### Motivation

ATLAS is a dataset released in February 2018 that contains post-stroke lesion segmentations. It would be extremely beneficial to automate the lesion segmentation process, which is manually intensive and requires extensive anatomical knowledge, because it is a barrier to large scale neuroimaging analysis. We attempt to automate the process using a cascaded convolutional neural network.

### Training Set and Data Augmentation

- **ATLAS data:**
  - Centered Crop
  - Data augmentation
  - Random Crops and Flips

**Box Net Architecture**

**Brain Image Slice** → **Bounding Boxes** → **BoxNet** → **UNets**

### Model and Architectures

- **Small Crop**
- **Medium Crop**
- **Large Crop**
- **Example UNet Architecture**

### Experiment Results and Model Performance

- **ATLAS Model/loss/loss**
- **Dev/dice**
- **Dev/loss**

**Legend:**

- S/:
- M/:
- L/:
- XL/:

**Performance Metric:**

\[
\text{DICE} = \frac{2TP}{2TP + FP + FN}
\]

where TP, FP, and FN are the true positive, false positive, and false negative pixels in the predicted mask.

### Conclusions & Future Work

- The S, M, and L networks were all able to achieve more than 0.30 DICE on the dev set. The M network was able to achieve 0.50.
- The XL network took an infeasible amount of time to train, and it ultimately overfit the training set.
- Further hyperparameter tuning and architecture search can improve the XL network performance.