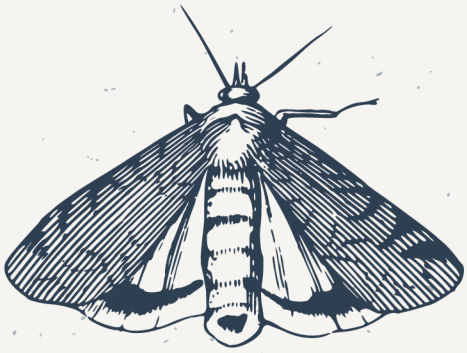
ONWARD TO GLORY

AWES

TRUTH IS GOD

DEPARTMENT OF INFORMATION TECHNOLOGY

2024-25



TECHNICAL E-MAGAZINE

2024-2025

VISION

“To become a "Globally Recognised" technical institute providing world class education and research facilities to the wards of Defence personnel.”

MISION

(a) Provide the right environment, to the wards of Defence personnel, for development of physical, intellectual, emotional and spiritual quotients, with a view to produce total quality engineers.

(b) Create an ecosystem which can foster the culture of research, innovation, creative thinking and higher studies.

(c) Develop an education system which creates entrepreneurs and technology leaders who are committed towards sustainable development of society and nation building.

INDEX

INDEX

Harsh Rai, Gaurav Dadwal, Shubham Jakhar, Ashok Choudhary

Guide: Dr. Sangeeta Jadhav

(Co-Guide): Prof Jayashree

Title:

"REAL TIME FOD DETECTION ON RUNWAYS."

ABSTRACT

Foreign Object Debris (FOD) on airport runways is a serious safety hazard that can cause damage to aircraft and disrupt operations. To address this issue, an advanced method for detecting FOD using YOLOv8, the latest version of the You Only Look Once (YOLO) object detection algorithm, is being developed. Faster RCNN is well-known for its accuracy and speed, making it an excellent choice for real-time FOD detection on runways.The project uses a comprehensive dataset of FOD images, which includes various types of debris such as stones, bolts, metal fragments, and glass pieces. These images are carefully labeled to help the SSD model learn to identify and differentiate between different types of FOD. The model is trained to achieve high accuracy in detecting FOD while minimizing false alarms. Performance is evaluated using metrics like precision, recall, and mean average precision (mAP), which are standard in object detection tasks. The results show that YOLOv8 is more accurate at detecting and classifying FOD than SSD and Faster RCNN and other similar algorithms. The model's ability to quickly and accurately detect FOD in real-time makes it a promising solution for improving runway safety. The system was tested in simulated runway environments to confirm its effectiveness. These tests showed that Faster RCNN can reliably detect FOD under realistic conditions, proving its potential for practical use in airport safety systems. By integrating this system, airports can significantly reduce the risk of FOD-related accidents, leading to safer operations. In summary, this project highlights the potential of YOLOv8 as a powerful tool for detecting FOD on runways. Its ability to quickly and accurately identify debris makes it an essential part of modern airport safety measures, helping to protect both aircraft and passengers.

2| Ritik Kumar, Soumyadip Roy, Ankit Kumar Singh,Kavya Chauhan

Guide: Dr. Sangeeta Jadhav

Title:

“MULTIMODEL RAG (RETRIEVAL ARGUMENTED GENERATION) CHATBOT.”

ABSTRACT

The Multimodal Chatbot using Retrieval Augmented Generation (RAG) is an advanced information retrieval system designed to enhance the accuracy and relevance of responses by integrating real-time data retrieval with Large Language Models (LLMs). Unlike traditional LLMs that rely solely on static training data, this system dynamically fetches relevant documents to generate precise and context-aware responses. Built using LangChain, FAISS, and Hugging Face’s open-source LLMs, the chatbot processes various document formats, including text, tables, and images, efficiently storing their vector representations in a FAISS database for quick retrieval. When a user submits a query, the system identifies the most relevant information from stored documents and generates a well-informed response using RAG techniques.Google Gemini enhances the summarization of text, tables, and images, improving response clarity and depth. This multimodal approach ensures the chatbot can analyse complex data structures, making it highly effective in domains such as finance, healthcare, and legal research. By automating document analysis and retrieval, the chatbot reduces manual effort and enhances decision-making through fast and reliable access to diverse data sources. Its scalable architecture allows seamless handling of large volumes of information while maintaining high performance and accuracy. This technology is bridging the gap between LLM-based chatbots and real-time knowledge retrieval systems.In conclusion, the integration of Retrieval Augmented Generation with multimodal processing significantly enhances the chatbot’s ability to provide accurate and context-aware responses. By leveraging dynamic document retrieval, advanced NLP techniques, and real-time summarization, the system bridges the gap between static LLMs and intelligent information access.

