

DEPARTMENT OF CSE [ARTIFICIAL INTELLIGENCE & MACHINE LEARNING]

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3	Dr. Mahesh Kotha, B. Prashanth	Congestion Control using Link Estimation and Energy Aware in Wireless Sensor Network	10.55784/2 025.2614.	0315-3 681	UtilitasMathematica, combinatorialpress & Scopus	Oct-2025
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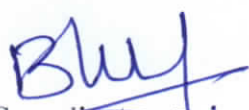
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Strongly correlated high-utility item-sets recommendation in e-commerce applications using EGUI-tree over data stream

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ABOUT

Abstract

The product recommendation feature in e-commerce applications plays a vital role in helping customers choose the right items. By analysing their purchase history, the system recommends relevant items. Although customers have the freedom to choose from the suggestions, if they do purchase them, it benefits both buyers and sellers. Sellers experience increased sales, while buyers save time searching for products. To meet these requirements, a recommendation system should prioritise items with High Utility (HU) and strong correlation. HU items generate high profits, and strongly correlated items have a higher probability of being selected. Here, since up-to-date data in the data stream are got, the stream of purchase transactions is mined using the sliding window technique to extract such item-sets. To store the immediately processed results, a tree like structure termed Extended Global Utility Item-sets Tree is used. Experimental results on real-time data prove the proposed algorithm is optimistic and scalable.

Keywords

HUIM, high utility item-set mining, recommendation system, utility, correlation, data stream, sliding window

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ENHANCED CONGESTION CONTROL IN FUTURE-GENERATION 5G/6G NETWORKS: A NOVEL HYBRID DEEP LEARNING MODEL

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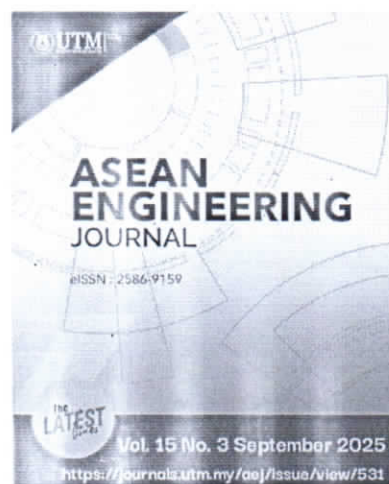
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Keywords: Network slicing, 5G/6G networks, Hybrid deep learning model, Congestion control, LSTM, SVM

ABSTRACT

Next-generation networks, such as millimeter-wave LAN, broadband wireless access systems, and 5th or 6th generation (5G/6G) networks, require enhanced security, diminished latency, and augmented reliability. Efficient congestion management is crucial for 5G/6G technologies, enabling operators to monitor many network instances on a unified infrastructure to provide enhanced quality of



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SECTION

Articles



Congestion Control Using Link Estimation and Energy Aware in Wireless Sensor Network

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ABSTRACT

Current communication systems lean on Wireless Sensor Networks (WSNs), which also offer health and environmental monitoring applications. However, issues congestion, inconsistent connectivity, and limited energy supply restrict longevity and efficiency. This study incorporates link quality evaluation with energy-conscious routing to enhance dependability, reduce delays, and conserve energy. Recent developments, including machine learning-based, energy-conscious, and hybrid approaches, are highlighted in the comparative study. The ability to improve data transmission, advance network longevity, and optimize network efficiency in WSNs is emphasized in this study.

Keywords: Congestion control, energy efficiency, link estimation, wireless sensor networks

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INTRODUCTION

Rising as a pillar of modern communications architecture, wireless sensor networks (WSNs) are utilized in environmental tracking, fitness, agriculture, and smart cities (Mazloomi et al., 2024). These networks include spatially disbursed sensors that accumulate and transmit statistics to a relevant sink node. In addition to its benefits, WSNs have many responsibilities, including crowded data transfer, unreliable communication links, and limited energy supply (Sridhar et al., 2022). One practical



Heart Diseases Prediction Using Deep Convolutional Neural Network with Deformable Angular Alignment Module

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Abstract: Heart disease prediction using an automated framework decreases the mortality rate of patients with cardiac disease. However, existing methods for predicting cardiac disease depend on internal risk factors and fail to predict external risk factors that affect the overall prediction accuracy. Hence, to overcome these issues, this research introduces a Deep Convolutional Neural Network with a Deformable Angular Alignment Module (DCNN-DAAM) utilized for heart disease prediction. A DCNN helps to accurately detect subtle patterns linked to heart disease by learning spatial features from medical images. The DAAM is used to align deformable heart features for reliable and robust heart disease prediction across patients. In the preprocessing phase, bandpass filtering removes irrelevant frequency components and noise from signals, such as the Electrocardiogram (ECG), preserving only the heart-related frequency range and thereby improving the signal quality. A One-dimensional Residual Denoising Convolutional Autoencoder (1D RDCA) is employed to extract spatial and temporal features from one-dimensional heart signals for the efficient prediction of heart diseases. Recursive Feature Elimination (RFE) iteratively selects the most relevant features by removing the least important ones, thereby enhancing the accuracy of prediction. The proposed DCNN-DAAM model attains an accuracy of 99.7% for ECG and 99.8% for the Massachusetts Institute of Technology–Beth Israel Hospital (MIT-BIH) dataset for human heart disease prediction.

Keywords: Deformable angular alignment module, Deep convolutional neural network, Human heart diseases prediction, Residual denoising convolutional autoencoder, Recursive feature elimination.

1. Introduction

The heart is primarily responsible for blood circulation through the arteries and venous network, which receive oxygenated blood from the coronary arteries and then pumps deoxygenated blood to the lungs [1]. The blood discharges carbon dioxide by releasing oxygen, which is a waste product of metabolism in the lungs [2]. The hectic schedule of the present era causes an unhealthy lifestyle that leads to despair and anxiety [3]. Excessive smoking, drinking, and use of drugs causes severe illness that

lead to cardiac diseases and chronic respiratory conditions [4]. Cardiovascular problems and cancer are major illnesses affecting the initial cases [5]. Abnormal heart and blood conditions refer to cardiovascular diseases (CVDs) [6]. Diseases such as peripheral arterial and aortic diseases, Coronary Heart Disease (CHD), and stroke or transient ischemic attacks are the primary forms of CVD [7]. Advanced Deep Learning (DL) neural networks enable the analysis and assessment of CVD, which effectively indicates post-determined symptoms and indicators [8]. When the blood supply to the coronary arteries is decreased the atheroma, fat, and obstructed

Machine Learning for Additive Manufacturing of 3D Printed Multi-Material Tissue Mimicking Anatomical Structures

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ABSTRACT

A new machine learning-based framework for additive manufacturing optimization in 3D-printed multi-material tissue-mimicking anatomical structures is presented in this study. The objective is to enhance the precision and functionality of printed models by optimizing material selection and printing parameters to replicate key mechanical properties of human tissues, such as elasticity, tensile strength, compressive modulus, and Shore hardness. A comprehensive dataset of material properties is utilized as input to a Sparse Spectral Graph Convolutional Network (SGCN), which captures complex relationships between materials and anatomical structures to predict optimal material combinations and printing parameters. Since SGCN lacks inherent parameter optimization capabilities, the Artificial Gorilla Troops Optimization (GTO) technique is employed to fine-tune the model's weight parameters, improving predictive accuracy. Python is used to implement the framework, and performance metrics like accuracy, precision, recall, and Root Mean Square Error (RMSE) are used to assess it. The proposed SGCN-GTO framework achieves an accuracy of 99.2%, precision of 98.5%, recall of 97.8%, and a low RMSE of 0.034, significantly outperforming existing models such as Convolutional Neural Networks (CNNs), Recurrent Neural Networks (RNNs), and Artificial Neural Networks (ANNs), which achieved average accuracies below 90%. This research provides a promising step toward advancing the clinical applicability of 3D-printed anatomical structures for surgical planning, medical education, and personalized healthcare by delivering models with superior mechanical fidelity and optimized production efficiency.



REAL-TIME FOOD CLASSIFICATION USING VGG19 WITH GRAD-CAM VISUALIZATION FOR ENHANCED INTERPRETABILITY

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ABSTRACT

As nutritional disorders increase, because of unbalanced diets and numerous cuisines available on markets, physical and mental health of humans is more likely to be ruined. Appropriate food categorization is essential in tracking food consumption and sensitizing nutrition. The following paper proposes a food recognition model based on the VGG19 deep convolutional neural network with the incorporated Grad-CAM (Gradient-weighted Class Activation Mapping) visualization of the predictions made by the model to improve its interpretability. The model is tested against extensive dataset of 53 dishes in international cuisine on which both non-vegetarian and vegetarian food items are found. VGG19 is chosen because it performs well in feature detection and Grad-CAM gives the areas on each image that affect the decisions made by the model, making them more transparent, and trustworthy. This explains AI model enables users and researchers to visualize and check classification results. As measured by experimental analysis, the enhanced VGG19 classifier with Grad-CAM achieves an efficient accuracy of 96 percent, which is better compared to the traditional machine learning models including Naive Bayes and Decision Tree. This proposed approach is effective in real-time applications monitoring food intake and diet assessment.

Keywords: : Nutrition Disorder, Grad Cam, VGG-19, Naive Bayes, Decision Tree.



