Kidney Disease Prediction Using Deep Learning

Sharvaree Bamane - 2015011
Jyotsna Chitte - 2015015
Sonal Ghughe - 2015021
Guide - Prof. Poonam Dhurpawar

Usha Mittal Institute of Technology S.N.D.T. Women's University

29th May 2024

Abstract

- This study introduces a new way using TensorFlow and Keras to detect and classify kidney diseases from medical images.
- It employs CNNs for feature extraction, with pre-processing to enhance image quality.
- Transfer learning enhances performance with limited data. Evaluation metrics include accuracy, sensitivity.
- Results indicate high accuracy in classifying abnormalities. Integration into clinical practice could improve diagnosis and treatment planning in nephrology.

Introduction

- Kidney disease remains a significant health challenge worldwide, affecting millions of people and leading to substantial morbidity and mortality.
- In this project we use TensorFlow and Keras for detecting and classifying kidney abnormalities. Traditional methods like ultrasound and MRI can be subjective and time-consuming. Deep learning, especially with TensorFlow and Keras, offers a solution by automating image analysis.
- The process involves collecting a diverse dataset, preprocessing it, designing a CNN architecture, training the model, and evaluating its performance using metrics like accuracy.
- This approach has the potential to enhance diagnostic accuracy and improve patient outcomes in managing kidney diseases

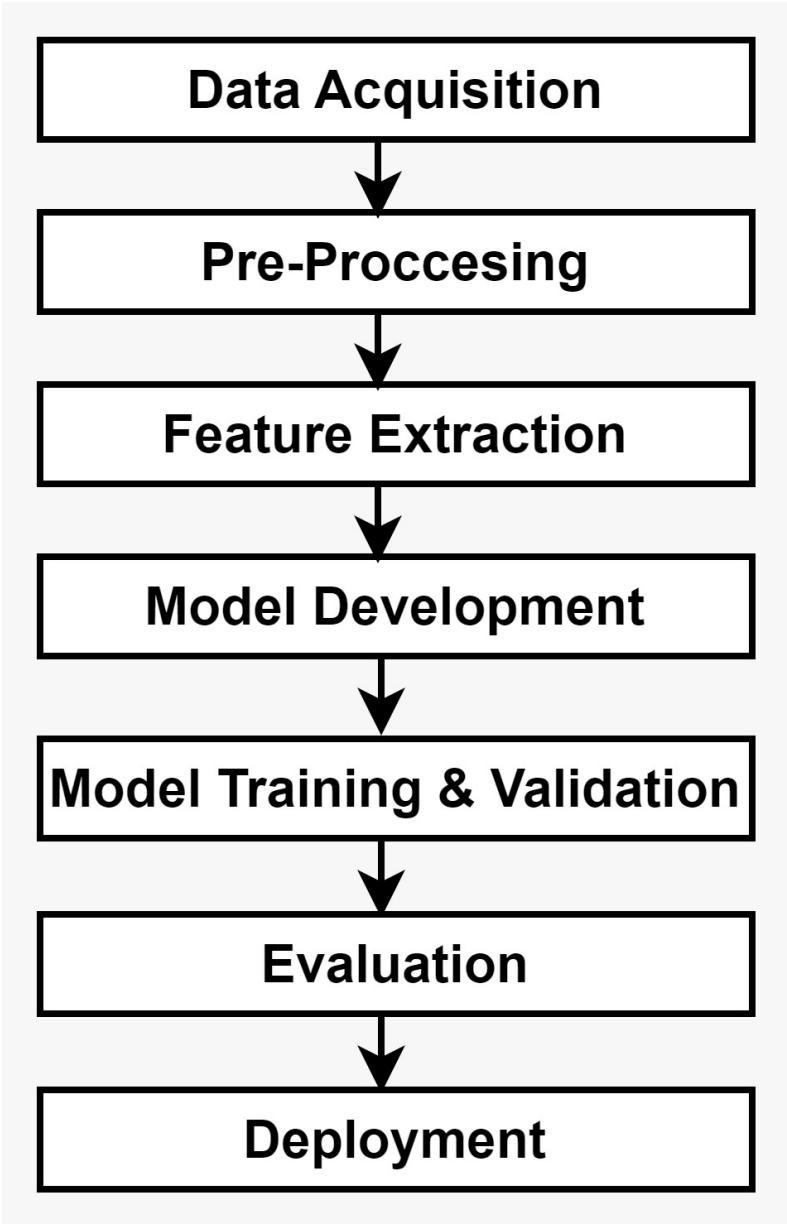
Problem Statement

- This project utilizes TensorFlow and Keras to create a convolutional neural network (CNN) capable of classifying kidney images into normal, cyst, tumor, stone and No Kidney categories. By analyzing image features, the algorithm automates the detection of kidney abnormalities, enabling faster diagnosis and intervention, potentially improving patient outcomes.

