# < RT704 Assignment 2 >

Glioma is the most primary brain tumor in the human brain. Glioma is divided into glioblastoma(HGG) and lower grade glioma(LGG) with HGG being an aggressive and life-threatening tumor. In this assignment, we will classify HGG/LGG of multi-modal brain MRI images via several machine learning algorithms.

Download MRI data. This dataset contains training, validation and testing data for classification. For each subject, img.npy, seg.npy and label.npy were prepared. Img.npy contains **[4,H,W] size array which represents 4 types of MRI images(T1, T2, T1ce, T2-Flair).** Label.npy contains classification label **(0: LGG and 1: HGG)**. Seg.npy is **pixel-level annotation of tumor**. It contains subregions that are heterogeneous, each with a different pattern on the brain MRI scan. Though each subregions were annotated with **1,2, and 4** in the [H,W] array, just use them as a single label using *array=np.clip(array, 0, 1)*.
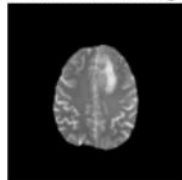
Check below examples. You can load the data from .npy file using this ***np.load(file_path)***.
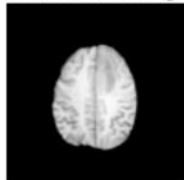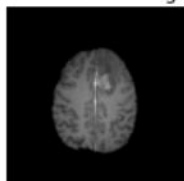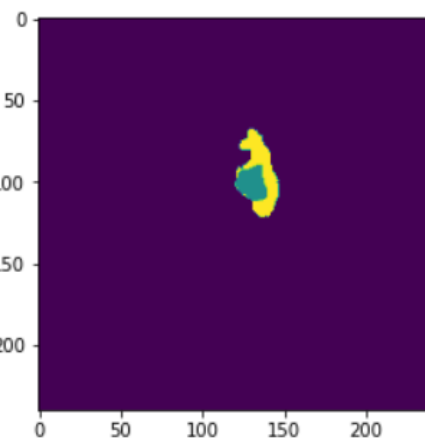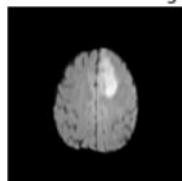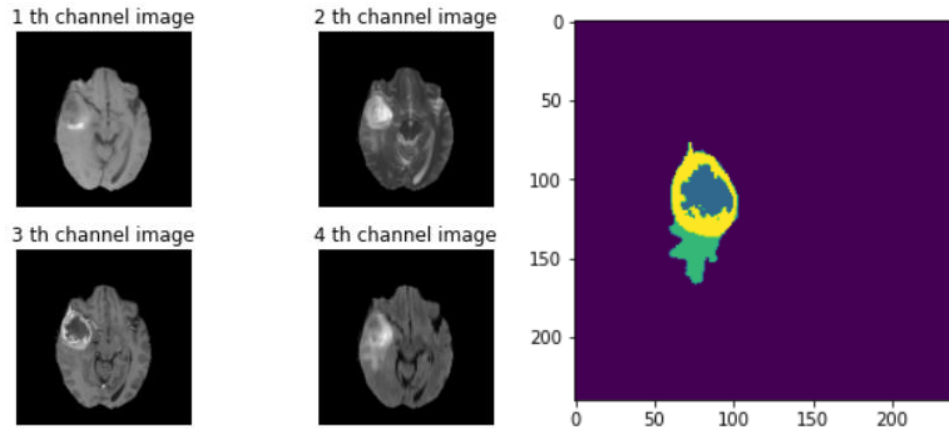
You can find more related information at http://braintumorsegmentation.org/ (optional)

[40 pt] 1. Train a CNN-based HGG/LGG classification model and test it. Use a simple CNN network as there are not that many data samples for training. Concatenate the image and mask array and use it as an input. Report your observation.

[40 pt] 2. Train logistic regression, neural network, and random forest classifiers using radiomics features and test them. Use pyradiomics library for feature extraction (see https://www.radiomics.io/pyradiomicsnotebook.html) and scikit-learn library for random forest model.
(see https://scikit-learn.org/stable/modules/generated/sklearn.ensemble.RandomForestClassifier.html).
The pyradiomics lib require nrrd file format. You need to save each type of MRI with nrrd file first. Report your observation.

[20 pt] 3. Report the difference between the deep-learning based CNN model and the machine learning algorithms.

Submit your report with the codes on LMS by 11/20. When you submit, make your zip filename "HW2_yourfirstname.zip"