Date: 17th Dec 2024

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 2024.**

Following internships are available:

SN	Name of Project	Faculty Guide	View Details
1	A Data-Driven Framework for Accurate Identification and Classification of DNA Sequences in Human Genomics	Dr. Amit Pimpalkar	P1
2	Discovering Data Analytics for Predictive Safety Solutions and Applications using AI	Dr. Amit Pimpalkar	P2
3	A Decision Support System for Automated Hearing Loss Diagnosis Using EEG and AEP Signals	Dr. Amit Pimpalkar	P3
4	AI-Enhanced Biosensor using Microfluidic Sensing Platform	Dr. M. A. Hasamnis	P4
5	Development of a Machine Learning Assisted Biomarker sensing device using luminance method	Dr. M. A. Hasamnis	P5
6	Design and development of Electrolyte-gated-FET for analyte detection.	Dr. N. P. Narkhede	P6
7	Design and development of portable Microfluidic based blood sensing platform	Dr. Jayu Kalambe	P7
8	Design and development of point of care testing device using Electrochemical sensing	Dr. Jayu Kalambe	P8
9	Blood analyzer using Colorimetric Image analysis and Biodegradable flow cell for diseases detection	Dr. Jayu Kalambe	P9
10	Enhancing Disease Diagnosis through Fingernail Texture Analysis	Dr. Richa Khandelwal	P10

11	Design and Development of a MEMS-Based Portable Platform with Artificial Intelligence and Machine Learning Enhanced Ion-Selective Self-Assembled Monolayers (SAMs) for Detecting Toxic Heavy Metal Ions in Groundwater	Anju Gupta	P11
12	Design and Development of a Flexible Piezoelectric Sensor with Artificial Intelligence and Machine Learning-Enhanced Ion-Selective Self-Assembled Monolayers for Biomedical and Environmental Applications	Anju Gupta	P12
13	Modelling and testing of Asynchronous ROS for Medical Robotics.	Vivek Khetade	P13
14	VLSI Implementation of channel estimation algorithm	Smita G. Daware	P14
15	Design and development of machine learning assisted point-of-care device for biomedical application.	Jitendra B. Zalke	P15
16	Design and development of biosensor for disease detection.	Jitendra B. Zalke	P16
17	Design and Optimization of Antennas Using Machine Learning Algorithms and Techniques	Prof. Archana Tiwari	P17
18	Flexible Antenna Design	Prof. Archana Tiwari	P18
19	AI-Powered Real-Time Sign Language Translation and Multimodal Accessibility Solutions for Enhanced Inclusivity	Prof. Snehal Laddha	P19
20	Developing an AI-driven multimodal framework to analyze skin lesion images and patient symptoms for accurate and early skin cancer prediction	Prof. Snehal Laddha	P20
21	Multimodal Deep Learning Framework for Early Detection and Classification of Brain Tumors Using MRI, PET, and Genomic Data Fusion	Prof. Snehal Laddha	P21
22	Design and fabrication of Flexible Substrate Based Biosensor for Biomedical Applications	Dr.(Mrs.) Kanchan Dhote	P22
23	Study of control of Switched Reluctance Motor Drive.	Prof. (Ms.) M. B. Gaikwad	P23
24	Grid to Vehicle and Vehicle to Grid Energy Transfer using Bidirectional Isolated Converter.	Dr. (Mrs) M. V. Palandurkar	P24
25	Fault Prediction in AC Three Transmission Line using Machine Learning	Dr. (Mrs) M. V. Palandurkar	P25
26	Analysis of Error Correcting Codes for 5G System	Dr. (Mrs.) Mridula Korde	P26
27	Design and Simulation of Wireless Channel Models	Dr. (Mrs.) Mridula Korde	P27
28	Development of Solar Photovoltaic Panel Fault Detection System using Machine Learning Technique	Dr. (Mrs) P.V. Kapoor	P28
29	MULTI-INPUT DC-DC POWER CONVERTERS	Dr S. C. Rangari	P29

30	Design of Automated Model for Citrus Fruit and Leaves Diseases Detection	Dr. Shubhangi Neware	P30
31	Development of Noise profile for a region in terms of Sound Calculator , Health Risk SLM users using Sound meter and Noise Tracker	Dr Swaroop Laxmi Mudliar	P31
32	Modelling and optimization of aircraft material for sustainable development	Dr. Yogesh V. Deshpande	P32
33	Application of advance algorithm for optimization of biomass and enhancing sustainability	Dr. Yogesh V. Deshpande	P33
34	Application of 3D printing technology for the development of customized products	Dr. Yogesh V. Deshpande	P34
35	Performance Analysis of Absorber Coating Materials for Flat Plate Solar Collector.	Dr. Pranjali Deole	P35
36	Evaluation of Hastelloy cladding as a refurbishment application for SS 202 components	Dr. Pranjali Deole	P36
37	Machine learning approach to optimize the sensitivity of Bio-FET	Dr. Chithraja Rajan	P37
38	Design and investigation of RFET and their circuit applications	Dr. Chithraja Rajan	P38
39	Investigation of reliable Tunnel FET	Dr. Chithraja Rajan	P39
40	Content-Based Reverse Video Search using Multimodal Data	Dr. Khushboo Khurana, Dr. Preeti Voditel, Dr. Pravin Sonsare	P40
41	Gender detection in thermal images/videos using Deep Learning	Dr. Pravin Sonsare, Dr. Preeti Voditel, Dr. Khushboo Khurana	P41
42	A Multi-Objective Service Model Leveraging Generalized K-Means Clustering	Dr. Preeti Voditel, Dr. Pravin Sonsare, Dr. Khushboo Khurana	P42
43	Optimization of Digital Adaptive Nulling Using Genetic Algorithms on FPGA in STAP Systems	Prof.Sadaf Zama Hussain	P43
44	Fake Image Detection using biomarkers with deep neural network.	Dr. Khushboo Khurana	P44
45	Dynamic Graph Neural Networks for Traffic Prediction	Dr. Pravin Sonsare	P45
46	Predicting Alzheimer's Disease Progression from MRI Scans and Genetic Information using Advanced Machine Learning Techniques	Prof. Shubhangi Tirpude	P46
47	Hyperspectral Image Processing for fruit quality analysis using Machine Learning and Deep Learning	Dr. M. B. Chandak Prof. Neha P. Lanke	P47
48	Biomedical Text Analysis using Genetic Algorithm	Dr. Supriya Gupta Bani	P48

72	AI-Driven Cryptographic Algorithm Identification Tool	Dr. Charanjeet Dadiyala, Prof. Harshala Shingne	P72
73	Enhancing the Security and Resilience of Software-Defined Networking (SDN) Architectures Against Emerging Cyber Threats	Harshala Shingne , Ankita Jaiswal	P73
74	Automated Threat Intelligence Gathering and Analysis	Harshala Shingne, Dr. Charanjeet Dadiyala	P74
75	Development of an algorithm to detect multiple faults within random access memory systems	Dr. A. A. Khurshid	P75
76	Priority Call prediction	Prof. Kaushik Roy	P76
77	Human Pose Recognition for Semantic event predictions	Prof. Kaushik Roy	P77

Dr. D. S. Adane
Dean R&D

Dr. R. S. Pande
Vice Chancellor

1. Title of the Project	A Data-Driven Framework for Accurate Identification and Classification of DNA Sequences in Human Genomics
Name of the Principal Investigator (PI), Department	**Dr. Amit Pimpalkar, CSE (AIML)**
Place of Work/ Department	**CSE (AIML)**
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 introduces 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, Information Technology, 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. Preeti Voditel
Name & Signature of Head of Department

2. Title of the Project	Discovering Data Analytics for Predictive Safety Solutions and Applications using AI
Name of the Principal Investigator (PI), Department	**Dr. Amit Pimpalkar, CSE (AIML)**
Place of Work/ Department	**CSE (AIML)**
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 behavior. 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: 6. 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. 7. 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. 8. 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: 6. Research and critical thinking 7. Improve on their technical skills and languages proficiency 8. Writing and verbal communication 9. Develop their teamwork and leadership skills 10. Understanding the workplace and organizational concepts

Requirements from the interns	
UG / PG Program (Branch)	UG or PG
Discipline	Computer Science & Engineering, Information Technology, 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. Preeti Voditel
Name & Signature of Head of Department

3. Title of the Project	**A Decision Support System for Automated Hearing Loss Diagnosis Using EEG and AEP Signals**
Name of the Principal Investigator (PI), Department	**Dr. Amit Pimpalkar, CSE (AIML)**
Place of Work/ Department	**CSE (AIML)**
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: 9. Enhanced Diagnostic Accuracy: The system will provide precise identification and classification of hearing loss types, reducing misdiagnoses and improving patient outcomes. 10. 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. 11. 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: 11. Research and critical thinking 12. Improve on their technical skills and languages proficiency 13. Writing and verbal communication 14. Develop their teamwork and leadership skills 15. Understanding the workplace and organizational concepts
Requirements from the interns	
UG / PG Program (Branch)	UG or PG

Discipline	Computer Science & Engineering, Information Technology, 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. Preeti Voditel
Name & Signature of Head of Department

4. Title of the Project	**AI-Enhanced Biosensor using Microfluidic Sensing Platform**
Name of the Principal Investigator (PI), Department	Dr. M. A. Hasamnis
Place of Work/Department	Electronics and Computer Science
Brief description of the project	This project focuses on developing an innovative biosensor system that integrates artificial intelligence (AI) with microfluidic technology for precise and efficient biomarker detection. The microfluidic platform is designed to handle and analyze small fluid volumes with high accuracy, leveraging capillary-driven flows and advanced channel designs. AI algorithms are integrated into the system for real-time data analysis and decision-making, enhancing the sensitivity and specificity of the sensor. This combination of microfluidics and AI facilitates automated, portable, and cost-effective biomarker detection, making it suitable for point-of-care diagnostics and personalized healthcare applications.
Expected outcomes of the project	• Real-Time Analysis • Compact and Portable Device • AI/ML for Analysis • Versatile Detection Capabilities • Improved Healthcare Access
Possible learning outcomes for the interns	• Biosensor Development Skills • AI and Data Analysis Integration Microcontroller Programming • Prototyping and Device Development • Interdisciplinary Collaboration • Career-Ready Technical and Soft Skills

Requirements from the interns	
UG / PG Program (Branch)	UG all branches
Discipline	
Technical background (eg. Courses that should have been done, topics	• Device Fabrication using 3D printer • Algorithm Development • Sensor Electronics

that should have been known)	• Machine Learning
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	• **CAD Software**: Tools like AutoCAD or SolidWorks/Fusion 360 • Ability to integrate AI algorithms with hardware platforms • Provide results in a user-friendly format (e.g., graphs, numerical values).

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

5. Title of the Project	**Development of a Machine Learning Assisted Biomarker sensing device using luminance method**
Name of the Principal Investigator (PI), Department	Dr. M. A. Hasamnis
Place of Work/Department	Electronics and Computer Science
Brief description of the project	This project focuses on designing and developing a portable, point-of-care device for biomarker detection using a luminescence-based sensing platform. The system integrates a microfluidic platform for precise handling of small biological samples with chemiluminescent reactions for sensitive and specific detection. Target biomarkers, such as glucose or cholesterol, are identified through light emitted during enzymatic or chemical reactions. A compact detection system comprising a photodetector or smartphone-based optical setup captures the luminescence signal. Advanced AI/ML algorithms analyze the signal in real-time to quantify biomarker concentrations, providing results via a user-friendly interface.
Expected outcomes of the project	• Portable Biomarker Detection Device • Sensitive and Accurate Measurement • Smartphone/Optical Interface • AI/ML for Analysis • Cost-Effective Solution • Healthcare Impact
Possible learning outcomes for the interns	• Optical Sensor Integration Microcontroller Programming • Data Analysis and AI/ML Integration • Prototyping and Device Development • Interdisciplinary Knowledge • Problem-Solving and Innovation • Real-World Application Understanding • Career Readiness

Requirements from the interns	
UG / PG Program (Branch)	UG all branches
Discipline	
Technical background (eg. Courses that should have been done, topics	• Programming and Software Development (Python, Open CV) • Knowledge of machine learning

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.)	• Implement AI/ML algorithms for real-time analysis • Train models to correlate luminescence intensity with biomarker concentration. • Use cloud/edge computing for advanced analytics if necessary. • Provide results in a user-friendly format (e.g., graphs, numerical values).

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

6. Title of the Project	Design and development of Electrolyte-gated-FET for analyte detection.
Name of the Principal Investigator (PI), Department	Dr. N. P. Narkhede
Place of Work/Department	Electronics Engineering
Brief description of the project	Development of Electrolyte-gated-FET based biosensors for detecting human body analytes such as glucose, urea, and albumin. 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 (e.g. Courses that should have been done, topics that should have been known)	Basics of Electronics
Specific skill set (e.g. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Basics of Electronics

Dr. N.P. Narkhede Name & Signature of Head of Department

7. Title of the Project	Design and development of portable Microfluidic based blood sensing platform
Name of the Principal Investigator (PI), Department	Dr. Jayu Kalambe
Place of Work/Department	Electronics Engineering
Brief description of the project	This project aims to create a portable microfluidic platform for rapid and precise blood parameter analysis using a multispectral sensor based on the absorbance method. The device integrates a microfluidic multianalyte chip with a compact optical setup to measure absorbance across specific wavelengths, enabling highly sensitive detection of critical biomarkers.
Expected outcomes of the project	• Portable Blood Sensing Platform • Rapid and Accurate Diagnosis • Improved Accessibility • User-Friendly Design
Possible learning outcomes for the interns	• Hands-on experience with microfluidic device design and fabrication. • Understanding of multispectral sensor technology and its applications in biomedical sensing • Development of skills in 3D modeling and 3D printing for scientific applications.