Transformer Based Explainable AI framework: A Case Study on Colorectal Cancer Diagnosis

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Abstract: The early detection of colorectal cancer (CRC) is critical and yet persistently challenging objective for clinical practice. This paper introduces a robust transformer based framework that integrates Deep learning (DL) models (Convolutional Neural Networks: AlexNet, VGG21-22 and ResNet-152), Vision Transformers (ViTs), and XGBoost to enhance CRC classification from medical images. The DL model perform high-quality initial feature extraction, while ViTs effectively model long-range spatial dependencies often missed by traditional architectures. XGBoost is employed for final structured data classification. This helps in boosting diagnostic precision and robustness. In order to address the imbalance nature of the dataset, an improved generalization, synthetic data generation has been employed using Generative Adversarial Networks (GANs) and standard augmentation techniques. Under 5-fold stratified cross-validation (the primary evaluation protocol), the framework achieves an accuracy of $95.8 \pm 0.7\%$, precision of $94.8 \pm 0.9\%$, recall of $95.1 \pm 0.8\%$, and F1 score of $94.9 \pm 0.7\%$, surpassing standalone DL models and ViT models by 4.1%–5.2 percentage points over the baseline (90.6%). The data augmentation techniques led to a 7.3% gain in recall for underrepresented classes. Furthermore, model interpretability was increased through SHAP, and LIME. Despite its complexity, the framework maintains computational efficiency, with only a 12% increase in training time compared to single-model systems. The proposed methodology offers an interpretable, scalable and high-performance solution for DL based transformer based colorectal cancer detection, supporting its integration into real-world clinical decision support systems.

Keywords: Colorectal cancer detection, CNN, ResNet-152, Feature fusion, Lime, SHAP, GAN, Vision transformer models.

1. Introduction

Colorectal cancer (CRC) is one of the most prevalent and lethal forms of cancer worldwide. The mortality rates have been ranked among the highest across all cancers and very prominent in under developed and developing countries. The need of early and accurate detection of CRC is indispensable

for significantly increases the likelihood of successful treatment and long-term survival. Traditionally, CRC diagnosis relies on colonoscopy and histopathological analysis. These techniques are manpower intensive, time-consuming, and dependent on expert interpretation. In the recent years, Artificial Intelligence (AI), particularly DL, has shown considerable promise in automating and enhancing the accuracy of medical image analysis. However,

Navy Hydroacoustic Surveillance System

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Abstract—Maintaining maritime security across vast ocean regions is a complex and resource-intensive task, often relying on manual monitoring and conventional radar systems that may fail to detect underwater threats effectively. This paper proposes an AI-Assisted Navy Hydroacoustic Surveillance System that enhances maritime situational awareness by combining underwater acoustic analysis with computer vision techniques. The system processes real-time data from hydrophones and surveillance cameras, applying deep learning models such as CNN and LSTM to detect anomalous underwater sounds including submarine movements, torpedo activity, and unusual vibrations. Simultaneously, computer vision models analyze sea-surface imagery to identify suspicious vessels and objects.

The monitored ocean region is divided into multiple zones, and each zone is assigned a threat score based on normalized outputs from acoustic and visual models. These scores are integrated to generate an overall threat intensity level for each zone. Detected threats are visualized through an interactive dashboard featuring maps, heatmaps, and alert indicators, enabling naval personnel to quickly identify high-risk areas and take appropriate action.

Experimental evaluation on simulated and real-world datasets demonstrates high detection accuracy and efficient real-time processing capabilities.

The proposed system provides a scalable and intelligent framework for multi-modal maritime surveillance, improving threat detection, response time, and decision-making in modern naval operations.

I. Introduction

Maritime security plays a critical role in protecting national boundaries, trade routes, and naval operations. Traditional surveillance systems primarily rely on radar and manual monitoring, which are often limited in detecting underwater threats such as submarines, torpedoes, and abnormal acoustic activities. These conventional approaches require continuous human supervision, are resource-intensive, and may fail to provide timely and accurate threat identification in complex ocean environments.

Recent advancements in artificial intelligence (AI), signal processing, and computer vision have enabled the development of intelligent surveillance systems capable of analyzing multi-modal data in real time. Techniques such as deep learning models, including Convolutional Neural Networks (CNN) and Long Short-Term Memory (LSTM), have shown significant success in processing acoustic signals and visual data. These technologies allow automated detection of anomalies in underwater sounds as well as suspicious activities on the sea surface.

In this work, we introduce an AI-Assisted Navy Hydroacoustic Surveillance System designed to automatically monitor maritime regions by integrating acoustic and visual intelligence. The system captures real-time data from hydrophones and surveillance cameras, processes it using deep learning algorithms, and identifies potential threats. The monitored area is divided into multiple zones, where each zone is analyzed and assigned a threat score based on combined acoustic and visual outputs. The system generates alerts and visualizes results through an interactive dashboard, enabling faster and more effective decision-making for naval personnel.



YOLOv8 for Real-Time Microplastic Detection in Aquatic Environments

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Abstract: Plastic waste is destroying marine ecosystems throughout the world and posing a threat to the life of animals and the health of the waters. This does research on a new deep learning model named YOLOv8 to identify and classify underwater plastic trash. The system is highly functional in all sorts of water, and can detect different plastic waste in real time. The technology can be useful in the context of conserving the ocean by providing more accurate estimates of the amount of trash that exists, its origin, and the optimal clean-up strategies. Testing indicates that accuracy of the new method is far much superior to the previously used methods particularly when visibility of the water is low. The article contributes to the emerging research on AI in environmental monitoring, by offering a scaled instrument and measuring plastic pollution to direct conservation and policy-related actions.

Keywords: Locating plastic, gathering garbage, categorizing them, YOLOv8, computer vision, and deep learning.

1. INTRODUCTION

The world is witnessing a massive threat to marine environments in the accumulation of synthetic polymers. This poses a severe crisis to the marine life by interfering with the habitats, obstructing the digestive systems, and passing the poison to the food chain[1]. The existing methods of locating submerged plastic like fishing vessel sweeps, hand gathered survey, and simple sonar mapping have dire constraints. They are not extensive enough, they are not frequently used, and they are difficult to operate.

The combination of artificial intelligence with environmental science has superior alternatives than the prior procedures. This paper examines the machine vision in automatic identification of underwater waste. We dwell upon YOLOv8 (You Only Look Once) framework, a novel visual processing system and the unique analysis line. The design also has built-in mechanisms, allowing YOLOv8 to analyze entire image frames simultaneously, rather than pixel by pixel in small patches[3]. This enables it to operate with silk speed but still capable of detecting the things hence it is perfect to be utilized in mobile applications such as remotely operated vehicles and autonomous monitoring stations.[5].

Using this technology in the field of environmental research, we desire the tools which would transform the practice of tracking of plastic pollution into the continuous process. Conservation work could be assisted by these tools to map the hot spots of contamination, discover the location of the waste introduction, and quantify the impact of clean-up measures.

The major findings of this paper are

In this project, YOLOv8 is presented to detect microplastic in water with accuracy. The model is effective with microplastic pieces (small) under complicated water backgrounds.

It has the ability to sort out various kinds of micro plastic fibers and pellets and it works more effectively with bubbles and reflections. □ It is effective in detecting microplastic in water to aid in mitigating pollution.

2. RELATED WORKS

The individuals have experimented numerous methods of shielding underwater creatures against waste materials such as plastic and rubbish. In 2019, Fulton and group offered a deep learning device which identifies plastic within pixel-based pictures in water. A ResNet design was adopted and trained on special underwater images. A similar application, the Marine Debris Tracker by Jambeck in the same year, sorted marine litter in images provided in the volunteer project, with machine learning. In 2021, Gómez -Rios et al constructed a CNN that was specifically aimed at detecting small pieces of plastic on the seabed; the CNN was able to focus attention on the shape and color of various plastics. In 2020, Wang and

Smart Garbage Segregation Using Resnet Model

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Abstract - The significant contribution of the pollution and health risks on the population is improper waste segregation. It is tedious, unsanitary, and inaccurate as people do not understand the process that should be used in sorting waste manually. The current paper is devoted to a Smart Garbage Segregation Mobile Application that facilitates Artificial Intelligence and image classification methods to identify and classify garbage automatically. People can scan or upload pictures of waste products and the system identifies them as biodegradable, recyclable, hazardous or general waste. Clear instructions on disposal and bin suggestions are given in the application, which promotes proper disposal of waste. Points and badges are some of the Gamification features present to attract more user engagement and foster sustainable behavior. The suggested system will be an effective, scalable, and user-friendly solution to enhance waste separation and waste sustainability by integrating machine learning, cloud services, and mobile technology.

Keywords: Smart Waste Management, Garbage Segregation, Image-Classification, Artificial Intelligence, Mobile Application, Environmental Sustainability

1. INTRODUCTION

Waste-management, environmental-awareness and environmental-responsibility are what creates a clean and sustainable environment. Nevertheless, the majority of waste-disposing procedures including household waste, plastic substances, or other hazardous materials, are implemented without any clear information or advice. The resulting lack of alignment between waste-management information and actual practice tends to cause improper-segregation, environmental-pollution, and health risks of people in that they do not know which category should be used to dispose of a waste product.

Waste segregation is the major issue in everyday life, and it is essential to have a clean and sustainable environment. A majority of the wastes produced at homes, offices and other places are not sorted out according to the biodegradable, recyclable and hazardous materials. Lack of proper segregation results in environmental pollution, health hazards, poor recycling system, and landfills congestion. Even after

they have been sensitized, there are still a lot of individuals who struggle to determine the proper category of waste to place in a particular case.

It is quite possible that the current system of waste segregation is still very much reliant on human judgment and manual labor. Individuals usually use guesswork or lack of full information when discarding waste material and this leads to wrong choices. Sanitation workers find it expensive to sort manually, which is also unhygienic and they are in contact with dangerous substances. Guidelines are not always practical to follow in real-time even in cases where there are guidelines available to follow considering that the user may not be certain about a given waste item.

