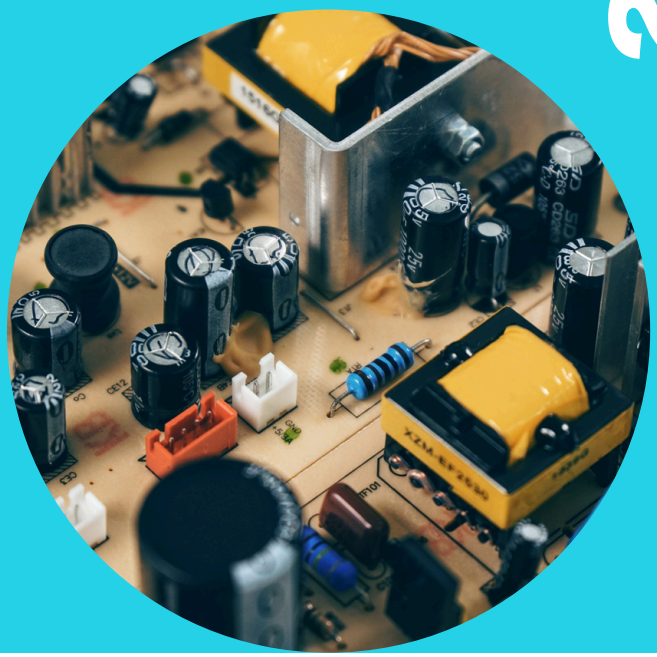
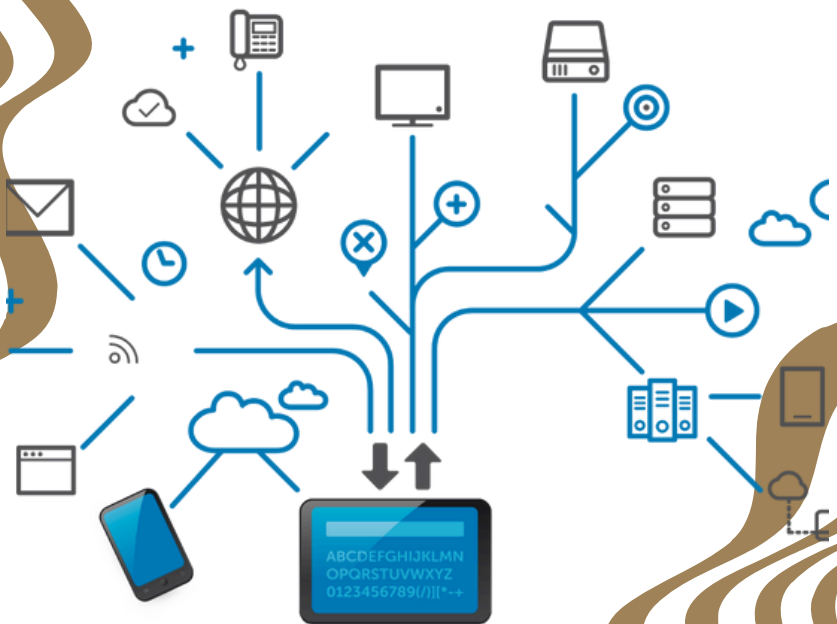
Hope Foundation's
International Institute of Information Technology, Pune

Gyanamrit

2023-24

Department of Electronics and Telecommunication





Department Magazine
Issue- 05

Department of Electronics and Telecommunication

VISION

To nurture young minds and provide them with a strong foundation through academic excellence & skill-based knowledge, transforming them into efficient professionals who can take on challenges in the fields of Electronics and Telecommunication Engineering for a sustainable technological development.

MISSION

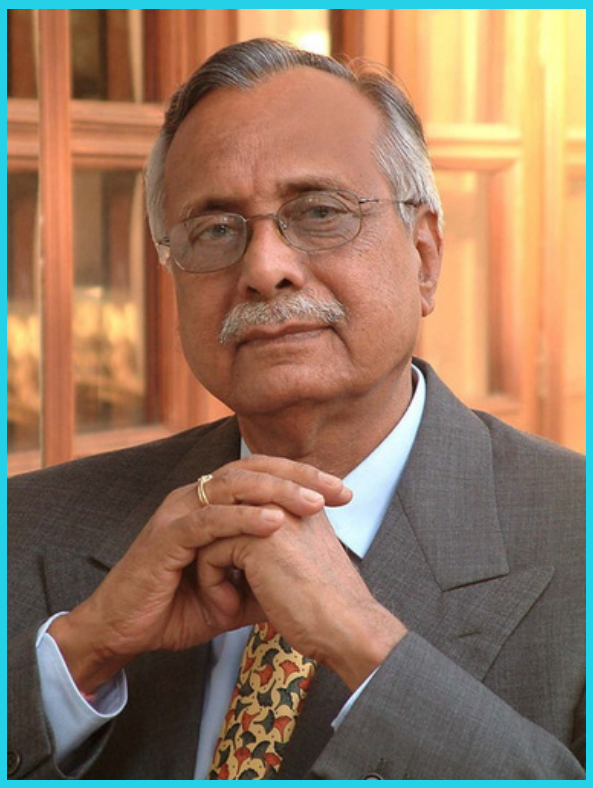
- To educate students on domain knowledge in Electronics and Telecommunication Engineering using adaptive teaching-learning practices.
- To create a conducive learning environment that offers value-added education, enabling students to be career ready.
- To cultivate research & innovation as a bent of mind among students by industry-academia interaction.
- To enrich students with self-learning ability to sustain with technological changes.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

- Apply skills acquired in E&TC to analyze problems & design innovative solutions
- Inculcate the habit of self-learning using state-of-the-art technologies & innovations for continuous improvement.
- Internalize and display professional ethics, team spirit & respect societal values.
- Inspire students for higher studies & research.

PROGRAM SPECIFIC OUTCOMES (PSOs)

- Understand fundamental concepts and acquire co-design skills of E&TC to apply them to its cognitive areas.
- Enhance programming skills for efficient coding practices using open source platforms.
- Develop analytical skills to achieve optimized and cost-effective technological solutions for challenges in E&TC.
- Bringing awareness about electromagnetic radiation hazards for the work environment



"An abiding trust in your abilities to perform, a strong determination to never give up and unshakeable belief in yourself are all you need to conquer the pinnacles of success"

Late Shri.Pralhad P.Chhabria
(12/03/1930-05/05/2016)

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HOD's Message (Chief Editor)

A big round of applause goes to the committee and students for their remarkable contributions to this edition! We are excited to share the fifth edition of Gyanamrit, which we believe will deeply resonate with you and offer valuable insights. This edition is a clear reflection of the dedication and hard work put in by all the magazine committee, students Projects and the faculty overseeing this project.

In this edition, you'll find a rich assortment of students projects and technical skills of contributors but also to broaden the knowledge of our readers. With a focus on the latest breakthroughs in Electronics and Telecommunication.

Gyanamrit is committed to providing a dynamic platform for emerging engineers to demonstrate their technical prowess and present their most creative and original ideas. We value your engagement with this edition and look forward to your continued support.

Prof. (Dr.) S M M Naidu

Faculty Incharge's message (Faculty Editor)

Greetings to everybody.

The fervent support and hard work of everyone involved in creating this magazine will undoubtedly contribute to its success. I want to sincerely thank the department's academic members and the editorial staff for their efforts. Additionally, I want to extend my gratitude to the students for their valuable contributions.

This fifth edition of GYANAMRIT will be enlightening, explicative, commutative, and inspiring. We have made an effort to discuss issues that are highly relevant to current technology developments. I believe that this issue will also be a tremendous success.

