

Appendix A

Motivation:

In this report, we present a deep learning approach to classify fetal ultrasound images into four distinct categories: abdomen, thorax, brain, and femur. The motivation behind this work is to assist medical professionals in automating the classification of fetal ultrasound images, which can be a time-consuming task. Automating this process can lead to faster diagnosis and treatment decisions, ultimately improving patient care.

Abstract

This report outlines the development and evaluation of a deep learning model for classifying fetal ultrasound images. The model utilizes convolutional neural networks (CNNs) and image data augmentation techniques to achieve accurate classification. We also provide insights into the experimental settings, the hypotheses tested, and key findings from our study.

Introduction

Ultrasound imaging is a widely used medical diagnostic tool for monitoring fetal health during pregnancy. However, interpreting ultrasound images can be challenging and time-consuming for healthcare professionals. Automating the classification of these images can assist medical experts in making quicker and more accurate diagnoses.

Data Preprocessing/Analysis

We begin by loading and preprocessing the dataset. The dataset consists of labeled fetal ultrasound images, with each image belonging to one of the four categories: abdomen, thorax, brain, or femur. Data preprocessing involves resizing the images to a standard size, normalizing pixel values, and splitting the dataset into training and testing sets.

Model Architecture

Our deep learning model is constructed using the TensorFlow and Keras libraries. It consists of multiple layers, including convolutional and max-pooling layers for feature extraction and fully connected layers for classification. The model is trained to classify ultrasound images into the four specified categories.

Experimental Setting

We use an image data generator for data augmentation during training to improve the model's robustness. The model is trained for a specified number of epochs, and we monitor both training and validation accuracy to assess its performance.

Hypotheses Tried

We hypothesize that data augmentation and a well-designed CNN architecture will improve the accuracy of ultrasound image classification. We also hypothesize that the model can generalize well to unseen data.

Results

We present the results of our experiments, including training and validation accuracy, as well as the final test accuracy of the model. Additionally, we evaluate the model's performance on a separate test dataset.

Key Findings

Key findings from our study include the model's accuracy in classifying fetal ultrasound images and its potential to assist healthcare professionals in automating the image classification process.

Future Work

In the future, we plan to explore additional techniques to further improve the model's accuracy, such as fine-tuning and ensembling. We also aim to expand the dataset to enhance the model's ability to generalize to different fetal ultrasound variations.