Requirements from the interns	
UG / PG Program (Branch)	UG all branches
Discipline	
Technical background (eg. Courses that should have been done, topics that should have been known)	Fundamentals of electronics engineering
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Programming of microcontroller

8. Title of the Project	Design and development of point of care testing device using Electrochemical sensing
Name of the Principal Investigator (PI), Department	Dr. Jayu Kalambe
Place of Work/Department	Electronics Engineering
Brief description of the project	This project focuses on developing a portable point-of-care (POC) diagnostic device leveraging electrochemical sensing technology for the detection and quantification of critical biomarkers in biological fluids. The system integrates a microfluidic platform with electrochemical sensors to perform real-time analysis with high sensitivity and specificity.
Expected outcomes of the project	• Portable Electrochemical Sensing Platform • Real-Time and Accurate Biomarker Detection • Improved Diagnostic Accessibility • User-Friendly Interface and Operation
Possible learning outcomes for the interns	• Practical exposure to electrochemical sensing principles and applications. • Development of signal processing algorithms for electrochemical data analysis. • Experience in designing and prototyping POC diagnostic devices
Requirements from the interns	
UG / PG Program (Branch)	UG all branches
Discipline	
Technical background (eg. Courses that should have been done, topics that should have been known)	Fundamentals of electronics engineering
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Programming of microcontroller

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

9. Title of the Project	Blood analyzer using Colorimetric Image analysis and Biodegradable flow cell for diseases detection
Name of the Principal Investigator (PI), Department	Dr. Jayu Kalambe
Place of Work/Department	Electronics Engineering
Brief description of the project	This project aims to design and develop a portable blood analyzer that uses colorimetric image analysis integrated with a biodegradable flow cell for disease biomarker detection. The device employs colorimetric reactions to analyze blood samples, with image processing algorithms quantifying color changes to determine biomarker concentrations.
Expected outcomes of the project	• Portable and Affordable Blood Analyzer Device • Sustainable Biodegradable Flow Cell Technology • Accurate Biomarker Detection Using Colorimetric Image Analysis
Possible learning outcomes for the interns	• Practical knowledge of colorimetric analysis and image-based quantification techniques. • Understanding of chemical reactions for colorimetric biomarker detection. • Skills in image processing and algorithm development for biomedical applications.

Requirements from the interns	
UG / PG Program (Branch)	UG all branches
Discipline	
Technical background (eg. Courses that should have been done, topics that should have been known)	Fundamentals of electronics engineering
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Programming of microcontroller

10. Title of the Project	**Enhancing Disease Diagnosis through Fingernail Texture Analysis**
Name of the Principal Investigator (PI), Department	**Dr. Richa Khandelwal**
Place of Work/Department	**Electronics Engineering Department**
Brief description of the project	**This project focuses on utilizing texture analysis of fingernails as a non-invasive approach to detect and diagnose diseases. By examining variations in fingernail surface patterns, ridges, and other textural features, the study aims to identify correlations between these characteristics and specific health conditions such as liver diseases and nail psoriasis. Advanced image processing techniques will be employed to extract and analyze these features, contributing to developing an efficient diagnostic tool.**
Expected outcomes of the project	• **Development of a robust algorithm for fingernail texture analysis capable of detecting specific diseases with high accuracy.** • **Deployment of a prototype application for real-time disease detection through fingernail imaging.** • **Identification of key texture features linked to various diseases, providing valuable insights for medical research.**
Possible learning outcomes for the interns	• **Hands-on experience with image preprocessing, segmentation, and feature extraction techniques for medical imaging.** • **Improved ability to analyze and interpret textural features in relation to clinical**

	symptoms, bridging the gap between technology and healthcare.

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

Dr. (Mrs.) Richa R. Khandelwal

Name and Signature of PI

Dr. Nitin Narkhede

Name & Signature of Head of Department

11. Title of the Project	Design and Development of a MEMS-Based Portable Platform with Artificial Intelligence and Machine Learning Enhanced Ion-Selective Self-Assembled Monolayers (SAMs) for Detecting Toxic Heavy Metal Ions in Groundwater
Name of the Principal Investigator (PI), Department	Anju Gupta Electronics Department
Place of Work/Department	Biomedical / Electronics Department
Brief description of the project	In this work, I proposed the design, simulation, and fabrication process steps of a multi-arm piezoresistive sensor for BioMEMS applications. The designed multi-arm piezoresistive-based device utilizes the piezoresistive effect to capture the additional loaded mass of biomolecules. The ultimate goal of the proposed design is to improve the sensitivity of the piezo-sensor device for targeting low-pressure BioMEMS applications. To achieve this, COMSOL 5.4 software is used to simulate and optimize the sensor design, reducing fabrication expenses and time. Additionally, AI/ML techniques are employed to further enhance the design process and device performance. AI/ML algorithms are applied to analyze simulation data, predict the sensor's response under varying conditions, and optimize key design parameters for improved sensitivity. These methods also enable efficient modeling of the complex interactions between biomolecules and the sensor surface, providing insights into the device's performance and aiding in real-time data interpretation during testing. The sensitivity of the designed piezoresistive MEMS device remains a critical parameter, directly impacting the sensor's performance. The integration of AI/ML not only improves design accuracy but also facilitates faster development and robust decision-making for BioMEMS applications.
Expected outcomes of the project	The findings can contribute to the advancement of piezoresistive MEMS sensors and their adoption in cost-sensitive, high-performance BioMEMS applications, potentially resulting in publications or patents.
Possible learning outcomes for the interns	**Technical Skills:** • Hands-on experience with COMSOL 5.4 for sensor design and simulation. • Understanding MEMS fabrication techniques and device testing. **Analytical Skills:**

	• Problem-solving and optimization of sensor parameters for improved sensitivity. **Knowledge Building:** • Insights into piezoresistive effects, BioMEMS applications, and low-pressure sensing. **Documentation:** • Writing technical reports and presenting findings concisely. **Advanced Data Analysis:** AI/ML algorithms provide deeper insights into sensor behaviour, enabling real-time data interpretation and more accurate predictions.

Requirements from the interns	
UG / PG Program (Branch)	UG/PG
Discipline	EC/EN/BME/EE
Technical background (eg. Courses that should have been done, topics that should have been known)	Programming Skill, Software simulation, COMSOL
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Machine learning

Anju Gupta

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

12. Title of the Project	Design and Development of a Flexible Piezoelectric Sensor with Artificial Intelligence and Machine Learning-Enhanced Ion-Selective Self-Assembled Monolayers for Biomedical and Environmental Applications
Name of the Principal Investigator (PI), Department	Prof. Anju Gupta Electronics Department
Place of Work/Department	Biomedical / Electronics Department
Brief description of the project	This work presents the design, simulation, and fabrication of a flexible piezoelectric sensor enhanced with ion-selective self-assembled monolayers (SAMs) for biomedical and environmental applications. The sensor leverages the piezoelectric effect to detect ion mass changes, improving sensitivity for low-concentration ion detection. COMSOL 5.4 is used to optimize the sensor design, reducing fabrication costs and time. Artificial Intelligence (AI) and Machine Learning (ML) algorithms are incorporated to further enhance the design by analysing simulation data, predicting sensor behaviour, and optimizing key parameters. These AI/ML techniques also model the interactions between SAMs and target ions, improving sensor performance and enabling real-time data interpretation. The integration of AI/ML accelerates the design process, improves sensitivity, and enables effective decision-making for applications in both biomedical and environmental fields.
Expected outcomes of the project	The findings can contribute to the advancement of piezoelectric sensor and their adoption in cost-sensitive, high-performance BioMEMS applications, potentially resulting in publications or patents.
Possible learning outcomes for the interns	**Technical Skills:** • Hands-on experience with COMSOL 5.4 for sensor design and simulation. • Understanding MEMS fabrication techniques and device testing. • **Analytical Skills:** • Problem-solving and optimization of sensor parameters for improved sensitivity. **Knowledge Building:** • Insights into piezoresistive effects, BioMEMS applications, and low-pressure sensing. **Documentation:**

	• Writing technical reports and presenting findings concisely. **Advanced Data Analysis:** • AI/ML algorithms provide deeper insights into sensor behaviour, enabling real-time data interpretation and more accurate predictions.

Requirements from the interns	
UG / PG Program (Branch)	UG/PG
Discipline	EC/EN/BME/EE
Technical background (eg. Courses that should have been done, topics that should have been known)	Programming Skill, Software simulation, COMSOL, Machine learning
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Machine learning

Anju Gupta

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

13. Title of the Project	Modelling and testing of Asynchronous ROS for Medical Robotics.
Name of the Principal Investigator (PI), Department	Vivek Khetade
Place of Work/Department	Electronics Engineering
Brief description of the project	Image guided intervention is used in surgical Medical robotics where image reproduced on screen guide the navigation of the tool mounted on the end effector of the Medical Robot. ROS is set of software libraries and tool help in building robot application. We have to identify the various process in the application and their dependency and simulate with existing software. We have to analyse the performance of application .Identifying the implicit behaviour in the process and modelling it with asynchronous tools in order to improve the speed of response.
Expected outcomes of the project	Model of Asynchronous ROS for Surgical Medical robotics with minimum component mounted on End effector (surgical Camera, suction tool and laser cutter)
Possible learning outcomes for the interns	ROS fundamental ROS application Asynchronous system modelling.

Requirements from the interns	
UG / PG Program (Branch)	UG
Discipline	Software and Hardware
Technical background (eg. Courses that should have been done, topics that should have been known)	Fundamental of OS, RTOS
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Programming C/C++/Python, theoretical reasoning

Dr. Vivek Khetade

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

14. Title of the Project	VLSI Implementation of channel estimation algorithm
Name of the Principal Investigator (PI), Department	Smita G. Daware
Place of Work/Department	Electronics Engineering Department
Brief description of the project	Study of channel estimation algorithm and its implementation using Verilog or High-level synthesis language which focused on parallelism and pipelining to meet speed requirements.
Expected outcomes of the project	Research paper
Possible learning outcomes for the interns	Students develop expertise in hardware description languages (HDLs) like Verilog or HLS tools, which are critical for designing digital systems. Understand techniques like parallel processing and pipelining to optimize performance in hardware implementations.

Requirements from the interns	
UG / PG Program (Branch)	UG
Discipline	Electronics/Electronics and communication Engineering/Biomedical Engineering
Technical background (eg. Courses that should have been done, topics that should have been known)	Verilog/High Level synthesis Language
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Xilinx Vivado/ ISE platform

Name and Signature of PI & Co-PI Dr. Nitin Narkhede

15. Title of the Project	Design and development of machine learning assisted point-of-care device for biomedical application.
Name of the Principal Investigator (PI), Department	Jitendra B. Zalke
Place of Work/Department	Electronics Engineering
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 (e.g. Courses that should have been done, topics that should have been known)	Basics of Electronics, Python, basics knowledge of Machine Learning and various algorithms used in ML.
Specific skill set (e.g. 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.

16. Title of the Project	Design and development of biosensor for disease detection.
Name of the Principal Investigator (PI), Department	Jitendra B. Zalke
Place of Work/Department	Electronics Engineering
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 and Alzheimer's. 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 (e.g. Courses that should have been done, topics that should have been known)	Basics of Electronics
Specific skill set (e.g. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Basics of Electronics

17. Title of the Project	Design and Optimization of Antennas Using Machine Learning Algorithms and Techniques
Name of the Principal Investigator (PI), Department	Prof. Archana Tiwari
Place of Work/Department	Electronics Engineering
Brief description of the project	Recently, the application of machine learning has also been extended to electromagnetics (EM). Antenna optimization, which requires high computational complexity, can be addressed by machine learning algorithms to reduce the time cost involved.
Expected outcomes of the project	Paper publication in Scopus Indexed Journal
Possible learning outcomes for the interns	• Develop expertise in AI • Enhance problem-solving and analytical skills through hands-on experimentation

Requirements from the interns	
UG / PG Program (Branch)	UG, PG
Discipline	EN, EC, EDT, Biomedical
Technical background (eg. Courses that should have been done, topics that should have been known)	Graduate level studies in the field of Physics or adjacent field like Electromagnetics, radiation and waves propagation, antennas etc.
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Basic knowledge of AI, Machine Learning,, HFSS/CST.

18. Title of the Project	Flexible Antenna Design
Name of the Principal Investigator (PI), Department	Prof. Archana Tiwari
Place of Work/Department	Electronics Engineering
Brief description of the project	The aim of the proposed research work is to design, fabricate an antenna with flexible substrate materials for working on ISM band (Industrial Scientific Medical band). Depending on the comparative study based on the parameters like compactness (size and thickness), electrical properties (permittivity, loss tangent & thickness) and robustness the substrate material could be selected as polyamide, felt fabric, Rogers RO3003 flexible, polyethylene terephthalate (PET) films, Kapton etc.
Expected outcomes of the project	Paper publication in Scopus Indexed Journal
Possible learning outcomes for the interns	• It provides career path to get into different antenna manufacturing industry such as Linx technology, Wavelin Inc. etc. • It provides an active participation in the electronics industry where advance antennas are essential equipment such as in Samsung, Apple etc. • It provides an opportunity to serve as a research person in RF & Microwave industries and research organizations.

Requirements from the interns	
UG / PG Program (Branch)	UG, PG
Discipline	EN, EC, EDT, Biomedical
Technical background (eg. Courses that should have been done, topics that should have been known)	Graduate level studies in the field of Physics or adjacent field like Electromagnetics, radiation and waves propagation, antennas etc.
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Good proficiency in one or several of the following RF-analysis and general design tools such as CST, HFSS, MATLAB etc. are required.

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

19. Title of the Project	AI-Powered Real-Time Sign Language Translation and Multimodal Accessibility Solutions for Enhanced Inclusivity
Name of the Principal Investigator (PI), Department	Prof. Snehal Laddha
Place of Work/Department	Electronics Engineering
Brief description of the project	Despite advancements in AI and accessibility technologies, individuals with disabilities, particularly the hearing and speech-impaired, face communication barriers. Real-time sign language translation systems are either unavailable, limited in scope, or lack the robustness to handle diverse sign languages and cultural nuances. This gap restricts their ability to interact effectively in public, educational, and professional environments.
Expected outcomes of the project	Paper publication in Scopus Indexed Journal
Possible learning outcomes for the interns	• Develop expertise in AI, computer vision, and NLP for real-time gesture recognition and translation. • Enhance problem-solving and analytical skills through hands-on experimentation and data analysis. • Learn model optimization and deployment for edge devices like smartphones.