3| Ayush Bhadoria, Mohit Maan,
Abhishek Bijaraniya , Utkarsh Parihar
Guide: Prof D.G.Auradkar
Co-Guide: Prof Trupti Khose

Title:

"DRUG DETECTION."

ABSTRACT

In this Bioinformatics Project titled Computational Drug Discovery , we integrate advanced machine learning techniques with molecular descriptors to expedite the identification of potential drug candidates . Our approach leverages Lipinski descriptors , based on Lipinski's Rule of Five, to evaluate the drug likeness of compounds by considering key pharmacokinetic properties such as molecular weight (<500 Dalton), octanol-water partition coefficient (LogP < 5), hydrogen bond donors (<5), and hydrogen bond acceptors (<10). This enables the assessment of oral bioavailability, which is crucial for successful drug development. In addition, we employ PaDEL-Descriptor software to compute molecular fingerprints and descriptors, offering a comprehensive representation of chemical structures. By calculating both fingerprint descriptors and PaDEL descriptors, we capture a wide range of molecular features that are crucial for QSAR (Quantitative Structure-Activity Relationship) modeling . This project uses QSAR models to analyze the relationship between molecular structure and biological activity, with a focus on predictive accuracy and external validation to ensure robust and reliable models. The combination of Lipinski's descriptors and PaDEL-derived fingerprint descriptors enables efficient screening of drug candidates based on bioactivity predictions, significantly reducing the need for costly in vivo testing. By integrating these computational approaches, the project facilitates a more rapid and cost-effective drug discovery process while supporting greener chemical synthesis and prioritizing experimental validation for promising candidates.

4| Tarush Pandey,Vansh Vatsal, Mohit Kumar Singh, Mukund Vashisht

Guide: Dr. Rahul Desai

Title:

"DETECTING AND PREVENTING OF ALILMEAGERY USING CNN."

ABSTRACT

The emergence of "deepfakes," or artificial intelligence-generated synthetic media, has presented serious problems for public confidence, media credibility, and digital security. To precisely detect deepfake photos, this research, "Detecting and Preventing of AI-Generated Fake Imagery using Convolutional Neural Network," offers a machine learning-based method. The Efficient Net model, a convolutional neural network architecture, is used to train the system to recognize minute differences between real and fake images. The model achieves excellent accuracy and robustness by learning to generalize across different types of fake media through intensive preprocessing, data augmentation, and fine-tuning procedures. By detecting AI-generated fraudulent content in real-world situations, this detection system seeks to be a useful tool for digital media verification, reducing the negative consequences of disinformation and improving cybersecurity.The Efficient Net framework, which balances high accuracy and computational cost, is used in the model architecture, which is created with efficiency and adaptability in mind. Using this method, the convolutional neural network analyses spatial data in images to find irregularities that are typical of AI-generated alterations but frequently invisible to the human eye. This software can be implemented in a variety of applications that need quick and accurate deepfake detection because it incorporates real-time capabilities. This technology helps to protect information integrity and provides a scalable solution for digital security across media, social networks, and business contexts by tackling the growing threat posed by deepfake content.

5| Aditya Kumar, Lokendra Singh, Prayas Poonia, Pradeep Shekhawat

Guide: Dr. Rahul Desai

Co-Guide: Prof Anjali Hudedamani

Title:

"BIDIRECTIONAL LSTM BASED ACCOUSHE MOTION RECONGNATION FOR SPEECH SIGNAL."