As the sphere of artificial intelligence and mobile technology rapidly develops, it is now possible to fill this gap by offering an intelligent and near-instant waste sorting assistance. Image recognition and machine learning can be used to classify waste items and direct users on how to get disposed of in a straightforward and user-friendly manner.

The Smart Garbage Waste Segregation App is aimed at aiding users in their everyday waste disposal tasks, and not substituting the current waste management strategies. The user is able to scan or post an image of a waste product and the system gives a clear classification and disposal directions. The app allows users to make informed decisions when they dispose of waste by a combination of automated image analysis and an interactive mobile interface.

The system is also very time and effort saving as waste segregation rules do not have to be searched out or it is not necessary to use trial and error. Users can also get immediate results by scanning a crowd of long guidance rather than having to make assumptions or peruse a lot of guidelines. It is also very beneficial in cases of households, students and small communities where failures to access expert advice on waste management is widespread. The Smart Garbage Waste Segregation App will help promote a better and cleaner environment by making waste segregation easier, faster, and more reliable.

Women Safety Alert System with Geo Location and Shake Service

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Abstract—The personal safety applications will also have to work in an emergency scenario whereby the user will not be in a position to physically control the gadgets. The majority of currently developed mobile safety solutions cannot be relied at the time of panics or any other threat because they depend on providing clear actions with the help of users. This research proposes an android safety system in relation to women safety which is implicitly sensory basing on the feedback of motion sensors. SOS is automatically triggered by the system without actual physical contact with the screen by a detection system that responds to shaking.

Index Terms—Women safety, Emergency alert system, Shake gesture detection, GPS location tracking, Android application, SOS communication

I. INTRODUCTION

Women are forced to face confronted with risky situations - on their commute to work, when in a hurry at work or when alone. It is now possible to install various safety applications in smartphones. Most of them however are forced to open the phone and select a stress signal button. In real tragedy, such behavior may be suppressed by stress (or trauma). Fear can freeze reactions. The locomotion may not be possible. When they are most needed that has the majority of the tools inefficient. Helping solution is not dependent on taps or swipes of the one holding a right solution constantly [1].

The new apps that consider the womanly safety feature include: SOS notification, direct dialing of a loved one or sharing the whereabouts. Useful? Sure. They however count on the fact that one is not so stressed to the point of grabbing his or her phone and thumbing their screens. Hazard always likes to come at the very moment - one has barely time to act. At the worst possible moment, an equipment may be turned off, packed away or simply unseen. This would mean that

postponement of an emergency alert may be caused by time lapses. Whenever people are asked to work on behalf of systems, mistakes are made during the moments of stress [2].

The majority of the phones available as well have mini-internal instruments like accelerators to check on their movements. Odds acts, then, those appearing as a change of position in these parts, as in constant shaking may be noticeable. Perhaps a sign is when an individual shocks his/her device a few times in the case. The motion data stream will not need any touch; therefore, the help can be activated even when the display is black [3].

It begins by shaking the phone - there is no need to press any keys. The application is Android-based, and the application is created in a secure way. The motion sensors perceive any undue shakes and take it as an alarm. Then GPS will start up and it will replace one wherever he is. A message is relayed to the already added contacts. Inside it? A piece of evidence to connect their location. Help is requested without phrasing or utterances. Putting up in a manner of making sure it is swift anguish that is likely to get to the appropriate individuals. Coughs when the hands are clumsy or the panic attacks.[4]

II. RELATED WORK

It is also possible to find quite many apps that are developed with the sole intention of helping women to deal in issues of their safety that can come to the rescue during trouble-making. We made them however might need to go through the first step of opening your phone, that can be lost in the panic. Others make automatic calls to significant individuals as some of them enable yelling digital assistance. The sharing of location will be fast and sent straight to users saved beforehand. But those times all the fingers fail to tap,



Traffic Accident Detection in Smart City Transportation Using an Ensemble Deep Learning Framework

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ABSTARCT

In the era of smart cities, intelligent transportation systems (ITS) are pivotal for ensuring efficient, safe, and sustainable urban mobility. One of the critical challenges in ITS is the timely and accurate detection of traffic accidents, which directly impacts emergency response, traffic management, and public safety. This study presents a hybrid deep learning ensemble approach that integrates classical machine learning algorithms—Support Vector Machine (SVM), K-Nearest Neighbours (KNN), and Random Forest (RF)—to enhance the accuracy and robustness of traffic accident detection. The proposed method leverages high-dimensional traffic data including vehicle speed, GPS coordinates, traffic density, and time-series patterns captured from IoT sensors and surveillance systems. A feature extraction phase powered by deep learning techniques, such as autoencoders or convolutional layers, reduces noise and enhances the representational quality of input data. Subsequently, individual classifiers (SVM, KNN, and RF) are trained on the processed features and their outputs are combined using a weighted ensemble strategy to form the final prediction.

I. Introduction

This project is focused on the development and implementation of a predictive accident model using advanced data analysis techniques. The study primarily utilizes road accident data collected from the Bangalore region for the years 2014 to 2017. The data encompasses various critical attributes such as accident type, weather conditions, road type, time and location, vehicle type, and number of casualties. These diverse data points are essential to accurately model the multifactorial nature of road accidents. The final system is realized as a desktop application with an interactive user interface, developed in Python using tools like Anaconda, Scikit-learn, TensorFlow, and visualization libraries such as Matplotlib. The application provides functionalities for risk prediction based on user-inputted data, visualization of accident trends, rule extraction from historical data, and entry of new accident cases for continuous improvement of the dataset. Through this comprehensive scope, the system not only serves as a predictive tool but also as an analytical platform for researchers and policy makers.

II. Related Work

The purpose of this project is to develop an intelligent and data-driven solution to address the growing concern of road accidents, particularly in densely populated and high-traffic areas. With the ever-increasing number of vehicles on the road, the frequency and severity of accidents have risen sharply, leading to significant human and economic loss.

AGRICONNECT: INTEGRATED FRAMEWORK FOR CROP AND LIVESTOCK TRADING

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ABSTRACT

The Agri-Livestock Hub is a web-based digital platform designed to facilitate transparent, direct, and location-based trading of agricultural crops and livestock between farmers and traders [3][4]. By removing intermediaries, the platform ensures that prices are directly accessible to producers, allowing buyers to efficiently source fresh, local inventory. The listing process requires detailed information—quantity, type, age, condition, and value as determined by each producer. Fluctuations in daily demand inform traders' purchasing decisions, enabling dynamic market participation. The platform is developed utilizing contemporary technologies, including React and TypeScript, and employs Tailwind CSS to maintain a streamlined and efficient user interface. Supabase is integrated to provide secure authentication, real-time database management, and data storage, thereby simplifying the technical infrastructure. The platform's user-friendly design accommodates individuals with varying levels of digital proficiency, ensuring broad accessibility. Location-based sorting capabilities assist farmers in identifying nearby buyers, thereby reducing logistical costs and mitigating geographic barriers. The implementation of digital tools within the Agri-Livestock Hub allows for real-time price visibility, reducing uncertainty in the valuation of agricultural goods.[4]

This technological intervention addresses longstanding issues such as opaque pricing mechanisms and delayed payments, which have traditionally hindered agricultural markets. The transition from paper-based to digital record-keeping enhances transparency and minimizes errors, fostering increased trust among stakeholders. Ultimately, improved information flow facilitates incremental advancements in profitability and operational efficiency, providing a sustainable solution to persistent challenges in the agricultural sector.

Keywords: AgriConnect, Smart Agriculture, Livestock Trading, Digital Marketplace, Web Application, PostgreSQL.

1. INTRODUCTION

Agriculture and livestock farming are essential for sustaining rural economies around the world [1][2]. For generations, these sectors have provided a primary source of income and stability for rural households. Despite their importance, farmers continue to encounter significant challenges due to traditional trading systems. Price volatility, dependence on intermediaries, and limited access to fair markets often restrict farmers' ability to secure equitable returns for their products. Meanwhile, buyers frequently experience difficulties in sourcing high-quality goods efficiently and responding to fluctuating market prices.

The emergence of digital technologies is transforming the landscape of agricultural trade. Online platforms are streamlining transactions, reducing the influence of intermediaries, and fostering greater transparency and trust among participants. The Agri-Livestock Hub is designed as a digital solution that directly connects farmers and buyers, enabling straightforward and structured trading of crops and livestock. Within the Agri-Livestock Hub, farmers can list their products by providing essential information such as quantity, type, breed, age, health status, and desired price. Registered traders are able to post their purchasing rates, while the platform continuously updates with real-time market data. Location-based filters further assist farmers in identifying nearby buyers, minimizing transportation costs and logistical challenges, particularly in remote areas. The platform's architecture leverages contemporary web technologies to ensure security, reliability, and user-friendliness. Its intuitive interface accommodates users regardless of their technical proficiency, and role-based access ensures that both farmers and buyers have a streamlined experience tailored to their specific needs. By addressing longstanding barriers in agricultural trade, the Agri-Livestock Hub aims to promote efficiency, equity, and growth within the sector.



AI-Powered Employment Platform for Low Income Workers

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Abstract

The low-income worker unemployment is a major problem due to the low access to job platforms and ineffective job-matching systems. This project is an AI-Based Employment System of Low-Income workers based on machine learning. This platform tries to match workers and employers according to the relevant skills rather than qualifications of the past. It provides employers and employees with different areas to log in and have a secure connection and custom features.