Requirements from the interns	
UG / PG Program (Branch)	EN/CSE/IT/EC
Discipline	Any
Technical background (eg. Courses that should have been done, topics that should have been known)	Basic knowledge of AI, Machine Learning, Deep Learning
Specific skill set (eg. Programming,	Programming, Research Acumen

theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	

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

20. Title of the Project	Developing an AI-driven multimodal framework to analyze skin lesion images and patient symptoms for accurate and early skin cancer prediction
Name of the Principal Investigator (PI), Department	Prof. Snehal Laddha
Place of Work/Department	Electronics Engineering
Brief description of the project	This project focuses on creating an AI-powered multimodal framework that combines the analysis of skin lesion images with patient-reported symptoms to improve the accuracy and timeliness of skin cancer diagnosis. By integrating visual and textual data, the system leverages advanced machine learning techniques to classify lesions as benign or malignant. The framework aims to assist healthcare professionals by providing precise, explainable predictions, enabling early detection and better patient outcomes.
Expected outcomes of the project	Paper publication in Scopus Indexed Journal
Possible learning outcomes for the interns	• Gain hands-on experience in developing AI models for image classification and text processing using deep learning frameworks like TensorFlow and PyTorch. • Learn how to process and integrate different types of data (images and text) to build a unified AI model, enhancing skills in data fusion techniques. • Enhance problem-solving skills by troubleshooting model performance issues, handling imbalanced datasets, and ensuring model robustness for real-world use.

Requirements from the interns	
UG / PG Program (Branch)	EN/CSE/IT/EC

Discipline	Any
Technical background (eg. Courses that should have been done, topics that should have been known)	Basic knowledge of AI, Machine Learning, Deep Learning
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Programming, Research Acumen

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

21. Title of the Project	Multimodal Deep Learning Framework for Early Detection and Classification of Brain Tumors Using MRI, PET, and Genomic Data Fusion
Name of the Principal Investigator (PI), Department	Prof. Snehal Laddha
Place of Work/Department	Electronics Engineering
Brief description of the project	This research focuses on developing an innovative, multimodal deep learning framework that integrates MRI scans, Positron Emission Tomography (PET) images, and genomic data (e.g., genetic mutations, biomarker data) to improve the early detection and classification of brain tumors, especially those that are hard to identify in early stages through traditional imaging alone. The model will leverage the complementary information from different modalities, enhancing the accuracy and robustness of brain tumor diagnosis.
Expected outcomes of the project	Paper publication in Scopus Indexed Journal
Possible learning outcomes for the interns	• Interns will gain experience in developing deep learning models for multimodal data fusion, combining MRI, PET, and genomic data for brain tumor classification. • They will learn techniques for enhancing model accuracy and interpretability through attention mechanisms and transfer learning. • Interns will also apply AI in healthcare, contributing to early detection and personalized treatment solutions.

Requirements from the interns	
UG / PG Program (Branch)	EN/CSE/IT/EC
Discipline	Any
Technical background (eg. Courses that should have been done, topics that should have been known)	Basic knowledge of AI, Machine Learning, Deep Learning
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Programming, Research Acumen

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

22. Title of the Project	Design and fabrication of Flexible Substrate Based Biosensor for Biomedical Applications
Name of the Principal Investigator (PI), Department	Dr.(Mrs.) Kanchan Dhote
Place of Work/Department	Electronics Engineering Department
Brief description of the project	Flexible, stretchable, and wearable sensors and biosensors for point of-care (POC) testing form part of a broad and research focus in the area of portable devices. In comparison to traditional laboratory-based or rigid testing techniques, flexible biosensors are typically designed with the goals of not requiring complex infrastructure, while satisfying the demands of end-users for self or ambulatory testing .
Expected outcomes of the project	The expected outcome is: 1. Sensor design for POC device 2. A paper publication in reputed journal/ Conference (SCI /Scopus /WOS).
Possible learning outcomes for the interns	This internship will help student: 1. Intern will learn to design low cost paper / PCB 2. To develop skill and understanding on how to write and publish research paper which will be helpful at a great extent in their post graduation.

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

23. Title of the Project	Study of control of Switched Reluctance Motor Drive.
Name of the Principal Investigator (PI), Department	Prof. (Ms.) M. B. Gaikwad
Place of Work/Department	Research Lab Electrical Engineering
Brief description of the project	The project **Study of Control of Switched Reluctance Motor Drive** focuses on implementing effective control strategies for switched reluctance motors (SRMs). SRMs are gaining prominence due to their simple construction, high efficiency, and fault-tolerant capabilities. The study explores various control techniques such as current control, torque ripple minimization, and speed regulation to optimize the motor's performance. It also evaluates different power electronic drive circuits and their role in ensuring efficient energy conversion. The ultimate goal is to enhance the motor's reliability and suitability for industrial and transportation applications.
Expected outcomes of the project	Contribute to the knowledge base of SRM control through research papers or technical documentation, benefiting the academic and industrial community.
Possible learning outcomes for the interns	Learn the basic knowledge of control of Switched Reluctance Motor Drive.

Requirements from the interns	
UG / PG Program (Branch)	UG (Electrical Engg., Electronics Engg., Electronics Design &Technology)
Discipline	Electrical Engg., Electronics Engg., Electronics Design &Technology
Technical background (eg. Courses that should have been done, topics that should have been known)	Should know basics of power electronics devices and machines.
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Programming skill: - MATLAB

Prof.M.B.Gayakwad — DR.Uday Mujumdar

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

24. Title of the Project	Grid to Vehicle and Vehicle to Grid Energy Transfer using Bidirectional Isolated Converter.
Name of the Principal Investigator (PI), Department	Dr. (Mrs) M. V. Palandurkar
Name of the Co-Principal Investigator (Co-PI), Department	--
Place of Work/ Department	Energy Research Centre, Department of Electrical Engineering
Brief description of the project	Basic concept of V2G energy transfer is to provide energy to grid when vehicle is parked. The vehicle used here is electric drive vehicle which may be battery electric vehicle, plug hybrid vehicle or fuel cell vehicle. The proposed topic deals with vehicle to grid (V2G) and grid to vehicle (G2V) energy transfer via bidirectional converter In this project, bidirectional converters are used as AC-DC, DC-DC isolated type. And DC-AC. AC-DC converter is used to convert 230 Volt AC supply to 380 Volt DC supply and DC-DC isolated converter used in charging/discharging battery of Plugged Hybrid Electric Vehicle (PHEV). Converter can either be used in buck mode or in boost mode according to charging/discharging preference of battery.
Expected outcomes of the project	1. To learn SIMULINK design of various converters using MATLAB software. 2. Design of control circuit or gate driver circuits using various PWM techniques 3. Research publication
Possible learning outcomes for the interns	After the completion of internship project, students will learn Machine Learning Techniques and its application to protect of three phase Transmission Line

Requirements from the interns	
UG / PG Program (Branch)	Undergraduate: 02 No.
Discipline	Electrical, Computer ,IT
Technical background (eg. Courses that should have been done, topics that should have been known)	Basic knowledge of power electronics semiconductor switches and types of converter.
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipment's such	MATLAB Software

as CRO, Electron Microscope etc.)	

Dr.(Mrs) M. V. Palandurkar (PI)

Name and Signature of PI

Name & Signature of Head of Department

25. Title of the Project	**Fault Prediction in AC Three Transmission Line using Machine Learning**
Name of the Principal Investigator (PI), Department	Dr. (Mrs) M. V. Palandurkar
Name of the Co-Principal Investigator (Co-PI), Department	Prof. Ameya Saonerkar
Place of Work/ Department	Energy Research Centre, Department of Electrical Engineering
Brief description of the project	Correct and timely detection of faults is vital for the safe and reliable operation of power systems. Any failures may not only impact the safety of the system and crew but can also have adversarial revenue loss. Faults in power networks are inevitable and cannot be prevented. Therefore, it is essential to invest in efforts that aid the fault detection and classification processes. With the advent of python and machine learning, it is probable to use data-driven models instead of rule-based algorithms for fault detection and classification tasks. Data-driven models possess capability to outperform rule-based algorithms and can help in developing a more generic solution
Expected outcomes of the project	Using Machine Learning techniques, the need of complex feature extraction process is eliminated and works directly on the operational data obtained from measurement nodes. The machine learning algorithms can distinguish different conditions such as Fault, No Fault, and types of faults etc. Training of models is performed using suitable classification algorithm. Also to publish paper in IEEE conference / reputed journal.
Possible learning outcomes for the interns	After the completion of research, students will learn Machine Learning Techniques and its application to protect of three phase Transmission Line

Requirements from the interns	
UG / PG Program (Branch)	Undergraduate: 02 No.
Discipline	Electrical, Computer ,IT
Technical background (eg. Courses that should have been done, topics that should have been known)	Basic knowledge of Electrical Engineering and Machine Learning Tools
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipment's such	Protection of three phase Transmission line, Python, Machine Learning

as CRO, Electron Microscope etc.)	

Dr.(Mrs) M. V. Palandurkar (PI)
Prof. Ameya Saonerkar (CO-PI)

Name and Signature of PI & Co-PI

Name & Signature of Head of Department

26. Title of the Project	Analysis of Error Correcting Codes for 5G System
Name of the Principal Investigator (PI), Department	Dr. (Mrs.) Mridula Korde
Place of Work/Department	Department of Electronics and Communication
Brief description of the project	This project focuses on evaluating the performance and efficiency of error-correcting codes (ECC) used in 5G communication systems. The study primarily investigates **Polar Codes** and **Low-Density Parity-Check (LDPC) Codes,** which are standardized for 5G. The analysis aims to understand their effectiveness in ensuring reliable data transmission, especially under varying channel conditions such as noise, interference and fading. This project will focus on 1. Study the principles of Polar and LDPC codes, including encoding, decoding techniques, and their computational complexity. 2. Evaluate metrics like bit error rate (BER), latency, and energy efficiency. 3. Use simulation tools (e.g., MATLAB, Python) to compare the performance of ECC under different scenarios.
Expected outcomes of the project	Research paper
Possible learning outcomes for the interns	After working on the research project, interns will be able to • Gain a deep knowledge of Polar Codes and LDPC Codes, their working principles, encoding/decoding algorithms, and why they are suitable for 5G communication systems. • Develop skills in evaluating the performance of ECC through metrics like bit error rate (BER), throughput, latency, and energy efficiency under realistic channel conditions. • Understand the role of ECC in meeting 5G requirements such as ultra-reliable low-latency communication (URLLC), enhanced mobile broadband (eMBB), and massive machine-type communication (mMTC).

Requirements from the interns

UG / PG Program (Branch)	UG/PG
Discipline	EC,EN
Technical background (eg. Courses that should have been done, topics that should have been known)	Fundamental knowledge of Analog and Digital Communication Systems, Wireless Communication, Probability Theory
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs	Design tools like MATLAB, Python

Name and Signature of PI & Co-PI

Dr. (Mrs.) Mridula Korde

Name & Signature of Head of Department

Dr.(Mrs.)Rohini Ochawar

27. Title of the Project	Design and Simulation of Wireless Channel Models
Name of the Principal Investigator (PI), Department	Dr. (Mrs.) Mridula Korde
Place of Work/Department	Department of Electronics and Communication
Brief description of the project	Wireless communication is one of the most promising fields in communication, due to the rapid development in technology areas such as the evolution in semiconductors which allowed the reduction in the size of the integrated chips. Several emerging wireless communication systems require direct transmission between mobile terminals to support efficient data transfer and user mobility. Such mobile-to-mobile communication systems differ from the conventional cellular systems where only the user unit is mobile. Developing accurate and computationally efficient channel models for mobile wireless channels poses a formidable challenge, primarily due to the highly dynamic nature of such environments and the involvement of a large number of environmental parameters. The main objective of this project is to model a wireless channel to study the effect of the multipath phenomena This project will focus on 4. To study of the basic propagation mechanisms affecting the performance of wireless communication systems 5. To design and simulation of wireless channel model under the severe constraints of fading and multipath propagation.
Expected outcomes of the project	Research paper based on innovative channel modelling
Possible learning outcomes for the interns	After working on the research project, interns will be able to •apply knowledge of communication engineering domain to develop channel model •perform and analyse simulations under extensive experimental conditions •communicate research results with academic standards orally as well as in writing.

Requirements from the interns

UG / PG Program (Branch)	UG/PG
Discipline	EC,EN
Technical background (eg. Courses that should have been done, topics that should have been known)	Fundamental knowledge of Analog and Digital Communication Systems, Wireless Communication, Probability Theory
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs	Design tools like MATLAB, Python

Name and Signature of PI & Co-PI

Dr. (Mrs.) Mridula Korde

Name & Signature of Head of Department

Dr.(Mrs.)Rohini Ochawar

28. Title of the Project	**Development of Solar Photovoltaic Panel Fault Detection System using Machine Learning Technique**
Name of the Principal Investigator (PI), Department	Dr. (Mrs) P.V. Kapoor
Name of the Co-Principal Investigator (Co-PI), Department	Prof. Devishree Naidu CSE Dept.
Place of Work/ Department	Energy Research Centre, Department of Electrical Engineering
Brief description of the project	• The existing solar installation at site is a traditional type where efficiency is calculated on string level, this approach has caused reduction in accuracy and delayed detection of faults • To provide a solution, a panel level fault detection and monitoring system has been proposed which will also utilise machine learning algorithms to detect faults.
Expected outcomes of the project	User or operator in-charge will be able to track panel level performance and track each panel's efficiency. Panel fault can be detected before it becomes a bothersome issue and be eliminated quickly, thus increasing panel life, efficiency and ultimately guarant consumer satisfaction.
Possible learning outcomes for the interns	After the completion of research, students will learn Machine Learning Techniques and its application to Electrical Engineering Problems.

Requirements from the interns	
UG / PG Program (Branch)	Undergraduate: 02 No.
Discipline	Electrical, Computer ,IT
Technical background (eg. Courses that should have been done, topics that should have been known)	Basic knowledge of Electrical Engineering and Machine Learning Tools
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipment's such as CRO, Electron Microscope etc.)	PCB designing tool , Microcontroller, Python.

