Automatic Registration and Segmentation

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Background

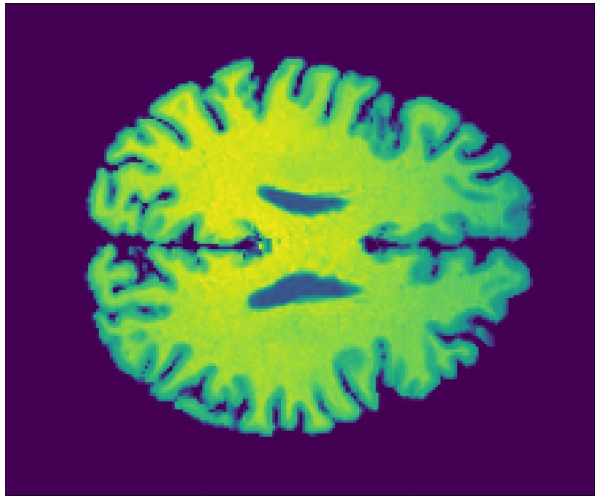
Intro

- Our goal is to train two networks to automatically register and segment MRI images.
- This goal is to train models that can then be generalized to a variety of brain data.

Registration

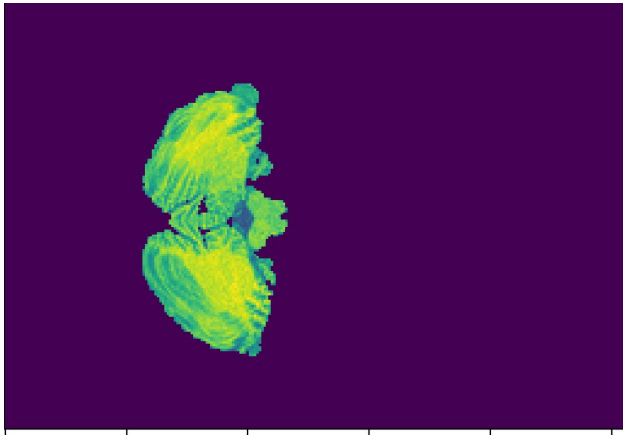
Goal is to track a specific object across several images and align to a common axis

Not a simple task in 3 dimensions



Registered

Unregistered



Segmentation

Predict labels for brain regions

Useful in detecting changes in specific structures

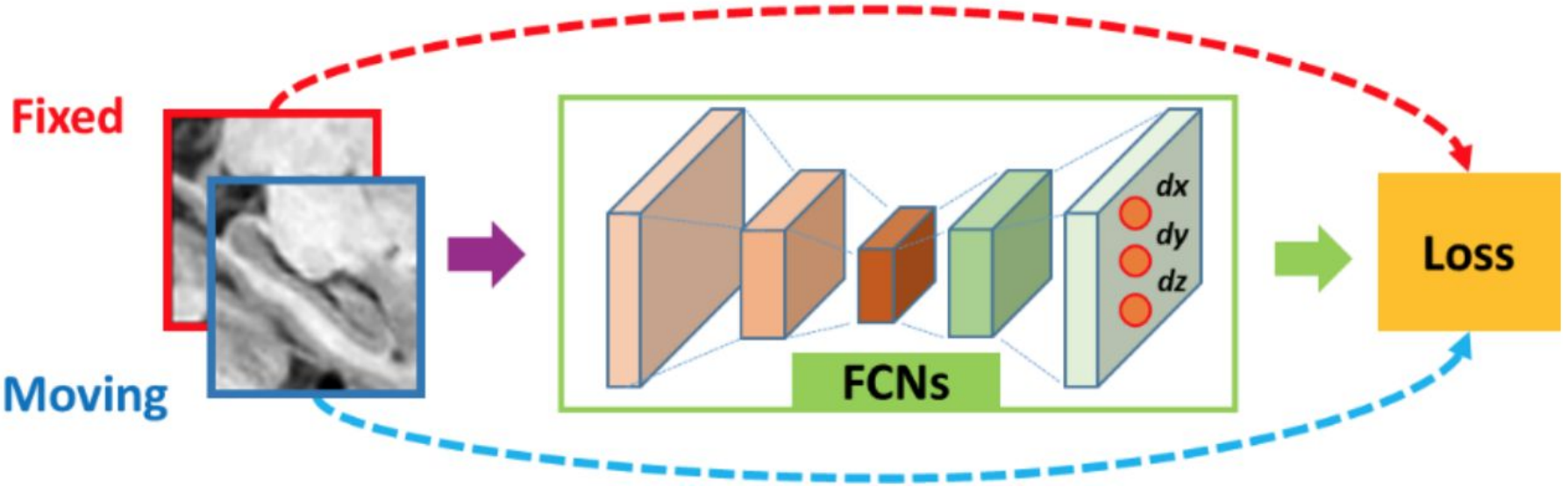
Example: Change in white matter volume in Parkinson’s

