CS574 Project Report 2

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Brain Tumors with Deep Learning

Our group have meet several times and have a clear understanding of the project now. Here are the steps towards our goal:

1. Separate the MRI image data set into Training data and Test data. For example, in our case, the data set has 185 patients. Randomly selecting 120 patients as training data and the remaining 65 as test data.

2. For each patient, find the slice with the largest area from the mask voxel. And for that slice, extract the tumor region form the background image as ROI. All the ROIs should have the same size in order for deep learning.

3. Choose CNNs (under theano library) as our deep learning tool. Use training data X to build feature learning P(X). And use X and ground truth labels Y and learned features to build classification. P(Y|X).

4. Use our test data to test our model and get the predicted labels Y'. Then compare Y' with ground truth labels Y_test. Calculate the accuracy of this model.

We are currently working on the second step: pre-processing of training data.

Using python bibabel library to load the image data with both background and mask voxel. Analyze image shape and extract the tumor region. Here is an example:

For patient TCGA-02-0003_1997-06-08, the largest slice is showing in Figure 1 (mask) and Figure 2 (background). And the extracted mask ROI and background ROI are showing in Figure 3 and Figure 4.

The shape of the voxel is (256,256,25). If the shape of the largest ROI is (M,N), the we need to find the center (X,Y) of all the other ROIs and extract the background region use the coordinate [(X-M/2):(X+M/2), (Y-N/2):(Y+N/2)]. In such case, all the training data have the same size, which is a requirement for deep learning.

Our next step is to accomplish this step iteratively and get ready for deep learning by following the tutorial of theano. http://deeplearning.net/tutorial/lenet.html

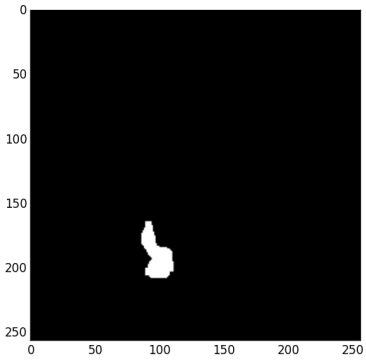

Figure 1 Largest slice (mask)

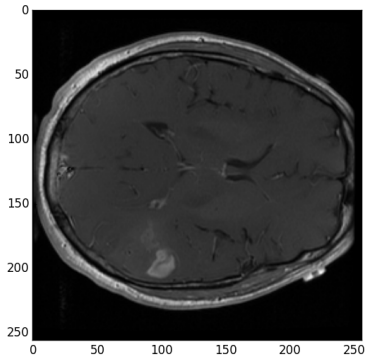

Figure 2 Largest slice (background)

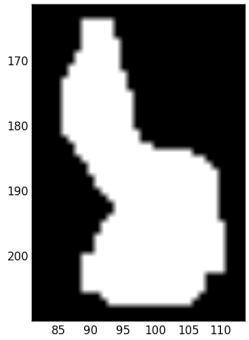

Figure 3 ROI (mask)

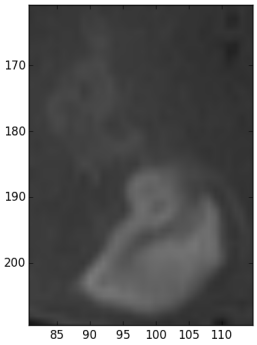

Figure 2 ROI (background)