Literature Survey

- Diagnosis of Chronic Kidney Disease Using Effective Classification Algorithms and Recursive Feature Elimination Techniques. Ebrahime Mohammed Senan,corresponding author 1 Mosleh Hmoud Al-Adhaileh, 2 Fawaz Waselallah Alsaade, 3 Theyazn H. H. Aldhyani, 4 Ahmed Abdullah Alqarni, 5 Nizar Alsharif publish in year 2021
- Survey on Automatic Kidney Lesion Detection using Deep Learning Mrs. Jyothi M Patil1, Shreyas M2, Shwetha KL3, Tejana Patel H B4, Thejaswini L5. publish in year 2023

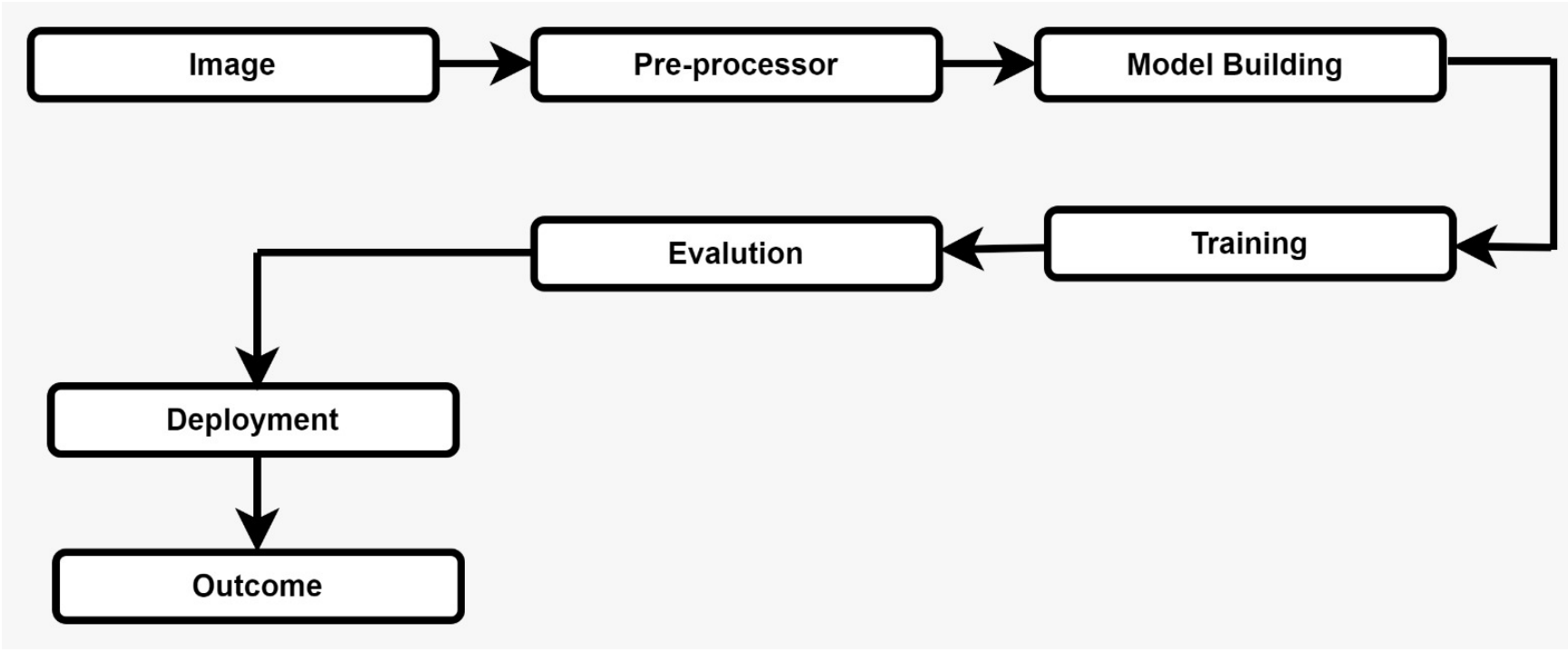
Proposed System



Requirements

1. Language: Python,HTML,CSS.
2. Tools: Jupyter
3. Framework: Flask
4. Documentaion Tool : Overleaf

Implementation



ALGORITHM USED

1. ResNet (Residual Network):

ResNet is a deep convolutional neural network architecture designed to address the problem of vanishing gradients in very deep neural networks. It introduces skip connections, also known as residual connections, which allow the gradient to flow directly through the network, mitigating the vanishing gradient problem.

2. LSTM:

LSTM is a type of recurrent neural network (RNN) architecture designed to overcome the limitations of traditional RNNs in capturing long-term dependencies in sequential data.

