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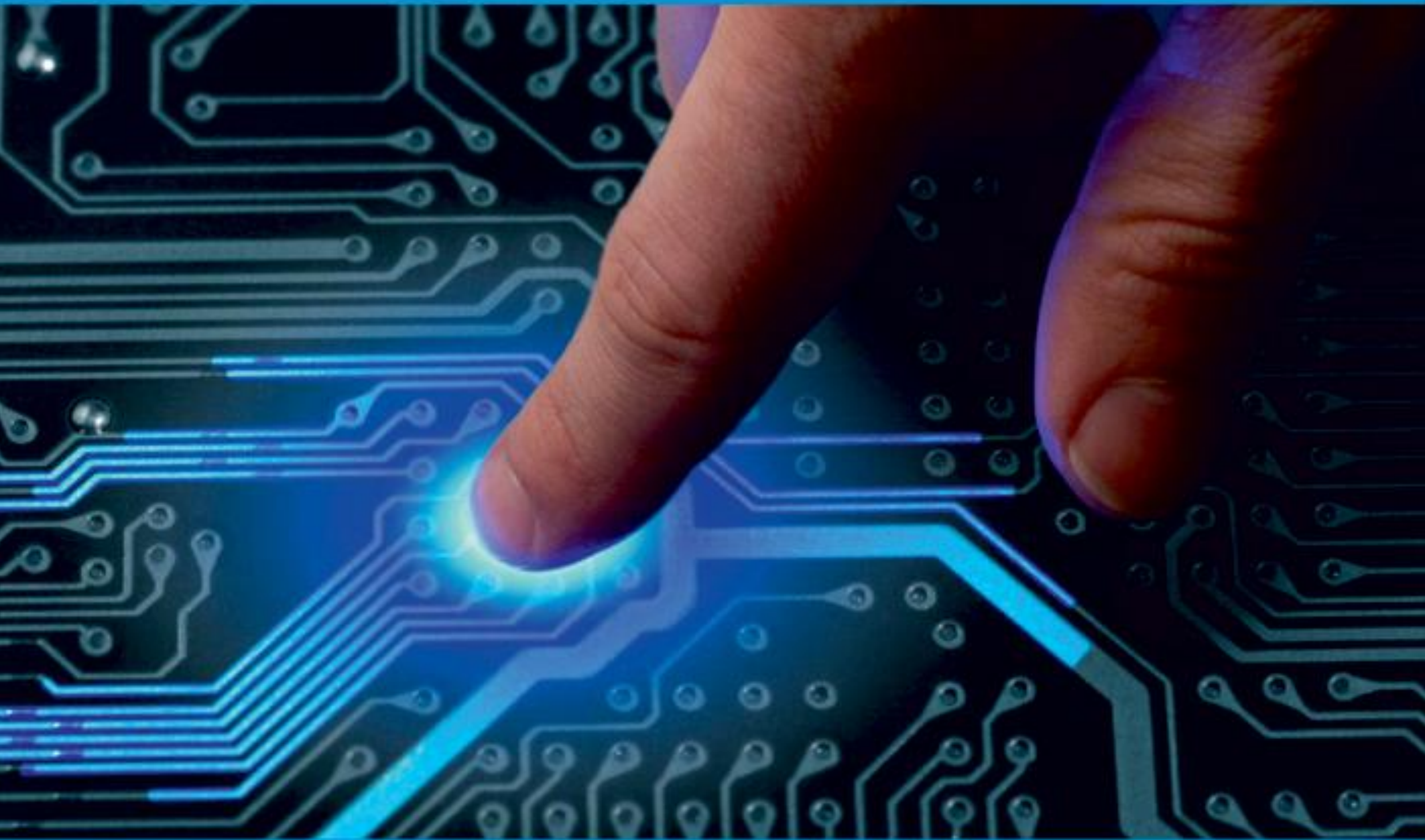

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Liver Disease Prediction Using AI

