by studying tiny, quick changes on their face, known as micro-expressions. These expressions happen so fast, often in a fraction of a second, that most people don't even notice them. But they reveal genuine emotions such as stress, fear, anger, sadness, or happiness, even when someone tries to hide how they feel. In this project, we will use video footage of a person's face and let the AI analyse important regions like the eyes, eyebrows, and lips. The system will observe small movements frame by frame and use them to understand the person's true emotional state. This technology can support areas like mental health, security, online learning, and customer service by helping us better interpret how people feel in real time.
Expected outcomes of the project	• A functional AI model that can detect micro-expressions • Real-time emotion recognition • More accurate and reliable emotion detection • Training on trusted micro-expression datasets • A clear and user-friendly output
Possible learning outcomes for the interns	• Gain hands-on skills in facial feature extraction, video frame analysis, and micro-expression detection • Build, tune, and evaluate deep learning models using trusted micro-expression datasets.

	• Understand real-world applications of emotion recognition

Requirements from the interns	
UG / PG Program (Branch)	B.Tech. CSE
Discipline	CSE and Allied Branches
Technical background (e.g. Courses that should have been done, topics that should have been known)	Computer Vision & Image Processing Machine Learning & Deep Learning Statistics & Signal Processing
Specific skill set (e.g. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Programming & Tools Analytical Reasoning Applied Research Skills

PI: Dr. C. Dadiyala   **Dr. Rashmi Welekar**
Co-PI: Dr. Rashmi Welekar   **Head of Department**

Research Internship @RBU

Session: 2025-26

Project Proposal for Research Internship

School: Computer Science and Engineering   Department: AICS

59. Name of the Principal Investigator (PI), Department	Dr. Charanjeet Dadiyala
Place of Work/Department	Department of Artificial Intelligence and Cyber Security
Title of the Project	AI-Driven Multi-Modal Testing and Security Prioritisation for Large-Scale Codebases
Brief description of the project	This research designs a private AI framework for recursively analyzing large codebases to identify security-sensitive components and suggest automated software security improvements. The framework integrates a multi-modal testing approach - static, dynamic, dependency scanning, and automated unit-test synthesis into an intelligent pipeline. A key element is an on-premises LLM-based analysis engine that prevents confidential enterprise code exposure, a critical adoption barrier. This framework advances secure software engineering by providing automated vulnerability detection, patch recommendations, and secure test generation while preserving software logic and architecture.
Expected outcomes of the project	5. A privacy-preserving AI framework for code analysis. 6. Recursive codebase mapping and components risk identification 7. Multi-modal security testing such as Static analysis, Dynamic analysis, dependency & vulnerability scanning. 8. Intelligent Security Patch Suggestions (Detect vulnerabilities, suggest secure code, etc.)
Possible learning outcomes for the interns	• Gain hands-on experience with multi-modal security testing such as static, dynamic, dependency, unit-test synthesis. • Understand secure coding practices and vulnerability detection in large-scale codebases • Explore integration of private on-premises AI/LLM engines for secure analysis

	• Develop skills in automated pipelines for vulnerability detection, patching, and secure test generation

Requirements from the interns	
UG / PG Program (Branch)	B.Tech. CSE
Discipline	Cyber Security
Technical background (e.g. Courses that should have been done, topics that should have been known)	- CS fundamentals - Software engineering & testing - Cybersecurity basics - AI/ML exposure
Specific skill set (e.g. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	- Programming - Theoretical reasoning & problem-solving - Software testing & automation - Cybersecurity & AI integration

Name and Signature of PI & Co-PI　　　　**Name & Signature of Head of Department**

Research Internship @RBU

Session: 2025-26

Project Proposal for Research Internship

School: Computer Science and Engineering

Department: AICS & Data Science

60. Name of the Principal Investigator (PI), Department	PI: Dr. Charanjeet Dadiyala Co-PI: Prof. Neha Tirpude
Place of Work/Department	Department of Artificial Intelligence and Cyber Security/ Data Science
Title of the Project	Comparative Analysis of Machine Learning Algorithms for Predicting Heating and Cooling Loads in Residential Buildings
Brief description of the project	• This research compares Linear Regression, Random Forest, and XGBoost for predicting building energy loads. • Using the UCI Energy Efficiency Dataset, models are tuned with GridSearchCV for optimal performance. • The goal is to find the most reliable model to guide energy-efficient building design.
Expected outcomes of the project	1. Optimized ML pipeline delivering accurate heating and cooling load predictions. 2. Comparative analysis of baseline vs. tuned Linear, Random Forest, and XGBoost models. 3. Validated results and visual insights from heatmaps and error plots.
Possible learning outcomes for the interns	• Hands-on skills in regression models, hyperparameter tuning, and performance evaluation. • Data visualization expertise through correlation heatmaps and prediction error analysis. • Applied domain knowledge on how ML supports energy-efficient building design.

Requirements from the interns	
UG / PG Program (Branch)	B.Tech. CSE
Discipline	CSE and Allied Branches
Technical background (e.g. Courses that should have been done, topics that should have been known)	Core Machine Learning Data Science Statistics & Probability Programming Foundations
Specific skill set (e.g. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Programming & Tools Analytical Reasoning Applied Knowledge

PI: Dr. Charanjeet Dadiyala   **Dr. Rashmi Welekar**
Co-PI: Prof. Neha Tirpude   **Head, AICS**

Research Internship @RBU

Session: 2025-26

Project Proposal for Research Internship

School: CSE   **Department: AICS**

61. Name of the Principal Investigator (PI), Department	Prof. Dev Mukherjee, AICS
Place of Work/Department	Department of Artificial Intelligence and Cyber Security
Title of the Project	**Lightweight Statistical Detection of Adversarial Inputs in Security Machine-Learning Systems**
Brief description of the project	Machine learning models used in cybersecurity—such as for malware classification or intrusion detection—can be tricked by crafted (adversarial) inputs that look normal but are intentionally modified to fool the model. This project focuses on building a simple, lightweight system that uses basic statistical features (e.g., distributional variations, anomaly scores) to detect such manipulated inputs. The work will involve using small, publicly available datasets, implementing basic ML models, and applying simple statistical tests to identify abnormal patterns.
Expected outcomes of the project	• A working prototype that flags suspicious inputs using lightweight anomaly metrics. • A small evaluation comparing normal vs adversarial samples. • A research publication discussing detection accuracy, limitations, and recommendations.
Possible learning outcomes for the interns	• Understanding adversarial attacks in a simplified, beginner-friendly way. • Exposure to designing basic ML-driven security tools. • Skills in handling datasets, implementing simple models, and interpreting results. • Experience in empirical research methodology and result reporting.

Requirements from the interns	
UG / PG Program (Branch)	B.Tech Computer Science and Engineering (Cyber Security)
Discipline	Cyber Security

Technical background (eg. Courses that should have been done, topics that should have been known)	• Basic understanding of Python or any programming language. • Basic understanding of data processing (arrays, CSV files). • Familiarity with introductory machine-learning concepts is helpful, not mandatory.
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	• Willingness to explore datasets and try small experiments. • Ability to learn from examples and work independently. • Basic coding habits (writing simple scripts, debugging). • Curiosity in ML security problems.

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School: CSE   **Department: AICS**

62. Name of the Principal Investigator (PI), Department	Prof. Dev Mukherjee, AICS
Place of Work/Department	Department of Artificial Intelligence and Cyber Security
Title of the Project	**Feasibility Study of Post-Quantum Cryptographic Algorithms on Resource-Limited Devices**
Brief description of the project	Post-quantum cryptographic (PQC) algorithms are designed to withstand attacks from future quantum computers. This project investigates how suitable these algorithms are for small or resource-constrained devices like embedded systems, IoT boards, or low-power CPUs. Interns will run simple experiments using PQC libraries on a laptop or Raspberry Pi and measure basic performance parameters such as execution time and memory usage.
Expected outcomes of the project	• Benchmark results for 2–3 PQC algorithms (e.g., ML-KEM/Kyber, ML-DSA/Dilithium). • A comparative analysis between PQC and traditional methods (e.g., RSA/ECC). • A research publication summarising the feasibility for IoT/CPS applications.
Possible learning outcomes for the interns	• Introduction to post-quantum cryptography in a practical and simplified form. • Experience running experiments and recording performance metrics. • Understanding how cryptographic choices affect system performance. • Development of research habits: writing results, comparing, interpreting trade-offs.

