INTELLIGENT ANALYTICS-7860

PROJECT PROPOSAL

PROJECT TITLE

“Kidney Stone Detection using Image Processing and Deep Neural Networks”

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Introduction

Kidney stones are a common health concern that impact the lives of millions around the globe. It's essential to detect and treat kidney stones early to avoid more serious problems and ensure the well-being of those affected. In this project, we're working on creating an automated tool that uses image processing and deep learning, particularly convolutional neural networks (CNNs), to spot kidney stones. By leveraging the capabilities of deep learning, the proposed system seeks to provide accurate and efficient classification of CT scan images, aiding in the early diagnosis and management of kidney stones.

Objectives

- To acquire and preprocess a comprehensive dataset of CT scan images for kidney stone detection.
- To implement advanced image processing techniques to enhance image quality and facilitate accurate detection.
- To develop a robust CNN model capable of classifying images with high precision.
- To evaluate the performance of the model using various metrics and validate its effectiveness in a clinical setting.

Methodology

Data Collection

The dataset is taken from GitHub, ensuring a diverse collection of CT scan images. The images are categorized into two classes: "Kidney_Stone" and "Normal," providing a clear basis for model training and evaluation.

Link to dataset:

https://github.com/yildirimozal/Kidney_stone_detection/tree/main/Dataset

Model Development

A CNN model will be developed with the following components:

- 2-D CNN layers with ReLU activation functions.

- Pooling layers for feature map size reduction.
- Dense layers with ReLU and Sigmoid activation functions for classification.
- Hyperparameters such as kernel size and model architecture will be tuned using random search.

Model Evaluation

The model's performance will be assessed using accuracy and other relevant metrics on the test set. The impact of different image processing techniques and model architectures will be analyzed to ensure the highest level of detection accuracy.

Expected Outcomes

The successful completion of this project is expected to yield a deep learning-based system capable of accurately detecting kidney stones in CT scan images. The system is anticipated to achieve high accuracy, providing a valuable tool for radiologists and healthcare professionals in the diagnosis and treatment of kidney stones. Furthermore, the insights gained from this project could contribute to the broader field of medical image analysis and the development of similar diagnostic tools.