Prof. Prashant Ahire

BE Projects

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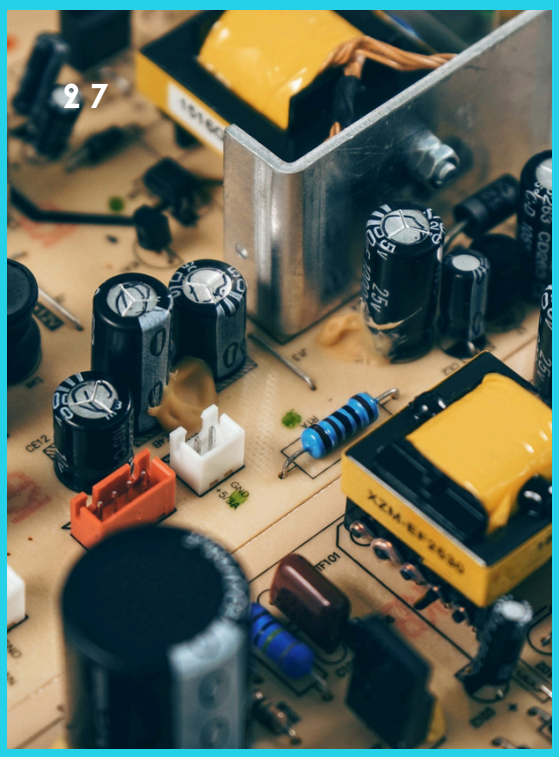


Gyanamrit

BE Projects

1. Biderectional Encoder Representation from Transformers (BERT)
2. Integrated Education Platform
3. AI protected Learning Environment
4. Smart Wheerchair
5. LipNet: End-to-End Sentence Level Lip Reading
6. Multilingual Sign Language Detection using CNN
7. Flood Forecasting and Inundation Zone Assessment using GIS
8. Flood Risk Zone Identification of Krishna River Basin, Satara, Maharashtra
9. Vegescan
10. Indoor Positioning Using Wi-Fi
11. Smart Flat Tire Detection And Alert System
12. Layout Lmv3
13. Instrumentation Of Water Level Monitoring And It's Software Development
14. Simulating Vehicle Driving Using Carla Simulator
15. Telemetry System For Vehicles
16. Real-Time Vehicle Tracking System
17. Fire Extinguisher Drone
18. Instrumentation For Feature Enhancement In Water Level Monitoring System
19. Graph Attention Network
20. Identification And Early Detection Of Lung Diseases
21. Smart Conveyor Belt
22. Health Monitoring System Through Tongue Image Analysis
23. Car Model Recognition Using Yolov8 Algorithm
24. 3d Mapping And Autonomous Navigation System Using Slam

BERT

PRAJWAL MALEGAVI
ANURAG SARDAR
SHREYA SHARMA

Bidirectional Encoder Representations from Transformers (BERT) is a language representation model based on NLP. With its innovation in the bidirectional approach to understanding context, enabling it to capture nuanced word meanings effectively. We have leveraged new transformer architecture based on LLMs, BERT undergoes pre-training by predicting masked words in sentences using MLM, followed by fine tuning for specific NLP tasks. This methodology yields remarkable results in tasks like text classification, question answering and next sentence prediction. Biderectional Encoder Representation from Transformers (BERT).

The strategy proposed entails fine-tuning a pre-trained BERT model on a di verse corpus of data, allowing it to recognize document-specific linguistic nuances and domain-specific terms. We use a two-step technique to apply our approach: preprocessing and categorization. The fine-tuned BERT model is utilized to build con textual embeddings for each document during classification. These embeddings record deep word associations, allowing the model to pick up on minor nuances that older approaches might overlook. Finally, BERT's applications span diverse domains, from sentiment analysis to chatbots, making human-computer interactions more intuitive and accurate.

INTEGRATED EDUCATION PLATFORM

Ajay Argulwar
Abhinesh Godase
Onkar Wagh

In recent years, the landscape of educational technology has witnessed a remarkable transformation, giving rise to a multitude of innovative solutions and platforms aimed at enhancing the learning experience. The Integrated Education Platform is a testament to this evolution, combining three distinct but interconnected features: a Note Sharing Platform, Video Conferencing, and an Examination Portal.

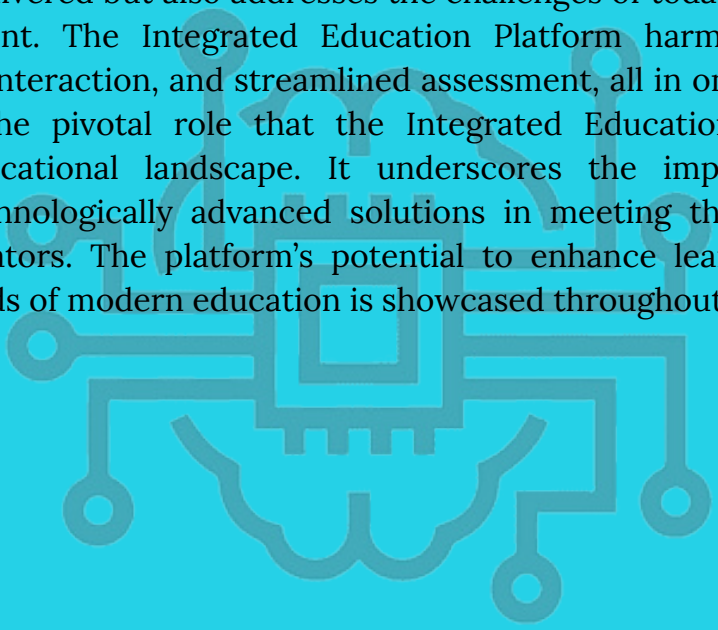
The realm of education has long been in need of a comprehensive solution that addresses the diverse requirements of both students and educators. The current educational technology landscape lacks a unified solution that effectively combines collaborative learning, real-time interaction, and streamlined assessment. Existing platforms often focus on individual components such as video conferencing or note sharing, but they fail to provide an integrated experience that addresses all aspects of the learning process. This fragmentation results in inefficiencies, with students and educators having to navigate multiple platforms to achieve their educational objectives.

The Integrated Education Platform has emerged as a response to this demand. This platform addresses the technology gap by harmonizing three essential features into a single, cohesive system: a Note Sharing Platform, Video Conferencing, and an Examination Portal. The Note Sharing Platform on the Integrated Education Platform serves as a dynamic hub for knowledge sharing. Unlike traditional note sharing platforms that operate in isolation, it empowers students and educators alike to upload, access, and collaborate on a wide array of educational materials, fostering a richer and more interactive educational experience.

In the ever-connected world of education, the Video Conferencing feature of the platform takes center stage. Our platform offers a seamless virtual classroom experience, unlike existing solutions that often lack integration with other educational tools. It bridges geographical gaps and facilitates real-time, interactive learning.

Educators can conduct lectures, seminars, and workshops, while students can engage in discussions and group projects, all from the comfort of their own devices. The Examination Portal component of the Integrated Education Platform is a game-changer in assessment and evaluation. Our examination portal revolutionizes the assessment process with advanced features such as automated grading, instant result generation, and performance analytics. This ensures a secure and user-friendly environment for conducting online exams and quizzes, streamlining the assessment process and ensuring fairness and efficiency.

The synthesis of these three essential features on a single platform not only redefines the way education is delivered but also addresses the challenges of today's fast-paced, digital learning environment. The Integrated Education Platform harmonizes collaborative learning, real-time interaction, and streamlined assessment, all in one place. This project report highlights the pivotal role that the Integrated Education Platform plays in reshaping the educational landscape. It underscores the importance of flexible, accessible, and technologically advanced solutions in meeting the evolving needs of students and educators. The platform's potential to enhance learning outcomes and adapt to the demands of modern education is showcased throughout this report.



AI PROCTORED LEARNING ENVIRONMENT

KALPESH SHIRKE
SARTHAK GUPTA
ZAHRA AMIN

In today's digital learning landscape, the need for robust assessment mechanisms that ensure academic integrity while promoting student success is more critical than ever. Our project presents an advanced AI Proctored Learning Environment designed to address these challenges comprehensively. Leveraging cutting-edge technologies including computer vision, natural language processing (NLP), and speech recognition, our project offers a multifaceted solution for monitoring student examinations and enhancing post-exam analysis.

Key features of our system include real-time proctoring capabilities, which utilize computer vision algorithms to detect unauthorized objects and monitor eye gaze patterns during exams. Through integration with speech-to-text services, we transcribe student responses and generate subtitles, enabling accurate analysis of verbal interactions. Post-exam as well as Pre exam functionalities include automated notes summarization using NLP techniques and dynamic question-answer generation from diverse content sources. Our system empowers educators with intuitive interfaces and export options for seamless administration and analysis of assessments.