3. CNN:

CNNs (Convolutional Neural Networks) are specialized deep learning models designed for processing structured grid-like data, such as images. They consist of convolutional layers that automatically learn hierarchical patterns and features from the input data, along with pooling layers to downsample feature maps. CNNs are widely used in computer vision tasks, achieving state-of-the-art performance in image classification, object detection, and other visual recognition tasks.

Result

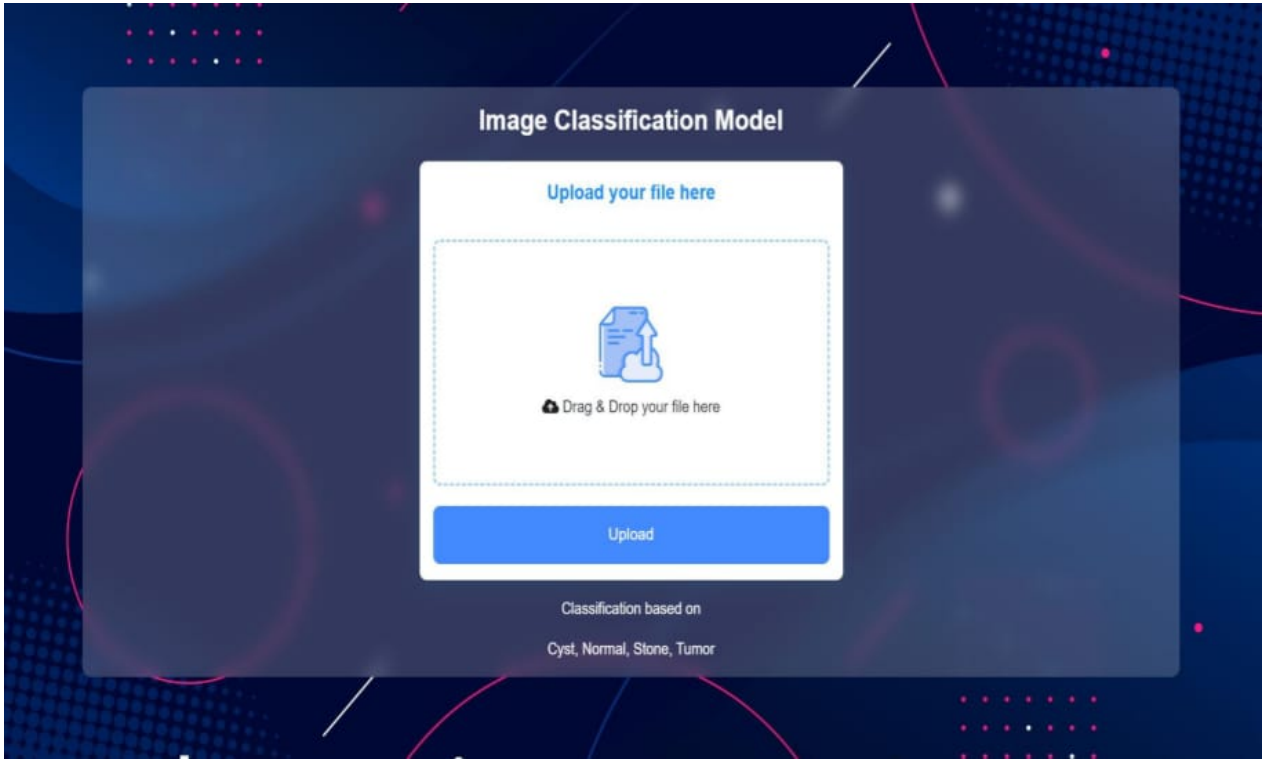
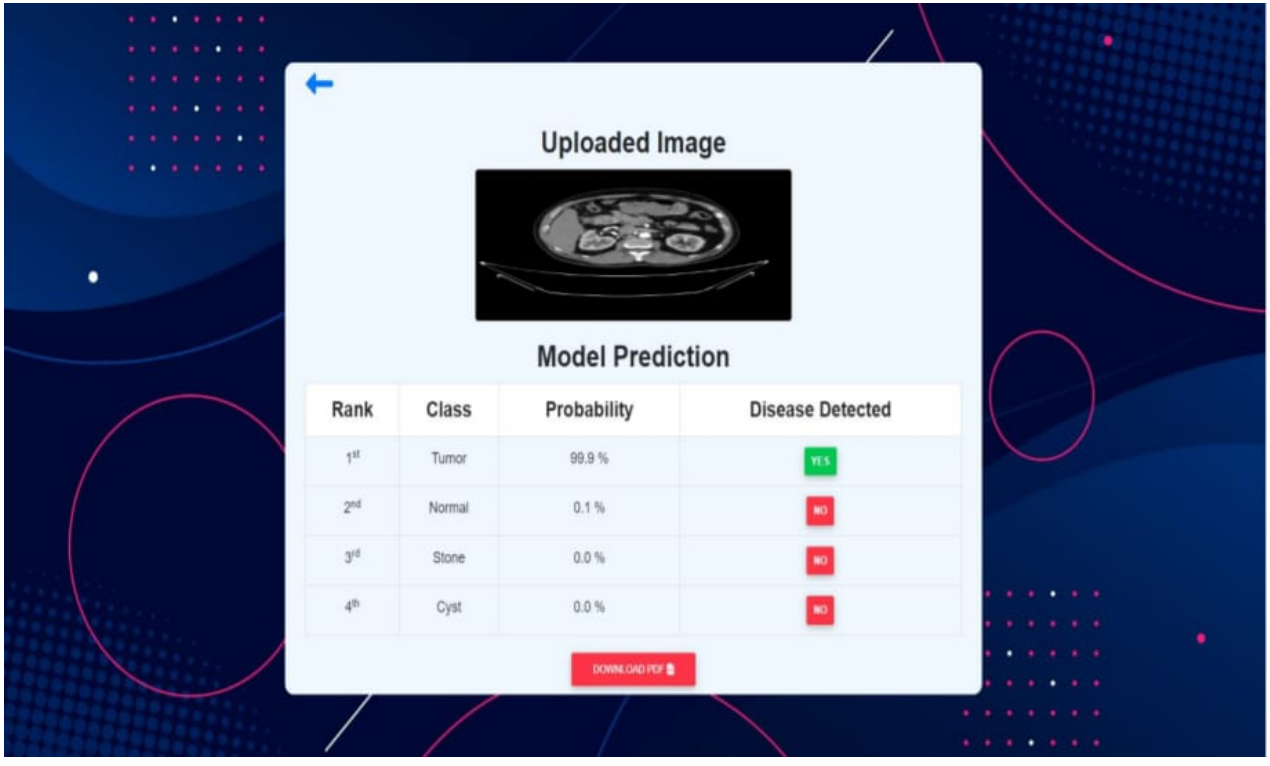