Data

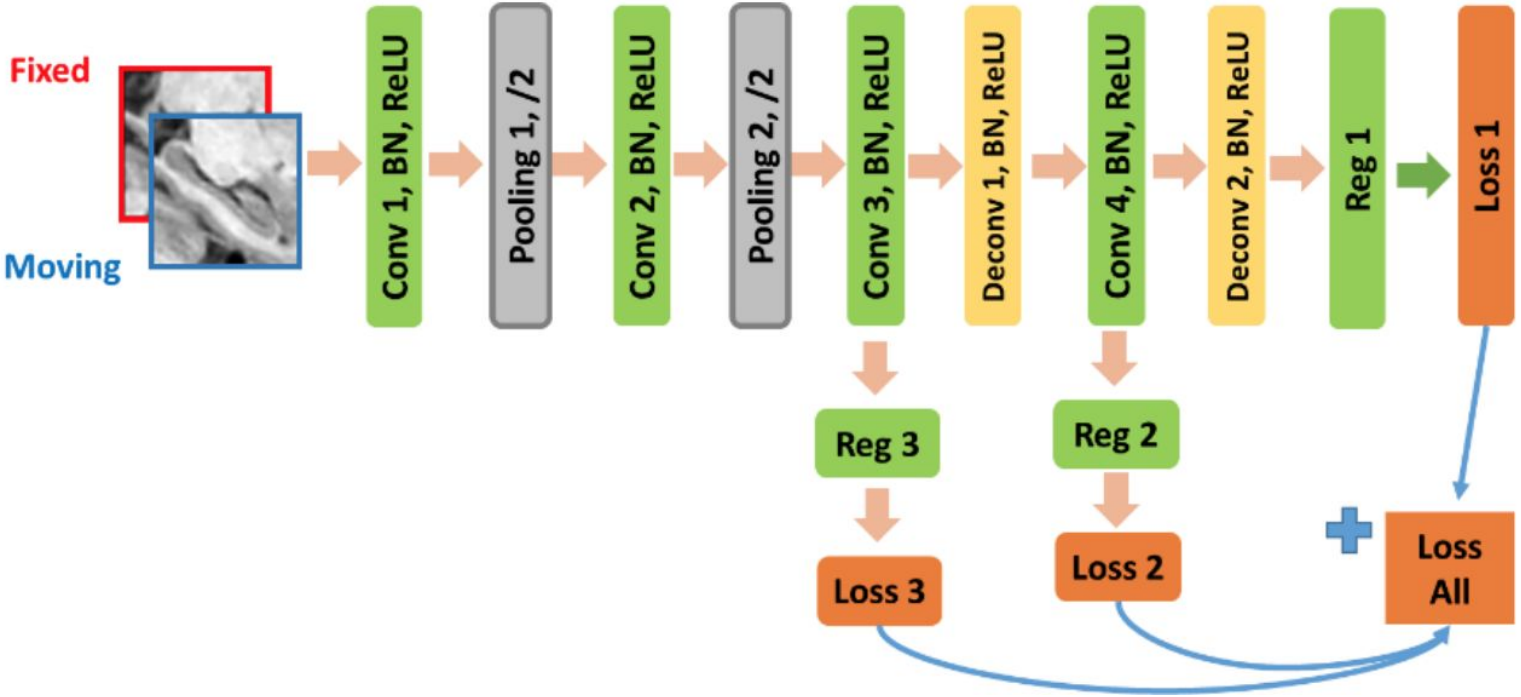
- Mindboggle-101 - Hand labeled dataset
  - Need hand labeled data because we don’t want to relearn the bad targets from existing algorithms
- Consists of MRI scans from 101 subjects
  - Registered and unregistered images (to MNI-152 atlas)
  - Segmentation labels for DKT25 and DKT31