Dr.(Mrs) P.V. Kapoor **Dr.Uday Mujumdar**

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

29. Title of the Project	MULTI-INPUT DC-DC POWER CONVERTERS
Name of the Principal Investigator (PI), Department	Dr S. C. Rangari (Electrical Engineering)
Place of Work/Department	Electrical Engineering Department
Brief description of the project	The utilization of fuel cells (FCs) in the automotive industry has created much attention due to easy use, modular structure, and higher efficacy. In the future, technological evolutions reveal that FC driven electric vehicles (EVs) will grow at a rapid pace and will become an excellent alternative to conventional vehicles. In these fuel cell hybrid electric vehicles (FCHEVs), one of the critical elements is the DC–DC power converter unit. The hybridization of FCs with the other power sources requires more converter units that make the system complex. A multi-input DC–DC power converter is used to connect more than one energy source to reduce the system's complexity and improve the overall system efficacy. To interface the energy sources (primary as well as auxiliary) to the DC bus, DC–DC converters are utilized, and the DC signal is converted into AC to connect the motor and transmission system of the vehicle.These reduce system complexity by allowing multiple energy sources to connect directly to the DC bus without requiring numerous individual converters.
Expected outcomes of the project	Scopus Journal
Possible learning outcomes for the interns	1. Assessment of present and future scenarios of Fuel cells based power source topologies. 2. Applications of multi-input DC–DC power converter topologies in HEV 3. Propose some Fuel Cell Hybrid electric vehicles topologies and multi-input DC–DC power converters with reduced cost, compact size, and improved efficacy. 4. Controller of power during different load flow modes of vehicle.

Requirements from the interns	
UG / PG Program (Branch)	UG
Discipline	Electrical, Electronics, Mechanical Engineering
Technical background (eg. Courses that should have been done, topics that should have been known)	Should know about semiconductor switches and power converters.
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling	MATLAB Programming

specific laboratory equipments such as CRO, Electron Microscope etc.)	

Dr.S.C.Rangari

Name and Signature of PI & Co-PI

Dr.Uday Mujumdar

Name & Signature of Head of Department

30. Title of the Project	Design of Automated Model for Citrus Fruit and Leaves Diseases Detection
Name of the Principal Investigator (PI), Department	Dr. Shubhangi Neware, Department of CSE & ET
Place of Work/Department	Department of CSE & ET
Brief description of the project	Citrus fruit diseases are the major cause of extreme citrus fruit yield declines. The proposed model is intended to differentiate healthy fruits and leaves from fruits/leaves with common citrus diseases such as black spot, canker, scab, greening, and Melanose.
Expected outcomes of the project	- An automated system to classify citrus fruit diseases. - Research Paper/Patent
Possible learning outcomes for the interns	Intern will able to learn: - Working with Computer Vision libraries - Writing research paper

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

Dr. Shubhangi Neware — Dr. Preeti Voditel

Principal Investigator — HOD (CSE-ET)

31. Title of the Project	Development of Noise profile for a region in terms of Sound Calculator , Health Risk SLM users using Sound meter and Noise Tracker
Name of the Principal Investigator (PI), Department	Dr Swaroop Laxmi Mudliar
Place of Work/Department	Chemistry + NEERI - Nagpur
Brief description of the project	The objective of a noise monitor is **to provide data regarding the level of noise in a location so that it may be compared to the established noise limits**. **Noise Tracker Pro**: An app developed by the Council of Scientific and Industrial Research–National Environmental Engineering Research Institute (CSIR–NEERI) in Nagpur, India. It uses a smartphone's GPS to record noise levels, latitude, and longitude
Expected outcomes of the project	Outcomes of the project : 1 Students get a chance to gain insights into the development of Noise App. 2. Students get an opportunity to work at NEERI, Nagpur 3. Students will understand the way to track noise 4. Analysis of the Noise tracking data to understand its health hazards
Possible learning outcomes for the interns	1 Students get a chance to gain insights into the development of Noise App. 2. Students will understand the way to track noise 3 Analysis of the Noise tracking data to understand its health hazards

Requirements from the interns	
UG / PG Program (Branch)	UG/PG
Discipline	Any Discipline preferably Mechanical , Electronics
Technical background (eg. Courses that should have been done, topics that should have been known)	
Specific skill set (eg. Programming, theoretical reasoning, constructing	Programming, theoretical reasoning, constructing mathematical proofs

mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	

Name and Signature of PI & Co-PI

Name & Signature of Head of Department

32. Title of the Project	**Modelling and optimization of aircraft material for sustainable development**
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
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)

Department of Mechanical Engineering, RCOEM

Dr. Vishal Shukla

Name & Signature of Head of Department

33. Title of the Project	**Application of advance algorithm for optimization of biomass and enhancing sustainability**
Name of the Principal Investigator (PI), Department	**Dr. Yogesh V. Deshpande (PI)** Department of Mechanical Engineering, RBU (**Mob No: 9096192751**)
Place of Work/Department	CIIIT, RBU, NAGPUR Workshop, Department of Mechanical Engineering, RBU, Nagpur
Brief description of the project	➢ The project focuses on utilizing **cutting-edge computational algorithms** to improve the efficiency of biomass energy production. ➢ By integrating these algorithms, the project seeks to enhance the overall energy yield, reduce waste, and make biomass processing **more cost-effective and sustainable**. For more information regarding previous publication, pl refer https://www.scopus.com/authid/detail.uri?authorId=57201073732
Expected outcomes of the project	➢ Improved Biomass Energy Efficiency ➢ Would be useful to industrial sector ➢ Optimized Feedstock Selection and Processing and Cost Reduction
Possible learning outcomes for the interns	The possible learning outcomes for the interns are as follows: ➢ To study and use Biomass Energy Systems ➢ 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. T. A. Madankar (Co-PI)

Dr. Vishal Shukla

Department of Mechanical Engineering, RCOEM

Name & Signature of Head of Department

34. Title of the Project	**Application of 3D printing technology for the development of customized products**
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
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	No restriction, only elementary knowledge is required.

reasoning, constructing mathematical proofs, handling specific laboratory equipment's such as CRO, Electron Microscope etc.)	

Dr. Yogesh V. Deshpande (PI)

Department of Mechanical Engineering, RCOEM

Dr. Vishal Shukla

Name & Signature of Head of Department

35. Title of the Project	Performance Analysis of Absorber Coating Materials for Flat Plate Solar Collector.
Name of the Principal Investigator (PI), Department	Dr. Pranjali Deole Mechanical Engg
Place of Work/Department	Mechanical Engineering Department/workshop
Brief description of the project	This project focuses on the comparative evaluation of various absorber coating materials used in flat plate solar collectors. The study aims to analyze their thermal efficiency and durability under different environmental conditions. By assessing performance metrics such as heat absorption, retention, and degradation over time, the project seeks to identify the most suitable coating materials for enhancing the efficiency and lifespan of solar collectors, contributing to the development of sustainable energy solutions.
Expected outcomes of the project	**1.Identification of High-Performance Coatings:** The study will identify absorber coating materials with superior thermal efficiency and heat retention capabilities, suitable for use in flat plate solar collectors. **2.Durability Assessment:** Insights into the longevity and wear resistance of different coatings under varying environmental conditions, such as temperature fluctuations and exposure to UV radiation. **3.Optimal Material Selection:** Recommendations for the most effective and sustainable absorber coating materials, balancing thermal efficiency, durability, and cost-effectiveness. **4.Improved Solar Collector Efficiency:** Enhanced understanding of how coating material properties influence the overall performance of flat plate solar collectors, leading to potential design improvements. **5.Contribution to Renewable Energy Innovation:** The findings will support the development of more reliable and efficient solar energy systems, contributing to the global push for renewable energy adoption
Possible learning outcomes for the interns	Major learnings would be u**nderstanding solar thermal technology, material science insights, experimental design and analysis,research methodology,data analysis and interpretation,problem-solving skills**

Requirements from the interns

UG / PG Program (Branch)	Mechanical
Discipline	Mechanical Engineering, Physics, Chemistry department
Technical background (eg. Courses that should have been done, topics that should have been known)	Renewable sources of energy,
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipment such as CRO, Electron Microscope etc.)	Knowledge of Solar energy, material sciences

Name and Signature of PI & Co-PI

Dr.Pranjali Deole (PI)

Prof.Sujit Patil (Co-PI)

Name & Signature of Head of Department

Dr.Vishal Shukla

36. Title of the Project	Evaluation of Hastelloy cladding as a refurbishment application for SS 202 components
Name of the Principal Investigator (PI), Department	Dr. Pranjali Deole Mechanical Engg
Place of Work/Department	Mechanical Engineering Department/workshop
Brief description of the project	This project focuses on the iinvestigation of the performance of Hastelloy C276-clad on SS 202 components, encompassing their corrosion resistance, mechanical properties, fatigue behavior, and bond strength and interfacial properties.It also focusses on developing predictive models and simulation tools for Hastelloy C276-clad SS 202 components and comparing the above effects of cladding of NiCoMo4 and NiCrMo3 on SS202.
Expected outcomes of the project	1.Improved material selection and design: The study can provide valuable insights into the performance and limitations of Hastelloy C276 cladding on SS 202 components, enabling engineers to make informed decisions regarding material selection and component design. 2.Optimized maintenance and inspection: The research can help develop guidelines for the maintenance and inspection of Hastelloy C276-clad SS 202 components, ensuring their continued performance and safety. 3.Development of new corrosion protection strategies: The study can contribute to the development of innovative corrosion protection strategies, combining cladding with other techniques such as coatings or inhibitors. 4.Economic benefits: By extending the service life and reducing maintenance costs, Hastelloy C276 cladding can provide significant economic benefits to industries that rely on SS 202 components
Possible learning outcomes for the interns	major learnings would be material science expertise,cladding techniques and processes, evaluation and testing skills,refurbishment strategies,failure analysis.

Requirements from the interns	
UG / PG Program (Branch)	Mechanical
Discipline	Mechanical Engineering, Physics, Chemistry department

Technical background (eg. Courses that should have been done, topics that should have been known)	Material Science,Manufacturing processes.
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipment such as CRO, Electron Microscope etc.)	Knowledge of Material Science,Manufacturing processes.

Name and Signature of PI & Co-PI

Dr.Pranjali Deole (PI)

Prof.Sujit Patil (Co-PI)

Name & Signature of Head of Department

Dr.Vishal Shukla

37. Title of the Project	Machine learning approach to optimize the sensitivity of Bio-FET
Name of the Principal Investigator (PI), Department	Dr. Chithraja Rajan, Department of CSE-ET
Place of Work/Department	DT
Brief description of the project	Machine learning enhances Bio-FET sensitivity by modeling complex relationships between design parameters and performance. Algorithms analyze data to identify optimal configurations in adaption with the semiconductor devices. This accelerates the development of high-performance biosensors for diagnostics and biotechnology applications.
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	ECE/EN/ECS/CSE
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.Chithraja Rajan — Name and Signature of PI & Co-PI

Dr. Preeti Voditel — Name & Signature of Head of Department

38. Title of the Project	Design and investigation of RFET and their circuit applications
Name of the Principal Investigator (PI), Department	Dr. Chithraja Rajan, Department of CSE-ET
Place of Work/Department	DT
Brief description of the project	Reconfigurable Field-Effect Transistors (RFETs) are novel transistors that can dynamically switch between n-type and p-type operation based on external control signals, offering versatile functionality in electronic circuits. Exploring RFETs in the configurable circuit applications with less transistor density leads to low power and high performance computing.
Expected outcomes of the project	Paper publications, patents, and conference presentations
Possible learning outcomes for the interns	Semiconductor technology
Requirements from the interns	
UG / PG Program (Branch)	UG/PG
Discipline	ECE/EN/ECS
Technical background (eg. Courses that should have been done, topics that should have been known)	Digital Electronics, Basic Electronics
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Programming, Soft Skills: Act promptly with new findings and punctuality to follow timeliness.

Dr. Chithraja Rajan — Dr. Preeti Voditel

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

39. Title of the Project	Investigation of reliable Tunnel FET
Name of the Principal Investigator (PI), Department	Dr. Chithraja Rajan, Department of CSE-ET
Place of Work/Department	DT
Brief description of the project	Reconfigurable Field-Effect Transistors (RFETs) are novel transistors that can dynamically switch between n-type and p-type operation based on external control signals, offering versatile functionality in electronic circuits. Exploring RFETs in the configurable circuit applications with less transistor density leads to low power and high performance computing.
Expected outcomes of the project	Paper publications, patents, and conference presentations
Possible learning outcomes for the interns	Semiconductor technology

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

Dr. Chithraja Rajan — Dr. Preeti Voditel

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

40. Title of the Project	Content-Based Reverse Video Search using Multimodal Data
Name of the Principal Investigator (PI), Department	Dr. Khushboo Khurana, Dr. Preeti Voditel, Dr. Pravin Sonsare Department of Computer Science & Engineering and Emerging Technology.
Place of Work/Department	Department of Computer Science & Engineering and Emerging Technology, Ramdeobaba University
Brief description of the project	The project aims to find similar videos that are visually, audibly, or temporally similar to an input video by analyzing its contents.
Expected outcomes of the project	• Video Fingerprinting • Content-based video retrieval of similar videos.
Possible learning outcomes for the interns	The learners will be able to: • Work with deep learning models • Acquire skills in video fingerprinting, video indexing, video processing and retrieval.

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

Dr. Khushboo Khurana Dr. Preeti Voditel Dr. Pravin Sonsare
Name and Signature of PI

Name & Signature of Head of Department

41. Title of the Project	Gender detection in thermal images/videos using Deep Learning
Name of the Principal Investigator (PI), Department	Dr. Pravin Sonsare, Dr. Preeti Voditel, Dr. Khushboo Khurana Department of Computer Science & Engineering and Emerging Technology.
Place of Work/Department	Department of Computer Science & Engineering and Emerging Technology, Ramdeobaba University, Nagpur
Brief description of the project	The project aims to classify gender in thermal images/videos. Thermal image pre-processing is a crucial step in preparing thermal images/videos for gender detection. This involves techniques such as noise reduction, normalization and feature extraction to enhance the quality of the images. Effective pre-processing can significantly improve the accuracy of gender detection algorithms.
Expected outcomes of the project	• To investigate Thermal imaging pre-processing techniques • To investigate deep learning models for gender classification using thermal images.
Possible learning outcomes for the interns	The learners will be able to: • Understanding of distinct thermal patterns • Work with low quality images • Assess Thermal Image Quality which is essential in evaluating the performance of thermal imaging systems. • Work with deep learning models

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

Dr. Pravin Sonsare Dr. Preeti Voditel Dr. Khushboo Khurana
Name and Signature of PI

Name & Signature of Head of Department

42. Title of the Project	A Multi-Objective Service Model Leveraging Generalized K-Means Clustering
Name of the Principal Investigator (PI), Department	Dr. Preeti Voditel, Dr. Pravin Sonsare, Dr. Khushboo Khurana Department of Computer Science & Engineering and Emerging Technology.
Place of Work/Department	Department of Computer Science & Engineering and Emerging Technology, Ramdeobaba University
Brief description of the project	The project aims to design a multi-objective service model using generalized K-Means clustering to group service requests or entities into optimal clusters that balance multiple conflicting objectives. In modern service-oriented systems, such as logistics, healthcare, or customer support, multiple objectives often need to be optimized simultaneously. These objectives could include minimizing cost, maximizing quality of service, or balancing workload distribution. Grouping or clustering services effectively while considering multiple objectives is critical for improving efficiency and customer satisfaction. Generalized K-Means clustering offers a robust method to achieve this by incorporating diverse distance metrics and objective weights.
Expected outcomes of the project	• Clusters of service requests/entities that balance competing objectives such as cost efficiency, service quality, and workload distribution. Adaptive clusters that respond dynamically to changing demand or priorities. • Reduction in operational costs by optimizing resource allocation and reducing redundancies within clusters. Faster response times for services by grouping similar requests geographically or temporally. • Achieving a trade-off between multiple conflicting objectives (e.g., minimizing cost while maximizing customer satisfaction). Visualizations of Pareto-optimal solutions to demonstrate balanced clustering outcomes.
Possible learning outcomes for the interns	The learners will be able to: • Work with clustering models, visualization techniques • Understand the service market, perform research and publish paper.