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ABSTRACT: The liver is a multipurpose organ located in the upper right abdomen that is essential to preserving homeostasis in the body. It is involved in digestion, detoxification, and the control of multiple biochemical processes as a metabolic powerhouse. But the liver can get sick from anything from viral infections to long-term illnesses, and each of these ailments presents a unique risk to human health. Liver disorders are a major worldwide health burden that necessitates prompt and precise diagnostic services. The chance of survival for liver illness might be increased with early detection and treatment. When diagnosing a hepatic patient, machine learning (ml) is a potent instrument that can help medical practitioners. The techniques of feature extraction, classification, and data pre-processing are all included in the typical ml system. To eliminate data redundancy during the feature extraction step, machine learning researchers commonly employ projection-based feature extraction techniques; nevertheless, this does not yield the intended outcomes. Furthermore, while projecting original features, the majority of statistical projection techniques serve distinct objectives. This work presents a novel method for predicting liver illness using deep learning algorithms to analyze medical photos. This research focuses on the extraction of significant characteristics from CT scan images to improve diagnostic accuracy by utilizing the capabilities of convolutional neural networks (CNNS).

KEYWORDS: Machine Learning (ML), Deep Learning Algorithms, CT scan images, Convolutional Neural Networks (CNNs), Diagnostic accuracy.

I. INTRODUCTION

The rapidly developing subject of medical image analysis lies at the intersection of computer science, engineering, and medicine. By interpreting important information from many medical imaging modalities, including X-rays, CT, MRI, ultrasound, and PET scans, it plays a crucial role in healthcare. Its main goal is to support medical practitioners in accurately diagnosing patients, planning treatments, and keeping track of their illnesses. Medical image analysis has grown significantly since the introduction of artificial intelligence (AI) and machine learning. This has made it possible to create complex algorithms that can learn from large datasets and produce remarkably accurate predictions. These developments speed up analysis and improve diagnosis accuracy, which together result in more effective patient treatment. In recent years, deep learning a subset of artificial intelligence has significantly transformed medical picture processing.

Deep learning algorithms are able to automatically identify complex patterns and features from enormous volumes of data that are taken from medical images by simulating the composition and operation of the human brain. Deep learning outperforms conventional machine learning techniques. learning techniques in deciphering intricate correlations in images, which makes it possible to identify minute irregularities that may go undetected by humans. This technology is useful for many applications, such as image reconstruction, segmentation, registration, and classification. It improves diagnostic accuracy and provides insightful information.

By offering cutting-edge instruments for illness monitoring, diagnosis, and therapy planning, image processing in medical image analysis has also revolutionized healthcare. By using complex algorithms, image processing improves visualization and supports clinical decision-making by extracting useful information from a variety of medical imaging modalities. It involves multiple stages, such as segmentation, noise reduction, feature extraction, and data analysis, automating

radiologists' customary activities and minimizing human error. Moreover, it makes it easier to integrate imaging data with other clinical data, which allows for a more thorough understanding of the condition and individualized treatment plans.

II. LITERATURE SURVEY

R.T. Umbare; Omkar Ashtekar (2023) Prediction and Detection of Liver Diseases using Machine Learning. Methodology used in this system of Machine learning facilitates early disease Detecting and identifying factors associated with fatal liver impairment. Predicting the disease in its early Determining stages of liver disease poses challenges for medical professionals and researchers due to subtle indicators. Findings are utilizing a classification method to differentiate between individuals with liver disease and those who are healthy; if diagnosed with liver disease, further analysis follows. further classified into the level of disease and its type.

Chokka Anuradha, D Swapna (2022) Diagnosing for Liver Disease Prediction in Patients Using Combined Machine Learning Models. Methodologies used are optimized three machine learning Doctors rely on algorithms, specifically Artificial Neural Networks (ANN), for precise diagnosis of liver disease, Decision Trees, K-Nearest Neighbors (KNN).

