

AI-Assisted Medical Image Analysis

Project Proposal

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1 Objectives

The increasing use of medical imaging for diagnosis and treatment has led to a growing demand for efficient and accurate image analysis. Traditional manual interpretation of medical images is time-consuming, prone to human error, and requires specialized expertise. This proposal outlines a research study that aims to explore the integration of artificial intelligence (AI) techniques into medical image analysis to improve diagnostic accuracy, reduce workloads, and enhance decision-making for healthcare professionals.

The focus of this research will be to design, implement, and evaluate AI algorithms—such as deep learning, convolutional neural networks (CNNs), and machine learning models—that can automatically detect and classify abnormalities in various types of medical images, including MRI, CT scans, X-rays, and ultrasounds. The study will investigate how AI can assist in identifying diseases like cancer, cardiovascular issues, and neurological disorders, as well as improving segmentation, feature extraction, and anomaly detection.

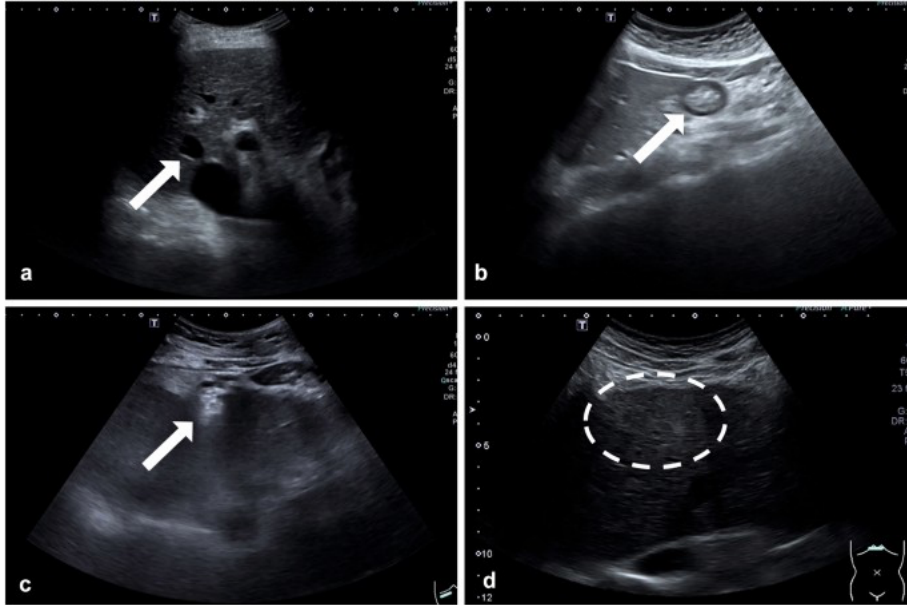


Figure 1: Illustration of the type of data this dissertations aims at dealing with. Source: <https://www.nature.com/articles/s41598-022-11506-z>.

2 Work Plan

- Data Collection: Acquire publicly available or hospital-approved datasets of medical images such as chest X-rays, brain MRI scans, and CT images.
- Model Development: Design deep learning models using CNNs and train them on annotated medical images for tasks such as image classification, segmentation, and disease detection.
- Evaluation Metrics: The models will be evaluated based on accuracy, sensitivity, specificity, precision, recall, and F1-score. Comparative studies will be conducted with manual interpretations by radiologists.
- Validation: The AI models will be validated using cross-validation techniques and tested on independent datasets to ensure generalizability.
- Ethical Considerations: The research will take into account the ethical implications of using AI in medical diagnosis, ensuring that patient data privacy is maintained, and addressing potential biases in AI models.

3 Academic Prerequisites

- Interest about Artificial Intelligence and Machine Learning topics.

- Programming skills *Python* (+ *Keras* or *Pytorch*).

4 Expected Results

- 1 computational prototype
- 1 report

5 Contact

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