Kidney Stones Detection System Through AI-Enhanced Image Processing

Research work Proposal

Research Work

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Abstract

The main objective of this project is to detect the kidney stone from the digital ultrasound image of the kidney by performing various image processing techniques. By utilizing advanced machine learning algorithms and image processing techniques.

Overview/Introduction

Kidney stones can be painful and dangerous if not detected early. This project aims to make the detection process faster and more accurate by using the power of artificial intelligence. In this project focus to using advanced image processing techniques and machine learning algorithms to analyze ultrasound images of the kidneys and identify any potential stones. It's a smart way of using computer technology to spot kidney stones in pictures of the kidneys, helping doctors identify and treat them faster and more accurately.

Problem statement or Project goal

The primary goal of this project is to develop an automated system that can accurately detect the presence of kidney stones in ultrasound medical images.

Related Work

[1] In this investigation, a deep analysis of stone detection in kidneys with image processing techniques using CT images was examined. It also identifies the number of patients facing problems with the stone. The investigation shows this research has 92.5% accuracy with an effective stone detection technique.

[2] This investigation focus on Ultrasonography, it is a versatile, cost-effective, and safe imaging technique widely used in healthcare. It's now enhanced by AI, particularly deep learning, allowing computers to independently recognize data through neural networks. Deep learning holds potential for improving ultrasound workflows, image quality, and vision tasks, but creating dependable and safe AI models for medical use presents challenges.

[3] This study proposes an approach of feature extraction of kidney ultrasound images based on five intensity histogram features and nineteen gray level co-occurrence matrix (GLCM) features. Preprocessing techniques including region of interest cropping, contour detection, image rotation and background removal, have been applied. This shows that these features can be used to classify kidney ultrasound images into different groups for creating database of kidney ultrasound images with different pathologies.

Methodology/Approach

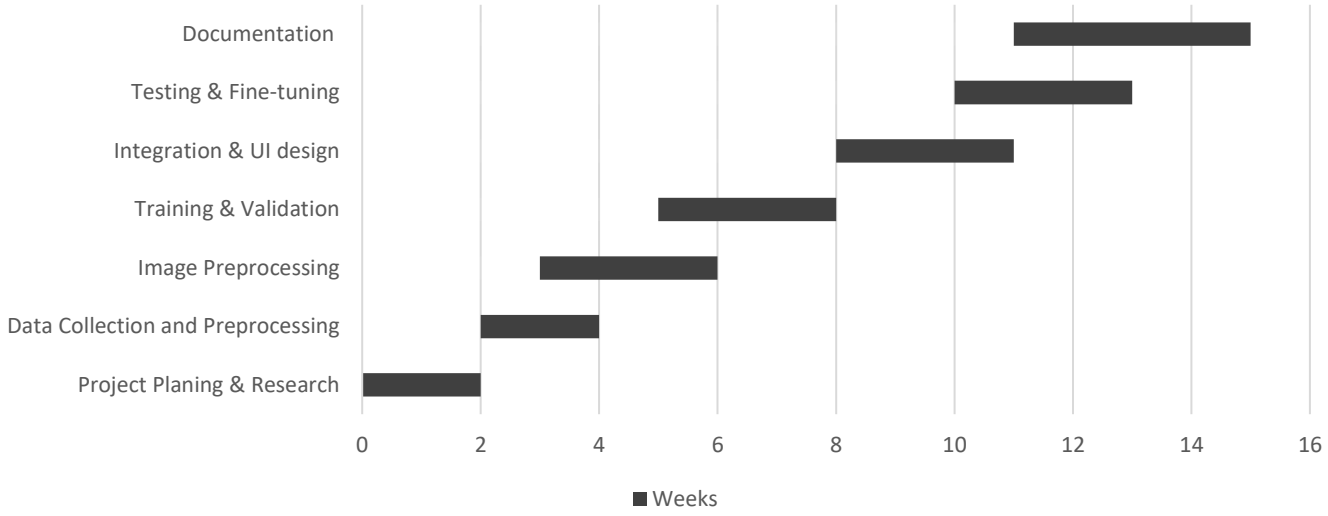
1. Data Collection: Gathering a dataset of kidney stone images. This dataset should include images with kidney stones and images without kidney stones for training and testing.
2. Preprocessing: Clean and preprocess the images using a filter to make them better to work with.
3. Feature Extraction: Employ advanced image processing techniques to extract relevant features from the images, such as texture, shape, and intensity patterns.
4. Machine Learning Model: Convolutional Neural Network (CNN) is trained to classify the kidney stones based on the features extracted in the previous steps..

5. Model Evaluation: Evaluate the trained model using a separate validation dataset, measuring accuracy, sensitivity, specificity, and other relevant metrics.
6. Integration: Develop a user-friendly interface that allows medical professionals to upload images for analysis.

Tools & Techniques

- Programming Language: Python
- Libraries/Frameworks: TensorFlow, Keras, OpenCV
- IDE: PyCharm
- Techniques: Image Processing, Machine Learning

Time Schedule



References

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[2] H. J. De Jesus-Rodriguez, M. A. Morgan, and H. Sagreiya, (2021) "Deep learning in kidney ultrasound: Overview, frontiers, and challenges", Advances in Chronic Kidney Disease, https://www.sciencedirect.com/science/article/pii/S1548559521000537.

[3] W. M. Hafizah, E. Supriyanto, and J. Yunus, (2012) "Feature extraction of kidney ultrasound images based on Intensity Histogram and Gray Level Co-occurrence Matrix" - IEEE explore, https://ieeexplore.ieee.org/abstract/document/6243932.

Signature

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