Requirements from the interns	
UG / PG Program (Branch)	B.Tech Computer Science and Engineering (Cyber Security)
Discipline	Cyber Secuirty
Technical background (eg. Courses that should	• Basic programming (Python/C) familiarity.

have been done, topics that should have been known)	• Basic understanding of what encryption means (high-level). • No prior knowledge of quantum computing required.
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	• Ability to follow documentation of cryptographic libraries. • Patience in running repeated tests for measurement. • Good note-taking and data-recording discipline. • Problem-solving mindset when minor errors occur in compilation or setup.

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Research Internship @RBU

Session: 2025-26

Project Proposal for Research Internship

School: CSE   **Department: AICS**

63. Name of the Principal Investigator (PI), Department	Prof. Dev Mukherjee, AICS
Place of Work/Department	Department of Artificial Intelligence and Cyber Security
Title of the Project	**Evaluating Prompt-Injection and Jailbreak Vulnerabilities in Large Language Models**
Brief description of the project	Large Language Models (LLMs) are vulnerable to certain crafted prompts that force them to generate unintended, unsafe, or policy-breaking responses. This project aims to systematically test different LLMs using a curated set of malicious prompts and measure how often the models fail to resist such attacks. The project will also explore simple mitigation strategies such as rewriting user prompts, filtering suspicious inputs, or detecting anomalies in the text.
Expected outcomes of the project	• A small test suite of prompt-injection and jailbreak attacks. • Evaluation of 2–3 LLMs (open-source or API-based). • A short analysis of attack success rates and effectiveness of simple mitigations. • A final research publication proposing a basic framework or guidelines for safer LLM usage.
Possible learning outcomes for the interns	• Understanding how LLM vulnerabilities arise and how attacks work. • Experience with designing tests and evaluating AI model behaviour. • Improved writing, prompt-crafting, and analytical skills. • Insight into emerging AI security research practices.

Requirements from the interns	
UG / PG Program (Branch)	B.Tech Computer Science and Engineering (Cyber Security)
Discipline	Cyber Secuirty

Technical background (eg. Courses that should have been done, topics that should have been known)	• Basic familiarity with Python or web-based AI tools. • Basic understanding of what LLMs are (high-level). • No ML or NLP expertise required.
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	• Curiosity about AI behaviour and willingness to experiment. • Discipline in documenting prompts, model responses, and observations. • Creativity in designing new test prompts. • Ethical mindset and responsible handling of AI safety topics.

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Research & Development Cell

Research Internship @RBU

Session: 2025-26

Project Proposal for Research Internship

School: Computer Science & Engineering   Department: AICS

64. Name of the Principal Investigator (PI), Department	Prof, Kaushik Roy
Place of Work/Department	Department of Artificial Intelligence and Cyber Security
Title of the Project	Sports video analysis and event detection
Brief description of the project	This project focuses using deep learning techniques, especially computer vision and temporal modelling. The system will extract player movements, identify important segments of the game, classify actions, and generate structured insights that can support analytics, coaching, broadcasting, and performance evaluation.
Expected outcomes of the project	1. A working prototype model for event detection in selected sports 2. A labeled dataset curated from publicly available sports videos with annotations for key events. 3. Implementation of deep learning pipelines including preprocessing, detection, tracking, and classification. 4. Performance evaluation by comparing different architectures (CNN, 3D CNNs, LSTM, Transformers, YOLO-based detectors, SlowFast networks, etc.). 5. Visualization of display detected events on video timelines. 6. Research publication
Possible learning outcomes for the interns	1. Understanding of sports video datasets, annotation processes, and preprocessing techniques. 2. Hands-on experience in deep learning for video, including spatial–temporal modeling. 3. Familiarity with object detection and tracking frameworks for players and ball tracking.

	4.Model training, hyperparameter tuning, evaluation, and metrics for video analytics. 5.Exposure to state-of-the-art architectures such as:YOLOv8 / YOLOv10,Vision Transformers,3D CNNs, SlowFast Networks, Pose Estimation models (OpenPose, MediaPipe)

Requirements from the interns	
UG / PG Program (Branch)	BTech students from CSE and allied branches
Discipline	CSE, IT, Cyber, DS, AIML,EC
Technical background (eg. Courses that should have been done, topics that should have been known)	1.Strong proficiency in **Python** 2.Experience with deep learning frameworks: 3.Training and fine-tuning CNNs, RNNs, 3D CNNs, Transformers 4.Implementing object detection (YOLO, Faster R-CNN)
Specific skill set	• Python, • PyTorch (preferred), • TensorFlow/Keras

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Research Internship @RBU

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Project Proposal for Research Internship

School: Computer Science & Engineering   Department: AICS

65. Name of the Principal Investigator (PI), Department	Prof, Kaushik Roy
Place of Work/Department	Department of Artificial Intelligence and Cyber Security
Title of the Project	Detection and Tracking of player movements in team sports using Hybrid Deep learning Algorithms
Brief description of the project	This project focuses using deep learning techniques, along with computer vision that will recognize player movements, identify important segments of the game, classify actions, and generate structured insights for performance evaluation.
Expected outcomes of the project	1. A working prototype model for event detection in selected sports 2. A labeled dataset curated from publicly available sports videos with annotations for key events. 3.Implementation of deep learning frameworks. 4.Visualization of display detected events on video timelines. 6.Research publication
Possible learning outcomes for the interns	1.Understanding of sports video datasets and annotation processes. 2.Hands-on experience in deep learning for video. 3.Familiarity with object detection and tracking frameworks for players movements. 4.Model training, hyperparameter tuning, evaluation, and metrics for video analytics.

Requirements from the interns

UG / PG Program (Branch)	BTech students from CSE and allied branches
Discipline	CSE, IT, Cyber, DS, AIML,EC
Technical background (eg. Courses that should have been done, topics that should have been known)	1.Strong proficiency in Python 2.Training and fine-tuning CNNs, RNNs, 3D CNNs, Transformers 3.Implementing object detection (YOLO, Faster R-CNN)
Specific skill set	• Python, PyTorch

Name and Signature of PI & Co-PI   **Name & Signature of Head of Department**

Research Internship @RBU

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Project Proposal for Research Internship

School: Computer Science & Engineering   Department: AICS

66. Name of the Principal Investigator (PI), Department	Prof, Kaushik Roy
Place of Work/Department	Department of Artificial Intelligence and Cyber Security
Title of the Project	AI-Driven Career Guidance and Dynamic Progress Monitoring System for Personalized Skill Development and Employability Enhancement
Brief description of the project	This project aims to design and develop an AI-powered career guidance platform that provides personalized career recommendations, identifies skill gaps, and monitors student progress over time. A dynamic dashboard will provide continuous monitoring and customized recommendations for courses.
Expected outcomes of the project	1. A functioning AI-based recommendation engine that suggests personalized career paths. 2. A multi-dimensional student profile model integrating academic, behavioural, psychometric, and skill parameters. 3. A dynamic monitoring dashboard showing student progress, career readiness scores, and suggested interventions. 4. A prototype mobile/web application.
Possible learning outcomes for the interns	1.Hands-on experience with machine learning and deep learning for recommendation systems. 2.Exposure to data engineering, preprocessing, and handling large multi-modal datasets. 3.Skills in designing interactive dashboards, APIs, and integrating ML models with front-end systems.