Employers are able to advertise job requirements which is the listing of essential skills and workers are able to enroll their skills, experiences and job preferences. This system employs machine learning to understand the skill patterns and align job requirements to that of the workers. It suggests appropriate workers to employer and applicable job trends to workers leading to less manual search as well as enhanced efficiency in hiring. The emphasis on skill-based labor position helps the platform to introduce a flexible work environment and promote the participation of more individuals in the economy. The aim of this platform is to automate the jobs market, reduce unemployment among the low-income groups, and achieve a platform that functions at scale and is flexible enough to meet the fluctuating labor market demands. On the whole, the system demonstrates that AI and ML need to be efficiently used to produce a significant employment ecosystem.

Keywords: AI Powered, Skill-based Job matching, Non- IT Workforce, Gig Economy, Unorganized Sector Employment, Digital Employment Platform, Employment Platform, Skill-Based Job Matching, Low-Income Workers, Non-IT Workforce, Job Recommendation System, Candidate-Job Matching

1. Introduction

Unemployment among low-income workers is a persistent social and economic problem in recent years, especially where opportunities to have access to the organized employment platform are scarce. A lot of talented people have problems with proper employment as they are not visible and the systems of matching jobs are not efficient. Conventional job markets tend to focus on official credentials and low-income earners can hardly compete even where the workers possess skilled understanding and expertise in the job.

AI Driven Agriculture-Predictive Analytics&Climate Smart Agriculture

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Abstract—Farming in the modern world is faced with the challenge of producing sufficient food with fewer wastes of water, fertilizer and crop losses. A recently developed AI-based technology named Crop Health and Disease Management can assist farmers and detect diseases and yield forecasts through computer vision and detailed predictions. It consists of three major components namely Crop Recommendation, Nutrient Analysis and Plant Disease Detection. The system involves a number of machine-learning models, which include Random Forest, XG Boost, SVM, the Decision Trees and the Naive Bayes to examine variables including fertilizer levels, temperature, and humidity and provide the recommendations on each field. It also possesses an intelligent nutrient module illustrating them as to how to improve soil well-being and PyTorch deep-learning apparatus telling farmers how to treat and prevent plant illness. It is effective in 92% test and its precision is 90%. The solution located in a Flask web application is simple to use, scalable, and assists farmers to increase in a more sustainable manner.

Index Terms—AI in Agriculture, Machine Learning, Crop Recommendation, Plant Disease Detection, Nutrient Optimization, Disease Prevention, PyTorch, Sustainable Farming.

I. Introduction

The modern day agriculture is facing a challenge to produce higher outputs with less input. This is being handled by the AI Driven Agriculture (Crop Health and Disease Management) project that entails the integration of a single platform that fuses predictive modeling and computer vision. It also depicts that it uses various machine-learning algorithms such as Random Forest, XG Boost, SVM, Decision Trees, and Naive Bayes to process primary environmental data such as NPK levels, temperature, humidity or rainfall to offer localized planting recommendations to the farmers.

In contrast to simple diagnostics uses the platform also includes a smart nutrient-optimal module that finds deficiencies in the soil nutrients and suggests solutions to them and an in-depth learning platform (PyTorch) that hints at the illnesses in the plants as well as the leaves. This holistic practice does not merely relate to diagnosing sickness but it gives the farmer obvious means of administering diseases and averting problems along with curing the soil. It builds on a Flask web-app and can rate high in terms of performance with a pre-high score of 92 92 and a precision score of 90, however, it offers a scalable solution that is easy to use and will increase production and close to sustainable farming.

II. Related Work

The technology of precision agriculture has developed significantly through the help of machine learning and computer sight in a fight to help farmers to increase crop production and reduce diseases.

Agrinova Application Using AIML

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Abstract- Agriculture is very important in the economic development and food security of most nations, however, it has been experiencing major threats like fluctuating weather, crop infections and lack of accessibility to professional agricultural advice. The high pace of developing digital technologies and artificial intelligence has presented new possibilities to overcome these challenges successfully. GRINOVA Application is an intelligent and combined smart agriculture support system which will help farmers make better decisions by integrating weather forecasting, predicting crop diseases, and AI-assisted chatbot into one platform.

On the whole, the AGRINOVA Application is an example of how artificial intelligence and data-driven technologies can be successfully used to transform agriculture, enhance its productivity, minimize risks, and aid sustainable farming and, thus, is a useful instrument in the context of smart agricultural management.

Keywords: Smart Agriculture, Machine Learning, Weather Prediction, Crop Disease Detection, Image Processing, Deep Learning, Natural Language Processing (NLP), Web Application, Sustainable Farming.

I. INTRODUCTION

Agriculture has been the major source of human civilization and still remains a crucial part of the economic growth of various nations, particularly in the developing world such as in India. The majority of the population relies on agriculture as a lifestyle and thus there is the need to embrace efficient and sustainable farming methods. Nevertheless, the contemporary agriculture is subject to a number of issues like uncertainty of climatic conditions, common crop diseases, inadequate access to specialized knowledge, and resource wastage. These issues have direct impacts on crop yields, income and food security of the farmers.

Among the most severe problems in the field of agriculture is the growing uncertainty of the weather patterns owing to the climate change. Rapid rains, droughts, extreme temperatures, and change of season usually interfere with the usual farming patterns. The farmers are normally dependent on the experience or local observation, which is not necessarily true in the current environment of climate change.

Poor decisions in terms of sowing, irrigation, fertilization, and harvesting are caused by inaccurate weather predictions which cause reduced crop yield and financial losses.

AGRINOVA weather prediction module is powered by real time information and forecasting software that provides the necessary weather parameters including temperature, precipitation, humidity, wind conditions, and many others. Through these predictions, farmers can plan on how to carry out agricultural activities in a more effective way, reduce risks that are experienced because of poor weather, and maximize the utilization of water and other resources. Weather information is very essential in enhancing crop management and having sustainable farming practices.

II. PROPOSED APPROACH

Agriculture is very sensitive to climate and prompt decision making, but there are still various challenges that are burning farmers and which have direct effects on the crop production and revenue. Climate change has been one of the major issues, particularly because of unpredictable weather conditions. The farmers do not have access to precise and location-specific weather data, which causes inadequate planning of agricultural practices including sowing, irrigation, and harvesting hence the damage of crops and loss of money.

Proposed Methodology:

The suggested methodology is aimed at gathering valuable agricultural data, working with it effectively, and coming up with valid predictions. Meteorological APIs are trusted with weather data, which is then processed into location specific forecasts. The images of the crops posted by a user are pre-processed and analyzed with trained machine learning models to identify diseases. The chatbot analyzes the queries of the users utilizing natural language processing algorithms and provides the relevant answers.

The late identification of crop diseases is another major challenge. The conventional methods of identifying diseases are based on manual observation and expert consultation which are time consuming and may not be readily available particularly in rural environment. Late diagnosis means that diseases propagate very fast leading to serious loss



DIGITAL SHIELD: AN AI-BASED PLATFORM FOR ONLINE SAFETY AND HARASSMENT REPORTING

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Abstract: One big issue today? Individuals who are abused and threatened online. Currently, aid tools are either disjointed, difficult to use, or sluggish. Enter Digital Shield an artificial intelligence based smart website that helps in fighting back. It is expected to educate, allow the users to report safely, as well as provide live chat where necessary. The more people raise their about their safety, the more they will be secure - this tool will help people speak easier. It directs more desirable decisions over the internet instead of disregarding injuries. Subsequent updates would be able to follow trends, speak various languages, even do it on phones.

Index Terms- Digital Safety , Online Harassment , AI Chatbot , Firebase, Cybersecurity, Web Application

I. INTRODUCTION

The rapid changes in internet technology nowadays are speedy. The use of social networks is becoming increasingly prevalent. Due to that, the manner in which individuals speak and exchange information has also evolved. Nevertheless, despite such advantages, such sites, such as Internet harassment, accompany him just as much. Cyberbullying is coming very often. Stalking occurs using screens more than in the past. Online abuse infiltrates at the low level. In the recent times, these ails are visible everywhere. They're seen as real dangers. It affects mental well-being negatively. Online safety does not seem as guaranteed to the user.

People tend to remain quiet even where a tool exists to indicate or prevent harmful posts in the internet. The fear of being exposed retards them. Anonymity feels uncertain. Most of them just do not understand the way the system works. Existing practices are diffuse and sluggish and one step behind. They do not prevent some harm before it occurs but wait to see what happens. Help during urgent moments? Rare. Live assistance is missing. Emotional care in crisis? Almost gone.

Recently, the literature indicates an increase in the use of smart digital solutions capable of managing education, avoiding and incident handling - all in a single system. Not a mere theory, artificial intelligence, as well as natural language processing, is highly promising in terms of easier interactions between individuals and machines, particularly in live scenarios, such as cyber threats. Nonetheless, the application of AI capabilities within the daily safety systems has not actually exploded yet - still in its infancy.

Here a new direction is developed. Digital Shield is an artificial intelligence-driven web tool that has been developed to enhance privacy on the internet. People can report on harassment without identifying themselves instead of remaining silent. The support is immediate with the help of an intelligent chatbot that works on the basis of intelligent algorithms. Notices about safety are placed at critical situations in

AI-Powered Green Home Planner: An easy approach to Sustainable Homes

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Abstract:

The non-expert users may have difficulties balancing cost, climatic suitability, terrain limitations, and environmental footprint when constructing a sustainable home. This paper presents Green Home Planner, an AI-based recommendation system that generates cost-effective and green plans to build a residential building. The system uses machine learning regression model to predict the cost of construction using user inputs such as built-up area, floors, budget, climate, terrain, and priority. The feasibility is checked using rule based checks. It also has a sustainability score due to material and system choices to be included with the detailed recommendations and cost breakdowns pertaining to making informed decisions.