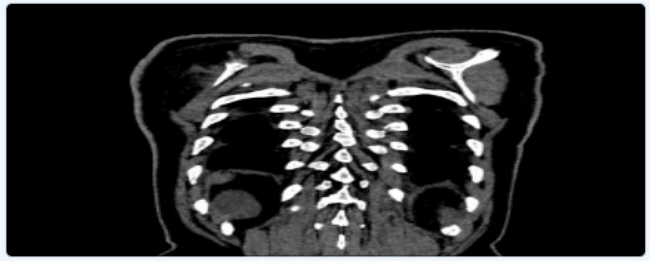
Image Classification Model
Upload your file here
Drag & Drop your file here
Upload
Classification based on
Cyst, Normal, Stone, Tumor

Result


Uploaded Image
Model Prediction
Rank
Class
Probability
Disease Detected
1st
Tumor
99.9 %
YES
2nd
Normal
0.1 %
NO
3rd
Stone
0.0 %
NO
4th
Cyst
0.0 %
NO
DOWNLOAD PDF

Result

Uploaded Image



Model Prediction

Rank	Class	Probability	Disease Detected
1st	Cyst	99.9 %	yes
2nd	Stone	0.1 %	NO
3rd	Tumor	0.0 %	NO
4th	Normal	0.0 %	NO
5th	NO kidney	0.0 %	NO

Conclusion

In Conclusion, the implementation of kidney disease prediction using deep learning techniques such as image processing with TensorFlow and Keras has shown in results. The model's accuracy in classifying kidney images into different categories like normal, cyst, tumor, and stone is crucial for its effectiveness. It is important to ensure the model's robustness by testing it with various datasets. Optimizing the model's architecture and leveraging hardware acceleration can improve its speed and efficiency for real-time applications. Further research, validation, and refinement are needed to successfully implement this approach in real-world clinical settings.

Future Scope

Future research could create a website using these algorithms and a bigger dataset to predict kidney problems better. This could help catch kidney issues early and improve patient care. It's essential to detect kidney problems early because they can get worse over time, sometimes needing dialysis or other treatments. Ultrasound, which looks at things like kidney size and echo patterns, is crucial for diagnosing kidney conditions like cancer and inflammation.

Reference

1. Koushal Kumar, Abhishek, “Artificial Neural Networks for Diagnosis of Kidney Stones Disease”, International Journal Information Technology and Computer Science, 2012, 7, 20-25.
2. Sandhya A et al , “Kidney Stone Disease Etiology and Evaluation Institute of Genetics and Hospital for Genetic Diseases”, India International Journal of Applied Biology and Pharmaceutical Technology, may june 2010.

THANK YOU !!