Requirements from the interns	
UG / PG Program (Branch)	BTech students from CSE and allied branches
Discipline	CSE, IT, Cyber, DS, AIML
Technical background	API development, Basic NLP, MongoDB/SQLite
Specific skill set	Programming Skills and familiarity with data visualization

Name and Signature of PI & Co-PI   **Name & Signature of Head of Department**

Research Internship @RBU

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Project Proposal for Research Internship

School: Computer Science & Engineering   Department: AICS

67. Name of the Principal Investigator (PI), Department	Prof, Kaushik Roy
Place of Work/Department	Department of Artificial Intelligence and Cyber Security
Title of the Project	AI-Based Fault Prediction in Cloud Infrastructure
Brief description of the project	This project focuses on early prediction of failures in cloud environments by analysing telemetry data such as CPU, memory, logs, and machine events. Machine learning modelsill be trained to anticipate VM, container, or node failures, enabling proactive remediation and improving system availability. The work includes dataset preparation, feature engineering, model training, evaluation, and integration into a monitoring pipeline.
Expected outcomes of the project	1. A working ML pipeline that predicts failures in advance using cloud telemetry. 2. Labeled dataset derived from Google cluster traces with defined failure windows. 3. Implementation of ML and anomaly detection models. 4. Evaluation of detection accuracy, false alarm rate, and prediction lead-time. 5. Prototype of an automated remediation simulator that acts on predictions.
Possible learning outcomes for the interns	1. Understanding cloud telemetry datasets, event logs, and large-scale system behavior. 2. Hands-on experience with ML-based anomaly detection and supervised classification. 3. Experience with feature engineering for timeseries And log data

Requirements from the interns	
UG / PG Program (Branch)	BTech students
Discipline	CSE, IT, Cyber, DS, AIML

Technical background	1. Basic understanding of cloud computing and virtualization. 2. Knowledge of Python and ML basics. 3. Familiarity with time-series data, logs, system metrics.
Specific skill set	Python, Scikit-learn, PyTorch, Pandas, NumPy

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Project Proposal for Research Internship

School: Computer Science and Engineering

Department: Data Science

68. Name of the Principal Investigator (PI), Department	Dr. Aarti Karandikar, Data Science Department
Place of Work/Department	Data Science department
Title of the Project	Urban heat island mapping with Land Surface Temperature (LST)
Brief description of the project	Land Surface Temperature (LST) has emerged as a critical environmental parameter globally due to its profound impact on urban microclimates. To mitigate urban heat islands, it is crucial to use advanced geospatial techniques to map and analyse vegetation and land surface temperature for informed urban planning decisions. The main objective map spatial and temporal patterns of Urban Heat Island intensity using satellite-derived Land Surface Temperature (LST), quantify UHI intensity, analyze drivers (vegetation, imperviousness), and produce maps/metrics useful for planners and heat-mitigation studies.
Expected outcomes of the project	AI model for integrating multi-temporal satellite datasets and geospatial indices which will analyse the spatiotemporal evolution of LST of a specific region over a period of time.
Possible learning outcomes for the interns	• Gain hands-on experience on using multi satellite data. • Proficiency in building, training, and evaluating deep learning models for satellite images.

Requirements from the interns

UG / PG Program (Branch)	All branches
Discipline	--
Technical background (eg. Courses that should have been done, topics that should have been known)	Knowledge of satellite image processing and computer vision is beneficial.
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	• Should have good programming Python skills • Familiarity with developing UI frameworks

Name and Signature of PI   **Name & Signature of Head of Department**

Research Internship @RBU

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Project Proposal for Research Internship

School: Computer Science and Engineering

Department: Data Science

69. Name of the Principal Investigator (PI), Department	Dr. Aarti Karandikar, Data Science Department
Place of Work/Department	Data Science department
Title of the Project	Agricultural stress monitoring using hyperspectral signatures
Brief description of the project	Early and accurate detection of crop stress is vital for sustainable agriculture and food security. Traditional vegetation indices such as NDVI and NDWI often fail to detect early-stage water and structural stress due to their limited spectral sensitivity. The main objective is to use multi-band spectral and image data to accurately identify diseases and nutritional status, while combining deep learning and other technologies to improve detection accuracy.
Expected outcomes of the project	AI model for monitoring agricultural stress using multi-band hyperspectral imagery.
Possible learning outcomes for the interns	• Gain hands-on experience on using multi satellite data. • Proficiency in building, training, and evaluating deep learning models for satellite images.

Requirements from the interns	
UG / PG Program (Branch)	All branches
Discipline	--
Technical background (eg. Courses that should have been done, topics that should have been known)	Knowledge of satellite image processing and computer vision is beneficial.
Specific skill set (eg. Programming, theoretical reasoning,	Should have good programming Python skills

constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Familiarity with developing UI frameworks

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School: Computer Science and Engineering

Department: Data Science

70. Name of the Principal Investigator (PI), Department	Dr. Aarti Karandikar, Data Science Department
Name of the Principal Investigator (Co-PI), Department	Dr. Suresh Balpande, AICS department
Place of Work/Department	Data Science department
Title of the Project	Deep Learning–Driven Clinical Decision Support System for Early Identification of ROP in Preterm Neonates
Brief description of the project	Retinopathy of Prematurity (ROP) is a disorder of the retina (the light-sensitive layer at the back of the eye) that affects premature infants. In preterm babies, the vascular development may be incomplete and, under certain conditions, can go awry. It is among the leading causes of potentially avoidable childhood blindness globally. The problem becomes more acute in settings where neonatal care has improved (leading to increased survival of preterm/low-birthweight infants), but **screening and** follow-up care for ROP have not scaled correspondingly. That leads to many infants with treatable ROP progressing to blindness. The primary objective is to architect and deploy a AI-driven ecosystem for ROP detection and prediction.
Expected outcomes of the project	Develop algorithms for ROP staging, plus-disease detection, zone classification (I, II, III), and progression risk stratification.
Possible learning outcomes for the interns	• Gain hands-on experience in building, training, and evaluating deep learning models for medical images.

	• Learn to apply data augmentation, transfer learning, and fine-tuning techniques to improve model performance on limited medical datasets. • Develop APIs or UI dashboards for clinicians using frameworks like Streamlit, Flask, or FastAPI.

Requirements from the interns	
UG / PG Program (Branch)	All branches
Discipline	--
Technical background (eg. Courses that should have been done, topics that should have been known)	Knowledge of digital image processing and computer vision is beneficial.
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	• Should have good programming Python skills • Familiarity with developing UI frameworks
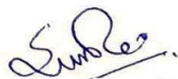
Aarti M. Karandikar

Name and Signature of PI

Name & Signature of Head of Department

Suresh S. Balpande

Name and Signature of Co-PI

Research Internship @RBU

Project Proposal for Research Internship

Department: Data Science

71. Name of the Principal Investigator (PI), Department	Dr. A. V. Chandak
Place of Work/Department	Data Science
Title of the Project	Advancements in Cyber-Physical Systems: Enhancing Interconnectivity and Security
Brief description of the project	This research aims to investigate and innovate within the realm of Cyber-Physical Systems (CPS), focusing on enhancing interconnectivity and security measures. CPS integration in various domains has led to transformative advancements; however, the increasing complexity and interdependence of these systems have raised critical challenges about connectivity robustness, resilience against cyber threats, and optimized performance. This research intends to explore novel methodologies and technologies to address these challenges, aiming to contribute to the sustainable evolution and security of CPS.
Expected outcomes of the project	- Proposed enhancements in CPS interconnectivity will result in improved system integration, facilitating seamless interaction among diverse components. - Explore approaches for seamless integration of CPS across different domains (healthcare, transportation, manufacturing, etc. - Develop strategies to ensure real-time data exchange and synchronization among distributed CPS components. - Investigate techniques for intrusion detection and response within CPS environments.
Possible learning outcomes for the interns	Understanding CPS Fundamentals: Gain in-depth knowledge of the foundational concepts, principles, and components of Cyber-Physical Systems.

- Interdisciplinary Insights: Acquire a multidisciplinary understanding by exploring the integration of computer science, engineering, networking, and security principles within CPS.