Keywords: Sustainable Construction · Cost Estimation · Machine Learning Regression · Rule-Based Recommendation · Climate Feasibility · Green Building · Residential Planning

1.Introduction

Sustainable housing is increasingly gaining relevance as the cost of construction is increasing and environmental issues are becoming a major concern. Nevertheless, due to the selections of budget estimation, materials, climate-appropriateness, terrain-feasibility, and sustainably, it is difficult to make a home design that is not only economical but also friendly to the environment in non-expert consumers. The traditional methods of planning primarily depend on hand calculations and expert advice which is often expensive and time consuming.

In the traditional planning of homes, manual methods of cost estimation and expert advice are highly utilized by the users. Despite the fact that this technique may be reliable, it is often very expensive, time-intensive, and not available during the initial stages of building planning. Moreover, instead of being integrated into the planning

process, such sustainability measures as the usage of low-carbon materials, energy-saving systems, and water-saving techniques are often perceived as an additional option. The consequence is the creation of designs that may not be cost effective or environmentally friendly.

The advancement in artificial intelligence has enabled the utilization of the intelligent recommendation systems and cost estimation based on the data to aid construction planning. Machine learning models are able to provide more accurate estimates of construction costs, based on the requirements of the user and historical information. Also, decision logic that is based on rules may ensure that recommendations remain viable due to terrain and climatic constraints. Such hybrid systems help users make more informed decisions and reduce the use of specialists.

In order to eliminate all these challenges, we apply GreenHome Planner, a computer-aided design that

AI Smart Screening System for Early Detection of Breast Cancer Using Deep Learning

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Abstract:

Breast cancer is one of the most important issues of health concern to women globally and early detection can be crucial in enhancing the survival rates. Conventional screening methods like mammography involve interpretation by experts and the interpretation process is time consuming and liable to human errors particularly in dense breast tissues. The proposed project introduces an AI Smart Screening System based on the deep learning methods to help with the early diagnosis of breast cancer. The offered one makes use of a Convolutional Neural Network (CNN) that is trained on the mammogram images to detect benign and malignant breast tissues and estimate the density of the breast tissues. The system offers both prediction outputs and a score of confidence and allows patients and doctors to access the information securely and through a web-based environment based on their roles. The system enhances the accuracy, efficiency, and ease of access of the mammogram analysis, report management, and aids the clinical decision-making process by automating mammogram analysis, incorporating digital report management.

Keywords: Breast Cancer Detection, Deep Learning, Convolutional Neural Networks, Mammogram Image Analysis, Medical Image Processing, AI-Based Screening System, Decision Support System.

1. Introduction

Breast cancer is a life threatening and one of the most widespread diseases in women all over the world, and it is a major cause of mortality in relation to cancer. Early and proper diagnosis has high success rates of treatment and survival. The most common method of screening is by mammography although interpretation of mammogram images is a complicated procedure considering that there is variation in density of breast tissues and the possibility of some delicate abnormalities that can hardly be detected using manual interpretation.

The recent Artificial Intelligence (AI) developments, especially the deep learning field, have demonstrated a tremendous promise in using medical images. Deep learning models will be able to automatically derive sophisticated patterns in mammogram images and help radiologists detect cancerous tissues with more precision and reliability. Project is a proposal of an AI-based smart screening system that will automate the process of identifying breast cancer, typing of tissue kinds and determine the breast density, thus,

SMART CIVIC ISSUE REPORTING SYSTEM

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Abstract:

In many urban regions, addressing civic issues such as garbage accumulation, water leakage, and potholes remains inefficient due to manual reporting procedures and delayed responses. The *Smart Civic Issue Reporting System (SCIRS)* presents an AI-integrated, web-based platform designed to streamline this process and promote transparency between citizens and municipal authorities. The system allows citizens for register, log in/log out, and report issue of any civic problems by capturing the image, adding a description, and the location is captured automatically. The issue reports are then assigned to respective municipal officer based on constituency, where the municipal officer can be review, accept, and updated the status of the civic issue. The system executes a deep learning model based on MobileNetV2 to identify images as garbage or non-garbage using a 0.65(65%) limit, helps to prevent manual verification of civic issue reported. From approving local officials right through to watching users across regions, admin holds every string. Oversight stretches everywhere without exception. At times, it might limit entry for a town without warning. A unique visual using charts appears alongside charts. When people share what they think, it gives a second look at whether things are done right. This extra check makes outcomes more accurate because real experiences shape the results. Trust grows when actions match what users actually face citizen trust. This approach ties into broader aims for city management that rely on technology. It uses artificial intelligence to help cities run better. Automation takes over repetitive tasks so systems respond faster. Instead of waiting for human input, decisions happen as conditions change. Efficiency grows when processes adapt in real time. Cities become more responsive because data guides actions. Tools like these, shape how places grow without slowing down daily life.

Keywords — Smart City, Civic Issue Reporting, Deep Learning, MobileNetV2, AI Automation, Urban Governance.

I. INTRODUCTION

Managing civic facilities is a big problem for developing cities. Piles of trash pile up where streets go uncleaned. Roads crack and break apart under constant wear. Sewage seeps through broken pipes beneath sidewalks is referred from

[1][2]. Problems stack when basic systems fail streetlights not working properly.

Still, many complaint systems run on paper. Getting help means visiting city buildings. Some folks must make phone calls instead. Offices stay busy with face-to-face requests. Voice lines fill up fast each morning. Few places offer online options yet. Workers write details by hand is

CRIME REPORT MANAGEMENT AND TRACKING SYSTEM

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Abstract:

The increasing difficulty of crime trends and the amount of data related to crime necessitates intelligent and automatic methods of effective management of crime. The traditional way of reporting on crime is more reliant on the paper work and un-organized digital information, thus resulting in an inefficient way of handling the crime, sluggish investigation and unavailability of the crime data. In this research paper, the suggestion is Crime Report Management and Tracking System with Human Suspicious Activity Detection as an efficient way to manage crime reports, track the investigations, and analysis of surveillance. The suggested system will have a centralized online system of registering crimes and managing criminal records, tracking of the cases, and storing evidence safely. In addition, computer vision that is run using deep learning is utilized in analyzing CCTV images and identifying suspicious human behavior by default. The suggested approach will reduce human interaction, enhance the accuracy of investigation, enhance citizen safety, and achieve proactive policing by using intelligent surveillance and making decisions based on data. Crime management system, crime report tracking, biometric identification, finger print recognition, facial recognition, deep learning, criminal record management, Multi, mode search, law enforced, and public safety.

I. INTRODUCTION

The control of crime has relevance to the security of the citizens and the police. However, crime is increasing with the advance between technology and urbanization. In the traditional methods, crime reports are submitted on paper or personal computers and so managing the crime is slow and subject to inaccurate results. Officers are not able to find the previous records and status of cases. Machine learning, AI, and computer vision have the potential to enhance the reporting and investigation of crime. The automated crime systems and intelligent surveillance can help respond more quickly, employ less staff, and be transparent. The focus of the research is to develop a system that will control and monitor crime reports and identify suspicious behavior. The system will enable individuals to report things online, store all the records of crime at one location, monitor cases in real time, and separate suspicious occurrences automatically on CCTV footage. It will combine crime management and intelligent surveillance analysis.

2 Related Work

Crime-management systems based on the newest computer techniques have received more and more attention of researchers in the recent years. Such techniques are enhanced database architecture, biometric identification and machine learning. Their aim is to find criminals in a better and quicker way. The initial computer-based crime recordkeeping system utilized mostly text programming and relations databases. It would be able to hold criminal records, fingerprints, and incident reports. It was efficient at managing data and was unable to analyze unformatted biometric data and authenticate identities automatically. Using new biometric technology, scientists began to construct systems that have been used to identify criminals with the help of fingerprints and face recognition. As an illustration, in 2004, Jain and others demonstrated that fingerprint recognition in forensic programs was more effective than the archaic ones. People applied eigenface and Fisherface models to face recognition in the early 2010s and subsequently included deep learning models, such as convolutional neural networks, to perform better when using different lighting and poses. These biometric systems were used to verify identity and were not normally linked to complete crime-management systems. New current research combines machine learning and deep learning to provide an improved biometric match. An example of this is that Zhang (2018) and Taigman (2014) deployed deep neural networks to form facial embeddings and identify similarities between them with high precision when applied to real-world scenes. Other scholars constructed the multi-modal biometrics systems that combine fingerprints, iris scans, and faces. This is useful where a single form of biometric information is poor. There are also researches on improved database and tracking systems. Gupta and Ahuja (2017) have examined the construction of distributed databases on the criminal systems, which allows you to query with data within various locations in real-time. Nonetheless, the majority of these systems do not include a biometric analysis, hence, such systems depend on individuals manually search or external biometric applications.

An AI-Agent Platform for Sustainable and Budget-Friendly Travel Planning

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Abstract - Modern travelers face a persistent dilemma in balancing cost efficiency with environmental responsibility. This paper proposes an AI-driven multi-agent platform that addresses this challenge by coordinating specialized agents to generate travel itineraries optimized simultaneously for cost-effectiveness, emission reduction, and user preference satisfaction. The architecture integrates generative language models to produce transparent, human-readable explanations for each recommendation. Experimental analysis demonstrates a 15% reduction in carbon emissions compared to price-only optimization approaches, while keeping costs within a 10% margin, confirming the feasibility of jointly optimizing financial and environmental objectives in real-world travel planning.

Key Words: AI Agents, Sustainable Travel, Budget Optimization, Multi-Agent Systems, Explainable AI.

1. INTRODUCTION

Travel planning requires simultaneous evaluation of numerous variables across reservation systems, transportation options, accommodation, and activities, all while staying within budget constraints. This manual process is time-consuming and often produces suboptimal outcomes [1]. Environmental concerns add further complexity, as tourism accounts for nearly 8% of global greenhouse gas emissions [3], yet most booking platforms do not factor ecological considerations into their recommendations.