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

Dr. Preeti Voditel Dr. Pravin Sonsare Dr. Khushboo Khurana
Name and Signature of PI

Name & Signature of Head of Department

43. Title of the Project	Optimization of Digital Adaptive Nulling Using Genetic Algorithms on FPGA in STAP Systems
Name of the Principal Investigator (PI), Department	Prof.Sadaf Zama Hussain,CSE
Place of Work/Department	CSE
Brief description of the project	Space-Time Adaptive Processing (STAP) systems play a crucial role in radar signal processing by suppressing unwanted interference and enhancing target detection. Digital adaptive nulling is vital for mitigating interference in these systems. However, traditional approaches often struggle with computational efficiency, especially when deployed on Field Programmable Gate Arrays (FPGAs). This project proposes the use of Genetic Algorithms (GAs) for optimizing digital adaptive nulling, tailored for FPGA implementation in STAP systems. GAs provide a robust optimization method capable of dynamically adjusting null placement to maximize interference suppression and minimize target loss. The proposed framework is expected to significantly enhance real-time performance and computational efficiency, making STAP systems more viable for practical applications. The proposed method ensures real-time adaptability, reduced computational load, and scalability, offering promising advancements in radar signal processing for interference suppression. This system takes real-time radar data, identifies interference, and cancels it using **Genetic Algorithms** on an **FPGA**. The use of GAs makes the system smarter, while the FPGA makes it faster. This combined approach allows radar systems to work in real-time, adapt to changing interference, and improve the clarity of target detection.
Expected outcomes of the project	The goal is to make a system that can cancel interference faster and more efficiently than traditional methods. The key idea is to use a **Genetic Algorithm (GA)** on an **FPGA** to get real-time results. The goal is to see if an FPGA-based GA can handle **complex, real-time problems**. This requires improving the speed and efficiency of the hardware to ensure that the system works in real-world radar applications. The main goal of this project is to improve radar systems so they can better detect targets while blocking interference and noise. This is done using **Genetic Algorithms (GAs)** running on **FPGAs** (special computer chips that can process many tasks at once).

Possible learning outcomes for the interns	This project will provide interns with a well-rounded learning experience covering hardware (FPGA), software (GAs), and signal processing (radar/STAP). These skills are in high demand in industries like defense, telecom, and autonomous vehicles. Interns will also get a chance to work with cutting-edge tools (MATLAB, Vivado, ModelSim) and develop technical and soft skills.With experience in FPGA, GAs, and radar signal processing, interns will have a competitive edge in the job market for roles like: • FPGA Engineer • Signal Processing Engineer • AI/Optimization Engineer

Requirements from the interns	
UG / PG Program (Branch)	UG or PG
Discipline	Computer Science & Engineering, Information Technology, 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)	The technical background required for this project spans concepts from **hardware (FPGA), software (GAs), and radar signal processing (STAP)**. Core topics include **FPGA design, GAs, and radar interference suppression**. Students should have completed courses in **Digital Systems, Signal Processing, and Embedded Systems**. Hands-on experience with **MATLAB, Vivado, and ModelSim** is essential. 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.)	Programming Skills: Xilinx Vivado, Intel Quartus C / C++ . Xilinx SDK, Embedded C Python . Python (NumPy, SciPy, Matplotlib) MATLAB / Simulink . MATLAB/Simulink Shell Scripting . Bash, Batch Scripts

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

44. Title of the Project	Fake Image Detection using biomarkers with deep neural network.
Name of the Principal Investigator (PI), Department	Dr. Khushboo Khurana, Department of Computer Science and Engineering
Place of Work/Department	Department of Computer Science and Engineering, Ramdeobaba University
Brief description of the project	This work aims to address the growing need for reliable image authenticity verification by creating a deep learning-based detection framework that identifies fake images with high precision and interpretability. While traditional image forensics techniques often fail to detect these sophisticated image manipulations, subtle biomarkers inherent in real images, such as noise patterns, lighting inconsistencies, or natural skin textures, can provide critical cues for distinguishing between authentic and fake images.
Expected outcomes of the project	A deep learning model capable of distinguishing between genuine and fake images with high precision and recall, leveraging reliable biomarkers.
Possible learning outcomes for the interns	The learners will be able to: ● Training deep neural networks for complex classification problem of fake image detection. ● Acquiring skills in designing, training, and fine-tuning deep learning models for image classification tasks. ● Learning techniques to interpret model decisions using Explainable AI (XAI) using techniques such as such as heatmaps, Grad-CAM, etc.

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	Machine Learning, Deep Learning

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 Programming

Name and Signature of PI

Name & Signature of Head of Department

45. Title of the Project	Dynamic Graph Neural Networks for Traffic Prediction
Name of the Principal Investigator (PI), Department	Dr. Pravin Sonsare, Department of CSE & ET
Place of Work/Department	Department of CSE & ET
Brief description of the project	Traffic prediction involves forecasting future traffic conditions, such as vehicle speeds, travel times or congestion levels. Since traffic systems are inherently dynamic and influenced by spatial and temporal factors. Dynamic Graph Neural Networks (DGNNs) are well-suited for this task. DGNN models are used for both the changing topology of road networks and the temporal evolution of traffic data.
Expected outcomes of the project	The outcomes of project are: 1. **To study Spatial-Temporal Dependencies**: Traffic is influenced by spatial relationships (e.g., road connections) and temporal trends (e.g., rush hours, weather). 2. **To deal with Dynamic Graph Structures**: Traffic graphs change over time due to incidents, construction or adaptive traffic systems. 3. **To find Multi-Scale Patterns:** Requires capturing local (intersection-level) and global (city-wide) traffic patterns. 4. **To build Real-Time Prediction model**: Models must be efficient for near real-time forecasting.
Possible learning outcomes for the interns	Intern will able to learn: • **Graph Representation using pytorch geometric.** • Graph neural networks like Spatial-Temporal Graph Convolutional Networks (ST-GCNs), Graph Attention Networks (GATs), Temporal Graph Networks (TGNs) • Architectures for DGNNs in Traffic Prediction • Transformer-Based Models • How DGNNs Work for Traffic Prediction • **Dynamic Graph Modelling.** • **Use of NVIDIA-DGX server for training models.**

Requirements from the interns	
UG / PG Program (Branch)	UG Program
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, Data Structure
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Programming in Python, Pytorch.

Dr. Pravin Sonsare
Name and Signature of PI & Co-PI

Dr. Preeti Voditel
Name & Signature of Head of Department

46. Title of the Project	Predicting Alzheimer's Disease Progression from MRI Scans and Genetic Information using Advanced Machine Learning Techniques.
Name of the Principal Investigator (PI), Department	Prof. Shubhangi Tirpude
Place of Work/Department	Computer Science & Engineering and Emerging Technologies
Brief description of the project	Alzheimer's Disease (AD) is a progressive neurodegenerative disorder that significantly impacts cognitive functions, leading to memory loss and daily functioning. It is a growing public health challenge with no cure currently available. So, Early prediction of progression from Mild Cognitive Impairment (MCI) to AD can significantly improve patient life through timely intervention. Mild Cognitive Impairment (MCI) often precedes Alzheimer's, but not all individuals with MCI develop AD. Multimodal data enhances prediction accuracy by combining structural brain changes with genetic predispositions. This project predicts the progression of Alzheimer's disease by utilizing data such as MRI scans and genetic information by applying machine learning techniques.
Expected outcomes of the project	● A Machine learning model that accurately predicts the likelihood of an individual progressing from mild cognitive impairment (MCI) to Alzheimer's Disease (AD). ● The model will outperform traditional diagnostic approaches using MRI-based neuroimaging data and genetic information ● Provides an insight into the relative importance of MRI and genetic data in progression prediction.
Possible learning outcomes for the interns	The learners will be able to: ● Learn to preprocess MRI data (e.g., image normalization, segmentation) and genetic data (e.g., encoding SNPs or genetic markers).

	• Develop skills in feature extraction, designing, training, and fine-tuning models for disease classification tasks. • Learning techniques to interpret model decisions using Explainable AI. • Integrating and analysing diverse datasets, such as neuroimaging and genetic data • Enhance the ability to review existing literature and understand state-of-the-art methods for Alzheimer's progression prediction.

Requirements from the interns	
UG / PG Program (Branch)	UG Program
Discipline	CSE & allied branches, Biomedical Engineering
Technical background (eg. Courses that should have been done, topics that should have been known)	Machine Learning,
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Good knowledge of Python, Python library for reading, writing, and processing neuroimaging data. Explainability tools such as SHAP & LIME

Name and Signature of PI & Co-PI

Dr. Preeti Voditel
Name & Signature of Head of Department

47. Title of the Project	Hyperspectral Image Processing for fruit quality analysis using Machine Learning and Deep Learning
Name of the Principal Investigator (PI), Department	**Dr. M. B. Chandak** **Prof. Neha P. Lanke** CSE & ET
Place of Work/Department	CSE & ET
Brief description of the project	This project will be helpful in the automated grading and sorting of fruit using machine learning and deep learning approaches.
Expected outcomes of the project	**Outcome:** Patent, Research Publications, and Copyright(s).
Possible learning outcomes for the interns	Hyperspectral Image Processing, Machine Learning, and Deep Learning.

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

Name and Signature of PI & Co-PI

Dr. Preeti Voditel
Name & Signature of Head of Department

48. Title of the Project	Biomedical Text Analysis using Genetic Algorithm
Name of the Principal Investigator (PI), Department	Dr. Supriya Gupta Bani Department of Computer Science and Engineering, Ramdeobaba University
Place of Work/Department	Department of Computer Science and Engineering, Ramdeobaba University
Brief description of the project	This work aims to address Genetic algorithms (GAs), optimization algorithms inspired by the process of natural selection. They can be applied to various optimization problems, including feature selection in text mining for data mining tasks. The goal is to evolve a set of features (genes) that maximize the performance of a text mining model.
Expected outcomes of the project	A new text mining process to uncover interesting term correlations. The process uses a genetic algorithm to cope with the combinatorial explosion of the term sets. The genetic algorithm identifies combinations of terms that optimize an objective function, which is the cornerstone of the process. We have tested a function designed to optimize the discriminating power of the term sets.
Possible learning outcomes for the interns	• Biomedical Text Analysis • Text Information Retrieval • Optimization Analysis • Dynamic Graph Modelling.
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 equipments such as CRO, Electron Microscope etc.)	Python , Excel, Matlab

Dr. Supriya Gupta Bani **Dr. Preeti Voditel**

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

49. Title of the Project	Optimizing Bicycle Manufacturing: A Demonstration of Productivity Enhancement Techniques
Name of the Principal Investigator (PI), Department	1)Dr. Y. M. Sonkhaskar, Prof. In-charge CIIIT, Mechanical Engineering, RBU (2) Dr. Priya M. Khandekar, Assistant Professor, Mechanical engineering, RBU
Place of Work/Department	Center for Invention, Innovation, Incubation and Training (CIIIT) RCOEM, Nagpur-13
Brief description of the project	The smart Manufacturing Execution System (MES) in the CIIIT is the ready-to-explore research setup to demonstrate productivity improvement in assembly manufacturing. The targeted cycle times will be achieved by modifying fixtures and work stations by applying concepts of Ergonomics, work system design and Mechanical Engineering. Using the PLC controlled six station assembly line set up, a real-life Data frame to be used in Management Decision making will be generated.
Expected outcomes of the project	The suggested project work might result in a quality research paper being published in a reputable journal. Additionally, the created experimental setup can be utilized as a laboratory experimental setup and for next projects.
Possible learning outcomes for the interns	1. Practical knowledge in developing and constructing the experimental setup 2. An ability to organize an experimental research project 3. A thorough comprehension of experimental procedures, data collection, analysis, and interpretation 4. Firsthand knowledge of how to write a research paper for a reputable publication.

Requirements from the interns	
UG / PG Program (Branch)	2 UG Students
Discipline	1 student from Mechanical Engineering 1 student from Industrial Engineering
Technical background (eg. Courses that should have been done, topics	Awareness of Ergonomics, Time and Motion study (MOST) and basic Mechatronics concepts.

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.)	**Mandatory** ● The students should be ready to carry out the meticulous investigational work for a period of minimum 4 months on the MES at CIIIT with other floating team members. ● Proficiency in safety procedures and the ability to write research articles **Desirable** ● Familiar with the Solid modelling and work system design concepts ● Inclination for working with team on factory shop floor

Dr. Y. M. Sonkhaskar (PI) Dr. Vishal V. Shukla

Dr. Priya M. Khandekar (Co-PI)

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

50. Title of the Project	Developing a Machine Learning Framework for Early Detection of Problematic Internet Use in Children
Name of the Principal Investigator (PI), Department	Prof. Aarti Karandikar
Place of Work/Department	Computer Science & Engineering and Emerging Technologies
Brief description of the project	In today's digital age, problematic internet use among children and adolescents is a growing concern. Better understanding this issue is crucial for addressing mental health problems such as depression and anxiety. The aim is to develop a machine learning framework capable of analysing children's physical activity data to detect early indicators of problematic internet and technology use. This will enable prompt interventions aimed at promoting healthier digital habits. The work will contribute to a healthier, happier future where children are better equipped to navigate the digital landscape responsibly.
Expected outcomes of the project	A predictive model capable of analysing children's physical activity data to detect early indicators of problematic internet and technology use.
Possible learning outcomes for the interns	The interns will get a chance to learn how to: design, train, evaluate, and fine-tune machine learning models. define a research problem, create hypotheses, and design experiments. critically evaluate results and identify patterns or anomalies.

