Brain Tumor MRI Imaging Classification with CNN

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Healthcare is an ever-evolving field on the precipice of using artificial intelligence to enhance the knowledge of doctors and assist in more rapid and effective treatment to promote a healthier and higher quality of life for people around the world.

As with all health-related issues, early and accurate detection is paramount to increasing a patient's chances of survival. Radiology is a science, but there can be disagreement between interpretations of disease. Chronic diseases like cancer are prevalent in society and while our technology is advanced, automating diagnostic imaging interpretation could give radiologists more time to focus on unique cases and increase accuracy in diagnoses by discovering patterns that a person could not. Rapid interpretation of diagnostic imaging could be applied even further to histology and pathology, to greatly shorten the intraoperative wait time for pathology in craniotomy, thyroidectomy, and other instances where biopsies are taken that dictate treatment procedure at that moment.

A convoluted neural network will be used to classify MRI imaging of brains to distinguish between healthy brains and scans with a tumor (of type glioma, meningioma, or pituitary). Image angles are not identical, with sagittal, coronal, and axial planes represented. Possible models to use are U-Net, VGG, and Perceiver IO.

The identified dataset is an amalgam of 3 other brain MRI datasets and contains over 7000 images. The dataset is fairly balanced between each of the four groups – normal, glioma, meningioma, and pituitary. A challenge of this dataset is the variety of image sizes, though this gives me a chance to exemplify my understanding of image segmentation and preprocessing.

Plenty of opportunity exists for deep learning to contribute to the diagnosis and treatment planning of diseases so that doctors can utilize their valuable time on the aspects of medicine that cannot be automated.