ABSTRACT

In the project "Bidirectional LSTM-Based Acoustic Emotion Recognition for Speech Signal Analysis," Enhancing human-computer interaction requires emotion recognition, virtual assistants, and real-time emotional feedback systems. Our model is based on deep learning approach to tackle the problem of correctly recognizing emotions from voice data. Bi-LSTMs are highly effective in capturing temporal dependencies and context from acoustic features, allowing for more accurate recognition of emotions like happiness, sadness, anger, and surprise. The model achieves higher performance in recognizing minor emotional subtleties inside highly variable speech signals by utilizing its capacity to learn both past and future contexts within speech data. The system is trained and evaluated on a benchmark emotional speech dataset, demonstrating significant improvements in emotion classification accuracy, precision, recall, and F1-score. Applications like virtual assistants, customer support, and emotion-aware interactive systems depend on the ability to recognize emotions from voice signals. The application of a bidirectional LSTM network to improve the precision and dependability of speech signal emotion identification is investigated in this work. Accurate emotion categorization is made possible by the suggested architecture's effective collection of temporal patterns in auditory data. The model demonstrated remarkable accuracy when tested on a popular dataset of emotional speech, confirming the efficacy of deep learning methods in emotion identification tasks. The findings support the use of BiLSTMs in speech emotion recognition systems on a larger scale.

6| Devesh Tiwari, Arvind Rathore, Shivank Singh ,Abhay Sahu

Guide: Dr. Ashwini Sapkal

Co-Guide: Prof Kavita Arkeri

Title:

"AUTOMATIC EXTRACTION OF TOPOGRAPHICAL FEATURES FROM SATELLITE & DRONE IMAGE USING DEEP LEARNING."

ABSTRACT

Automatic Extraction of Topographical Features from Satellite Images using Deep Learning

This research addresses the problem of automatic extraction of topographical elements including roads, water bodies, mountains and ground surfaces from satellite images with the application of deep learning algorithms. Such terrains are very important in urban planning as well as environmental management and control of disasters. So the final outcome of the project is aimed at creating a viable model that will help to detect and classify these kinds of landscape objects to minimize human work and increase precision.

To accomplish such tasks, we applied two state of art deep learning networks, U-Net and Deep Lab v3 for feature extraction. The model will be trained on Deep Globe 2018 dataset, a Sentinel imagery dataset, both easily obtainable in high-resolution satellite images. Some preprocessing operations, such as image segmentation, were carried out to boost the efficiency of a given model.The obtained result indicates the high performance of the model, especially when it comes to the extraction of the required features according to the time spent on the extraction which is less as compared to the traditional methods. This work highlights deep learning contributions in the field of analyzing geographical data and offers a solution which can be adopted in any other activities in future.As a final remark, this project has been able to achieve the goal of automating the process of extracting topographical features from satellite images, thus enabling improvements in geospatial data analysis across several sectors

7 | Ajay Singh, Divya Prakash, Jaskaran Singh, Deepesh Tiwari

Guide: Dr. Ashwini Sapkal

Title:

"DIGITAL OUT OF HOME ADVERTISEMENT RECOMMENDATION SYSTEM USING DEEP LEARNING."

ABSTRACT

The proposed system is a real-time, AI-powered advertisement recommendation solution designed for mall environments, utilizing camera-based technology to deliver personalized ads to shoppers. It employs advanced human detection and demographic analysis to process video streams captured from digital banners. By analyzing user attributes such as age, gender, and real-time emotional expressions, the system dynamically selects and displays targeted advertisements that align with individual shopper profiles.At the core of the system is a hybrid recommendation engine that integrates machine learning models with collaborative and content-based filtering techniques. This approach ensures highly relevant product suggestions, maximizing engagement and enhancing ad effectiveness.By leveraging real-time analytics and AI-driven personalization, the system not only optimizes marketing strategies for retailers but also enhances the overall shopping experience, making advertisements more relevant, interactive, and engaging.

8| Shivam Giri, Shubham , Himanshu Rai, Rewant Singh

Guide: Dr. G.M.Walunjkar

Co-Guide: Prof Priya Jadhav

Title:

"TWO WHEELER NO. PLATE & HELMET DETECTION USING DEEP LEARNING."