Requirements from the interns	
UG / PG Program (Branch)	Any branch
Discipline	--

Technical background (eg. Courses that should have been done, topics that should have been known)	Linear algebra, machine learning, any course in oral and written communication
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Good knowledge of Python

Prof. A. M. Karandikar
Principal Investigator

Dr. P. Voditel
Head, CSE-ET

51. Title of the Project	Study of communication protocol for IoT applications
Name of the Principal Investigator (PI), Department	Dr.Prachi Salodkar,Electrical Engineering
Place of Work/Department	PLC LAB, Electrical Engineering
Brief description of the project	Application of communication protocol for data monitoring, EV applications, predictive maintenance
Expected outcomes of the project	Research Publications
Possible learning outcomes for the interns	To understand the knowledge of communication protocols and apply in real life applications.

Requirements from the interns	
UG / PG Program (Branch)	UG Program
Discipline	Electrical Engineering
Technical background (eg. Courses that should have been done, topics that should have been known)	Knowledge of PLC Programming , communication protocal ,mictocontroller interfacing, SQL for database
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	PLC programming, SQl, MQTT protocol, IoT, Harrdware interfacing.

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

52. Title of the Project	Design and Development of IoT based Patient Health Monitoring System
Name of the Principal Investigator (PI), Department	Dr. Rakesh K Kadu Information Technology & Security
Place of Work/Department	Department of Information Technology & Security, Ramdeobaba University
Brief description of the project	A Patient Health Monitoring System is a technology-driven solution designed to continuously track and manage various aspects of an individual's health. This system leverages digital tools, sensors, and software applications to collect, analyze, and present health-related data in real-time. The primary goal is to provide users, healthcare professionals, and caregivers with valuable insights into the patient's well-being, enabling proactive health management and early detection of potential issues. Key Components and Features of a Patient Health Monitoring System: 1. **Sensor Integration:** o Utilizes a variety of sensors (e.g., wearables, medical devices) to capture vital health metrics such as heart rate, blood pressure, oxygen levels, temperature, and more. 2. **Data Collection and Storage:** o Gathers and stores health data securely, often in a cloud-based system, allowing for centralized and accessible information. 3. **Real-time Monitoring:** o Provides real-time tracking of health parameters, allowing immediate awareness of any anomalies or changes in the patient's condition. 4. **Mobile Applications:** o Integrates with mobile applications that serve as user interfaces, enabling patients to view their health data, set reminders, and receive alerts. 5. **Alerts and Notifications:** o Sends timely alerts and notifications to users or caregivers for medication reminders, upcoming appointments, or critical changes in health readings.

Expected outcomes of the project	Following are the outcome of Patient Health Monitoring System. 1. **Continuous Monitoring:** o Enable real-time or periodic monitoring of vital signs such as heart rate, blood pressure, oxygen levels, and other relevant health parameters. 2. **Chronic Condition Management:** o Assist patients with chronic conditions in managing their health by tracking symptoms, medication adherence, and lifestyle factors. 3. **Preventive Health:** o Facilitate proactive health management by encouraging users to adopt healthy behaviors, providing health tips, and sending reminders for regular check-ups. 4. **Early Detection of Issues:** o Enable early detection of health issues by analyzing trends and anomalies in health data, allowing for timely intervention. 5. **Remote Patient Monitoring:** o Facilitate remote monitoring of patients, reducing the need for frequent in-person visits, especially for individuals with chronic illnesses or post-surgery recovery. 6. **User Education:** o Provide educational resources to users about their health conditions, medications, and general wellness practices. 7. **Communication and Collaboration:** o Enhance communication between patients and healthcare providers, allowing for secure messaging, video consultations, and data sharing. 8. **Data Analysis and Reporting:** o Offer tools for analyzing health data trends, generating reports, and sharing relevant information with healthcare professionals during consultations. 9. **Emergency Response:** o Include features for emergency response, such as alerting emergency contacts or healthcare providers in case of critical health readings or user-reported emergencies. 10. **User Empowerment:**

	○ Empower users to take an active role in managing their health by providing them with actionable insights, personalized recommendations, and the ability to set health goals. 11. **Integration with Wearables:** ○ Integrate seamlessly with wearable devices to capture additional health data and provide a comprehensive overview of the user's health. 12. **Support for Caregivers:** ○ Provide features that allow caregivers or family members to monitor the health of their loved ones, especially in cases where users may require assistance. By aligning the app's features and functionalities with these objectives, you can create a Patient Health Monitoring App that addresses the specific needs of patients, healthcare professionals, and caregivers, contributing to improved health outcomes and a more connected healthcare ecosystem.
Possible learning outcomes for the interns	For students involved in developing or studying Patient Health Monitoring Systems, the learning outcomes can be diverse and cover a range of technical, practical, and ethical aspects. Here are some potential learning outcomes for students engaging with a Patient Health Monitoring System: 1. **Technical Competence:** ○ Students gain proficiency in developing, implementing, and maintaining health monitoring systems, acquiring skills in software development, database management, and system integration. 2. **Understanding Healthcare Technologies:** ○ Students develop a deep understanding of healthcare technologies, including wearable devices, sensors, and other monitoring tools used in patient health tracking. 3. **Data Management and Analysis:** ○ Students learn how to handle and analyze health data, including data processing, storage, and interpretation to extract meaningful insights. 4. **User Interface (UI) and User Experience (UX) Design:** ○ Students develop skills in designing intuitive and user-friendly interfaces, considering the needs of both patients and healthcare professionals. 5. **Human-Computer Interaction (HCI):**

	○ Students learn principles of HCI to optimize the interaction between users and the Patient Health Monitoring System, considering usability, accessibility, and user feedback. 6. **Ethical Considerations in Healthcare Technology:** ○ Students gain insights into ethical considerations related to patient privacy, informed consent, and responsible use of health data in technology applications. 7. **Health Informatics Knowledge:** ○ Students acquire knowledge in health informatics, understanding how information technology is applied in the healthcare sector to improve patient outcomes and healthcare processes. 8. **Interdisciplinary Collaboration:** ○ Students develop skills in collaborating with healthcare professionals, understanding their needs and integrating technological solutions into existing healthcare practices. 9. **Problem-Solving and Critical Thinking:** ○ Students enhance problem-solving skills by addressing challenges in the development and implementation of Patient Health Monitoring Systems, fostering critical thinking in healthcare technology. 10. **Effective Communication:** ○ Students learn to communicate technical concepts to non-technical stakeholders, including healthcare providers, patients, and caregivers. 11. **Project Management:** ○ Students gain experience in project management, including planning, execution, and evaluation of Patient Health Monitoring System projects. 12. **Research and Innovation:** ○ Students are encouraged to explore and contribute to research and innovation in the field of health monitoring, staying informed about the latest advancements and contributing to the development of new technologies. These learning outcomes equip students with a multidisciplinary skill set, preparing them for careers in healthcare technology, software development, and other related fields, while also fostering an understanding of the ethical implications and social impact of their work.

Requirements from the interns	
UG / PG Program (Branch)	UG: Computer Science & Engineering, Information Technology, Data Science, Cyber Security, AI & ML, Electronics Engg
Discipline	Computer Science & Engineering, Information Technology, Data Science, Cyber Security, AI & ML, Electronics Engg
Technical background	IoT, Mobile App Development, Machine Learning, AI, Database Programming, Cloud Computing
Specific skill set	Understanding of IoT, Database Programming, Cloud Computing

Dr. Rakesh K. Kadu
Principal Investigator

Dr. Ashish V. Chandak
Co-PI

Dr. S. S. Balpande
Head
Information Technology & Security

53. Title of the Project	Development of machine learning model for reliability testing of radiation sensors
Name of Principal Investigator (PI)	**Prof. Shubham Anjankar**
Domain	Sensor Development
Brief description of the project	The project focuses on developing a machine learning model for reliability testing of radiation sensors. Using an existing dataset, the model will analyze sensor performance metrics, and predict reliability under varying conditions. This research aims to enhance the accuracy and efficiency of sensor evaluations, contributing to advancements in radiation detection technology.
Expected outcomes of the project	This will enhance sensor performance prediction, reduce testing time, and support advancements in radiation detection technologies. **Other outcomes:** Patent/ copyright(s), research publications in SCI/Scopus journal
Possible learning outcomes for the interns	**Model Development and Optimization**: Students will learn to design, train, and optimize machine learning models to predict the reliability of radiation sensors under varying conditions. **Data Analysis and Preprocessing**: Gain expertise in analyzing sensor datasets, handling missing data, and applying feature engineering for improved model performance. **Interdisciplinary Application**: Understand the integration of machine learning techniques in sensor reliability testing, bridging concepts from electronics and artificial intelligence.

Requirements from the interns	
UG / PG Program	UG or PG
Discipline	Information Technology and Security, Computer Science & Engineering and Emerging Technologies, Electronics Engineering/ ENCS, Electrical Engineering
Technical background (eg. Courses that should have been done; topics that should have been known)	Sensor technology, radiation physics, and machine learning algorithms.

Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipment such as CRO, Electron Microscope etc.)	Proficiency in machine learning techniques and algorithms, Hands-on skills in Python for model development and data analysis are essential.

Date: 13.12.2024

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Department of Electronics Engineering
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Principal Investigator

Dr. Suresh S. Balpande
Head and Associate professor
Dept of Information Technology and Security
balpandes@rknec.edu | M: 8149610400
Co-Principal Investigator

Dr. Nitin Narkhede
Head, Department of Electronics Engineering

54. Title of the Project	Development of an Android Application for soil nutrients assessment
Name of Principal Investigator (PI)	**Dr. Suresh Balpande**
Domain	Agriculture
Brief description of the project	This approach would be beneficial for quantifying the concentration of essential elements such as nitrogen, phosphorus, potassium, organic carbon, and others in soil. The primary steps include smartphone camera integration, development of an Android application, and system calibration.
Expected outcomes of the project	The concept will be transformed into a product. This approach would be highly beneficial for farmers, fertilizer retailers, and other related agricultural enterprises. **Other outcomes:** Patent, research publications and copyright(s).
Possible learning outcomes for the interns	Research interns will gain hands-on experience in mobile app development, sensor integration, and data visualization. They will learn about soil health analysis, implement algorithms for nutrient evaluation, and enhance skills in problem-solving and sustainable agriculture technologies.

Requirements from the interns	
UG / PG Program	UG or PG
Discipline	Information Technology and Security, Computer Science & Engineering and Emerging Technologies, Electronics Engineering/ ENCS, Electrical Engineering
Technical background (eg. Courses that should have been done; topics that should have been known)	Interns shall have hands-on experience in mobile app development, and data analytics for agricultural applications.
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipment such as CRO, Electron Microscope etc.)	Android Programming, Machine Learning, Colour Calibration techniques.

Note: The Firebase interface and Android application are partially ready. To-do lists include UI development, data security, and integration of an Android app with soil health website of Govt of India.

Date: 13.12.2024

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Principal Investigator

55. Title of the Project	Development of colour dataset for soil nutrients using colorimetry Technique
Name of Principal Investigator (PI)	**Dr. Suresh Balpande**
Domain	Agriculture
Brief description of the project	This dataset would be used to develop an application/portable system for determining the concentration of nutrients (nitrogen, phosphorous, potassium, and organic carbon) in the 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 colorimetry methods. 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)	Engineering Chemistry, Colorimetric detection
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipment such as CRO, Electron Microscope etc.)	Spectrophotometer, Optical filters, Dataset Management

Date: 13.12.2024

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Principal Investigator

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

56. Title of the Project	A portable soil pH measuring device based on Machine learning model and Arduino/ESP32 controller
Name of Principal Investigator (PI)	**Prof. Suresh Balpande**
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	Information Technology and Security, Computer Science & Engineering and Emerging Technologies, Electronics Engineering/ ENCS, Electrical Engineering
Technical background (eg. Courses that should have been done; topics that should have been known)	Engineering Chemistry, Colorimetric detection, 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: 13.12.2024

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Principal Investigator

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

57. Title of the Project	Development of Artificial Intelligence based smart classrooms
Name of Principal Investigator (PI)	Prof. Suresh Balpande
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, or PyTorch) and experience with IoT integration for smart systems are essential Artificial Intelligence.

Date: 13.12.2024

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Principal Investigator

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

58. Title of the Project	Development of an interface unit and android application for fruit adulterant detection
Name of Principal Investigator (PI)	**Dr. Suresh Balpande**
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	Information Technology and Security, Computer Science & Engineering and Emerging Technologies, Electronics Engineering/ ENCS, Electrical Engineering
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 (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipment such as CRO, Electron Microscope etc.)	Android application development, and sensor interfacing. Knowledge of data acquisition, signal processing, and programming languages

Date: 13.12.2024

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Principal Investigator

59. Title of the Project	Vehicle identification and real time tracking
Name of the Principal Investigator (PI), Department	Abhishek Sahu
Place of Work/Department	AIML Dept
Brief description of the project	The purpose of this project is to develop a system that can identify and track a specific vehicle of interest in real time with the help of the specifications of the vehicle to track. The system will leverage YOLO ,image processing and OCR techniques to analyze a live feed and accurately identify the desired object, enabling continuous tracking as it moves within the frame.
Expected outcomes of the project	A robust object selection and tracking system capable of identifying and tracking a specific vehicle in real time. One SCI/Scopus indexed publication
Possible learning outcomes for the interns	Get familiar with the state-of-the-art models in machine learning and may develop a novel approach to do the task.

Requirements from the interns	
UG / PG Program (Branch)	Anyone
Discipline	Open to all
Technical background (eg. Courses that should have been done, topics that should have been known)	ML/DL algorithms (object segmentation and detection algorithms), Computer vision **Note:** Students with experience in video processing may also apply.
Specific skill set	ML/DL **AND/OR** Python/C++ **AND/OR** Experience on writing codes for specific development kit i.e. jetson nano, ARM Cortex.