We propose a multi-agent system that distributes the planning task among specialized agents: a Cost Agent (budget optimization), an Environmental Agent (ecological impact assessment), a Personalization Agent (individual preference matching), and a Coordination Agent (cross-agent synchronization). This addresses a key gap in existing solutions by providing holistic, transparent budget-sustainability optimization [12].

Contributions: (1) a multi-agent architecture for joint travel itinerary optimization; (2) integration of optimization techniques with generative models to produce interpretable recommendations; (3) a balanced scoring mechanism that prioritizes competing objectives; and (4) a functional prototype validated through experimental evaluation.

2. RELATED WORK

Traditional Systems. Existing booking platforms typically optimize isolated metrics such as minimum cost, requiring users to manually synthesize information across multiple sources, which imposes a significant cognitive burden [9].

Multi-Agent Systems. Agent-based frameworks allow competing objectives to be processed concurrently within a modular architecture [1]. Lenfers et al. [2] demonstrated multi-modal travel integration through a case study of Hamburg; however, existing implementations do not adequately address sustainability-budget optimization.

Sustainable Tourism. Ecological footprint computation has been studied extensively [17, 18]. Gössling et al. [4] reviewed

mitigation strategies, and Rodríguez-Moreno et al. [5] validated such approaches in practice, yet few of these methods have been incorporated into platforms offering practical, sustainability-balanced recommendations.

Multi-Objective Optimization. Sun et al. [14] applied ant colony optimization to route planning, while Silva et al. [15] proposed bi-objective approaches. Ruiz-Meza et al. [8, 10, 11] examined fuzzy trip design for heterogeneous preferences using self-adaptive evolutionary algorithms and a GRASP-VND algorithm. Chen et al. [16] addressed stochastic traffic conditions, and Ntakolia et al. [13] focused on personalization; however, none of these approaches integrate generative AI for explainability.

Explainable AI. Recent research has emphasized transparency in AI systems [6]. Luo and Specia [7] surveyed explainability approaches for large language models (LLMs). Integrating such models bridges the gap between optimization output and human understanding through natural-language descriptions.

3. PROPOSED METHODOLOGY

A. System Architecture

The platform employs a four-layer architecture: a Presentation Layer (user interface), an Agent Orchestration Layer (coordination), an Intelligence Layer (AI and optimization), and a Data Layer (APIs and storage). This modular structure provides clear interfaces between layers and enables independent development of each component.

B. Problem Formulation

Given a set of travel configurations $O = \{o_1, \dots, o_n\}$, the objective is to maximize:

$$F(o) = w_{fc}(o) + w_{fe}(o) + w_{fp}(o) \quad (1)$$

where fc , fe , and fp are normalized scores representing cost-effectiveness, environmental sustainability, and preference satisfaction, respectively, and the weights satisfy $w_c + w_e + w_p = 1$. The optimization is subject to: $C(o) \leq B_{max}$ (budget constraint), $T_{start} \leq t_{departure} \leq T_{end}$ (date constraints), and additional logical-consistency constraints.

AI- POWERED SMART FIRE DETECTION FROM CCTV USING DEEP LEARNING

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Abstract—When fire breaks out in places like building, shopping malls, colleges, schools and industries, most of the time, this leads to serious damages, as they are not spotted at an early stage. The standard systems of fire detection, such as smoke and heat sensors tend to be responsive after a long time and may also give false alarms. To alleviate these shortcomings, this paper will propose a smart fire detection systems which involves the use of computer vision and deep learning algorithms to detect fire at an early stage using camera footage of a CCTV camera. The proposed system will be based on the YOLOv8 deep learning and OpenCV to analyze the video streams in real-time and identify any visuals related to fire (flame and smoke). This system does not require physical sensors and instead uses the already existing surveillance cameras which makes the system very cost efficient and simple to install. After a fire is identified with high confidence, an automatic notification is forwarded to the emergency department via email, which will aid in prompt response and minimise the use of human surveillance. The system is created on the basis of such technologies as python, Django framework and MySQL database to control the video processing, the results of video processing, and alerts. According to the experimental results, the system is effective and has an accuracy of about 92 percent with a rapid response time in various indoor environmental conditions. On the whole, this piece of writing shows that the regular CCTV systems may be converted to intelligent fire monitoring systems, helping to enhance safety and minimize the risk of fires.

Index Terms—Vision-based Fire Detection, YOLOv8 Nano, Computer Vision, Real-Time Surveillance, Deep Learning, CCTV Systems, Automated Emergency Alerts.

I. Introduction

Fire accidents remain to be among the most grave and most frequently recurrent hazards in residential, commercial and industrial setups like residences, shopping centers, offices and industries. A small-scale fire can be easily expanded into a big tragedy unless it is recognized at the early stages, hence leading to human fatalities, extensive destruction of property, and adverse environmental impact. The early fire detection is thus very critical in reducing the losses and the safety of people and infrastructure. The timely detection of fire incidences will enable emergency services to be deployed within a shorter time, and they will avoid instances that may lead to an outburst.

The conventional fire systems primarily rely on smoke and heat detectors. However, despite its popularity, these equipment have serious disadvantages. As an example, smoke alarms might not perform the role of quickly notifying in large or open areas hence pending the production of alarms. In addition, heat detectors are normally opened at a higher temperature of heating that is, the fire is most probably at an advanced stage. More than this, the appliances are prone to false alarms that may occur frequently and hence lower trustworthiness and confidence of the users. Accordingly, the traditional methods of fire detection are bound to be erroneous and lack timeliness in most of the real life applications.

AI-ENABLED CERVICAL CANCER RISK PREDICTION USING YOLOV12 DEEP FEATURES AND OPTIMIZED RF- XGBOOST CLASSIFICATION

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ABSTRACT

Cervical cancer is the second malignancy that is highly diagnosed among women and is regarded as one of the preventable ones. However, despite the existence of effective prevention measures, the literature has shown that the level of ignorance is high concerning cervical cancer, its causative factors, and prevention measures in the developing countries, in particular. The medical students and health care professionals are in a strategic position to raise the awareness of people by elevating the level of their knowledge regarding the symptoms, risk factors, and the early screening practices. Approximately 500,000 new cases of cervical cancer are reported each year all over the world with over 300,000 deaths. The main etiological factor leading to the development of the disease is the persistent infection with the human papillomavirus (HPV) of high-risk subtypes. Although cervical cancer cases can be considerably avoided due to the organized screening and HPV immunization campaigns, almost 90 percent of the cases occur in the states with low and middle income due to the lack of access to systematic screening and immunization. By contrast, the cervical cancer incidence and mortality rates in high-income countries have decreased tremendously during the last thirty years due to the complex screening and early intervention efforts. Also, fertility saving surgical procedures are now the norm in the treatment of women with cervical cancer at the early and low risk stages. The current paper introduces an advanced ensemble-based deep learning framework that could be utilized to identify and forecast at an early stage cervical cancer risk using both YOLOv12 and RF+XGBoost to extract and classify deep features respectively. The suggested YOLOv12-RF+XGBoost model has performed better than the conventional classifiers, with the peak accuracy of 96.5, and can be used in the early detection of risks and the provision of clinical decisions. And when compared with some base classifiers like Decision Tree and Support Vector Machine the proposed classifier has given the best accuracy in predicting/detecting cervical cancer.

Keywords: Cervical cancer, Risk factors, screening, (HPV), YOLOv12, Random Forest, XGBoost, Decision Tree, Support Vector Machine

CARDIAC ARRHYTHMIA DETECTION FROM ECG SIGNALS USING HYBRID DEEP LEARNING APPROACH

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ABSTRACT

This study has been undertaken to investigate the determinants of stock returns in Karachi Stock Exchange (KSE) Heart attacks are serious medical emergencies that need quick and correct diagnosis to save lives. To help with this, the present study proposes a method that uses Electrocardiogram (ECG) signals, which are commonly used to check the condition of the heart. ECGs record the heart's electrical activity over time and can show if the heartbeat is normal or abnormal. However, it is still difficult to accurately classify ECG signals into specific heart diseases because of their complex patterns. Since cardiovascular diseases (CVDs) cause a large number of deaths worldwide, researchers are working on developing automated systems that can improve the speed and accuracy of diagnosis. This study introduces a Bidirectional Long Short-Term Memory (Bi-LSTM) neural network model to classify ECG signals and detect arrhythmias, which are irregular heartbeats. The Bi-LSTM model is designed to learn patterns from both past and future signal sequences, giving better accuracy. It is trained using the MIT-BIH Arrhythmia Database, which contains five different types of heart conditions. To solve the problem of uneven data distribution, re-sampling techniques are applied during preprocessing. The results show that this method can effectively help doctors in diagnosing heart diseases more accurately and quickly.

Keywords: Electrocardiogram (ECG) signals, cardiovascular diseases (CVDs), arrhythmias, re-sampling techniques.