ABSTRACT

Two Wheeler Number Plate and Helmet Detection Using Deep Learning
Road safety is a critical concern in urban areas, with increasing traffic accidents often resulting from non-compliance with safety regulations, such as wearing helmets and following vehicle registration rules. This project aims to develop a robust, automated system for helmet detection and number plate extraction using advanced computer vision and deep learning techniques. The pipeline involves preprocessing video or image feeds, detecting motorcyclists, classifying helmet usage, and isolating and extracting license plate information. Key technologies include YOLO (You Only Look Once) for object detection, OpenCV for image processing, and OCR tools for number plate extraction. The project also addresses challenges such as varying lighting conditions, occlusions, and diverse plate formats by employing data augmentation techniques and a comprehensive dataset. In addition to safety enforcement, the system has potential applications in urban traffic management and crime prevention. By automating the monitoring process, authorities can efficiently track violators and ensure compliance with road safety regulations, minimizing human effort and reducing response times. The integration of this technology into smart city frameworks can also foster a culture of accountability and proactive safety measures.
This system can be deployed for traffic monitoring, law enforcement, and road safety campaigns, offering scalability and efficiency in ensuring compliance with regulations. By integrating automation with enforcement, this project aims to contribute to safer roads and enhanced public awareness.

9| Lalit Chaudhary, Aman Buldak, Dhiresh, Aryan Dabholkar

Guide: Dr. G.M. Walunjkar

Title:

"SPINAL CORD INGURY DETECTION ON MRI & X-RAY USING UMT & MON AI."

ABSTRACT

A state-of-the-art medical imaging initiative called the Smart Spinal Cord Injury Detection System uses machine learning to enhance the identification of spinal cord injuries from MRI data. For accurate MRI picture segmentation, the system uses the U-Net architecture, concentrating on vital areas including the spinal canal, intervertebral disks, and vertebrae. After segmenting the image, the system classifies the type of spinal injury (vertebral fractures, disk herniation, etc.) using the MONAI (Medical Open Network for AI) framework, a specialized deep learning library designed for medical image analysis. With the help of labeled MRI datasets, the model is trained to identify characteristics linked to various spinal lesions, enabling quick and precise diagnosis. This technology improves medical professionals' diagnostic abilities by automating the segmentation and classification process, which lowers manual error and increases efficiency in injury identification.

This technology improves medical professionals' diagnostic abilities by automating the segmentation and classification process, which lowers manual error and increases efficiency in injury identification. The technology is especially helpful in clinical settings, providing radiologists and doctors with a scalable tool to help them make better decisions on patient care.

In conclusion, UNet is especially well-suited for segmentation jobs needing high precision, like medical image analysis, because of its architecture and capacity to capture both local and global context. It is perfect for identifying anomalies in medical scans, including MRI pictures in spinal injury detection projects.

10 | Diakar Gupta, Saurabh Kumar, Sumit Soni

Guide: Prof. Vaishali Ingale

Title:

"ABOENGINE USING WORD EMBEDDING TECHNIQUES."

ABSTRACT

Algo Engine using word embedding technique

The "AlgoEngine using word embedding techniques" project aims to simplify the process of finding relevant coding problems for students and learners by consolidating problems from various coding platforms into a single, unified platform. Developed by a team of four members, the project addresses a common challenge: learners often waste time searching across multiple platforms to locate problems from different topics. Our goal is to provide a solution that helps users save time and focus on solving problems efficiently by integrating them into one comprehensive system.

To achieve this, we employ two key natural language processing techniques: the BERT (Bidirectional Encoder Representations from Transformers) model and the TF-IDF (Term Frequency-Inverse Document Frequency) algorithm. BERT is used to understand the context and semantics of coding problem descriptions, while TF-IDF is applied to improve keyword relevance in the search function. This dual approach enhances the platform's ability to retrieve the most relevant coding problems based on user queries, combining the deep contextual understanding of BERT with the efficiency of TF-IDF for matching keywords.

The results of our implementation show a 48% improvement in search capabilities, with more accurate and relevant results delivered to users. By integrating TF-IDF alongside BERT, we ensure that keyword relevance is optimized, resulting in a more effective search process. This platform not only saves time for learners but also improves their experience by centralizing access to a wide variety of coding problems, enabling them to focus on problem-solving rather than searching across different platforms

11 | Aditya Tiwari, Shantanu Rajmane,
Yogesh Kumar, Yashvir Yadav
Guide: Prof. Vaishali Ingale

Title:

"PEDIATRIC BONE AGE ASSESSESMENT."