- System Design and Integration: Develop skills in designing and integrating diverse CPS components across various domains, emphasizing seamless interconnectivity.

- Cybersecurity Techniques: Acquire proficiency in implementing security frameworks, encryption methodologies, and intrusion detection systems tailored for CPS.

Requirements from the interns	
UG / PG Program (Branch)	UG and PG
Discipline	Students from Information Technology, CSE, CSE(AIML), CSE(Data Science), CSE(Cyber Security), ECE, ENCS
Technical background (eg. Courses that should have been done, topics that should have been known)	Knowledge of Operating Systems and Security
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Problem Solving, Programming

Name and Signature of PI & Co-PI   Name & Signature of Head of Department

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Project Proposal for Research Internship

School: Computer Science and Engineering

Department: Data Science and Artificial Intelligence & Cyber Security

72. Name of the Principal Investigator (PI), Department	1. Neha Tirpude (Department of Data Science) 2. Dr. Charanjeet Dadiyala (Department of Artificial Intelligence & Cyber Security)
Place of Work/Department	Ramdeobaba University/ Department of Data Science
Title of the Project	Social Media Analysis for Adverse Events Detection for enhanced Cosmetovigilance
Brief description of the project	This work will explore the evolving field of Cosmetovigilance within pharmacovigilance by assessing how people use cosmetic products and the adverse effects they report. As the use of personal care products continues to increase worldwide, prolonged exposure to their ingredients can cause a range of health problems. This work will aim to characterize the effectiveness of social media analysis in adverse event detection and cosmetovigilance
Expected outcomes of the project	● Evaluation of Social Media as a Surveillance Tool ● Predictive Analytics: Identification of Common Adverse Events & Detection Patterns using classical ML or basic deep learning methods
Possible learning outcomes for the interns	● Technical Writing, Research Documentation, Project Management ● Exposure to Real-World Public Health and Regulatory Systems

	• Ability to Collect and Curate Social Media Data • Analytical Skills for Adverse Event Detection

Requirements from the interns	
UG / PG Program (Branch)	UG (B.Tech) [Computer Science and Engineering and Allied Branches]
Discipline	Computer Science and Engineering and Allied Branches
Technical background (eg. Courses that should have been done, topics that should have been known)	Core Machine Learning, Data Science, Statistics & Probability Programming Foundations
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Programming & Tools Analytical Reasoning Applied Knowledge

Neha Tirpude & Dr. Charanjeet Dadiyala   **Dr. Aarti Karandikar**

Name and Signature of PI & Co-PI   **Name & Signature of Head of Department**

Research Internship @RBU

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Project Proposal for Research Internship

School: Computer Science and Engineering

Department: Data Science

73. Name of the Principal Investigator (PI), Department	Dr. Purshottam J. Assudani, Data Science Department
Place of Work/Department	Data Science department
Title of the Project	**AI-Powered Climate Control Platform for Industrial Decarbonization and Waste Management**
Brief description of the project	The AI Climate Control Platform is an advanced system designed for steel and cement industries to monitor, report, and verify (MRV) carbon emissions while optimizing waste-to-energy pathways. The platform integrates GenAI capabilities to provide intelligent emission analytics, automated compliance reporting, and real-time anomaly detection.
	Climate change mitigation in heavy industries requires sophisticated monitoring systems that can process multi-source data, predict emission patterns, and generate actionable insights. This project addresses the critical need for automated climate intelligence systems that support international carbon credit mechanisms (Article 6), circular economy initiatives, and decarbonization roadmaps.
	Key Focus Areas: - Real-time emission monitoring and MRV workflows for industrial plants - AI-powered climate assistant using multi-agent systems (CrewAI + GPT-4o) - Automated compliance report generation (Gold Standard, Verra, ISO 14064) - Smart alerts and anomaly detection for emission spikes - Circular waste pathway optimization (MSW to RDF/cement materials) - Biogas integration for coal displacement in steel production - Scenario modeling for carbon reduction strategies
	The platform demonstrates TRL 4-6 readiness with a working prototype currently deployed and operational.
Expected outcomes of the project	1. **Enhanced GenAI Features**: Advanced conversational AI capabilities for emission

	intelligence, carbon trading insights, and regulatory compliance guidance
	2. **Predictive Analytics Module**: Machine learning models for forecasting emission trends, identifying optimization opportunities, and predicting maintenance needs
	3. **Mobile Application**: Cross-platform mobile app for field monitoring and real-time alerts for plant managers
	4. **Advanced Data Visualization**: Interactive dashboards with temporal analysis, comparative metrics across plants, and drill-down capabilities
	5. **Integration APIs**: RESTful APIs for connecting with IoT sensors, third-party emission monitoring systems, and carbon credit registries
	6. **Automated Testing Suite**: Comprehensive test coverage for frontend, backend, and AI agent systems
	7. **Documentation & Deployment**: Production-ready deployment guides, API documentation, and user manuals
Possible learning outcomes for the interns	Technical Skills: • **Full-stack Development**: Hands-on experience with React, TypeScript, Python Flask, and modern web technologies • **AI/ML Integration**: Working with Large Language Models (GPT-4o), multi-agent systems (CrewAI), and prompt engineering • **Cloud Deployment**: Experience with Vercel, Railway, AWS, and containerization (Docker) • **API Development**: Building RESTful APIs, integrating third-party services (OpenAI, SerpAPI) • **Data Visualization**: Creating interactive charts and dashboards using modern libraries • **Mobile Development**: React Native or Flutter for cross-platform applications Domain Knowledge: • **Climate Tech**: Understanding MRV frameworks, carbon credits, Article 6 mechanisms • **Industrial Processes**: Steel and cement production, emission sources, waste management

	• **Sustainability Metrics**: Carbon accounting, circular economy principles, decarbonization strategies
	• **Compliance Standards**: Gold Standard, Verra, ISO 14064 verification protocols
	Professional Skills:
	• Agile development methodologies and version control (Git)
	• Technical documentation and API specification writing
	• Code review practices and collaborative development
	• Problem-solving in real-world climate tech applications

Requirements from the interns	
UG / PG Program (Branch)	All branches
Discipline	--
Technical background (eg. Courses that should have been done, topics that should have been known)	**Courses/Topics that should be known:** - Object-Oriented Programming - Web Development (Frontend and/or Backend) - Database Management Systems - Data Structures and Algorithms - Machine Learning / AI (for ML-focused roles) - Software Engineering principles
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	**Essential Skills:** - **Programming**: Proficiency in Python and/or JavaScript/TypeScript - **Web Technologies**: Understanding of HTML, CSS, React or similar frameworks - **Version Control**: Basic Git and GitHub knowledge - **Problem-solving**: Analytical thinking and debugging skills **Preferred Skills (any of the following):** - Experience with React, Node.js, or Flask - Familiarity with REST APIs and JSON - Knowledge of SQL/NoSQL databases - Understanding of cloud platforms (AWS, Vercel, Railway) - Experience with AI/ML libraries (TensorFlow, PyTorch, LangChain) - Mobile app development (React Native, Flutter) - UI/UX design principles and tools (Figma, Tailwind CSS)

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Project Proposal for Research Internship

School: Computer Science and Engineering

Department: Data Science

74. Name of the Principal Investigator (PI), Department	Dr. Purshottam J. Assudani, Data Science Department
Place of Work/Department	Data Science department
Title of the Project	**Smart Waste Management System with IoT and Generative AI**
Brief description of the project	The Smart Waste Management System is an AI-powered platform that integrates IoT sensor technology with Generative AI to revolutionize urban waste collection and management. The system collects real-time data from waste collection trucks and zones, processes it through automated ETL pipelines, and leverages AWS Bedrock (Claude) to provide intelligent insights and optimization recommendations. The project addresses critical challenges in urban waste management including: • Inefficient collection routes and schedules • Poor visibility into waste composition and recycling rates • High operational costs and environmental impact • Lack of data-driven decision making **KEY COMPONENTS:** 1. IoT Data Collection: Simulates and processes sensor data from waste collection trucks monitoring waste amounts (wet, dry, metals, glass, plastic), gas emissions (CO_2, methane, H_2S), environmental conditions, and economic metrics.