Due to the current paradigm, there is a shift from o✏️ine learning to online learning like online degrees, MOOC's and courses. These provide a lot of benefits like remote learning and easy accessibility to learning. The question of how to maintain academic integrity with online courses is still an ongoing question, but this project demonstrates that online proctoring using AI can influence the overall educational experience. Hu man proctoring is tiresome and impacts the overall structure of the examination. It requires huge labor, infrastructure and hardware. Exams like GRE, TOEFL, ILETS have online proctoring and have been increasing investing in technology to make it better.

The Grade Change: Tracking Online Education in the United States, 2013 report by the Online Learning Consortium revealed that around 7.1 million higher education students are enrolled in at least one online course. Additionally, the proportion of academic leaders who consider the learning outcomes in online education to be equivalent or better than those in traditional face-to-face classes increased from 57% in 2003 to 74% in 2013. These findings underscore the widespread acceptance and integration of online learning into the higher education landscape.

The increasing prevalence of both offline and online exam malpractices underscores the urgent need for a robust, AI-proctored exam environment. Cheating not only jeopardizes the future of the students involved but also unfairly disadvantages genuine candidates, undermining the integrity of the examination process. To address this critical issue, we introduce AI Proctored Learning Environment, a comprehensive solution designed to foster a culture of honest and diligent exam-taking habits among students.

It provides a secure, AI-monitored platform that continuously observes students during exams, detecting any foreign objects, tracking eye gaze, and analyzing voice patterns. This rigorous proctoring ensures a fair testing environment, preparing students to face actual exam scenarios without resorting to malpractices. By simulating a real exam setting, it helps students develop the discipline and confidence needed to perform under examination conditions, reducing anxiety and enhancing their test-taking skills.

Beyond the exam environment, offers powerful tools to aid students in their academic journey. The notes summarization feature allows for the ecient distillation of complex topics into concise, manageable summaries, enabling students to review and focus on critical areas quickly. Additionally, the question-answer generation functionality pulls from diverse content sources to create a wide range of practice questions, both objective and subjective. This feature equips students with a comprehensive understanding of possible question types and formats, ensuring thorough preparation across the entire syllabus.

In essence, AI Proctored learning environment not only upholds the integrity of the examination process but also supports students in achieving their academic potential by providing the necessary tools to practice and excel. This project aims to revolutionize the way students prepare for exams, fostering a fair, focused, and effective learning environment.

SMART WHEELCHAIR

AAKANKSHA SHINDE
YASH UMBARKAR
ASHISH DHAKNE

A wheelchair equipped with medical equipment integrates various medical technologies to cater to individuals requiring continuous medical support while maintaining their mobility. These specialized wheelchairs are designed with built-in devices such as oxygen tanks, ventilators, IV poles, and suction machines, essential for users with respiratory issues, severe medical conditions, or those needing intravenous medications. Additionally, they feature vital signs and cardiac monitors for real-time health tracking, ensuring timely medical interventions and consistent monitoring of the user's condition. The seating systems in these wheelchairs are highly specialized, incorporating pressure relief cushions made from memory foam or gel to prevent pressure sores, and mechanisms allowing reclining and tilting to enhance comfort and reduce the risk of pressure ulcers. These systems also offer customized posture support, crucial for individuals with musculoskeletal issues or severe physical disabilities. Electric motors and advanced control systems, such as joystick controls or sip-and-puff systems, provide effortless navigation, while some models are designed with all-terrain capabilities to allow greater independence and outdoor activity. The proposed work in this report contributes in this direction, towards building predictive learning schemes based on soft computing techniques for Cognitive Radio. Predictive schemes towards forecast of key functional parameters of data rates and throughput are built. The different learning schemes used in the proposed work range from basic supervised algorithms like Feed Forward Network, Focused Time Delay Neural Networks, recurrent networks to unsupervised algorithms based on Self-Organizing Maps. Wheelchairs equipped with medical equipment significantly improve the user's quality of life by promoting independence and reducing the need for constant supervision. The integration of medical devices ensures better management of chronic conditions and reduces the risk of medical emergencies, allowing users to receive necessary care without the inconvenience of transferring to different equipment or locations. This consolidation of mobility and medical care into a single device also simplifies the caregiving process, making it easier to manage and transport necessary medical equipment.

LipNet: End-to-End Sentence Level Lip Reading

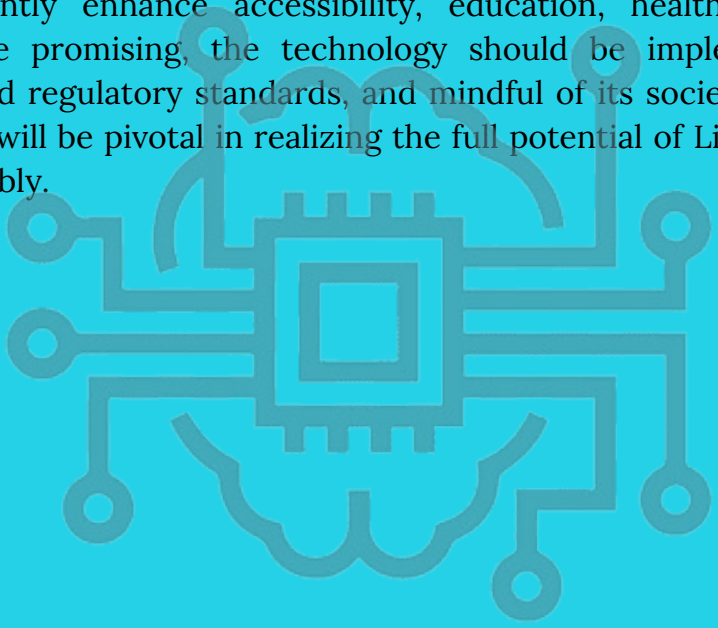
SHUBHAM MAHARAJ
MRUNMAI KULKARNI
VARUN GUPTA

LipNet, an innovative deep learning model, has emerged as a transformative technology in the domain of sentence-level lip reading. By exclusively leveraging visual cues, primarily the subtle movements of a speaker's lips, this end-to-end approach to speech recognition presents a compelling alternative to traditional audio-based systems. This technology is poised to have a multifaceted impact on society and the environment, with both advantageous and potentially challenging consequences. Lip Net is an end-to-end model, which means that it learns both the visual features and temporal features of lip movements and the language model directly from the data. This project explores the architecture, training process and applications. LipNet has a number of potential applications, such as helping people with hearing loss to communicate, providing real-time subtitles for videos, and improving the accuracy of speech recognition systems

The primary societal advantage of LipNet is its potential to enhance accessibility for individuals with hearing impairments. By transcending the constraints of audio input, LipNet empowers those with hearing challenges to engage in more effective communication, fostering inclusivity and improving their quality of life. In the educational sphere, it paves the way for inclusive classrooms, enabling the seamless integration of deaf and hard-of-hearing students into mainstream educational environments. Moreover, LipNet holds promise in aiding language learning and literacy development, making education more effective for language learners and individuals struggling with reading. In healthcare, this technology can assist medical professionals in understanding patients with speech difficulties, thereby elevating the quality of healthcare delivery.

In professional settings, LipNet's real-time transcription capabilities offer a boon for communication in noisy environments, bolstering workplace safety and efficiency. It stands to be a valuable tool for emergency services, disaster response, and public safety by facilitating clearer communication. However, with the promise comes several challenges. LipNet deployment raises privacy concerns, particularly when used in surveillance and security applications. Rigorous ethical guidelines and robust regulation are imperative to prevent misuse and uphold privacy rights.

Furthermore, the technology could potentially displace human jobs in certain industries. Adequate workforce retraining and strategies for job creation must be considered to mitigate this impact. Overreliance on technology for communication may reduce face-to-face interaction and social bonds, prompting a need for mindful technology usage. From an environmental perspective, the energy consumption associated with LipNet's development, operation, and data processing could have ecological consequences. Energy-efficient infrastructure and sustainable practices should be promoted to limit environmental impact.
In summary, LipNet introduces a transformative solution to speech recognition with the potential to significantly enhance accessibility, education, healthcare, and workplace communication. While promising, the technology should be implemented thoughtfully, adhering to ethical and regulatory standards, and mindful of its societal and environmental impacts. This balance will be pivotal in realizing the full potential of LipNet while addressing its challenges responsibly.