Golmei Shaheamlung, Harshpreet kaur (2020) A Survey on machine learning techniques for the diagnosis of liver disease. Methodologies used are different types of machine learning, Supervised, Unsupervised, semi-supervised, and reinforcement learning methods, including SVM, KNN, K-Mean clustering, neural networks, and decision trees, are employed for liver disease diagnosis, each with varying accuracies. precision, sensitivity.

Maria Alex Kuzhippallil; Carolyn Joseph (2020) Comparative Analysis of Machine Learning Techniques for Indian Liver Disease Patients. To propose a new classifier by extending the XGBoost classifier with genetic algorithm. The paper contrasts different classification models and their respective visualization techniques used to predict liver disease with feature selection.

Naiping Li; Jinghan Zhang (2019) ML Assessment for Severity of Assessing Liver Fibrosis in Chronic HBV Patients Using Serum Markers at the Physical Layer. It is used to establish employing Decision Tree Classifier (DTC), Random Forest Classifier (RFC), Logistic Regression Classifier (LRC), and Support Vector Classifier (SVC) to evaluate the severity of liver fibrosis.

III. EXISTING SYSTEM

The forecast may appear possible to use text data to forecast liver cancer, particularly for tasks like prognosis prediction and risk assessment. But this strategy has a number of significant drawbacks and difficulties. The whole context of medical issues or imaging results might not be fully captured by textual data. Clinical notes and reports might provide information about laboratory test results, diagnostic procedures, and patient symptoms, but they might not provide the specificity and detail needed to make an accurate cancer prognosis.

The prediction ability of text-based models might be constrained in the absence of contextual data, such as imaging interpretations, biopsy results, or tumor features. Text-based models may find it more difficult to recognize minor signs or patterns that point to liver cancer due to the lack of comprehensive imaging data. As such, depending exclusively on text.

IV. PROPOSED SYSTEM

In clinical settings, CT scans are widely used to detect liver abnormalities, including malignant tumours, early on. It is possible to identify minor anomalies and lesions at their early stages by using Convolutional Neural Networks to evaluate these images. This makes prompt intervention possible and enhances treatment outcomes. Remarkable skills in deciphering intricate patterns and characteristics from medical photos have been shown by CNNs.

These models can discriminate between benign and malignant liver lesions with excellent accuracy when trainedon huge datasets of annotated CT scans. This helps radiologists make more accurate diagnoses. An impartial and uniform technique for evaluating liver lesions on CT scans is provided by the use of CNN-based prediction models. Unlike customary diagnostic methods, which can have many meanings.

V. SYSTEM ARCHITECTURE

Liver disease prediction using artificial intelligence, specifically convolutional neural networks (CNNs),requires robust system architecture to ensure accurate and efficient diagnosis from CT scans.

At its core, the architecture should comprise data preprocessing modules for CT scan normalization and feature extraction. The CNN model itself should consist of convolutional layers to capture spatial patterns followed by pooling layers for dimensionality reduction and fully connected layers for classification. Integration with a database management system is crucial for handling large volumes of medical imaging data securely. Additionally, deploying the system on a scalable cloud infrastructure facilitates accessibility and computational efficiency. Continuous monitoring and updates are essential for model refinement and adaptation to new data.