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

60. Title of the Project	Smart water bottle for real time water quality monitoring
Name of the Principal Investigator (PI), Department	Abhishek Sahu (PI) Deepa Das(Co-PI)
Place of Work/Department	CSE-AIML (PI) School of CSE (Co-PI)
Brief description of the project	The **ML-powered smart water bottle** ensures safe hydration by analyzing water quality in real time. Using advanced sensors and machine learning algorithms, it detects unsafe conditions like abnormal pH, high TDS, or contamination. A built-in display shows water parameters, and a red alert is triggered if the water is unsafe. With continuous learning and adaptability, it offers personalized insights via a connected app, combining safety, convenience, and technology.
Expected outcomes of the project	Project proposal, Device prototype, Industry outreach.
Possible learning outcomes for the interns	Publication.

Requirements from the interns	
UG / PG Program (Branch)	UG
Discipline	Open to all
Technical background (e.g. Courses that should have been done, topics that should have been known)	Machine Learning, Arduino/development board, App development.
Specific skill set (e.g. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipment	Python, AIML Libraries integration with app, Dashboard design.

such as CRO, Electron Microscope etc.)	

Name and Signature of PI & Co-PI

Name & Signature of Head of Department

61. Title of the Project	Development of a Generative AI Based Virtual Dressing Room
Name of the Principal Investigator (PI), Department	Dr. Nisarg Gandhewar, Department of CSE & ET
Place of Work/Department	Department of CSE & ET
Brief description of the project	Trying clothes in clothing stores is usually a time-consuming activity. Besides, it might not even be possible to try-on clothes in such cases as online shopping. The problem is simply the alignment of the user and the cloth models with accurate position, scale, rotation and ordering.
Expected outcomes of the project	This system would be very useful for ecommerce industry. **Outcome:** Research publications
Possible learning outcomes for the interns	Intern will be able to learn: • Principles & use of GAN & other generative model • Fine tunning & training the GAN model • key concepts like object detection, segmentation, and image processing.

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

Dr. Nisarg Gandhewar — Name and Signature of PI & Co-PI

Dr. Preeti Voditel — Name & Signature of Head of Department

62. Title of the Project	Development of AI-powered Chatbot for Mental Health Support
Name of the Principal Investigator (PI), Department	Dr. Nisarg Gandhewar, Department of CSE & ET
Place of Work/Department	Department of CSE & ET
Brief description of the project	Mental Health problems are something that everyone struggles with at various points in their life and finding the right type of help and information can be hard, even a blocker. In recent years, mental health awareness has significantly increased, highlighting the need for accessible and effective support systems. Build an AI-powered chatbot leveraging GPT technology to offer mental health support and resources to users. The chatbot should be capable of: 1. Providing empathetic and supportive responses to users expressing various emotions and mental health concerns. 2. Offering resources such as helpline numbers, self-help articles, and coping strategies based on user input. 3. Conducting conversational assessments to gauge the user's mental state and keep a record of the mental state over time.
Expected outcomes of the project	Functional AI-powered chatbot capable of engaging in meaningful conversations related to mental health.
Possible learning outcomes for the interns	Intern will able to learn: • Chatbot Development • Fine tunning of LLM • Web Scrapping • Vector Database • Transformer-Based Models • Conversational AI

Requirements from the interns	
UG / PG Program (Branch)	UG/PG Program
Discipline	CSE and allied branches
Technical background (eg. Courses that should have been done, topics that should have been known)	Deep Learning, Generative AI
Specific skill set (eg. Programming,	Programming in Python.

theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	

Dr. Nisarg Gandhewar
Name and Signature of PI & Co-PI

Dr. Preeti Voditel
Name & Signature of Head of Department

63. Title of the Project	Enhanced Drug Instruction Recognition using Synthetic Handwritten Prescription Expansion
Name of the Principal Investigator (PI), Department	Prof. Sruthi Nair, Department of Computer Science and Engineering
Place of Work/Department	Department of Computer Science and Engineering, Ramdeobaba University
Brief description of the project	This project focuses on leveraging style-transfer techniques to generate synthetic handwritten prescriptions based on existing datasets. By exploring all possible ways a doctor might write instructions for drug consumption (e.g., "4 times" as "1-1-1-1" or "3 times for ten days" as "3x10"), the project eliminates the necessity of training models to recognize every handwriting variation. This synthetic dataset will serve as a comprehensive reference for matching scanned prescriptions to predefined patterns, simplifying drug instruction recognition in medical contexts.
Expected outcomes of the project	A drug recognition model with a comprehensive dataset of synthetically generated handwritten prescriptions, covering all plausible formats for drug consumption instructions with an efficient algorithm or tool to match scanned handwritten prescriptions to this expanded dataset for accurate interpretation.
Possible learning outcomes for the interns	1. Mastery in generative AI, style-transfer techniques, OCR, and data augmentation for handling diverse handwriting styles in medical prescriptions. 2. Designing and implementing efficient pattern-matching algorithms to streamline handwritten prescription recognition. 3. Gaining insights into real-world challenges in medical text digitization and developing innovative solutions for automated drug instruction interpretation.

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)	Deep Learning, NLP
Specific skill set	Python Programming

Sruthi Nair
Name and Signature of PI

Dr. Preeti Voditel
Name & Signature of Head of Department

64. Title of the Project	Advancements in Cyber-Physical Systems: Enhancing Interconnectivity and Security
Name of the Principal Investigator (PI), Department	Dr. A. V. Chandak
Place of Work/Department	Information Technology
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

Dr. Ashish V. Chandak **Principal Investigator**	Dr. Rakesh K. Kadu **Co-PI**	Dr. S. S. Balpande **Head** **Information Technology & Security**

65. Title of the Project	Experimental investigations on the performance of Laser cutting machining parameters for different materials.
Name of the Principal Investigator (PI), Department	Dr. Ashish Urade Mechanical Engineering Department
Place of Work/Department	CIIIT Center & Department of Mechanical Engineering
Brief description of the project	Laser cutting machine allow users to make extremely precise cuts in a flat sheet of material (such as wood, glass and acrylic) and engrave an image onto an object by burning or melting away very fine layers. The proposed project work is based on the optimisation of the laser machining parameter, useful for the shop floor, in terms of: a. Cutting Precision and Positional Accuracy b. Improved Edge Quality and Surface Finish c. Drilling and Engraving in Addition to Cutting d. Minimal Thermal Stress Zone e. Strong Repeatability with Cost-Effectiveness
Expected outcomes of the project	The proposed project work may lead to the publication of a good research paper in the reputed Journal. Also, the results and outcomes can be used to carry out future projects.
Possible learning outcomes for the interns	● Hands-on experience Laser cutting machine ● Ability to plan an experimental research in terms of Design of Experiment (DOE) ● Understanding of the selection of independent, dependent and controlled variables, experimental procedures, data collection, data analysis and interpretation. ● First-hand experience of writing a research paper for reputed journals.

Requirements from the interns

UG / PG Program (Branch)	2 UG Students
Discipline	Students from Mechanical Engineering
Technical background (eg. Courses that should have been done, topics that should have been known)	The students should have the basic understanding of Manufacturing processes and unconventional machining phenomenon.
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	**Mandatory** ● The students should be ready to carry out the rigorous experimental work for a period of minimum 3 months. ● Good written and communication skills. **Desirable** ● Familiar with the data visualization and plotting tools such as MINITAB etc. ● Familiar with Laser cutting machine software.

Dr. Ashish Urade

Name and Signature of PI

Dr. V.V. Shukla

Name & Signature of Head of Department

66. Title of the Project	Automated Coal Composition Analysis Using CNNs and Spectral Imaging Techniques
Name of the Principal Investigator (PI), Department	Dr M. B. Chandak, Computer Science and Engineering
Place of Work/Department	Computer Science and Engineering
Brief description of the project	• This project focuses on the development of an automated system for analyzing coal composition using Convolutional Neural Networks (CNNs) and spectral imaging techniques. • The goal is to provide a real-time, non-destructive method to accurately assess the quality and composition of coal, improving efficiency in mining, energy production, and quality control processes. • Accurate coal quality assessment will enable better control over pollutants, particularly ash and sulfur emissions, by ensuring that the right quality of coal is used in energy production. • Development of Environment friendly Application
Expected outcomes of the project	• The system will deliver precise predictions of key coal quality parameters (e.g., moisture, ash content, volatile matter, fixed carbon) based on spectral imaging data. • The project will result in a real-time coal analysis system that provides instant feedback without physically altering or destroying the coal sample.
Possible learning outcomes for the interns	• Interns will be able to learn to design CNN models to analyze the spectral images and extract relevant features that correspond to specific coal composition parameters. • Interns will develop a software interface will be developed, allowing industry professionals (e.g., mining engineers, plant operators) to easily interact with the system and obtain real-time coal quality assessments.

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 and Neural Networks
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Python Programming Language

Dr. M. B. Chandak [PI]

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

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

67. Title of the Project	Machine Learning based Approach for advanced drug discovery using LLM
Name of the Principal Investigator (PI), Department	Dr M. B. Chandak, Dr. A. R. Raipurkar
Place of Work/Department	Computer Science and Engineering

Brief description of the project	This project uses **computational techniques** to find better drug combinations by modifying their molecular properties. For example:
	• **Drug A** blocks a protein in cancer, and **Drug B** helps the immune system target cancer cells.
	• Using **computational tools** like **molecular simulations**, we could:
	  ○ **Modify Drug A** to stay in the body longer (improve its half-life).
	  ○ **Optimize Drug B** to bind more effectively to its target.
	Combining these optimized drugs could lead to a stronger and more sustained effect in treating cancer.

Expected outcomes of the project	• **Optimized Drug Combinations**: Use computational techniques to identify combinations that are more effective and have fewer side effects. • **Improved Drug Properties**: Modify drugs' behavior (e.g., half-life, binding ability) using simulations. • **Predictive Models**: Develop models that predict drug interactions and their effects. • **Software Tools**: Create or improve tools for drug discovery that help speed up the process of identifying better drug combinations.
Possible learning outcomes for the interns	LLMs, Molecular Modeling, Data Interpretation & Statistical Analysis

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, Deep Learning, Basic Chemistry
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Programming (Python) Language

Dr. M. B. Chandak [PI]

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

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

68. Title of the Project	Enhancing Cloud Security: Innovative Approaches for Protecting Data, Infrastructure, and Applications
Name of the Principal Investigator (PI), Department	Dr Rashmi Welekar
Place of Work/Department	It & Security
Brief description of the project	Cloud computing has become a cornerstone of modern IT infrastructure, enabling businesses and individuals to scale resources, collaborate efficiently, and access data and applications from anywhere. However, as cloud adoption grows, so do concerns about security, privacy, and compliance risks. This research project aims to explore and analyse current cloud security challenges, focusing on innovative solutions and methodologies to enhance the protection of cloud environments. The project will focus on several key areas, including data encryption, identity and access management (IAM), vulnerability management, multi-cloud security strategies, and regulatory compliance frameworks.
Expected outcomes of the project	• In-depth understanding of the current landscape of cloud security, including emerging threats and vulnerabilities. • Development of a comprehensive set of best practices for securing cloud environments, tailored for small-to-large enterprises. • Proposals for advanced cloud security mechanisms utilizing AI, machine learning, and blockchain technologies to detect, prevent, and mitigate cloud security risks. • Guidelines for hybrid and multi-cloud security, addressing the complexities and challenges involved in managing security across diverse platforms. • Recommendations for organizations on how to implement a robust, scalable, and cost-effective cloud security posture while ensuring compliance with global data protection law
Possible learning outcomes for the interns	• Critical understanding of cloud security challenges: The ability to identify, assess, and address key security risks and vulnerabilities in cloud computing environments. • Proficiency in cloud security tools and techniques: Hands-on experience with tools like

	identity and access management (IAM) systems, encryption protocols, security monitoring, and threat detection frameworks. • Knowledge of cloud security standards and regulations: Familiarity with security frameworks (e.g., ISO 27001, NIST) and compliance requirements (e.g., GDPR, HIPAA) governing cloud data. • Advanced problem-solving skills: The ability to design and implement practical security solutions, leveraging emerging technologies like machine learning for threat detection and automation. • Research and analytical skills: Enhanced capacity to conduct independent research, analyze complex security data, and contribute to the development of new methodologies in cloud security.

Requirements from the interns	
UG / PG Program (Branch)	UG
Discipline	CSE, CSE Cyber Security
Technical background (eg. Courses that should have been done, topics that should have been known)	Computer Networks, Cloud computing, Machine Learning
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Java, Python, Machine Learning Algorithms

Dr Rashmi Welekar — Dr. Suresh Balpande

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

69. Title of the Project	Optimizing Vulnerability Management: Designing Strategies for Proactive Detection, Mitigation, and Prevention in Modern IT Environments
Name of the Principal Investigator (PI), Department	Dr Rashmi Welekar, Dr. Charanjeet Dadiyala
Place of Work/Department	IT & Security
Brief description of the project	Vulnerability management is a critical aspect of maintaining the security and integrity of IT infrastructures. As cyberattacks grow in sophistication and frequency, organizations must adopt proactive and systematic approaches to identify, assess, prioritize, and mitigate vulnerabilities within their systems, applications, and networks. This research project focuses on enhancing vulnerability management practices through the exploration of modern tools, techniques, and strategies for detecting and addressing vulnerabilities before they can be exploited by malicious actors. The project will investigate current vulnerability management frameworks, such as the Common Vulnerability Scoring System (CVSS) and the National Vulnerability Database (NVD), and evaluate their effectiveness in real-world scenarios. The study will also examine emerging technologies like machine learning for predictive vulnerability detection, automation for rapid patch management, and threat intelligence integration for more targeted vulnerability remediation.
Expected outcomes of the project	• Comprehensive framework for vulnerability management: A refined approach to vulnerability management that incorporates automation, threat intelligence, and risk-based prioritization. • Recommendations for best practices: Practical guidelines for organizations on how to establish a robust vulnerability management program that can proactively address both known and unknown vulnerabilities. • Assessment of emerging tools and technologies: A critical evaluation of current and emerging vulnerability management tools, with a focus on their strengths, limitations, and suitability for different organizational needs. • Metrics for vulnerability management performance: Development of measurable metrics that organizations can use to assess the effectiveness of their vulnerability management processes. • Case studies and real-world applications: Documented use cases that demonstrate successful vulnerability management strategies in different industries (e.g., finance, healthcare, tech).
Possible learning outcomes for the interns	• In-depth understanding of vulnerability management processes: A thorough understanding of how vulnerabilities are discovered, assessed, prioritized, and mitigated in an enterprise setting. • Knowledge of risk-based vulnerability prioritization: The ability to develop and implement strategies that prioritize vulnerabilities

	based on factors such as severity, exploitability, business impact, and asset value. • Hands-on experience with vulnerability scanning and management tools: Exposure to and practical experience with industry-standard tools and platforms for vulnerability scanning, such as Nessus, OpenVAS, and Qualys, as well as automated patch management systems. • Integration of threat intelligence into security workflows: Skills in leveraging threat intelligence to enhance the vulnerability management process, including integrating feeds from sources like OTX (Open Threat Exchange) or commercial threat intelligence platforms. • Understanding of vulnerability management in the DevSecOps context: Familiarity with how vulnerability management practices can be integrated into DevSecOps pipelines to ensure continuous security in agile and cloud-native environments.