ABSTRACT

Bone age assessment in pediatrics is important for diagnosing growth disorders, hormone imbalances, or other developmental issues in children. Traditional methods, like the Tanner-Whitehouse and Greulich-Pyle systems, rely on manual comparison of hand X-rays using reference atlases, making them highly subjective with a significant degree of intra and interobserver variation. Recent advancements in deep learning, especially using Convolutional Neural Networks (CNNs), have automated and enhanced the accuracy of bone age prediction. By analyzing large datasets, such as the Radiological Society of North America's (RSNA) Pediatric Bone Age dataset, CNNs have reduced manual labor and improved precision.

In this paper, we will be using the Regression Vision Transformer (RViT) for pediatric bone age prediction. ViTs offer benefits like patch-based image processing and self-attention mechanisms, which allow the model to better capture both local and global skeletal features. The regression head employed at the end of ViT will enable us to get an accurate prediction of the age. The approach aims to reduce observer variability and provide a more reliable automated solution for pediatric bone age prediction.

Keywords—Regression Vision Transformer (RViT), Bone age assessment, Pediatrics, Deep learning, Vision Transformer (ViT), RSNA Pediatric Bone Age dataset

12 | Vikram Reniwal, Vivek Singh, Sumit Beniwal, Shubham Kumar

Guide: Prof. Yuvraj Gholap

Title:

“AGRICULTURE MANAGEMENT SYSTEM.”

ABSTRACT

In our research project titled "SmartFarm: Intelligent Crop Management System," we aim to build a comprehensive solution for farmers, empowering them to make real-time, data-driven agricultural decisions. The core objective of SmartFarm System is to provide tailored crop recommendations, predict and diagnose crop diseases from image inputs, and offer precise fertilizer recommendations based on soil nutrient requirements. These capabilities are designed to enhance productivity, minimize resource waste, and contribute to sustainable farming practices. The primary objectives of the SmartFarm System are to: Provide tailored crop recommendations: Based on environmental and soil conditions, suggesting crops that are well-suited to specific regions. Predict and diagnose crop diseases from image inputs: Employing image recognition to identify crop diseases early on, thus minimizing crop loss. Offer precise fertilizer recommendations: By assessing soil nutrient levels and crop needs, SmartFarm ensures balanced fertilizer application to maximize yield without overuse, supporting sustainable soil health. Our approach leverages advanced deep learning architectures and machine learning techniques, drawing on methodologies from recent studies on crop disease recognition pest identification, and soil nutrient analysis. By utilizing convolutional neural networks (CNNs) for disease identification from captured images and ensemble machine learning models for crop recommendations based on real-time data, we enhance the system's adaptability and precision Additionally, IoT-enabled soil nutrient monitoring further refines fertilizer recommendations, aligning with crop-specific nutritional needs Trained on public agricultural datasets and fine-tuned for optimal accuracy, this system provides a valuable tool for farmers, reducing the time and effort needed to make informed agricultural decisions. This project ultimately seeks to empower agricultural practitioners with real-time, data-driven insights, supporting more sustainable and productive farming practices.

13 | Shreeya, Kanu Priya, Ambati Maneesha, Sakshi Sharma

Guide: Prof. Sandeep Samleti

Title:

"ADVANCE DRIVING ASSISTANCE USING EYE DETECTION."

ABSTRACT

Drowsy driving is a leading cause of accidents globally, resulting in severe injuries and fatalities due to reduced attention, cognitive abilities, and reaction time caused by fatigue. This study introduces a real-time drowsiness detection system using Eye Aspect Ratio (EAR) and yawning as primary indicators, which are reliable markers of fatigue. Leveraging computer vision and machine learning algorithms, the system utilizes Python libraries such as OpenCV and Dlib to monitor facial landmarks, analyzing vertical and horizontal eye coordinates to calculate EAR and tracking mouth movements to detect yawning. Designed for integration into ADAS or autonomous vehicles, the lightweight and scalable system provides visual or auditory alerts to prompt drivers to rest, reducing accidents caused by driver fatigue. Tested on real-world datasets, it achieves high accuracy with minimal false positives. Future enhancements could incorporate additional metrics like head pose or blink rate to further refine accuracy, highlighting its potential to save lives and promote safer driving.

Key Words : Drowsy, EAR , Attention, Cognitive, yawning

14 | Prabhat Pandey, Nirmal Kumar, Parikshit, Praveen Kumar

Guide: Dr. Rupali Bagate

Title:

"AUTOMATED RESUME BASED TECHNICAL INTERVIEW SYSTEM USING SEQUENTIAL LEARNING LLM APPAROACH."

