EC386 Image Processing Mini Project Synopsis Report

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Approval from guide - PENDING

Introduction to problem

Using Capsule Endoscopy technique we will obtain the interior body images. Using the images we will perform anatomical Classification .These images contain the 3 parts of the small intestine (Ileum , Duodenum , Jejunum). We need to classify the images based on their texture, size and other features into classes which can be used in medical treatments .

Motivation

The concept of Image Processing was a huge breakthrough in the medical field in recent years. One main reason for this is because it allows us to explore and deep dive further into anatomy without being invasive.

By enhancing the image and reducing noise, we can get a clear and accurate observation of the disease at hand and obtain necessary pathological information from the image.

The motivation to work on this project is to get a clear understanding of the concept of Image Processing and understand how it can be applied to real world problems.

Planned Approach

- We will begin with pre-processing of the dataset.
- If there is less data in the given dataset, we will perform data augmentation to increase the number of training data to further improve our accuracy of the model we will build.
- Segregate the dataset into train, validation and test data batches.
- We will use deep learning models to classify them. Most probably we will use Convolutional Neural Networks (UNET architecture - as this is well suited for medical imaging feature extraction)
- Image classification can also be achieved using Generative Adversarial Networks (GAN) which can help in providing another accurate solution for the Classification problem. This is an alternative approach that is being considered for the Image Processing Classification.
- Tune the hyperparameters of the model and train the neural network model
- Based on the accuracy we will fine tune it or follow transfer learning approach to increase accuracy
- Then we will finally test the accuracy on the given test dataset.

Previous work/ Literature Survey

Many people have tried to approach this problem statement of classification using different types of Deep learning models or different architectures of CNN (LeNET-5, ResNet, SegNet, AlexNet , MobileNet).

We have found that other minds who tried to perform the same Image Classification had problems with the dataset - it was not sufficient. When they split the given dataset into 70% training and 30% testing, there was not much data to work with which can affect the overall accuracy of the resulting

model. From this problem, we can try to give some significant time to Data Augmentation to enhance our dataset.

Selection of proper features is more important than selection of classifiers in automated polyp detection methods.

The Generative Adversarial Network proved to be a success when it was used to help diagnose pneumonia disease from chest X-Rays with an accuracy of 94.5%. It has made major breakthroughs in the medical field. Reading about this success gives us motivation to apply the same for the diagnosis of diseases in the intestine.

References

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