MULTILINGUAL SIGN LANGUAGE DETECTION USING CNN

Piyush Baravkar
Khushi Parkhe
Yashsingh Chandel

The project titled "Multilingual Sign Language Detection using YOLO v5 and Convolutional Neural Networks (CNNs)" is an innovative endeavor aimed at revolutionizing the accessibility and inclusivity of communication for the hearing and speech impaired community. This project endeavors to develop a sophisticated system capable of real-time sign language detection and interpretation across three languages: English, Hindi, and Marathi. Leveraging cutting-edge technologies such as the YOLO v5 (You Only Look Once) algorithm and Convolutional Neural Networks (CNNs), the system aims to achieve high accuracy and efficiency in recognizing and interpreting sign language gestures.

The project's primary focus lies in harnessing the capabilities of the YOLO v5 algorithm, renowned for its superior performance in object detection tasks. Unlike traditional object detection methods that rely on sliding window approaches, YOLO v5 adopts a single neural network architecture that directly predicts bounding boxes and class probabilities, enabling real-time inference on live video streams. By integrating YOLO v5 with CNNs, the system can effectively identify and localize sign language gestures within video frames, facilitating seamless communication between individuals proficient in sign language and those who are not.

The methodology employed in this project encompasses several crucial stages, including dataset preparation, model training, and testing. A diverse and representative dataset comprising samples of sign language gestures in English, Hindi, and Marathi is curated to ensure the robustness and generalizability of the trained model. The YOLO v5 model is then fine-tuned using transfer learning techniques on this multilingual dataset, enhancing its ability to accurately detect and interpret sign language gestures across different languages and dialects.

The implementation phase involves the integration of hardware and software components to create a cohesive sign language detection system. Utilizing standard computer vision libraries and frameworks, the system captures live video input from a camera, processes each frame using the trained YOLO v5 model, and generates real-time predictions regarding the detected sign language gestures. The seamless integration of YOLO v5 with CNNs ensures efficient inference and robust performance even in challenging environments with varying lighting conditions and background clutter.

The results obtained from extensive testing and evaluation demonstrate the efficacy and reliability of the proposed system. High accuracy rates are achieved in recognizing and interpreting sign language gestures across all three languages, reaffirming the potential of YOLO v5 and CNNs in assistive technology applications. Furthermore, the system's real-time performance capabilities pave the way for practical deployment in diverse settings, including educational institutions, healthcare facilities, and public spaces, thereby enhancing accessibility and promoting social inclusion for individuals with hearing and speech impairments. In conclusion, the integration of YOLO v5 with CNNs for multilingual sign language detection represents a significant technological advancement with far-reaching societal implications. By bridging communication gaps and empowering individuals with hearing and speech impairments to express themselves more effectively, this project underscores the transformative potential of artificial intelligence in fostering inclusivity and diversity in our communities. Moving forward, continued research and development in this domain hold promise for further enhancing the capabilities and accessibility of assistive technologies for the benefit of all individuals.

FLOOD FORECASTING AND INUNDATION ZONE ASSESSMENT USING GIS

RUPESH BHURE
SHRISHAIL KHOT
YASH SHEREKAR

This project presents a comprehensive study and the development of a Flood Forecasting and Inundation Modeling System (FFIMS) using a Geographic Information System (GIS)-based application. Flooding is a global concern, causing widespread destruction, loss of life, and economic hardship. The need for accurate flood forecasting and inundation mapping has never been more critical. In response to this challenge, our project brings together the power of GIS technology, hydrological modeling, and meteorological data to create an advanced system that improves flood prediction, response, and management.

The key features and highlights of the project are as follows:

1. Hydrological Modeling: We have employed advanced hydrological models to simulate river behavior, analyze precipitation data, and predict river discharge during heavy rainfall events. This modeling process enhances the accuracy of our flood forecasts.

2. Geospatial Data Integration: The project integrates various geospatial datasets, such as digital elevation models, land use data, and river networks, to create a comprehensive GIS database that serves as the foundation for flood forecasting and inundation mapping.

3. Real-Time Data: Our system incorporates real-time meteorological data, allowing for dynamic flood forecasting and the ability to respond quickly to changing weather conditions.

4. Flood Inundation Mapping: We use GIS technology to generate flood inundation maps, which provide crucial information to aid in disaster management, emergency response, and urban planning.

5. User-Friendly Interface: The GIS-based application offers an intuitive user interface, enabling a wide range of users, including emergency responders, urban planners, and government agencies, to access critical flood-related information.

FLOOD RISK ZONE IDENTIFICATION OF KRISHNA RIVER BASIN, SATARA, MAHARASHTRA

SMRUTI SURANA
SAKSHI PATIL
SAYALI SATHE

Important features:

1. Accuracy: The flood risk zone identification should be accurate and reliable. This is important for developing effective flood management plans and for helping people and communities to prepare for and respond to floods.

2. Comprehensiveness: The flood risk zone identification should be comprehensive and should consider all relevant factors, such as historical flood data, flood inundation models, topography, land use, and infrastructure.

3. Accessibility: The flood risk zone information should be accessible to all stake holders, including government agencies, communities, businesses, and individuals. This will help to ensure that everyone is aware of the flood risk in their area and can take steps to protect themselves and their property.

4. Timeliness: The flood risk zone identification should be timely. This is important for ensuring that flood risk information is available to stakeholders before flooding occurs.

5. Sustainability: The flood risk zone identification process should be sustainable. This means that it should be able to be updated and maintained on a regular basis.

Description:
Floods are the most and repeatedly occurring destructive natural disaster due to an overflow of water submerges land which is basically dry. Generally, floods are occurring due to heavy rainfall or cloud bursting or manmade disturbance to nature, fast snow melt, global warming or tropical cyclone or tsunami. In 2019, the Krishna River has faced very heavy rainfall and major floods which took the lives of approximately 500 people and nearly isolating 350 villages and leaving millions homeless. Here we studied the previous flood disaster at the basin of the Krishna River and processed the GIS environment using software tools. This facilitates exploring the data and methods that are mostly unexplored, and areas that have not lightened in the field of flood studies in Krishna basin Satara. It is impossible to avoid floods and risk associated with flood; however it is possible to work on the flood reduction. Flood hazard mapping is to identify comparatively safe sites in high elevation with low risk is one of the powerful tools for this purpose. Flood hazard mapping flash flood will be beneficial for risk assessment. Management and emergency services during flood events. The objective of this paper is to generate flood hazard zonation maps of Krishna sub-basin using GIS tools and satellite images. To do so, we use spatial data and SRTM DEMs with accuracy assessment is achieved by using check points, obtained by GPS observations. Runoff, surface slope, drainage density, distance to main channel and land use were considered causative factors. All used data are processed and integrated in an QGIS to prepare a final flood hazard map for Krishna sub-basin. The areas in high risk flood zones are obtained by overlaying the flood hazard index map with the zone boundaries layer.