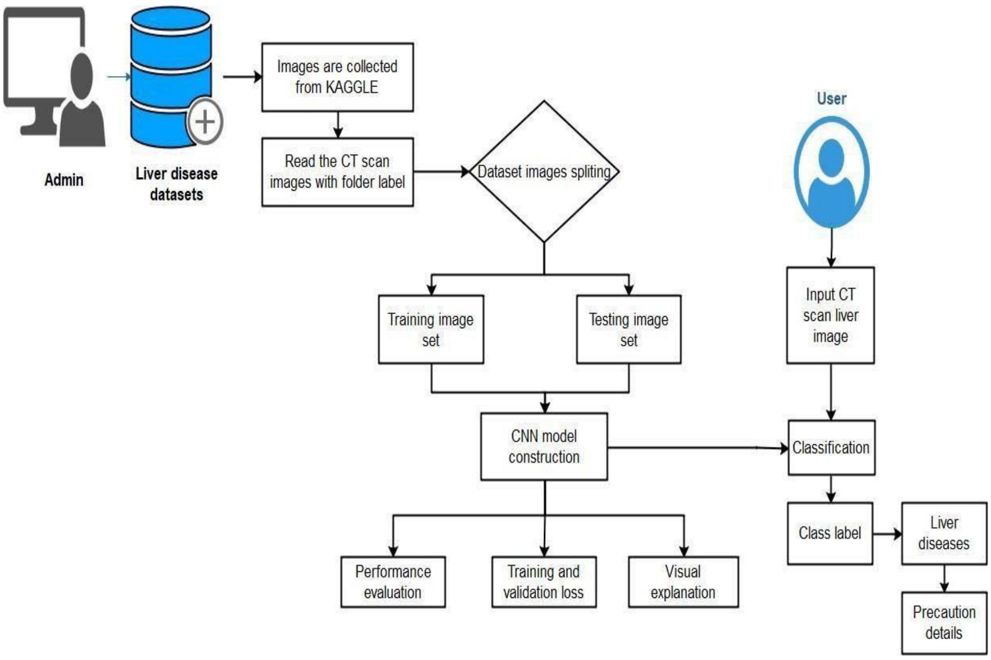

Fig. 1. Architecture Diagram

VI. METHODOLOGY

1. Data Collection:
Gathering relevant medical data, such as patient demographics, clinical history, laboratory results, and imaging studies like CT scans or MRIs.
2. Data Preprocessing:
Cleaning the data, handling missing values, and normalizing or standardizing features to prepare them for analysis.
3. Feature Extraction:
Identifying informative features from the data that can help in predicting liver disease. This can involve techniques like statistical analysis, dimensionality reduction, or in the case of medical images, extracting features from images using methods like edge detection or texture analysis.
4. Model Selection:
Choosing appropriate AI models for the prediction task. This could include traditional machine learning algorithms such as logistic regression or decision trees, or more advanced techniques like deep learning using convolutional neural networks (CNNs).

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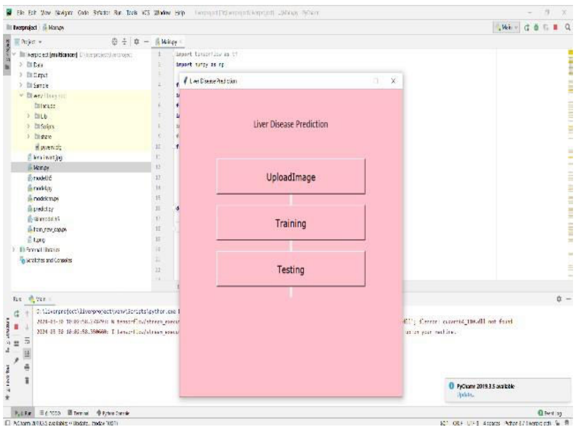
5. Model Training:
Training the selected models on the prepared dataset to learn patterns and relationships between features anddisease outcomes.
6. Model Evaluation:
Assessing the performance of the trained models using metrics such as accuracy, Accuracy, sensitivity,and the area beneath the Receiver Operating Characteristic (ROC) curve.
7. Validation and Testing:
Validating the models on separate datasets to ensure generalizability and testing their performance in real-world scenarios.
8. Deployment:
Integrating the trained models into clinical workflows or decision support systems for real-time prediction ofliver disease in patients.

