Research Progress Report

Kamyar Pour Mohammad

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1 Introduction

This report documents my research activities and progress in the area of object segmentation in medical images, with a particular focus on chest radiography. The work explores modern segmentation approaches, explainable AI techniques, and large-scale medical datasets.

The ultimate goal of the project is to develop an effective segmentation model for radiological chest images using limited annotated data.

2 Background Study

This section presents a foundational overview of the key elements involved in conducting academic research in a structured and professional manner. The focus is on understanding the landscape of scholarly communication, which includes:

- Types of Scientific Papers
- Major Scientific Publishers
- Reference Structure in Scientific Papers

3 Selected Main Paper

Title: Explanations of Classifiers Enhance Medical Image Segmentation via End-to-End Pre-training.

This paper proposes generating pseudo-segmentation labels from classification explanations and using them for segmentation pre-training. Method overview:

1- Train classifiers on CheXpert
2- Generate pseudo masks using XAI
3- Pretrain segmentation model on pseudo masks
4- Fine-tune on small ground-truth dataset

4 Project Goal and Challenges and Proposed Approach

Goal: Train a segmentation model for chest radiographs.
Main Challenge: Lack of large-scale datasets with accurate segmentation masks. Most public datasets only contain classification labels.
Proposed Approach:

Train a chest disease classifier
Use XAI (e.g., Grad-CAM) to generate pseudo-masks
Pretrain segmentation model on pseudo-labels
Fine-tune using limited annotated data

5 Implementation Progress

1- Implemented classification model on CheXpert-small
2- Developed Grad-CAM-based heatmap generation
3- Began pseudo-dataset creation
Challenge encountered: Full dataset heatmap generation required 15 hours on a Kaggle T4 GPU, so a subset of 1000 images was used.

6 Future Work

Obtain larger or annotated datasets
Improve model architecture
Aim for publishable novelty

7 Refrences