1. INTRODUCTION

Cardiovascular diseases (CVDs) are one of the leading causes of death worldwide, causing nearly 18 million deaths every year. Heart attacks and arrhythmias are among the most common heart problems, making early diagnosis very important. An Electrocardiogram (ECG) is a widely used test that records the electrical activity of the heart and helps doctors identify abnormal heart rhythms. However, interpreting ECG signals manually can be difficult because the signals are complex and require expert knowledge. To improve diagnosis, researchers have developed automated ECG classification systems using Artificial Intelligence (AI) and Deep Learning (DL). Traditional machine learning methods require manual feature extraction, which is time-consuming and less effective. Deep learning models, especially Long Short-Term Memory (LSTM) networks, can automatically learn patterns from ECG signals. A Bidirectional LSTM (Bi-LSTM) further improves performance by analysing the signal in both forward and backward directions, allowing better understanding of heartbeat patterns. In this research, a Bi-LSTM model is proposed to classify ECG signals and detect arrhythmias using the MIT-BIH Arrhythmia Database. The dataset contains ECG recordings from 47 patients and includes both normal and abnormal heartbeats. Since some heartbeat types occur less frequently than others, data balancing techniques such as oversampling, under sampling, and bootstrapping are applied to improve model performance. The ECG data is also pre-processed through normalization, noise removal, and one-hot encoding before training. The main objective of this study is to accurately classify five types of heartbeats and improve arrhythmia detection. Compared with traditional methods, the proposed Bi-LSTM model automatically extracts important features, captures temporal relationships in ECG signals, and provides higher classification accuracy. Such automated systems can assist doctors in making faster and more reliable diagnoses and can also be integrated into wearable devices and remote healthcare systems for continuous patient monitoring. Overall, the proposed Bi-LSTM-based approach offers an efficient and reliable solution for ECG Signal classification..

2. LITERATURE REVIEW

Cardiovascular diseases (CVDs) are the leading cause of death worldwide, causing nearly 18 million deaths every year. Heart attacks and arrhythmias are among the most common cardiac disorders, making early diagnosis essential for reducing mortality and improving patient outcomes [1], [2], [3]. The Electrocardiogram (ECG) is a non-invasive and cost-effective diagnostic tool that records the electrical activity of the heart and helps identify abnormalities in cardiac rhythm through P, QRS, and T wave patterns [3], [4], [6]. However, manual interpretation of ECG signals is difficult because the signals are complex, require expert knowledge, and are prone to human error, especially during continuous monitoring and emergency situations [1], [4], [5]. Therefore, the development of automated ECG classification systems has become an important research area for improving the

Medical Image Analysis-Based Early Tonsillitis Detection Using Deep Learning Techniques

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Abstract:

Tonsillitis is a common inflammatory disorder of the tonsils that affects individuals of all age groups, particularly children and young adults. In its early stages, tonsillitis often presents symptoms similar to minor throat irritation, which leads many individuals to delay professional medical consultation. Conventional diagnostic practices rely mainly on physical examination and subjective clinical interpretation, which may vary among practitioners and result in inconsistent assessment. These challenges are further amplified in rural and resource-limited regions where access to specialized healthcare professionals is restricted. This paper presents a deep learning-based framework for early tonsillitis detection using throat images. The proposed system strictly focuses on automated image classification and categorizes throat images into two classes: healthy and tonsillitis-affected. A custom Convolutional Neural Network (CNN), along with transfer learning architectures ResNet50 and EfficientNetB0, is employed to extract discriminative visual features and enhance classification performance. The framework integrates data augmentation, class-imbalance handling, and optimized training strategies. Experimental evaluation is conducted using accuracy, precision, recall, and confusion matrices. The system is implemented as a digital screening platform that allows users to upload throat images and receive real-time predictions. The framework is intended only as a screening and decision-support tool. The results demonstrate that deep learning models can effectively support early tonsillitis screening.

Keywords: Tonsillitis Detection, Deep Learning, Medical Image Classification, Convolutional Neural Networks (CNN), Transfer Learning, Computer-Aided Diagnosis.

1.Introduction

Tonsillitis is an inflammatory condition of the tonsils caused primarily by viral or bacterial infections. The tonsils are lymphoid tissues located at the back of the throat and play a vital role in immune defence by trapping pathogens entering through the oral cavity. When infected, the tonsils become swollen and inflamed, leading to throat pain, fever, difficulty swallowing, and general discomfort. Tonsillitis is



Prediction of Breast Cancer, Comparative Review of Machine Learning Techniques, and their Analysis

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ABSTRACT

Breast cancer remains one of the most prevalent and life-threatening diseases affecting women worldwide. Early and accurate prediction plays a crucial role in improving patient outcomes and survival rates. With the advancement of computational intelligence, machine learning (ML) techniques have emerged as powerful tools for disease prediction and diagnosis. This study provides a comprehensive comparative review of various machine learning algorithms applied to breast cancer prediction, including Support Vector Machines (SVM), Decision Trees, Random Forest, K-Nearest Neighbors (KNN), Naïve Bayes, Logistic Regression, and Neural Networks. The performance of these models is evaluated based on key metrics such as accuracy, precision, recall, F1-score, and AUC-ROC values using standard datasets such as the Wisconsin Breast Cancer Dataset. Our analysis highlights the strengths and limitations of each method, with ensemble models and deep learning approaches showing higher

prediction accuracy and robustness. The review also discusses preprocessing techniques, feature selection, and the importance of balanced datasets in improving model performance.

I.

Introduction

Breast cancer is a significant global health concern and ranks as one of the leading causes of cancer-related deaths among women. According to the World Health Organization (WHO), early detection and timely diagnosis of breast cancer can substantially increase the chances of successful treatment and survival. Traditional diagnostic methods, such as mammography, biopsies, and ultrasound imaging, though effective, often involve manual interpretation and are time-consuming, expensive, and subject to human error. In recent years, the integration of data science and artificial intelligence, particularly machine learning (ML), has

AI based Content Summarization using RAG

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Abstract: - The increased use of digital documents in academic, technical, and professional fields has resulted in a demand for systems that can provide concise, document, based summaries answering user queries. Large language models alone for document, based question answering generally give answers that are only loosely based on the source content, thus, Retrieval, Augmented Generation (RAG) is used. In this paper, the author presents a content summarization tool that is entirely dependent on PDF, DOCX, and text files uploaded by end users, and that adapts its retrieval behavior based on inferred user expertise. The documents are passed through a well, organized ingestion pipeline consisting of text extraction, overlapping semantic chunking, and dense embedding with a lightweight sentence, level transformer, while the similarity search is performed by a FAISS [4, 5] index over normalized embeddings. A heuristic cognitive assessment module examines query features such as length, use of technical terms, clarification patterns, and interaction history to identify the user expertise and, thus, retrieves between two and four relevant document chunks for prompt construction. The answers are generated by a language model running locally and equipped with real, time streaming [10] support. The trials demonstrate that adaptive retrieval leads to higher

Key words: Document Summarization, Adaptive Retrieval, Cognitive State Estimation, Vector Similarity Search, Large Language Models, Interactive Question Answering.

I. INTRODUCTION

The ever, expanding collection of digital documents has turned the demand for systems that can provide clear, context aware summaries and even answers straight from the user, supplied content, to be very high. In the past document summarization tools only generated one single, static summary. Lately, many question answering systems have been built upon large pretrained models but without structured retrieval, thus resulting in answers that are only loosely backed up by the source documents or being quite inefficient if the texts are long.

Retrieval, augmented generation [1] has been proposed as a solution to these issues by combining semantic retrieval with language model generation. However, most methods based on RAG, only use a fixed retrieval depth for all users and query types, thus disregarding the variations in user expertise or query complexity.

Indeed, in the real world usage scenarios, simple questions usually need very little contextual information while complicated or technical questions require a broader coverage. Hence, applying the same retrieval policy to all can either lead to a shower of background information for naive users or it may constrain the completeness of the answers for advanced users. To get rid of this limitation, a content summarization and question answering system is put forward that dynamically adjusts its retrieval strategies, the, guided, by a user's.

II. RELATED WORKS

Document summarization methods have transformed from extractive methods based on lexical or positional heuristics to neural abstractive methods. The latter increased the fluency of the output but frequently generated ungrounded facts. RAG (Retrieval, augmented Generation) was developed to address this issue. It combines dense retrieval with conditional text generation so that the generated answers can be directly grounded in the retrieved document passages. RAG has been demonstrated to be effective in



EDU Proctorx: AI Powered Remote Assessment Monitor

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The rapid proliferation of online exams has led to a significant demand for reliable systems that uphold academic integrity, fairness, and security in remote assessment settings, and since monitoring students without physical supervision is challenging and conventional methods are often inadequate, this paper proposes the AI Powered Remote Assessment Monitor, a multimodal proctoring framework aimed at ensuring a secure and unbiased examination environment by integrating computer vision, audio processing, and behavioral modeling techniques to continuously monitor candidate activities during an examination, with identity checks based on facial recognition and liveness detection, supplemented by gaze tracking, head pose estimation, object detection, and sound classification methods to detect suspicious behaviors, thereby leveraging a multimodal analysis of signals to yield more accurate insights into candidate activities. First, unlike traditional rule-based or entirely manual methods, the framework emphasizes automated monitoring through modular AI elements and a weighted decision fusion approach that integrates data from various sources to reach balanced and contextually aware decisions instead of relying on isolated alerts; also, to ensure responsible utilization, the platform incorporates secure data handling protocols, including encrypted logging and privacy-conscious monitoring; the solution is built to accommodate both live and recorded examinations, and it can be implemented by educational institutions, certification bodies, and training organizations (ibid).

Keywords: Artificial Intelligence, Computer Vision, Machine Learning, Facial Recognition, Behaviour Analysis, Ethical AI, Online Proctoring, Secure Assessments.

Transforming Unstructured Data into Accessible Braille Content Using AI

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Abstract: The conversion of unformatted electronic data into the useable formats is crucial in making sure that visually impaired people have equal opportunities to access. The paper is a proposal of an AI-based tool that will transform unstructured data into standardized Braille material in an efficient and accurate way. The proposed solution combines Optical Character Recognition, Natural Language Processing and Machine Learning and extracts, cleanses and analyzes text on scanned documents, images, PDF files, and web pages. Deep learning models also increase the quality of Braille translation because, in addition to the character recognition, it also increases the contextual understanding. The system will do automated text extraction, noise reduction, language detection and semantic processing and encode the material in Braille that can be displayed digitally and embossed or cut into digital displays and embossing machines. The experimental results prove that the solution can serve real-time processing and decrease the amount of effort required to conduct manual transcription considerably. The suggested system helps enhance the availability of information and introduce inclusive online communication.