	2. ETL Pipeline: Automated data processing pipeline that transforms raw sensor data into actionable insights, aggregating metrics by truck, zone, and time period.
	3. Generative AI Integration: AWS Bedrock integration with Claude 3.5 Sonnet for natural language querying, predictive analytics, and intelligent recommendations for route optimization, cost reduction, and sustainability improvements.
	4. Interactive Dashboard: Streamlit-based web portal providing real-time analytics, visualizations, and AI-powered assistant for stakeholders.
	MAIN OBJECTIVES:
	• Develop scalable IoT data ingestion and processing infrastructure
	• Build intelligent analytics using Generative AI for waste management optimization
	• Create predictive models for waste generation patterns
	• Design user-friendly interfaces for municipal operators and decision-makers
	• Implement sustainability metrics and environmental impact tracking
Expected outcomes of the project	1. Fully Functional Smart Waste Management Platform with real-time monitoring and analytics capabilities
	2. AI-Powered Optimization Engine that provides:
	• Route optimization recommendations
	• Predictive maintenance alerts
	• Cost reduction strategies
	• Recycling efficiency improvements
	3. Comprehensive Analytics Dashboard featuring:
	• KPI tracking (waste amounts, emissions, costs, revenue)
	• Trend analysis and forecasting
	• Zone and truck performance metrics
	• Environmental impact assessments
	4. Research Publications on IoT-GenAI integration for smart city applications

	5. Scalable Architecture that can be deployed for real municipal waste management operations
	6. Documentation and Best Practices for building IoT-GenAI systems on AWS cloud infrastructure
Possible learning outcomes for the interns	IoT Systems Development: Gain hands-on experience with IoT sensor data simulation, collection, and real-time processing
	• Cloud Computing & AWS Services: Proficiency in AWS Bedrock, S3, Lambda, and other cloud services for building scalable applications
	• Generative AI Applications: Learn to integrate and fine-tune Large Language Models (LLMs) for domain-specific use cases
	• Data Engineering: Master ETL pipeline development, data transformation, and processing large-scale sensor data
	• Full-Stack Development: Build end-to-end applications with Python, Streamlit, and modern web frameworks
	• Data Visualization: Create interactive dashboards using Plotly, Pandas, and advanced visualization techniques
	• Machine Learning & Analytics: Develop predictive models for waste generation forecasting and pattern recognition
	• System Architecture: Design scalable, production-ready systems with proper separation of concerns
	• Research Methodology: Conduct literature reviews, experiments, and contribute to research publications
	• Problem-Solving: Address real-world urban challenges using technology and data-driven approaches

Requirements from the interns	
UG / PG Program (Branch)	All branches
Discipline	--
Technical background (eg. Courses that should have been done, topics that should have been known)	**REQUIRED:** • Data Structures and Algorithms • Database Management Systems • Python Programming • Basics of Machine Learning or AI **PREFERRED:** • Cloud Computing fundamentals

	• IoT Systems or Embedded Systems
	• Natural Language Processing
	• Data Analytics and Visualization
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	**ESSENTIAL SKILLS:** • Strong Python Programming: Experience with pandas, numpy, and data manipulation libraries • Data Analysis: Ability to work with CSV/JSON data, perform aggregations, and derive insights • Problem-Solving: Analytical thinking and debugging capabilities **DESIRABLE SKILLS:** • AWS Cloud Services: Familiarity with AWS console, Bedrock, or other AWS services • Web Development: Experience with Streamlit, Flask, or similar frameworks • Version Control: Git and GitHub for collaborative development • API Integration: Working with REST APIs and external services • Data Visualization: Plotly, Matplotlib, or similar visualization libraries

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Project Proposal for Research Internship

School: Computer Science and Engineering

Department: Data Science

75. Name of the Principal Investigator (PI), Department	Dr. Purshottam J. Assudani, Data Science Department
Place of Work/Department	Data Science Department
Title of the Project	**AI-Powered Adaptive Learning Platform for Competitive Exam Preparation**
Brief description of the project	CognoAI is an innovative AI-powered adaptive learning platform designed to revolutionize competitive exam preparation (NEET/JEE). The platform leverages cutting-edge artificial intelligence, machine learning, and computer vision technologies to provide personalized, intelligent tutoring experiences that adapt to each student's unique learning patterns. The project addresses critical challenges in online education including lack of personalization, student isolation, and inability to understand individual learning processes. Unlike traditional learning platforms that simply deliver content, CognoAI creates an intelligent ecosystem that understands how students think, adapts in real-time, and provides collaborative learning experiences. **Key Objectives:** 1. Develop and enhance AI-driven adaptive learning algorithms that adjust difficulty and content based on multi-factor analysis (accuracy, time, confidence levels) 2. Implement multi-modal AI capabilities for analyzing handwritten solutions, video explanations, and text-based responses 3. Build intelligent study buddy matching system using machine learning for compatible peer learning 4. Create advanced learning analytics with predictive modeling for exam readiness and performance forecasting 5. Design and implement an evolving AI companion with emotional intelligence for student motivation and engagement

	Technical Innovation Areas: - Real-time adaptive difficulty adjustment using behavioral pattern recognition - Computer vision for handwriting analysis and solution methodology understanding - Natural Language Processing for conversational AI tutoring - Collaborative learning with AI-mediated problem solving - Spaced repetition algorithms with cognitive load optimization - Predictive analytics for performance forecasting and weak area identification
Expected outcomes of the project	1. Enhanced AI Adaptive Engine: Advanced multi-algorithm system that provides personalized learning paths with 85%+ accuracy in predicting exam readiness 2. Multi-Modal AI Solution Analyzer: Computer vision-based system capable of analyzing handwritten solutions, providing detailed feedback on methodology and thinking processes 3. Intelligent Study Buddy Matching Platform: ML-based compatibility algorithm that matches students for collaborative learning with measurable improvement in retention rates 4. Comprehensive Learning Analytics Dashboard: Real-time analytics system with predictive modeling, learning velocity calculation, peak performance detection, and retention rate analysis 5. Scalable AI Tutor System: Conversational AI capable of providing subject-specific explanations (Physics, Chemistry, Mathematics, Biology) with contextual understanding 6. Research Publications: Potential for publishing research papers on adaptive learning algorithms, multi-modal AI in education, and collaborative learning optimization 7. Production-Ready Platform: Fully functional web application with modern tech stack (Node.js, React, MongoDB) ready for deployment and user testing
Possible learning outcomes for the interns	**Technical Skills:** - Hands-on experience with state-of-the-art AI/ML frameworks (TensorFlow, PyTorch, Scikit-learn) - Proficiency in building and deploying full-stack web applications using modern JavaScript frameworks - Expertise in implementing computer vision models for handwriting recognition and image analysis

	- Experience with Natural Language Processing for conversational AI development - Knowledge of real-time systems using WebSocket and event-driven architectures - Understanding of cloud deployment, scalability, and microservices architecture **Research & Development:** - Exposure to educational technology research and adaptive learning methodologies - Experience in designing and conducting A/B testing for algorithm optimization - Understanding of cognitive science principles applied to software development - Skills in data analysis, visualization, and deriving actionable insights **Professional Development:** - Collaborative software development using Git, Agile methodologies, and code reviews - Experience working on a real-world product with potential market impact - Opportunity to contribute to research publications and technical documentation - Understanding of product development lifecycle from ideation to deployment **Domain Knowledge:** - Understanding of EdTech industry challenges and opportunities - Knowledge of educational psychology and learning science principles - Awareness of AI ethics, bias mitigation, and responsible AI development