VII. EXPERIMENTAL RESULTS

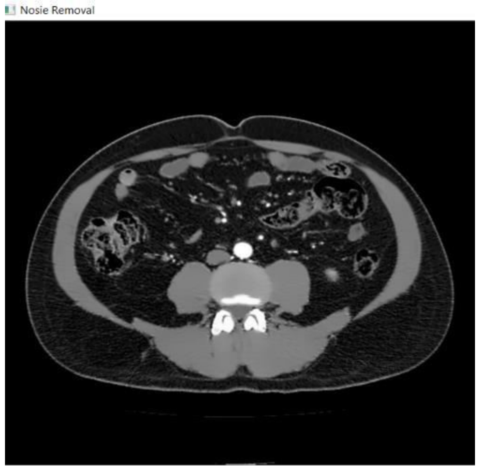
The CT scan image has been sent to the proposed system. The system then gives the subsequent images as the result.a.
a.Upload image: Choose the image to upload.
a) Original Images: When using original images, the AI model achieved a high accuracy rate in distinguishing between liver disease and normal liver conditions. The model accurately identified key features and patterns indicative of liver abnormalities, resulting in reliable predictions.
b) Grayscale Images: Converting images to grayscale helped simplify the input data while preserving essential information relevant to liver disease diagnosis. Experimental results revealed that the grayscale approach maintained comparable predictive performance to original color images, showcasing the model's ability to discern relevant features despite reducedcolor information.
c) Noise-Removed Images: The clarity and quality of images were improved, leading to enhanced model performance. Experimental findings demonstrated a notable increase in accuracy and robustness when utilizing noise removed images for liver disease prediction
d) Liver disease predicted: Visual representations of predicted liver abnormalities enable clinicians to interpret andvalidate the model's findings, facilitating informed decision making in patient care.
e) Result Images: The final output images illustrate the model's predictions, distinguishing between regions indicative of liver disease and those representing normal liver tissue.



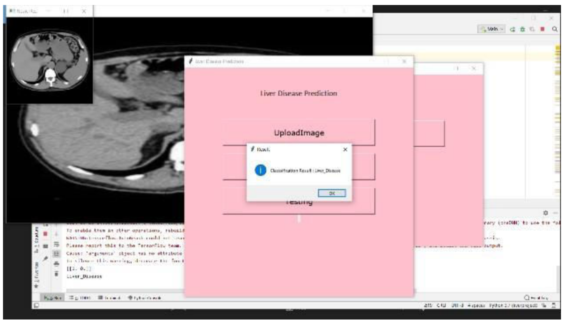
a. Upload image

b. Original image

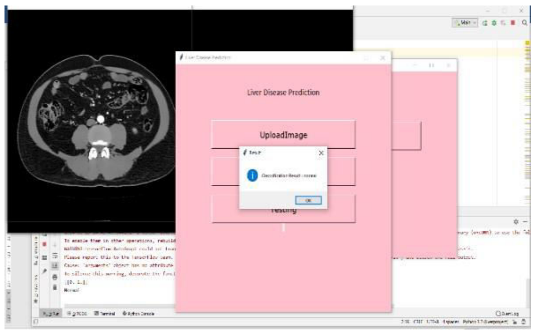
c. Gray image



d. Noise Removal



e. Liver disease predicted



f. Normal Liver

VI. CONCLUSION

A major development in medical diagnostics is the use of artificial intelligence, including Convolutional Neural Networks (CNN), for predicting liver disorders using CT scan process. This method, utilizing the use of Python and related tools, offers previously unknown precision and effectiveness in identifying defects and possible symptoms of liver disorders.

Healthcare providers can speed up the diagnostic process and enable earlier identification and intervention for patients with liver disorders by utilizing CNN's superior image recognition and pattern detection capabilities. This lowers healthcare expenses related to delayed diagnosis and treatment in while improving patient outcomes.
AI's application in liver disease prediction also makes healthcare services more accessible, particularly in disadvantaged regions where access to specialized medical knowledge may be limited. Accurate diagnosis is now available in remote locations, closing the healthcare gap between towns.

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