Keywords: Braille Accessibility • Artificial Intelligence • Unstructured Data • NLP • Assistive Technology • OCR1

I. INTRODUCTION

The current digital age is producing and storing enormous volumes of information that are stored in unstructured forms, as scanned documents, images, web pages, emails and PDF files. Although this information is readily available to the average user, it is inaccessible to those who have visual impairment and as such, poses a huge obstacle to the even availability of information. Traditional Braille transcription is notable as being mostly manual and time consuming, cost and expertise intensive, and it is hard to scale to high content volumes [1][2].

Using the Artificial Intelligence to convert raw data into easy to read Braille files is a good solution to this problem. The system combines the use of technologies like Optical Character Recognition (OCR), Natural Language Processing (NLP) and Machine Learning to automatically extract, comprehend, and transpose raw digital content to common Braille models. These smart techniques facilitate proper identification of characters, words and contextual meaning of a noisy or complicated data source [3][4].

The suggested solution ensures that the amount of human work is significantly decreased, the processing speed will be enhanced, and the quality of the output will be constant. It also facilitates real time access via digital Braille displays and embossing equipment, and makes learning, professional and online resources

An AI-Based Medical Chatbot Model for Infectious Disease Prediction

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Abstract—An AI-Based Medical Chatbot Model for Infectious Disease Prediction is proposed to support early identification of diseases and improve access to basic healthcare services. The system leverages artificial intelligence, machine learning, and natural language processing to interact with users, collect symptom information, and analyze health data in real time. By providing preliminary risk assessment and health guidance, the chatbot assists users in understanding possible infectious conditions without immediate dependence on healthcare professionals. The chatbot integrates a trained predictive model capable of identifying patterns associated with common infectious diseases based on user-reported symptoms. Through a conversational interface, the system delivers accurate, timely, and personalized responses while maintaining ease of use. This approach helps reduce the burden on healthcare systems, minimizes delays in diagnosis, and supports informed decision-making for patients. The proposed model aligns with Sustainable Development Goal 3 (Good Health and Well Being) by promoting early detection, preventive care, and healthcare accessibility, particularly in remote and underserved areas. Overall, the AI-based medical chatbot demonstrates potential as a scalable and cost-effective solution for enhancing public health monitoring and improving overall healthcare outcomes.

Index Terms—Artificial Intelligence (AI), Disease Prediction, Electronic Health Records (EHR), Healthcare Informatics, Infectious Disease Prediction, Long Short-Term Memory (LSTM), Machine Learning (ML), Medical Chatbot, Natural Language Processing (NLP), Symptom Analysis].

I. INTRODUCTION

The scope of this project includes the design and development of an AI-based medical chat bot capable of predicting infectious diseases based on user-reported symptoms. The system focuses on providing

preliminary health assessment, basic medical guidance, and recommendations for further consultation. It is intended to act as a supportive tool rather than a replacement for professional medical diagnosis, ensuring ethical and responsible use of artificial intelligence in healthcare [1].

The project covers the implementation of machine learning models, particularly for symptom-based disease prediction, along with natural language processing techniques to enable effective user interaction. The chatbot is designed to handle multiple user queries simultaneously and provide real-time responses. Integration with a backend database allows secure storage of medical datasets, user interactions, and prediction results for analysis and future model improvement [2].

The scope also includes the development of a user-friendly web or mobile interface that ensures accessibility for users with varying levels of technical expertise. The system supports features such as symptom checking, health tips, and emergency guidance, making it useful for daily health monitoring. Emphasis is placed on usability, response speed, and clarity of information delivered to the user [3].

Finally, the project scope extends to system evaluation and performance analysis using standard metrics to measure prediction accuracy and response efficiency. Security and data privacy considerations are addressed to protect user information. The system is scalable and can be enhanced in the future to include additional diseases, advanced AI models, and integration with external health data sources, aligning with broader public health objectives [4].

Smart Hire System Using Machine Learning

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Abstract:

Hire using Machine Learning is an intelligent recruitment system designed to automate and optimize the hiring process by analyzing candidate data efficiently and accurately. The system leverages machine learning algorithms to screen resumes, evaluate candidate skills, experience, and qualifications, and match them with job requirements. By processing large volumes of applicant data, Smart Hire reduces manual effort, minimizes human bias, and improves decision-making speed. In the rapidly evolving job market, identifying suitable career opportunities based on individual skills remains a significant challenge for students, graduates, and job seekers. This paper presents Smart Hire, a machine learning-based skill recommender system that analyzes resumes and recommends appropriate job roles along with required skill improvements. The system extracts textual content from resumes using PyMuPDF, performs pre-processing, and applies TF-IDF vectorization for skill extraction. Cosine similarity is used to compare extracted skills with predefined job-role profiles and identify the most suitable career path. Additionally, the system performs skill gap analysis and provides recommendations for skill enhancement. Developed using Python and Streamlit, Smart Hire offers an intelligent, user-friendly, and scalable solution for career planning and employability enhancement.

Keywords: Machine Learning, Resume Analysis, Skill Recommendation, TF-IDF, Cosine Similarity, NLP, Career Guidance.

1. Introduction

The increasing demand for skilled professionals has made career planning more challenging than ever. Many job seekers struggle to understand the skills required for their desired positions, while recruiters face difficulties in efficiently evaluating large volumes of resumes. Traditional resume screening methods rely heavily on manual review or keyword matching, resulting in inefficiencies and inaccurate recommendations. Smart Hire is designed to address these challenges by providing an automated skill recommendation system that analyzes resumes and recommends suitable job roles. The system leverages machine learning and natural language processing techniques to identify skills, compare them with industry requirements, and provide personalized career guidance. One of the most critical duties of any company is to hire the best employees because the quality of an employee has a direct impact on the company's performance and competitiveness. Traditional recruitment methods have mainly depended on manual resume screening and human judgment, which have led to delays, inconsistency, and even bias unintentionally. Since the volume of job applications keeps increasing, particularly on online hiring platforms, there is a pressing demand for more intelligent and efficient recruitment solutions. Machine learning technology is transforming the

FISH SPECIES DETECTION AND CLASSIFICATION USING DEEP LEARNING

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ABSTRACT

"Fish Species Detection and Classification using Deep Learning with YOLO Algorithm": YOLO, or You Only Look Once, is a deep learning-based algorithm used to detect fish in real-time by identifying them with bounding boxes in a fraction of a second. YOLO is a full-image vision system providing accurate fish detection from images taken on or above the surface. YOLO can detect objects in full-image vision conditions. This project can be useful in real-time applications such as marine studies because it minimizes processing time in identifying fish by real-time vision methods and can improve aquatic life surveys with accurate fish species recognition.

Keywords: Fish Species · Machine Learning · Deep Learning.

1. INTRODUCTION

Fish species identification is an important activity in such areas as fisheries management, aquaculture, and marine biodiversity conservation. Understanding what type of fish species are in a water body helps researchers and authorities monitor ecosystem health, track illegal fishing, and enforce sustainable harvesting practices. However, manual identification of fish from underwater images or videos is a time-consuming process and usually requires professional expertise in case there is a large dataset to cover [1].

In natural conditions, fish detection is even more challenging because not all underwater environments are perfect. Changes in lighting, turbidity of water, motion blur, background clutter, and occlusion of fish can make the fish difficult to observe clearly. Also, many species of fish look similar in shape and color, which increases the chances of human error in identification. These challenges highlight the need for a wiser and automated approach which can work reliably under variable situations. [2].

Deep learning methods have proved efficient enough to overcome the challenges encountered while dealing with computer vision tasks like the detection and classification of objects. YOLO (You Only Look Once), which is a fast and efficient method, is utilized to locate the position of the fish by drawing boxes on them. Once the fish is located, it becomes easy enough to focus only on the location of the fish, as opposed to the whole image [3].

As such, with its speed, accuracy, and most important, less manual work, this particular project provides an important solution concerning the monitoring of fish and aquatic ecosystem management [4].

2. METHODOLOGY

Recently, there has been a large interest from researchers in exploring the use of computer vision technology to automatically classify fish species. Previous works were mainly based on certain predefined features such as shapes, textures, edges, or defined colors and then employed certain learning algorithms like SVM or KNN. Though they were feasible within certain constraints, in real-world underwater environments, they were not very efficient because images of fish can come from different angles or of different sizes under varying lights [5].

With the advent of deep learning techniques, especially Convolutional Neural Networks (CNNs), fish classification systems can be more accurate and adaptable. Indeed, many studies attempted to train deep learning-based images classification models like VGG, ResNet, MobileNet, etc., to classify the images containing different species of fish. However, in most studies based on images classification along with CNNs, it was considered that the fish is in clear view or visible in the images [6].

Thus, to enhance the performance of models on natural underwater scenes, there was a need to merge the detection and classification processes. Instead of the model processing the whole image, object detection was first performed on the image, and then classification was carried out on the detected area of the image. Detection-based models proved quite efficient, especially on videos, as more than one fish would appear on the screen, and the model would focus on the area of the detected fish. [7].

Overall, existing research allows us to confirm that using deep learning in fish detection is quite practical and efficient, especially if YOLO is used in the detection and classification of fish. However, there is still ongoing research aimed at increasing efficiency and accuracy, especially in environments that might experience blur, reflections, and heavy