VEGESCAN

YASH MISHRA
RAVI PRAKASH
TEJAS SATPUTE

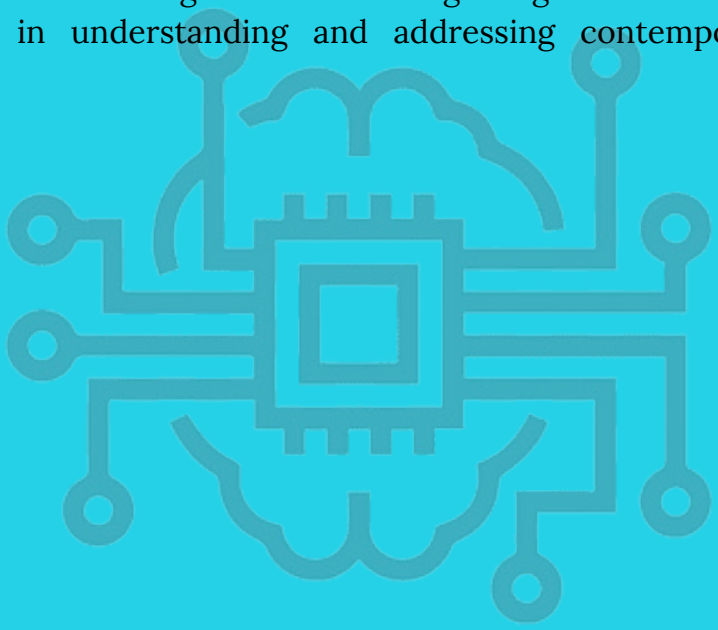
Land use/land cover (LULC) and vegetation dynamics play pivotal roles in understanding the environmental changes occurring in urban areas. In this study, we utilized Copernicus Sentinel-2 imagery and ESRI datasets to analyze the LULC and Normalized Difference Vegetation Index (NDVI) of Pune, India, for the years 2020 and 2022. The software tools QGIS 2.8.3 Wien and ArcMap 10.8.2 were employed for data processing, facilitating the generation of LULC and NDVI maps. Subsequently, the Molusce 3.0.13 plugin was utilized for predictive analysis, enabling the projection of LULC and NDVI for the year 2024.

Utilizing extensive multi-temporal satellite data, we employed the MOLUSCE plugin within QGIS to integrate uncorrelated parameters such as Digital Elevation Model (DEM), gradient, and proximity to roadways, coupled with a Cellular Automata Artificial Neural Network (CA-ANN) technique. Through this approach, we investigated the development potential of both present and future LULC scenarios.

The study area, Pune, was meticulously examined, considering its geographical, climatic, and land use characteristics. LULC and NDVI maps for 2020 and 2022 were generated, revealing significant changes in land cover and vegetation over the two-year period. Moreover, the predicted LULC and NDVI maps for 2024 provided insights into the anticipated trends in vegetation cover.

Through accuracy assessment and validation techniques, the reliability of the prediction model was evaluated, elucidating both its strengths and limitations. The observed and predicted changes in LULC and NDVI were meticulously interpreted, shedding light on their implications for urban planning and environmental management in Pune. Comparisons with previous studies and existing literature further enriched the analysis, offering a broader perspective on Pune's land use dynamics and vegetation trends. The findings underscore the importance of continuous monitoring and assessment of LULC and vegetation dynamics for informed decision-making and sustainable urban development.

This study contributes to the growing body of knowledge on urban environmental monitoring. It underscores the significance of integrating remote sensing techniques and predictive modeling in understanding and addressing contemporary environmental challenges.



INDOOR POSITIONING USING WI-FI

ABHISHEK RATHOD
ATHARV KADAM
TANISHQ MIRKALE

This project focuses on the development of an indoor positioning system powered by Wi-Fi signals. The primary objective is to establish an accurate and real-time location detection system within indoor environments. The system's design is geared towards enhancing indoor navigation and asset tracking, addressing the specific needs of spaces like retail stores, healthcare facilities, and warehouses. Our approach involves the collection and analysis of Wi-Fi signal strength data, culminating in the creation of a robust database of reference points. We employ advanced positioning algorithms, including trilateration and machine learning techniques, to provide precise and instantaneous location estimations. The potential impact of this project is wide-ranging. It has the capacity to optimize inventory management in warehouses, elevate the shopping experience in retail environments, and enhance patient care in hospitals. Furthermore, it lays the groundwork for the development of smart indoor spaces and innovative location-based services. A user-friendly interface is a core component of our system, ensuring accessibility and usability. This interface, adaptable for both mobile and web platforms, will empower users to navigate intricate indoor spaces effortlessly. Beyond addressing present demands, this project also emphasizes future scalability and adaptability. It is poised to accommodate evolving technologies and incorporate additional features, contributing to the ongoing evolution of indoor positioning technology. In conclusion, this project is a significant step towards accurate indoor positioning. By leveraging Wi-Fi signals and cutting-edge algorithms, it aims to simplify indoor navigation and location-based services, enhancing both user experiences and operational efficiency across various sectors.

SMART FLAT TIRE DETECTION AND ALERT SYSTEM

GIRIRAJ DAYMA
DEEP KANAWADE
SALMAN MUJAWAR

This project presents the design and implementation of a Smart Flat Tire Detection and Alert System, aimed at enhancing vehicle safety by monitoring tire pressure in real-time. The system employs a BMP180 pressure sensor to measure the air pressure within the tire tube. The BMP180 sensor communicates with an ESP32 microcontroller via I2C protocol to transmit real-time pressure data. The ESP32 processes this data and checks it against a predefined threshold.

If the tire pressure falls below the threshold, the ESP32 triggers a GSM module to send an alert SMS to the user's mobile phone, ensuring immediate awareness of the issue. Additionally, an audible alert is provided through a connected buzzer. The ESP32 is also configured to interface with Adafruit IO, a cloud-based service, enabling remote monitoring. Real-time tire pressure data is continuously sent to Adafruit IO, where it is displayed on a customizable dashboard.

To enhance user accessibility and interaction, a user interface (UI) is designed for mobile devices. This UI displays real-time pressure data using a visual pressure gauge retrieved from the Adafruit IO dashboard. It also integrates a Google Maps application, which provides real-time location-based services. Users can click on this application to find and navigate to nearby mechanics, facilitating prompt tire repairs. Moreover, the UI includes a direct link to the Adafruit IO dashboard, allowing users to monitor detailed tire pressure trends and history.

This system is designed to improve driving safety by providing timely alerts and easy access to maintenance services, leveraging IoT technologies and user-friendly interfaces. The integration of multiple communication protocols and platforms demonstrates the feasibility and effectiveness of using modern embedded systems and cloud services to enhance automotive safety.

LAYOUT LMv3

DHANASHREE KHAMGAL
NIKITA KHAMGAL
GAURI MANDLIK

LayoutLMv3, a multimodal transformer model for document AI, has been trained on a large dataset of text and images, enabling tasks like visual question answering, document classification, and table question answering. The model has a new transformer architecture, a fresh pre-training goal, and a novel tuning method for task-specific model adaptation. It has demonstrated its ability to provide state-of-the-art results on various document AI benchmarks.

The advances in document AI have been largely driven by self-supervised, pre-trained methods. However, multimodal representation learning is more difficult due to the differing pre-training goals for the picture mode. To address this issue, the pre-trained method of layoutLMv3 is recommended, which includes integrated text and image masking. The model's pre-training is based on the word-patch align ability objective, allowing for cross-modal alignment by determining if an associated text word has a hidden picture patch.

LayoutLMv3 excels at both text-oriented tasks such as document visual question answering and image classification, as well as document layout analysis. Natural Language Processing (NLP) is used to improve human communication and machine understanding in fields like healthcare, finance, education, and legal. LayoutLMv3, LayoutLMv2, and Layout LMv3 are pre-training language models for document understanding, addressing challenges like layout variability, data quality, and computational complexity.

INSTRUMENTATION OF WATER LEVEL MONITORING AND IT'S SOFTWARE DEVELOPMENT

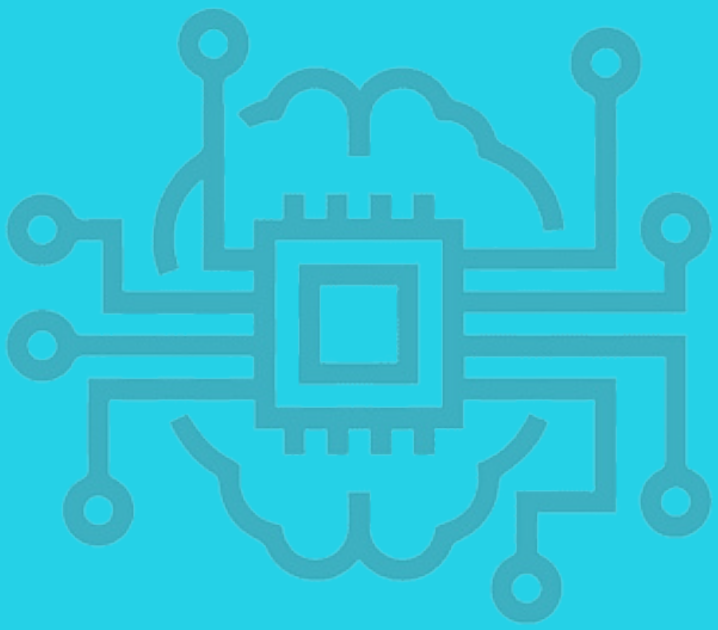
VIRENDRA MALI
OM NILESH WAGH

The Water Level Tank Monitoring, Automation and Prediction System presented in this project harnesses advanced sensor technologies and predictive algorithms to address the critical issue of efficient water management. With depleting water resources and the growing demand for sustainable practices, real-time monitoring of water levels in storage tanks becomes imperative. This system integrates ultrasonic sensors, microcontrollers, Relays and data analysis techniques to monitor water levels in tanks accurately, automate the Water pump accordingly based on the data fetched and predict future levels based on historical data.