Requirements from the interns	
UG / PG Program	All branches
Discipline	--
Technical background (eg. Courses that should have been done, topics that should have been known)	- Data Structures and Algorithms - Database Management Systems - Web Technologies / Full Stack Development - Machine Learning / Artificial Intelligence (preferred) - Computer Vision (preferred for CV-focused roles)

	- Natural Language Processing (preferred for NLP-focused roles)
	Topics that should be known: - Object-Oriented Programming concepts - RESTful API design and development - Database design and query optimization - Basic understanding of machine learning algorithms - Frontend development concepts (HTML, CSS, JavaScript) - Version control systems (Git)
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	**Essential Skills:** - Programming: Strong proficiency in JavaScript (Node.js) and Python - Web Development: Experience with React.js, Express.js, and MongoDB - Problem Solving: Strong analytical and algorithmic thinking abilities - Collaboration: Ability to work in team environments with effective communication **Preferred Skills (based on role):** **For AI/ML Focused Roles:** - Experience with TensorFlow, PyTorch, or Scikit-learn - Understanding of neural networks, CNNs, RNNs, and transformer models - Knowledge of computer vision techniques and image processing - Familiarity with NLP libraries (spaCy, NLTK, Hugging Face) - Experience with model training, evaluation, and optimization **For Full-Stack Development Roles:** - Proficiency in React.js with hooks and state management - Experience with Node.js and Express.js backend development - Knowledge of MongoDB and database optimization - Understanding of authentication systems (JWT, OAuth) - Experience with responsive UI/UX design **For Data Analytics Roles:** - Strong Python skills with pandas, numpy, matplotlib - Experience with data visualization libraries (D3.js, Chart.js) - Understanding of statistical analysis and A/B testing - Knowledge of predictive modeling and time-series analysis

Name and Signature of PI   **Name & Signature of Head of Department**

Research Internship @RBU

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Project Proposal for Research Internship

School: Computer Science & Engineering   Department: Data Science

76. Name of the Principal Investigator (PI), Department	Prof. Rasika M. Rewatkar
Place of Work/Department	Data Science
Title of the Project	Smart GauRaksha: IoT-Based Intelligent Cow Collision Avoidance System
Brief description of the project	Smart GauRaksha is an innovative IoT-based safety system developed to protect cows from road accidents and help owners monitor them in real time. In this project, a smart collar is placed on the cow. The collar is fitted with a GPS module and IoT communication system which continuously tracks the cow's location. When the cow moves close to a road or danger zone, the collar automatically sends an alert signal to two places at the same time: 1. A roadside smart alert unit, which turns on bright LED warning lights, a buzzer, and a digital message board showing *"Cow Ahead – Slow Down"* for drivers. 2. The cow owner's mobile phone, through an SMS or mobile app notification, giving the live location of the cow. This helps both the driver to slow down and the owner to quickly bring the cow back to a safe place. The system is powered by solar energy, making it efficient, eco-friendly, and suitable for rural areas.
Expected outcomes of the project	Research Paper/Patent
Possible learning outcomes for the interns	1. Understand the basics of IoT (Internet of Things) 2. Learn how GPS tracking systems work for real-time location monitoring. 3. Design and assemble electronic circuits involving microcontrollers (Arduino/Node MCU), sensors, LEDs, buzzers, and communication modules. 4. Enhance problem-solving and critical-thinking skills by addressing real-life issues like animal safety and road accident prevention. 5. Increase awareness about rural challenges and animal protection, promoting social responsibility.
Requirements from the interns	
UG / PG Program (Branch)	UG

Discipline	Computer Science & Engineering or Allied Branches
Technical background (eg. Courses that should have been done, topics that should have been known)	1. Electronics fundamentals (LEDs, sensors, circuits) 2. Microcontrollers (Arduino / NodeMCU / ESP32) 3. IoT basics (Wi-Fi / GSM / data communication) 4. GPS & location tracking 5. Basic programming (C / C++ / Python) 6. Sensors & modules (motion, distance, GPS) 7. Solar energy basics *(optional)*
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	1. Programming: Arduino/NodeMCU (C/C++) 2. IoT & GPS: Wireless communication, location tracking 3. Electronics: Circuit wiring, sensors, LEDs, buzzers 4. Testing & Troubleshooting: Sensor calibration, system validation 5. Lab Tools: Multimeter, breadboard, soldering 6. Analytical Thinking: Problem-solving and system improvement

Prof. Rasika Rewatkar   Dr. Aarti Karandikar

Name and Signature of PI & Co-PI   Name & Signature of Head of Department

Research Internship @RBU
Session: 2025-26
Project Proposal for Research Internship

School: <u>Computer Science and Engineering</u>   Department: <u>Data Science</u>

77. Name of the Principal Investigator (PI), Department	Sruthi Nair
Place of Work/Department	Data Science
Title of the Project	Secure Model Aggregation in Federated Learning for Sensitive Healthcare Data
Brief description of the project	The project will focus on designing a secure model aggregation framework in a federated learning environment for sensitive healthcare data, ensuring that patient information remains private while enabling collaborative model training across multiple institutions. It will incorporate NLP-based techniques for tasks such as medical text classification and drug name recognition from clinical records or prescriptions. Secure aggregation mechanisms, including encryption and privacy-preserving updates, will be implemented to prevent leakage of individual client information during model sharing.
Expected outcomes of the project	Research Paper/Patent
Possible learning outcomes for the interns	1. Understand and implement Federated Learning with secure model aggregation for handling sensitive healthcare data without centralizing it. 2. Identify and address real-world challenges such as data heterogeneity, communication overhead, and client reliability in distributed learning systems.

Requirements from the interns	
UG / PG Program (Branch)	UG
Discipline	Computer Science & Engineering or allied branches
Technical background (eg. Courses that should have been done, topics that should have been known)	Natural Language Processing, Deep Learning
Specific skill set (eg. Programming, theoretical reasoning,	

constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Python, deep learning frameworks, and collaborative AI systems

Prof. Sruthi Nair
Name and Signature of PI & Co-PI

Dr. Aarti Karandikar
Name & Signature of Head of Department

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School: Computer Science and Engineering   Department: Data Science

78. Name of the Principal Investigator (PI), Department	Sruthi Nair
Place of Work/Department	Data Science
Title of the Project	Agentic AI for Context-Aware Clinical Entity Recognition
Brief description of the project	The project will focus on developing an Agentic AI system to extract key medical information such as symptoms, diagnoses, medications, dosages, and procedures (any 2 depending on the time duration throughout the semester) from unstructured clinical notes. Unlike traditional NLP pipelines, the proposed system uses an autonomous agent capable of reasoning about context, planning multi-step extraction workflows, and verifying outputs using medical knowledge bases.
Expected outcomes of the project	Research Paper/Patent
Possible learning outcomes for the interns	1. Gain hands-on experience in understanding Agentic AI systems for context-aware medical text extraction. 2. Learn to fine-tune and evaluate advanced NLP models for identifying clinical entities from unstructured text. 3. Understand and apply medical knowledge bases and reasoning techniques to improve accuracy and reliability in clinical NLP tasks.

Requirements from the interns	
UG / PG Program (Branch)	UG
Discipline	Computer Science & Engineering or allied branches
Technical background (eg. Courses that should have been done, topics that should have been known)	Natural Language Processing, Deep Learning
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs,	

handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Python, deep learning frameworks, and collaborative AI systems

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Prof. Sruthi Nair
Name and Signature of PI & Co-PI

Dr. Aarti Karandikar
Name & Signature of Head of Department

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Project Proposal for Research Internship

School of Electrical and Electronics Engineering

Department of Electronics Engineering

79. Name of the Principal Investigator (PI), Department	Prof. Vikas R. Gupta, Department of Electronics Engineering
Place of Work/Department	Department of Electronics Engineering
Title of the Project	PrivLogDetect: Privacy-Preserving Encrypted Log Anomaly Detection using Homomorphic Machine Learning
Brief description of the project	This project aims to design a privacy-preserving anomaly detection system for system log data using homomorphic encryption and distilled machine learning models. A high-capacity teacher model is trained on plaintext logs and later distilled into a lightweight, HE-compatible student model that performs inference on encrypted log features without revealing sensitive information. The project ensures end-to-end confidentiality where logs remain encrypted during transmission and server-side processing. A two-tier detection pipeline is implemented—fast sketch-based filtering followed by encrypted model inference for suspected anomalies.
Expected outcomes of the project	- A working prototype capable of detecting anomalies from encrypted log data. - Implementation of teacher-student distillation to support HE-friendly inference. - A privacy-preserving inference pipeline using CKKS/Paillier encryption schemes. - Experimental evaluation on LogHub datasets with accuracy, latency, and privacy benchmarking.