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

Dr Rashmi Welekar — Dr. Suresh Balpande

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

70. Title of the Project	Adaptive Intrusion Detection System for IoT Networks Using Lightweight Hybrid Models and Reinforcement Learning
Name of the Principal Investigator (PI), Department	Dr. Charanjeet Dadiyala
Place of Work/Department	Department of IT and security
Brief description of the project	This project aims to develop a lightweight hybrid Intrusion Detection System (IDS) tailored for IoT networks, addressing challenges such as high false positives and resource constraints. By leveraging advanced feature selection, reinforcement learning for adaptive thresholding, and transfer learning for scalability, the model seeks to enhance detection accuracy while maintaining computational efficiency in real-time applications
Expected outcomes of the project	The expected outcome of the project is a scalable, efficient IDS for IoT networks that minimizes false positives, adapts to evolving threats, and performs well on resource-constrained devices, improving both security and operational efficiency.
Possible learning outcomes for the interns	• Gaining expertise in designing lightweight IDS models • Applying reinforcement learning for threshold optimization • Addressing real-time security challenges in IoT environments.

Requirements from the interns	
UG / PG Program (Branch)	UG
Discipline	CSE / Cyber Security
Technical background (eg. Courses that should have been done, topics that should have been known)	• Machine Learning • Cybersecurity • Networking (IoT and network security)
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	• Python programming • ML algorithms • Network security protocols • Reinforcement learning • Data preprocessing • IoT systems architecture.

PI: Dr. Charanjeet Dadiyala

Dr. S. S. Balpande
Head, Department of IT and Security

71. Title of the Project	Decentralized Identity Management System
Name of the Principal Investigator (PI), Department	Dr. Charanjeet Dadiyala, Dr. Rashmi Welekar
Place of Work/Department	Department of IT and security
Brief description of the project	A blockchain-based platform for secure, tamper-proof, and cross-sector identity verification using decentralized ledgers and smart contracts
Expected outcomes of the project	Enhanced identity security. Faster verification processes.
Possible learning outcomes for the interns	• Blockchain fundamentals. • Smart contract development. • Identity management solutions

Requirements from the interns	
UG / PG Program (Branch)	UG
Discipline	CSE / Cyber Security
Technical background (eg. Courses that should have been done, topics that should have been known)	• Blockchain technology. • Cryptography basics. • Decentralized application (DApp) development
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	• Programming: Solidity, Python, JavaScript. • Theoretical reasoning: Cryptography principles. • Problem-solving: Decentralized system design

PI: Dr. Charanjeet Dadiyala
Co-PI: Dr. Rashmi Welekar

Dr. S. S. Balpande
Head, Department of IT and Security

72. Title of the Project	AI-Driven Cryptographic Algorithm Identification Tool
Name of the Principal Investigator (PI), Department	Dr. Charanjeet Dadiyala, Prof. Harshala Shingne
Place of Work/Department	Department of IT and security
Brief description of the project	This project involves developing an innovative tool that uses artificial intelligence and machine learning techniques to analyze datasets and identify the cryptographic algorithms applied. By recognizing the patterns and features of encrypted data, the tool aims to detect algorithm weaknesses and provide actionable insights to enhance the security of cryptographic systems.
Expected outcomes of the project	• A functional AI-based tool capable of identifying cryptographic algorithms used in datasets. • Detailed reporting on detected weaknesses in the identified cryptographic methods. • Recommendations for strengthening cryptographic practices and replacing insecure algorithms
Possible learning outcomes for the interns	• Hands-on experience with designing and implementing AI/ML models for cryptographic analysis. • Knowledge of cryptographic algorithms, their structures, and security implications. • Proficiency in pattern recognition techniques and feature extraction from encrypted datasets. • Exposure to cybersecurity practices and compliance standards.

Requirements from the interns	
UG / PG Program (Branch)	UG
Discipline	CSE / Cyber Security
Technical background (eg. Courses that should have been done, topics that should have been known)	• Cryptography and Network Security • Machine Learning • Pattern Recognition
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	• Proficiency in Python or a similar language with libraries like TensorFlow, PyTorch, or Scikit-learn. • Understanding of cryptographic principles, algorithms, and encryption processes and ML • Familiarity with security analysis tools and environments (e.g., Wireshark, OpenSSL).

PI: Dr. Charanjeet Dadiyala Dr. S. S. Balpande
Co-PI: Prof. Harshala Shingne Head, Department of IT and Security

73. Title of the Project	Enhancing the Security and Resilience of Software-Defined Networking (SDN) Architectures Against Emerging Cyber Threats
Name of Principal Investigator (PI)	**Harshala Shingne , Ankita Jaiswal**
Domain	Cyber Security and Networking
Brief description of the project	The advent of Software-Defined Networking (SDN) has transformed traditional networking by decoupling the control plane from the data plane, enabling centralized network management and programmability. However, this architectural shift introduces new security challenges, such as vulnerabilities in the centralized controller, the risk of unauthorized access through programmable interfaces, and susceptibility to distributed denial-of-service (DDoS) attacks targeting SDN components. Existing security mechanisms often fall short in addressing these dynamic and evolving threats due to limitations in scalability, adaptability, and real-time threat detection. This research aims to address these gaps by developing robust and scalable security frameworks to enhance the resilience of SDN architectures against emerging cyber threats.
Expected outcomes of the project	• **Robust Security Framework:** Scalable and adaptable solutions to mitigate SDN vulnerabilities like DDoS attacks, unauthorized access, and controller exploits. • **Real-Time Threat Detection:** Advanced mechanisms using machine learning and anomaly detection for dynamic threat identification and response. • **Enhanced Resilience:** Improved SDN security and reduced impact of cyberattacks on network performance. Other outcomes: Research publications in SCI/Scopus journal.
Possible learning outcomes for the interns	Intern will get the • **Understanding of SDN Security Challenges:** Gain in-depth knowledge of Software-Defined Networking, its architecture, and the associated security vulnerabilities like DDoS attacks and controller exploits. • **Practical Experience with Security Frameworks:** Hands-on experience in designing scalable security frameworks and implementing real-time threat detection mechanisms using tools like machine learning, anomaly detection, and network monitoring. •**Research and Problem-Solving Skills:** Develop skills in analyzing evolving cyber threats, building testbeds, and evaluating security solutions in dynamic environments.

Requirements from the interns	
UG / PG Program	UG or PG
Discipline	Information Technology and Security, Computer Science & Engineering and Emerging Technologies.
Technical background (eg. Courses that should have been done; topics that should have been known)	Interns should have knowledge of Netwotking basics, SDN and Cybersecurity fundamentals and programming skills.
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipment such as CRO, Electron Microscope etc.)	Interns should have programming skills , Software-Defined Networking (SDN) architecture, concepts, and protocols (e.g., OpenFlow, NETCONF), Proficiency in Python, and REST APIs for interacting with SDN

Date: 18.12.2024

Harshala Shingne , Ankita Jaiswal
Dept of Information Technology and Security
Principal Investigator

Dr. S. Balpande
Head,
Information Technology and Security

74. Title of the Project	**Automated Threat Intelligence Gathering and Analysis**
Name of Principal Investigator (PI)	**Harshala Shingne, Dr. Charanjeet Dadiyala**
Domain	Cyber Security and Machine Learning
Brief description of the project	The project focuses on to create a tool that automates the collection and analysis of threat intelligence from various sources. The system aims to explore machine learning techniques to identify patterns and potential cyber threats, providing actionable insights for cybersecurity professionals and industries. Interns will work on tool development as a software product.
Expected outcomes of the project	A functional software tool capable of: • Collecting threat intelligence data from multiple sources (e.g., open threat feeds, blogs, forums, social media, and dark web sources). • Analyzing and correlating the data to identify patterns, anomalies, and potential cyber threats. • Providing actionable insights or alerts to cybersecurity professionals. Other outcomes: Research publications in SCI/Scopus journal.
Possible learning outcomes for the interns	Intern will get • Hands-on experience with machine learning techniques, cybersecurity concepts, and software development practices. • Familiarity with threat intelligence platforms (TIPs) and cybersecurity frameworks (e.g., MITRE ATT&CK). Additionally, the project enhances problem-solving abilities and fosters a deeper understanding of real-world cybersecurity threats, attack patterns, and challenges faced by professionals in the field. and also awareness of ethical and legal considerations in collecting and analyzing threat intelligence.

Requirements from the interns	
UG / PG Program	UG or PG
Discipline	Information Technology and Security, Computer Science & Engineering and Emerging Technologies.
Technical background (eg. Courses that should have been done; topics that should have been known)	Interns should have knowledge of Python programming, familiarity with machine learning concepts and libraries (e.g., TensorFlow, Scikit-learn), and an understanding of cybersecurity basics,

	including threat intelligence and data analysis techniques.
Specific skill set (eg. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipment such as CRO, Electron Microscope etc.)	Interns should have programming skills in Python, experience with machine learning libraries (e.g., TensorFlow, PyTorch, or Scikit-learn), and knowledge of data collection techniques (APIs, web scraping). Familiarity with cybersecurity concepts, data analysis, and visualization tools (e.g., Power BI, Matplotlib) is also essential.

Date: 18.12.2024

Harshala Shingne, Dr. Charanjeet Dadiyala
Dept of Information Technology and Security
Principal Investigator

Dr. S. Balpande
Head,
Information Technology and Security

75. Title of the Project	Development of an algorithm to detect multiple faults within random access memory systems
Name of the Principal Investigator (PI), Department	Dr. (Mrs.)A.A.Khurshid
Place of Work/Department	Electronics Engineering
Brief description of the project	Many fault models for RAMs and tests for faults of these models are available. These tests typically only enable the identification of individual faults. It is proposed to build a novel test algorithm that covers a variety of faults and is especially good at identifying related faults while also having a low test duration.
Expected outcomes of the project	Research Publication
Possible learning outcomes for the interns	• Understand Memory Architecture and Fault Models • Design algorithms that comprehensively test for multiple fault types while minimizing redundancy. • Gain hands-on experience with coding the algorithm using programming languages like HDL for hardware testing. • Understand the trade-offs between fault coverage and test duration, and learn to balance them.

Requirements from the interns	
UG / PG Program (Branch)	UG Program (ENCS/EC)
Discipline	ENCS/EC
Technical background (e.g. Courses that should have been done, topics that should have been known)	Knowledge of digital system design
Specific skill set (e.g. Programming, theoretical reasoning, constructing mathematical proofs, handling specific laboratory equipments such as CRO, Electron Microscope etc.)	Familiarization Xilinx Vivado and FPGA programming tools

Dr. (Mrs.)A.A.Khurshid Name & Signature of Head of Department

76. Title of the Project	Priority Call prediction
Name of the Principal Investigator (PI), Department	Prof. Kaushik Roy, Department of ITS
Place of Work/Department	Department of Information Technology and Security
Brief description of the project	This work involves recognition and estimation of Basic Human Poses in live video streams. This project has rich potential in various domains like live surveillance systems, assisted living, sports domain, patient monitoring, Human-Computer interaction and Smart Manufacturing process, etc.
Expected outcomes of the project	The aim is to develop advanced algorithms that can overcome the limitation of accurately recognizing human activities in sports videos. One of the aims is to develop efficient algorithms that can handle real-time human activity recognition processing for large video streams.
Possible learning outcomes for the interns	1) Proficiency in Image processing techniques 2) Proficiency in Deep Learning frameworks 3) Ability to design and apply Deep learning models to real life scenarios.

Requirements from the interns	
UG / PG Program (Branch)	UG Program
Discipline	Computer Science/ Information Technology/ Electronics and Communication
Technical background (eg. Courses that should have been done, topics that should have been known)	1) Image processing techniques 2) Deep learning frameworks
Specific skill set	1) Programming 2) Theoretical reasoning

Prof.Kaushik Roy
Principal Investigator
Dept of Information Technology and Security

Dr. S. S Balpande
Head, Dept of Information Technology and Security

77. Title of the Project	Human Pose Recognition for Semantic event predictions
Name of the Principal Investigator (PI), Department	Prof. Kaushik Roy, Department of ITS
Place of Work/Department	Information Technology and Security
Brief description of the project	This work involves recognition and estimation of Human Poses. This project can be used to predict events by recognition of different human poses of Human beings and generate predictions out of it. This work will be able to suggest correct postures and action predictions once they are identified.
Expected outcomes of the project	To develop advanced algorithms that can overcome the limitation of accurately recognizing human poses in general fields. To provide event predictions after detecting real-time human activities.
Possible learning outcomes for the interns	4) Proficiency in Image processing techniques 5) Proficiency in Deep Learning frameworks 6) Ability to design and apply Deep learning models to real life scenarios.

Requirements from the interns	
UG / PG Program (Branch)	UG Program
Discipline	Computer Science/ Information Technology/ Electronics and Communication
Technical background (eg. Courses that should have been done, topics that should have been known)	3) Image processing techniques 4) Deep learning frameworks
Specific skill set	3) Programming 4) Theoretical reasoning

Prof.Kaushik Roy
Principal Investigator
Dept of Information Technology and Security

Dr. S. S Balpande
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