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# Guiding Brain Anomaly Detection and Segmentation Using Semi-Supervised Learning

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## Abstract

In this project, we aim to improve the detection and segmentation of tumor areas in 2D MRI brain scans using autoencoder (and variant) models by first creating and comparing unsupervised, supervised, and semi-supervised models. Currently, unsupervised models are trained to reconstruct images using only healthy brain scans, then the model is made to reconstruct unhealthy brain scans and the difference between the two is analyzed. The downside of this approach is that your model only understands what an unhealthy brain is through what a healthy brain is not. By adding some labels, we hope to improve the accuracy of anomaly detection since the model should be able to more actively seek out anomalies while also still finding patterns in unlabeled data. However, there are two challenges to overcome: the constraint optimization problem and how to segment anomalies using post processing techniques. We hope to demonstrate that semi-supervised learning can improve brain anomaly detection.