	• Research-ready results, graphs, and documentation suitable for publication.
Possible learning outcomes for the interns	• Hands-on experience with log analytics and anomaly detection techniques. • Practical exposure to Homomorphic Encryption, Zero-Knowledge concepts, and secure ML. • Model distillation and design of lightweight neural networks for encrypted inference. • Skills in dataset handling, training pipelines, and performance evaluation. • Research paper writing experience and understanding of privacy-preserving computing.

Requirements from the interns	
UG / PG Program (Branch)	**UG (Electronics and Computer Sceince)**
Discipline	**Electronics and Computer Sceince**
Technical background (eg. Courses that should have been done, topics that should have been known)	Machine Learning, Deep Learning, Cryptography & Privacy-Preserving ML
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	1. Understanding of Homomorphic Encryption (HE) concepts 2. System Logs & Security Concepts 3. Strong Python programming 4. Experience with API design and secure data transmission 5. Knowledge of containerization (**Docker**) 6. Ability to read and understand research papers 7. Basic LaTeX or scientific writing (preferred)

Prof. V. R. Gupta   Dr. N. P. Narkhede

Name and Signature of PI & Co-PI   Name & Signature of Head of Department

Research Internship @RBU

Session: 2025-26

Project Proposal for Research Internship

School of Electrical and Electronics Engineering

Department of Electronics Engineering

80. Name of the Principal Investigator (PI), Department	Prof. Vikas R. Gupta, Department of Electronics Engineering
Place of Work/Department	Department of Electronics Engineering
Title of the Project	Detecting Synthesized and Manipulated Speech Using Audio-Forensic Deep Models
Brief description of the project	This project focuses on developing an advanced audio-forensic system capable of identifying AI-generated (synthesized) and tampered (manipulated) speech. With the rise of powerful voice-cloning and text-to-speech models, distinguishing real human speech from synthetic audio has become essential for security, media integrity, and authentication systems. The system examines speech recordings to detect abnormalities or forensic patterns that indicate synthesis or manipulation. The outcome is a reliable audio-forensic tool that ensures authenticity, prevents misuse of voice deepfakes, and enhances the verification of digital audio content.
Expected outcomes of the project	● A functional prototype capable of detecting AI-generated and manipulated speech with high reliability. ● Extraction and analysis of audio-forensic features that distinguish synthetic, cloned, or tampered speech. ● Development of deep learning models trained on real vs. fake speech datasets for robust classification. ● Comprehensive experimental evaluation with accuracy, confusion matrices, and robustness testing across diverse audio conditions. ● Research-ready results, visualizations, and documentation suitable for academic publication or demonstration.

Possible learning outcomes for the interns	- Understand the fundamentals of audio forensics, including characteristics of natural vs. synthesized speech. - Gain hands-on experience with speech processing, such as feature extraction, spectrogram generation, and acoustic analysis. - Learn to build and train deep learning models (CNNs, RNNs, Transformers) for speech deepfake detection. - Develop skills in working with real-world audio datasets, including pre-processing, noise handling, and augmentation. - Enhance programming, experimentation, and research skills, including model tuning and visualization. - Gain research paper writing experience, including structuring results, preparing figures, and drafting technical content.

Requirements from the interns	
UG / PG Program (Branch)	UG (Electronics and Computer Science)
Discipline	Electronics and Computer Science, Electronics and Communication Engineering
Technical background (eg. Courses that should have been done, topics that should have been known)	- Digital Signal Processing (DSP), - Machine Learning, - Deep Learning, - Speech Processing / Audio Signal Processing
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	1. Strong proficiency in Python programming 2. Experience with PyTorch or TensorFlow 3. Building and training neural networks (CNNs, RNNs, LSTMs, or Transformers) 4. Ability to read and understand research papers 5. Basic LaTeX or scientific writing (preferred)

Prof. V. R. Gupta   Dr. N. P. Narkhede

Name and Signature of PI & Co-PI   Name & Signature of Head of Department

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Session: 2025-26

Project Proposal for Research Internship

School: Electrical and Electronics Engineering

Department: Electronics Engineering

81. Name of the Principal Investigator (PI), Department	Dr. Lokesh M. Heda
Place of Work/Department	Department of Electronics Engineering
Title of the Project	Automated Identification of AI-Generated Text Using Deep Neural Architectures
Brief description of the project	This research focuses on developing and evaluating deep neural network models capable of distinguishing between human-written text and text generated by large language models (LLMs). With the increasing use of AI for content creation, accurately detecting AI-generated text has become essential for academic integrity, misinformation defense, cybersecurity, and digital forensics. The study explores various deep learning architectures—such as transformers, CNNs, RNNs, and hybrid models—to analyze linguistic patterns, text embeddings, statistical cues, and semantic structures. The objective is to design a robust detection framework that generalizes across different LLMs, text domains, and manipulation strategies.
Expected outcomes of the project	Research paper publication in reputed journal/ Conference (SCI /Scopus /WOS)
Possible learning outcomes for the interns	This research gives interns practical experience in AI, NLP, and deep learning—skills highly valued in top tech companies. It also strengthens their research foundation, making them strong candidates for competitive higher-study programs in AI and computer science.

Requirements from the interns	
UG / PG Program (Branch)	B.Tech
Discipline	CSE, ECS and EC

Technical background (eg. Courses that should have been done, topics that should have been known)	**Machine Learning & Deep Learning:** Basics of neural networks, model training, evaluation. **Natural Language Processing:** Tokenization, embeddings, text classification. **Programming (Python):** Familiarity with ML/NLP libraries like PyTorch, TensorFlow, HuggingFace. **Mathematics for ML:** Linear algebra, calculus, probability, and statistics.
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	**Model Building**: Implementing and fine-tuning deep learning models for text classification. **NLP Processing:** Handling text datasets, preprocessing, and embedding generation. **Data Handling:** Collecting, cleaning, and analyzing human vs. AI-generated text. **Analytical Skills:** Evaluating model performance and interpreting results. **Programming Skills:** Efficient coding, experiment setup, and use of ML frameworks.

Dr. Lokesh M. Heda

Name and Signature of PI & Co-PI

Dr. N P. Narkhede

Name & Signature of Head of Department

Research Internship @RBU

Session: 2025-26

Project Proposal for Research Internship

School: Electrical and Electronics Engineering

Department: Electronics Engineering

82. Name of the Principal Investigator (PI), Department	Dr. Lokesh M. Heda
Place of Work/Department	Department of Electronics Engineering
Title of the Project	Advanced Neural Fusion Methods for Detecting Abusive and Hate Content
Brief description of the project	This research focuses on developing advanced neural network fusion techniques to automatically detect abusive and hate speech in text. By combining multiple deep learning models, the framework leverages complementary strengths to improve accuracy, robustness, and generalization across diverse datasets. The study aims to provide a scalable solution for moderating online content and addressing cyberbullying, hate speech, and abusive communication in social media and digital platforms.
Expected outcomes of the project	Research paper publication in reputed journal/ Conference (SCI /Scopus /WOS)
Possible learning outcomes for the interns	This research gives interns a hands-on experience in building and fusing deep learning models for hate speech and abusive content detection. They will learn NLP preprocessing, model evaluation, and experiment design, while developing analytical, programming, and ethical AI skills.