ABSTRACT

During placement seasons, Students have to prepare for technical interviews. For good preparation, mock interviews are very helpful for them but almost all students are involved in their interview preparations so they are not available for taking mock interviews of each other on D-day. So to solve this problem, came up with the idea of making this "Automated Resume Based Interview System". This Project aims to create an AI-powered Automated Resume Based Interviewer which will take candidate's resume as input and extract relevant technical keywords from the resume using some Large Language Model like Gemini or Chat GPT. Thereafter, extracted words are used to scrape interview questions from popular technical interview questions websites like Geeks for Geeks and Interview bit. The System then presents the scraped interview questions to the candidate through a GUI (which will be a python based application) that includes both text and speech capabilities. After this candidate's responses are recorded as input and are passed to the LLM for the evaluation purposes. The system is also capable of asking follow up questions related to the previous question. On completion of the interview process, the system gives the candidate his overall feedback and score. It may also tell the candidate about the areas of improvements also. So, this AI based interviewer will prove to be a very helpful tool to the candidates preparing for the technical interviews. Along with this AI based Automated Interviewer has the potential to streamline the interview process for both candidates and recruiters, saving time and resources of both.

15 | Ankita Mishra, Anushna Panwar, Akash Kumar, Aditi More

Guide: Dr. Dipika Birari

Title:

"CLASSIFICATION OF SENSOR SIGNALS USING DEEP CONVOLUTIONAL NETWORKS."

ABSTRACT

Topic: Classification of solar signal using deep convolutional neural network
Classification of sonar signals is essential in various underwater applications, including object detection and identification, such as distinguishing between natural formations and man-made objects. A deep learning approach utilizing Convolutional Neural Networks (CNNs) is proposed to address this challenge. CNNs are well-suited for extracting complex spatial features from sonar data, enabling more accurate and efficient classification. By leveraging their capability to automatically learn hierarchical patterns, the model achieves superior performance in identifying subtle distinctions within noisy and variable sonar signals. The system is trained and evaluated on a sonar dataset, showing marked improvements in classification accuracy, precision, recall, and F1-score.

PROCESSES RELATED TO PROJECT IDENTIFICATION, ALLOTMENT, CONTINUOUS MONITORING, AND EVALUATION

SEMESTER 1

- STUDENT PROJECT GROUPS WILL BE FORMED.
- STUDENT HAS TO SUBMIT PROJECT IDEAS EFFORTS ARE TAKEN TO GET MAXIMUM SPONSORSHIP PROJECT.
- INTERNAL GUIDE IS ALLOTTED TO THE PROJECT GROUP.
- REVIEW COMMITTEE OF SENIOR FACULTY IS FORMED TO ASSESS PROGRESS OF PROJECT WORK
- REVIEW 1: - SHORTLIST PROJECTS AND TO CHECK FEASIBILITY. - FINALIZE OBJECTIVES AND SCOPE OF PROJECT. - TO DISCUSS LIST OF REQUIRED HARDWARE, SOFTWARE OR OTHER EQUIPMENT FOR EXECUTING THE PROJECT, TEST ENVIRONMENT TOOLS.
- REVIEW 2 : FOR FINALIZATION OF SRS - HIGH LEVEL DESIGN ,PLANNING WITH CPM/PERT CHART.
- STUDENT SUBMITS PRELIMINARY PROJECT REPORT . APPEARS FOR UNIVERSITY EXAM (PPT PRESENTATION) EVALUATED BY EXTERNAL/INTERNAL EXAMINER .

PROCESSES RELATED TO PROJECT IDENTIFICATION, ALLOTMENT, CONTINUOUS MONITORING, AND EVALUATION

SEMESTER 2

- REVIEW 3 : FOR CHECKING THE IMPLEMENTATION STATUS

↓

- REVIEW 4 : FINAL PROJECT DEMONSTARTION AND RESULT ANALYSIS.

↓

- STUDENT PREPARE FINAL PROJECT REPORT! - APPEAR FOR UNIVERSITY EXAM (PROJECT DEMO) EVALUATED BY EXTERNAL/INTERNAL EXAMINER