Medical Informatics: Segmenting post-stroke lesions with Deep Learning

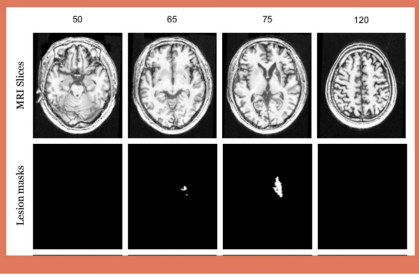
CS 230

Problem Statement

Stroke is a leading cause of disability in the US.

It is the 5th most frequent cause of death in the United States, killing nearly 130,000 people a year (128,978). That's one in every 20 deaths. (Stroke Association).

Manually segmenting post-stroke lesions requires **technical knowledge** and it is **highly time consuming** (up to one hour per MRI).



Deep Learning Opportunity

Research on the relationship between brain MRI scans and the recovery process is currently **constrained** by the **lack of large datasets of segmented post-stroke lesions**.

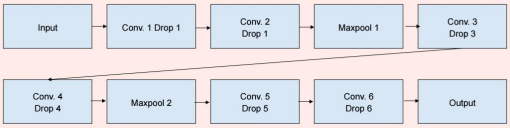
Developing an algorithm that is able to segment in an efficient, accurate way **would set the standard and enable the generation of these valuable datasets.**

Dataset

- To design and train the algorithm ATLAS (Anatomical Tracings of Lesions After Stroke), an **open source dataset of 229 manually segmented lesions**.
- Image input size: [232, 196, 1]

Baseline model

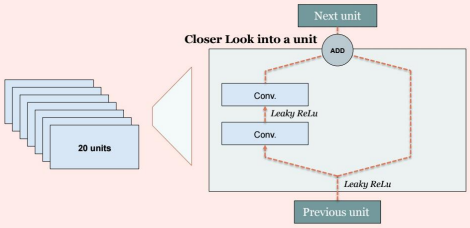
8-layer Convolutional Neural Network



Features

- Learning rate = 0.001
- Dropout factor: 0.15
- Mini-batch size = 100
- Sigmoid cross entropy function
- Adam optimizer

Residual Network model



Results

Baseline model	ResNet model
Evolution of loss on the training set	Evolution of loss on the trainning set
Evolution of dice in the dev set	Evolution of dice in the dev set
Evolution of loss in the dev set	Evolution of loss in the dev set

References

He, K., Zhang, X., Ren, S., & Sun, J. (2016). *Deep residual learning for image recognition.* In Proceedings of the IEEE conference on computer vision and pattern recognition (pp. 770-778).

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Zagoruyko, S., & Komodakis, N. (2016). *Wide residual networks.* arXiv preprint arXiv:1605.07146.

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