The system begins by continuously collecting real-time data from ultrasonic sensors placed inside water tanks. These sensors measure the water level accurately and transmit the data to a central microcontroller unit. The microcontroller processes the incoming data and sends it to a database for storage and analysis. After this the data is fetched by a microcontroller and the water pump is turned on and off by a relay according to the data collected. Using sophisticated algorithms, historical water usage patterns are analyzed to predict future water levels. Machine learning techniques, such as regression analysis and neural networks, are employed to forecast water consumption trends, enabling proactive decision-making.

The Water Level Tank Monitoring, Automation and Prediction System offers several significant advantages. Firstly, it provides real-time monitoring, ensuring that water levels are constantly observed. This real-time data is crucial for immediate action in case of leakages or sudden increases in demand. Secondly, the predictive analysis facilitates informed planning by anticipating water needs based on historical patterns. This proactive approach helps in optimizing water distribution, minimizing wastage, and ensuring a consistent water supply.

In addition to its practical applications for households, industries, and municipalities, the system contributes significantly to water conservation efforts. By promoting efficient use of water resources and reducing unnecessary wastage, it aligns with the global goal of sustainable water management. Adhering to professional ethics and engineering practices, the system strikes a balance between innovation, sustainability, and ethical responsibility in addressing critical water management challenges.



SIMULATING VEHICLE DRIVING using CARLA SIMULATOR

Sakshi Nadarge
Anushree Patil

The demand for autonomous vehicles is driven by a combination of factors that are shaping the future of transportation. One significant aspect of the demand for autonomous vehicles comes from consumers who are increasingly interested in the potential benefits of self-driving technology. The convenience, safety, and potential cost savings associated with autonomous vehicles are appealing to many individuals, especially in urban areas where traffic congestion and parking challenges are prevalent. Consumers see autonomous vehicles as a way to improve their daily commute, reduce the stress of driving, and enhance overall mobility. Autonomous vehicles are incorporating a variety of sensors, including cameras, LiDAR, radar, and ultrasonic sensors, to improve perception capabilities. Sensor fusion techniques are being used to combine data from multiple sensors for more accurate and reliable object detection and tracking. The increasing autonomy of vehicles necessitates a paradigm shift in testing methodologies. Traditional real-world testing is resource-intensive, time-consuming, and often constrained by safety concerns. Firstly, CARLA offers a rich and diverse set of pre-built urban environments, including highways, urban streets, and rural roads. These environments allow users to create a wide range of driving scenarios, from basic lane following to complex urban navigation and traffic interactions. Researchers can validate their algorithms in various conditions, enhancing the robustness and safety of autonomous systems. Secondly, CARLA incorporates sensor models that emulate the behavior of real-world sensors like LiDAR, radar, and cameras. This enables developers to evaluate perception algorithms and test sensor fusion techniques in a controlled and reproducible environment. The simulator can also introduce sensor noise and environmental variability, helping researchers assess the resilience of their algorithms to real-world challenges.

TELEMETRY SYSTEM FOR VEHICLES

APURVA SANTOSH APUNE
AMIT SANJAY GHATOL
VINAY VILAS MORALE

In the dynamic landscape of modern vehicle fleet management, the Telemetric Control Unit (TCU) project emerges as a pioneering initiative with the potential to redefine the way essential vehicle data is harnessed and utilized. The primary goal of this project is to address the persistent challenges faced by businesses that rely on telemetry data from their vehicle fleets. These challenges stem from inaccessible telemetry ports or limitations imposed by vehicle manufacturers. The TCU project's core objective is to engineer a TCU system capable of capturing vital vehicle data accurately and reliably, transcending the constraints of vehicle make or model. This system will provide a universal solution, eliminating compatibility issues that have hindered the industry. It will also incorporate a secure wireless communication mechanism, enabling the real time transmission of data to centralized servers or cloud platforms. A user-friendly dashboard will empower fleet managers to monitor and analyze vehicle data, offering insights into vehicle performance, driver behavior, and maintenance needs. Compatibility with existing systems, robust security measures, and non-invasive data capture techniques will be key features, ensuring regulatory compliance and data privacy.

The Telemetric Control Unit project sets out to empower businesses with a revolutionary solution, enabling data-driven decisions and optimized fleet management while maintaining the highest standards of data security and privacy. This project presents the development of a comprehensive telemetry system for vehicles, utilizing an ATmega328P microcontroller to collect, transmit, and store crucial vehicular data. The system is equipped with various sensors, including a petrol level sensor, an RPM sensor, and a voltage sensor. These sensors provide real-time data on the vehicle's fuel level, engine speed, and battery voltage, respectively.

The primary aim of this project is to create a robust and efficient telemetry system that enhances vehicle diagnostics and performance analysis. The collected data is transmitted using the Controller Area Network (CAN) bus, a protocol renowned for its reliability and efficiency in automotive applications. Additionally, an SD card module is incorporated to log the sensor data, enabling long-term data storage and historical analysis. The implementation begins with configuring the ATmega328P microcontroller to interface with the sensors and the CAN module. The petrol level sensor is connected to an analog input, the RPM sensor to a digital input capable of handling external interrupts, and the voltage sensor to another analog input. The CAN module (MCP2515) is connected via the SPI interface to the microcontroller, ensuring seamless data transmission across the CAN bus.

To facilitate data storage, the SD card module is also connected via the SPI interface. The microcontroller reads sensor data at regular intervals, packages it, and sends it over the CAN bus. Simultaneously, this data is logged onto the SD card in a structured format for future analysis. The project also involves developing software using the Arduino IDE to manage sensor data acquisition, CAN communication, and SD card logging. Error handling mechanisms are implemented to ensure system reliability, including checks for sensor read failures, CAN bus communication errors, and SD card write errors. The successful deployment and testing of this telemetry system in a vehicle environment demonstrate its potential for real-world applications. The system provides a scalable solution for fleet management, predictive maintenance, and performance optimization. The data logged on the SD card can be used for trend analysis, helping in proactive maintenance and improving vehicle performance.

This project represents a significant step towards advancing vehicle telematics technology, offering a reliable and efficient method for monitoring and analyzing critical vehicle parameters.

REAL-TIME VEHICLE TRACKING SYSTEM

AANKIT RAJ SHARMA
HEMANG JAIN
YASH JAGTAP

This report presents an innovative approach for real-time vehicle tracking using ESP32 technology. The aim is to enhance the efficiency and reliability of vehicle monitoring systems. The paper addresses the challenges involved in real-time tracking and reviews previous approaches in the field. The ESP32-based system is introduced, highlighting its architecture and implementation process.

The implementation details encompass the integration of GPS modules and GSM communication to develop a robust tracking solution. The experimental setup in cludes hardware selection, software configuration, and evaluation metrics. The results demonstrate the system's high accuracy in tracking vehicle locations and its ability to provide real-time updates.

The limitations of the system are discussed, and future work is proposed for further improvement. In conclusion, the research paper presents a reliable system based on ESP32 that advances vehicle tracking, enabling efficient monitoring and management of vehicle fleets. The findings contribute to the field by demonstrating the potential impact of the proposed approach.

