IMPROVED DEEP LEARNING METHOD FOR BREAST MASS DETECTION IN MAMMOGRAPHY IMAGES

Guided By

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1. Introduction

Breast cancer is the most common cancer among women, accounting for 24.5% of all new cancer cases in 2021. Early detection is essential for improving survival rates, and mammography is the primary screening tool for breast cancer. However, mammography interpretation is challenging, and even experienced radiologists can miss subtle lesions.

Deep learning has the potential to improve the accuracy of breast cancer detection and segmentation in mammography images. Deep learning models can be trained to learn the features of breast masses and other abnormalities, and to distinguish between benign and malignant lesions. Additionally, deep learning models can be used to segment breast masses, which can help radiologists to better visualize and characterize the lesions.

YOLOv8 and DeepLabv3 are two state-of-the-art deep learning models for object detection and segmentation, respectively. YOLOv8 is a fast and accurate object detector that has been shown to achieve high performance on a variety of tasks, including breast mass detection. DeepLabv3 is a powerful segmentation model that has been shown to achieve high performance on a variety of medical image segmentation tasks, including breast mass segmentation.

2. Objectives

The objective of this project is to develop an improved deep learning method for breast mass detection and segmentation in mammography images using YOLOv8 and DeepLabv3 respectively. The proposed method will address the limitations of existing methods by:

- Develop a deep learning model that can accurately detect and segment breast masses in mammography images.

- Improve the robustness of the model to noise and variability in image quality.
- Achieve better performance than existing methods on a held-out test set.

3. Methodology

The proposed method will be developed using a combination of deep learning techniques, including:

- YOLOv8 used for breast mass detection.
- DeepLabv3 used for breast mass segmentation.
- Data augmentation is used to create new training data by applying transformations to existing data. This can help to improve the robustness of the model to noise and variability in image quality.

The proposed method will be trained on the CBIS-DDSM and INbreast datasets. The training dataset will be divided into three parts: training set, validation set, and test set. The training set will be used to train the model, the validation set will be used to evaluate the performance of the model during training, and the test set will be used to evaluate the performance of the model after training.

The proposed method will be evaluated using a variety of metrics, including accuracy, sensitivity, and specificity for detection, and dice coefficient and mean IoU (Intersection over Union) for segmentation. The performance of the proposed method will be compared to that of existing methods on the test set.

4. Work Plan

The project will be completed in 4 phases:

1. Data collection and preparation

- Collect the CBIS-DDSM and INbreast datasets.
- Split the datasets into training, validation, and test sets.
- Preprocess the images, e.g., resize, normalize, and augment the images.

2. **Model development**
    - Implement YOLOv8 for breast mass detection and DeepLabv3 for breast mass segmentation.
    - Train the models on the training set.
    - Evaluate the performance of the models on the validation set.
    - Fine-tune the models as needed.
3. **Model evaluation**
    - Evaluate the performance of the models on the test set.
    - Compare the performance of the proposed method to that of existing methods.
4. **Model deployment**
    - Integrate the proposed method into a clinical workflow.
    - Provide training to clinicians on how to use the proposed method.

5. **Budget**

This is to certify that _____is a bonafide final year student course of_____our College/University and it is also certified that 2 copies of Utilization of Certificate and final report along with seminar paper will be sent to the Council after completion of the project by the end of May 2024.

Student Signature HoD Signature Principal Signature