CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)

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Project Number

S1506

Project Title

A Deep Learning Approach for Gland Segmentation in Cancerous Tissue Images

Abstract

Objectives/Goals

The goal of this project was to use a deep learning based fully convolutional neural network (FCN) for pixel level gland segmentation of cancer images, and test the ability of the model learnt on colon cancer images to segment glands in different types of cancer images.

Methods/Materials

The gland FCN model is initialized by transferring the VGG-16 learnt model, pre-trained on an image database of 1.5 million images. Matlab training and testing scripts in the FCN-Matconvnet toolbox were modified for gland segmentation, and the training was done on a computer with a GPU for 1200 epochs (iterations) over 40 hours of training.

Results

The algorithm was trained and validated on a colon cancer image database, for which the training and testing accuracy were approximately 96% and 90% respectively. The same model was also tested on a prostate cancer image dataset, for which the segmentation results qualitatively look accurate.

Conclusions/Discussion

Overall, the results from this model are promising, especially since this accuracy was achieved with a training set of less than 100 images, proving that it is possible to construct a highly accurate deep neural network model to automatically segment a multitude of glands in various cancer type tissue images.

Summary Statement

This project aims to develop a deep learning algorithm based on fully convolutional neural networks and transfer learning to segment glands in cancer images, then test its ability to be able to expand to different types of cancers.

Help Received

We contacted various pathologists for cancerous tissues images. After downloading the FCN-Matconvnet scripts, we contacted professionals to get more information about the specifics regarding the code. After writing the code, we requested a professional to simply run the code.