Requirements from the interns	
UG / PG Program (Branch)	B.Tech
Discipline	CSE, CSE- Data Science
Technical background (eg. Courses that should have been done, topics that should have been known)	**Machine Learning & Deep Learning:** Basics of neural networks, model training, evaluation. **Natural Language Processing:** Tokenization, embeddings, text classification.

	Programming (Python): Familiarity with ML/NLP libraries like PyTorch, TensorFlow, HuggingFace. **Mathematics for ML:** Linear algebra, calculus, probability, and statistics.
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	**Programming:** Python, PyTorch, TensorFlow, HuggingFace, data preprocessing. **Deep Learning & NLP Skills:** Building CNN, RNN, and transformer models; text embeddings; model fusion techniques. **Analytical & Research Skills:** Evaluating model performance, interpreting results, experiment design, hyperparameter tuning. **Mathematical & Theoretical Skills:** Linear algebra, calculus, probability, statistics, understanding optimization and neural network fundamentals. **Programming Skills:** Efficient coding, experiment setup, and use of ML frameworks.

Dr. Lokesh M. Heda　　　　　　　　　　**Dr. N P. Narkhede**

Name and Signature of PI & Co-PI　　　**Name & Signature of Head of Department**

Research Internship @RBU
Session: 2025-26
Project Proposal for Research Internship
School: Electrical and Electronics Engineering
Department: Electronics Engineering

83. Name of the Principal Investigator (PI), Department	Dr. Deepali M. Kotambkar Electronics Engineering
Place of Work/Department	Electronics Engineering, RBU Nagpur
Title of the Project	Damage Characterization of composite plate under low velocity impact using AI and ML techniques.
Brief description of the project	The damage characterization of composite plates under low-velocity impact involves using Artificial Intelligence (AI) and Machine Learning (ML) techniques to analyze and predict the effects of impact on these materials. **Objective of the Project** The purpose of this statement is to characterise various defects in composite plate subjected to low velocity impact under different boundary conditions.
Expected outcomes of the project	Publication/Patent
Possible learning outcomes for the interns	At the conclusion of the research project, the intern will demonstrate the ability to 1. By employing AI and ML techniques, intern can gain insights into the complex relationship between impact conditions and damage in composite materials. 2. This approach allows for more accurate predictions and better understanding of the structural response to low-velocity impacts, ultimately enhancing the design and durability of composite structures.

Requirements from the interns	
UG / PG Program (Branch)	UG
Discipline	Electronics and Computer Science, Mechanical Engineering , Computer Science
Technical background (eg. Courses that should have been done, topics that should have been known)	EC,CS,ME,ECS
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Basics of AI and ML applications and Digital Image Processing.

Name and Signature of PI & Co-PI   **Name & Signature of Head of Department**

Research Internship @RBU

Session: 2025-26

Project Proposal for Research Internship

School: CSE   **Department: Data Science**

84. Name of the Principal Investigator (PI), Department	Dr. D.S. Adane
Place of Work/Department	CSE-AIDS Project Lab
Title of the Project	Use of Blockchain Technology for Mitigating Hunger Management
Brief description of the project	Blockchain is a decentralized, immutable digital ledger that securely records transactions across a network of computers (nodes). Each record, or "block," is cryptographically linked in a chronological "chain," creating a tamper-proof, transparent record system that operates without the need for a central authority or intermediary. While popularly adopted for cryptocurrency, Blockchain Technology shows promising applications in areas such as: **Finance and Banking:** For faster, more efficient cross-border payments, interbank settlements (JPMorgan's Onyx project), and trade finance. **Supply Chain Management**: For transparent tracking of goods from origin to destination, ensuring authenticity and improving efficiency (e.g., Walmart and Oracle in food tracking). **Healthcare:** To securely store and share patient medical records and manage clinical trial data while ensuring privacy and regulatory compliance (HIPAA). **Smart Contracts**: Self-executing agreements coded directly onto the blockchain that automatically enforce terms and conditions, reducing the need for intermediaries like lawyers. **Identity Management:** For secure, verifiable digital identities that give users control over their personal information and reduce identity theft. **Voting Systems:** To create secure, transparent, and immutable voting records that can help prevent fraud in elections. The **Sustainable Development Goals (SDGs)**, also known as the Global Goals, were adopted by the United Nations in 2015 as a universal call to action to end poverty, protect the planet, and ensure that by 2030 all people enjoy peace and prosperity. The 17 SDGs are No Poverty, Zero Hunger, Good Health and Well Being, Quality Education, Gender Equality, Clean Water and Sanitation, Affordable and Clean Energy, Decent work and Economic Growth, Reduced Inequalities, Sustainable Cities and Communities, Responsible Consumption and Production, Climate

	Change, Life Below Water, Life on Land, Peace, Justice and Strong Institutions and Partnerships for the Goals. The goals are integrated—they recognize that action in one area will affect outcomes in others, and that development must balance social, economic and environmental sustainability.
Expected outcomes of the project	The project proposes "A Frame work for addressing Hunger Management (a SDG) using Blockchain Technology". **The outcomes shall be in the form of Indexed Journal Publication and a Patent based on working model.**
Possible learning outcomes for the interns	Following are the distinct Learning Outcomes: • Knowledge of Blockchain Technology • Hands on experience in Language for Smart Contracts • Familiarity with the SDG's and their impact on Societies • Publication / Patent

Requirements from the interns	
UG / PG Program (Branch)	UG / PG
Discipline	CSE / AIDS / EN
Technical background (eg. Courses that should have been done, topics that should have been known)	Background / Knowledge of Computer Networks and Information Security is necessary.
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Experience of Solidity or any other language for writing Smart Contracts shall be preferred.

Dr. D.S. Adane
Professor, Data Science Department &
Director R&D, RBU

Name and Signature of PI & Co-PI　　　　　　**Name & Signature of Head of Department**

Research Internship @ RBU

Session: 2025-26

Project Proposal for Research Internship

Department: Electronics and Computer Sciences Engineering

85. Name of the Principal Investigator (PI), Department	Dr. M. A. Hasamnis
Place of Work/Department	Electronics and Computer Science
Title of the Project	**Smart Bio-Sensing Application Using Machine Learning for Real-Time Analysis**
Brief description of the project	This project aims to develop an automated bio-sensing platform powered by machine learning for rapid and accurate biomarker detection. The system integrates a sensing device with a Raspberry Pi controller for processing and real-time data acquisition. A machine learning algorithm will be designed and trained to analyze the captured intensity patterns and classify biomarker concentrations with improved accuracy. Both front-end and back-end software will be developed to ensure smooth communication between the sensing hardware and the processing unit. Additionally, a dedicated mobile-based Intensity Tracker App will be created for remote monitoring, visualization of sensor output, result recording, and user-friendly decision support. This integrated platform supports point-of-care testing, enabling fast, low-cost, and intelligent biomarker screening outside conventional laboratory settings..
Expected outcomes of the project	• AI-Driven Biomarker Sensing Capability • Integrated Hardware–Software System • Portable and User-Friendly Platform • Automated Signal Processing & Decision Support Improved Sensitivity & Accuracy Through ML Training
Possible learning outcomes for the interns	• Apply Machine Learning for Real-World Data Data • Develop Full-Stack Applications • Mobile App Development Skills

	• Signal Processing and Feature Extraction • Problem Solving & Innovation

Requirements from the interns	
UG / PG Program (Branch)	UG all branches
Discipline	ECS/ CSE/AI-ML/ECE
Technical background (eg. Courses that should have been done, topics that should have been known)	• Basic experience in Python (preferred for ML & Raspberry Pi) • Knowledge of machine learning .Concepts of supervised learning, model training, validation • Designing user interfaces for data display and control
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	• Familiarity with C/C++ or Java for embedded/mobile development (optional) • Working knowledge of tools such as TensorFlow, scikit-learn, or PyTorch (basic level). • Familiarity with Git and collaborative development tools

Name and Signature of PI   Name & Signature of Head of Department