FIRE EXTINGUISHER DRONE

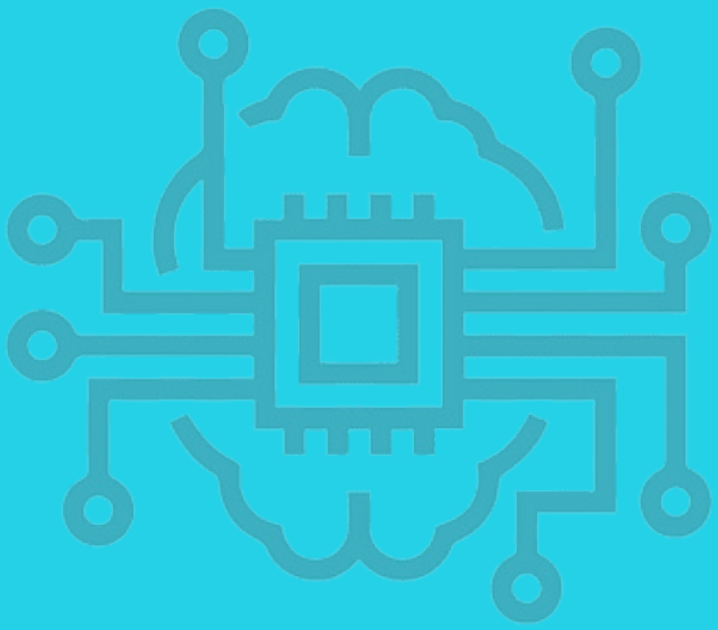
DHANANJAY KHOLE
SARTHAK KODAG
YUKTA KABRA

In India, the diversity of urban landscapes, ranging from densely congested areas to narrow, hard-to-access locations, poses significant challenges for traditional firefighting methods. Accommodating four-wheelers, heavy vehicles, and trucks in such areas is often impossible, creating difficulties in addressing fire-related emergencies. The escalating incidence of fire accidents in these urban pockets calls for innovative solutions that can surmount the limitations of conventional firefighting.

Drones, or Unmanned Aerial Vehicles (UAVs), have emerged as a promising technological solution, offering versatility and adaptability across various domains. These flying robots can be remotely controlled or autonomously follow predefined flight plans, utilizing onboard sensors and a Global Positioning System (GPS) for navigation. This college project outlines a groundbreaking approach to real-time fire suppression through the use of Fire Extinguisher Drones. The primary objective is to revolutionize firefighting by enhancing speed and efficiency, particularly in challenging and remote locations where conventional methods encounter significant constraints. The project's experimental setup entails the selection of fire-prone areas, the formulation of evaluation criteria, and the configuration of the drone's hardware and software components. The results showcase the system's remarkable capability to swiftly extinguish small fires, dramatically reducing response times and the potential for severe damage. Moreover, the report addresses the system's limitations and charts a course for future enhancements aimed at refining and fortifying the fire response mechanism.

The central goal of the Fire Extinguisher Drones is to rapidly extinguish small fires by deploying Fire Extinguisher Balls. In cases where the fire surpasses the drone's extinguishing capacity, the system autonomously alerts the nearest authorities, ensuring swift and effective intervention. This streamlined approach dramatically curtails the risk of multiple fatalities and substantial property damage, particularly in isolated or challenging-to-access areas like congested urban zones and narrow roadways, which are prone to frequent accidents.

This project underscores the pivotal role that fire extinguisher drones play in elevating firefighting efforts, significantly reducing response times, and preempting the escalation of emergency situations. The findings not only underline the potential impact of this innovative approach on public safety and property preservation but also exemplify the limitless prospects that emerging technologies offer in overcoming complex real-world challenges.



INSTRUMENTATION FOR FEATURE ENHANCEMENT IN WATER LEVEL MONITORING SYSTEM

VYANKAT BHURE
GAURI DESAI
ARADHYA GHARDE

In today's world, efficient water management is crucial, especially in regions facing water scarcity. Our project, Instrumentation for Feature Enhancement in Water Level Monitoring System," addresses this issue by developing a water level monitoring system utilizing modern technology. The system integrates an ESP32 microcontroller, an ultrasonic sensor, and a SIM800L GSM/GPRS module to continuously monitor water levels in reservoirs, tanks, or any water storage systems.

The ESP32 microcontroller is connected to an ultrasonic sensor, which accurately measures the water level. When a low water level is detected, the system sends an SMS alert to the user via the SIM800L module, ensuring timely intervention. Additionally, the system uploads the water level data to Think-Speak, an IoT analytics platform, using Wi-Fi or GPRS connectivity. This dual-mode communication ensures data reliability even when Wi-Fi is unavailable.

To provide users with real-time access to water level data, we developed a web interface using HTML, CSS, and JavaScript. This interface displays the latest 10 readings and historical data in a graphical format. Users can access this web interface from anywhere, at any time, via the internet. The system also includes a power management feature, allowing it to switch between main power and solar power, ensuring uninterrupted operation.

Our project aims to enhance water resource management by providing accurate, real-time water level monitoring, thereby preventing water shortages and optimizing water usage.

GRAPH ATTENTION NETWORK

UTI ALTE
SAKSHI BARI
VAISHALI PATIL

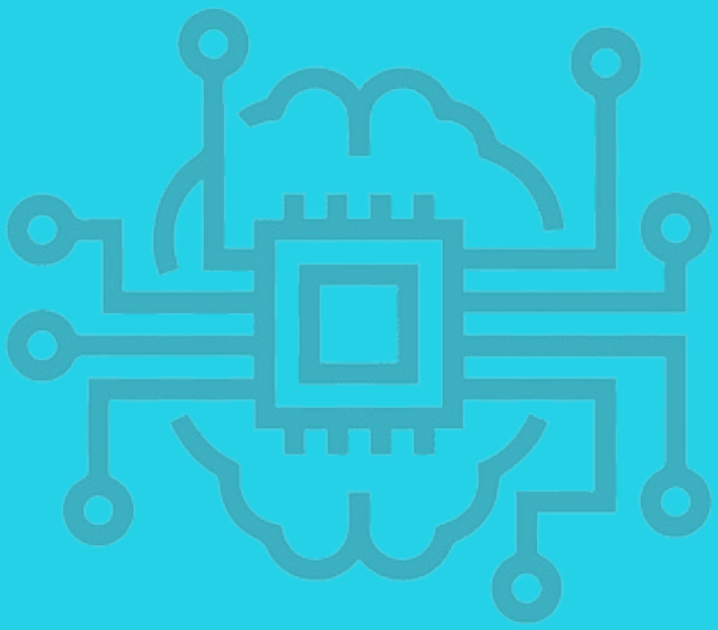
Graph attention network (GAT'S) is a multi-model for AI datasets.. It works on text data to represent into graph structured form. We enable (implicitly) specifying different weights to different nodes in a neighborhood without requiring any type of expensive matrix operation (such as inversion) or depending on knowing the graph structure in advance by stacking layers in which nodes are able to attend over their neighborhoods' features. Thereby, we simultaneously overcome several of the major issues with spectral-based graph neural networks and make our model easily adaptable to both inductive and transductive applications. The implementation will be focused on cite seer and Cora with improving performance parameters in comparison with state-of-art-methods transductive and inductive graph benchmarks.

IDENTIFICATION AND EARLY DETECTION OF LUNG DISEASES

ATHARVA GIRIYAL
MEGHNA MALAVADE
SANSKRUTI PATOND

Our primary aim is to validate our models as a new direction to address the problem on the datasets and then to compare their performance with other existing models. To augment the patient's treatment, deep learning techniques are promising and successful domains that extend the machine learning domain where CNNs are trained to extract features and offer great potential from datasets of images in biomedical applications. Our models were able to reach higher levels of accuracy for possible solutions and provide effectiveness to humankind for faster detection of diseases and serve as best performing models. lung diseases, such as pneumonia, tuberculosis, and lung cancer, continue to pose significant health challenges worldwide, necessitating accurate and timely diagnosis for effective treatment. The main aim of this project is to identify and describe various lung diseases such as pneumonia, pneumonia and lung cancer with the help of data volume through x-ray images and computed tomography (CT). We implemented three deep learning models namely Sequential, Functional, and Transfer models, and trained them on open-source training datasets. In recent years, deep learning techniques have emerged as powerful tools in medical image analysis, particularly for the early detection and classification of lung diseases. This paper presents a comprehensive review of the state-of-the-art in lung disease detection using deep learning, with a focus on the methodologies, datasets, and performance metrics involved. The review encompasses various deep learning architectures, including convolutional neural networks (CNNs), recurrent neural networks (RNNs), and their combinations, which have been employed for tasks such as lung nodule detection, classification, and segmentation.

We discuss the advantages and limitations of these techniques in the context of lung disease diagnosis and their applicability in real-world clinical settings. Furthermore, we propose a novel deep-learning framework for lung disease detection, combining a hybrid CNN and RNN approach to leverage both spatial and temporal information from medical imaging data. The proposed model is designed to provide accurate and efficient diagnosis while addressing the challenges associated with varying data sources and disease types. The evaluation of our framework on a diverse set of publicly available lung disease datasets demonstrates its superior performance in terms of accuracy, sensitivity, and specificity compared to existing methods. This research contributes to the ongoing efforts to improve the early diagnosis of lung diseases, ultimately leading to better patient outcomes and reduced healthcare costs.



SMART CONVEYOR BELT

ATHARVA SAGAR CHATUR
PRIYANKA MAHESH KAITKAR
RUPESH VIJAY THAKARE

This project presents the development of a smart conveyor belt system that utilizes image detection techniques for efficient separation of objects. Traditional conveyor belt systems often rely on manual sorting or simplistic mechanisms for object separation, which can be time-consuming and prone to errors. To address these limitations, our proposed system leverages advanced image detection algorithms and machine learning techniques to automate the separation process.

The system consists of a conveyor belt equipped with a high quality camera positioned strategically along its length. These cameras capture images of the objects as they move across the belt. The acquired images are then processed using computer vision algorithms, which analyze various visual features and extract relevant information to identify and classify the objects in real-time. To achieve accurate separation, a machine learning model is trained on a large dataset of annotated images, encompassing different object types that are likely to be encountered on the conveyor belt. The model learns to classify the objects based on their visual characteristics, such as shape, color, and texture. Once an object is identified, the system triggers an actuation mechanism to divert the object onto a separate path or container, ensuring proper separation.

In conclusion, the smart conveyor belt system presented in this project combines image detection techniques and machine learning to enable efficient and accurate separation of objects. This technology has the potential to revolutionize industrial processes that rely on conveyor belt systems, improving productivity, reducing labor costs, and enhancing overall efficiency.

HEALTH MONITORING SYSTEM THROUGH TONGUE IMAGE ANALYSIS

HEALTH MONITORING SYSTEM THROUGH TONGUE IMAGE ANALYSIS

KADAM BHAKTI BHAGWAN
MANE NEHA SAMBHAJI
SHIVANGI JADHAO

One of the most significant and useful diagnostic techniques is tongue diagnosis, which has been applied extensively for thousands of years in Ayurveda clinical analysis and applications. Numerous researchers have been interested in ways to use computer technologies to enhance traditional Ayurveda in recent years. Our project involves creating a novel tongue analysis system using CNN Edge Impulse that combines the insightful knowledge of Ayurveda with state-of-the-art technology.

In this modern lifestyle, technologies are helping us to maintain our finances, our household things, shopping and so one. In this pandemic period, we have to suffer and be more responsible. We were avoiding public places as much as possible. In today's era, most of the data stored on cloud and converted into digital form professional places used biometric like finger, eyes, speech recognition, DNA, tongue biometric of individual itself justifies the presence of authenticated person. In authentication of a person tongue can also be used because it is a unique organ of the person. In this research we develop a machine which detects the disease of a person with the help of tongue. It can detect the percentage of having disease that the user may have through tongue diagnosis by considering changes in various tongue factors. we avoid the disease at its final stage were we cannot do anything. Our main goal is to find disease earlier and get proper treatment. It saves time and money instead of going to multiple doctors who give multiple advice.

CAR MODEL RECOGNITION using YOLOv8 ALGORITHM

DIGVIJAY PATIL
YASH RANE
RISHAB KAR CHAUDHURI

In the era of rapid technological advancements, the intersection of computer vision and artificial intelligence has unlocked remarkable potential across various industries. This project “Car Model Recognition using YOLOv8 Algorithm,” encapsulates the convergence of these cutting-edge fields, aiming to develop a sophisticated system for automated car model identification and classification within images and video streams. The objective of this project is to leverage the You Only Look Once (YOLO) algorithm, a groundbreaking object detection technique, to create a robust and efficient car model recognition system. By harnessing the power of deep learning and the YOLO framework, this system endeavors to provide real-time or near-real-time identification of diverse car models under various environmental conditions. Key milestones of the project include the collection and meticulous annotation of a comprehensive car image dataset, the training of a YOLO model to recognize car models with high precision and recall, and the development of a user-friendly interface for visualizing detection results. Precise objectives encompass model optimization, performance evaluation, generalization to new car models, and seamless real-time detection.

Through rigorous implementation, this project seeks to contribute to the fore front of computer vision and artificial intelligence, with potential applications spanning traffic management, surveillance, marketing, and beyond. As society increasingly embraces the fusion of AI and visual recognition technologies, the Car Model Recognition using YOLOv8 Algorithm project endeavors to play a pivotal role in enhancing automotive technology and enriching the digital landscape.

3D MAPPING AND AUTONOMOUS NAVIGATION SYSTEM USING SLAM

NIKHIL DATTATRAY KUSALE
VAIBHAV HINDURAO KADAM

The advent of autonomous systems has revolutionized numerous industries, from automotive to robotics, necessitating sophisticated navigation and mapping technologies. This project focuses on developing a comprehensive system for 3D mapping and autonomous navigation using Simultaneous Localization and Mapping (SLAM). The primary objective is to design, implement, and validate a SLAM-based system capable of creating accurate 3D maps of an environment while navigating autonomously within it.

SLAM is a computational problem of constructing or updating a map of an unknown environment while simultaneously keeping track of an agent's location within it. The complexity of SLAM arises from the need to solve two interdependent problems concurrently: mapping the environment and localizing the agent. This project leverages cutting-edge algorithms and robust hardware to address these challenges effectively.

Our system utilizes a combination of sensors, including LIDAR and cameras, to collect data from the environment. LIDAR provides high-resolution distance measurements, essential for creating detailed 3D maps, while cameras offer information that enhances the system's understanding of the surroundings. These sensors are integrated into a hardware platform consisting of a microcontroller and a processing unit, such as a Raspberry Pi or NVIDIA Jetson, capable of handling the computational demands of SLAM algorithms.

The software framework for this project is built upon the Robot Operating System (ROS), an open-source middleware that facilitates the integration of various sensors and algorithms. ROS provides a flexible and modular architecture, allowing seamless implementation and testing of SLAM algorithms such as Gmapping, Hector SLAM, and ORB-SLAM. These algorithms were evaluated for their accuracy, computational efficiency, and robustness in diverse environments. In conclusion, this project presents a robust solution for 3D mapping and autonomous navigation using SLAM, contributing to the advancement of autonomous systems. The integration of LIDAR and camera sensors, coupled with state-of-the-art SLAM algorithms and a versatile software framework, enables the system to operate effectively in various environments. Future work will focus on enhancing the system's scalability, exploring advanced SLAM techniques, and extending the application to more complex scenarios.

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Success is the result of perfection, hard work and determination. Team GYANAMRIT is dedicated in bringing the best magazine.

With this determination, we have worked hard to bring this edition. We would like to extend our deepest gratitude to the President Ms. Aruna Katara. Also, we are deeply thankful to our Principal, Dr. Vaishali Patil, for her constant encouragement and support. Heartiest accolades for our HoD Dr. S M M Naidu and Faculty In-charge Dr. Prashant Ahire, without them GYANAMRIT wouldn't have been what is today.

Lastly, we would like to thank all our students and fellow colleagues for helping us in putting up this edition successfully.

THANK YOU, READERS.

-The Editorial Team
GYANAMRIT


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3. To groom students so as to make them lifelong learners by helping them imbibe professional, entrepreneurial and leadership qualities.
4. To embrace an environment that allows all stakeholders to benefit from the technology-enabled processes and systems.