Registration

Overview

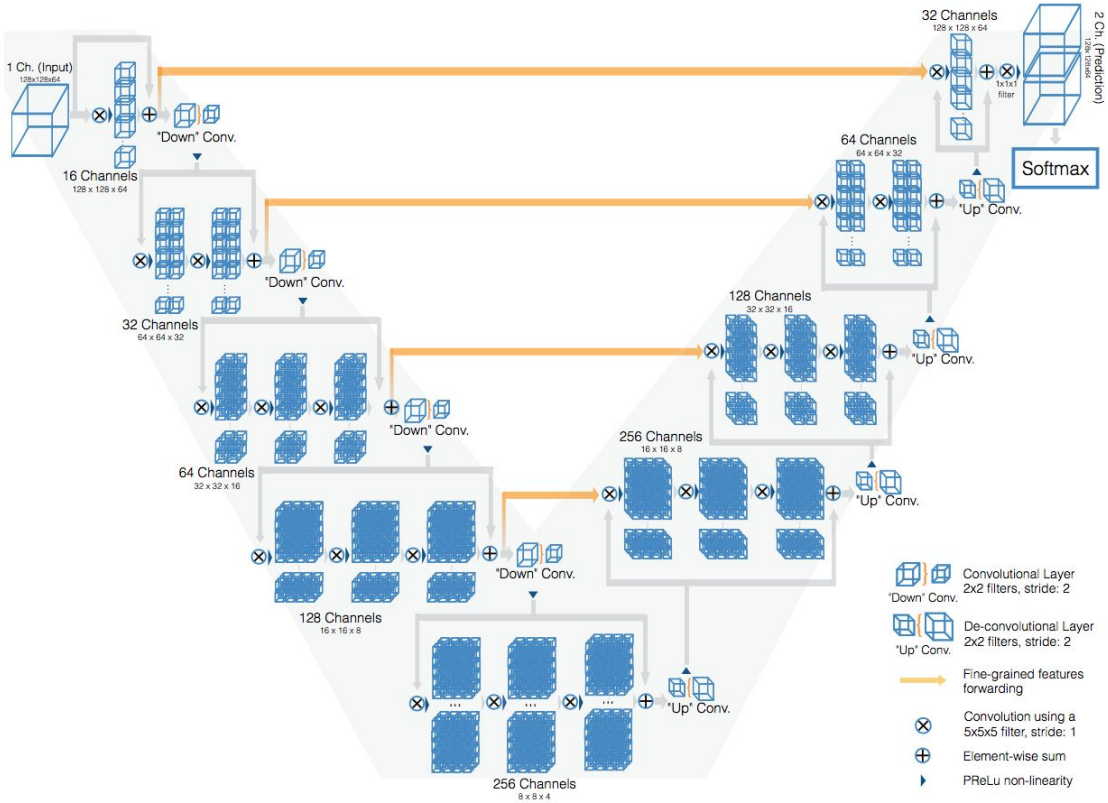


Architecture



Segmentation

Architecture



Final point

Just keep on chugging along

References

Li, H., & Fan, Y. (2018). Non-Rigid Image Registration Using Self-Supervised Fully Convolutional Networks without Training Data. *arXiv preprint arXiv:1801.04012*.

Milletari, F., Navab, N., & Ahmadi, S. A. (2016, October). V-net: Fully convolutional neural networks for volumetric medical image segmentation. In *3D Vision (3DV), 2016 Fourth International Conference on* (pp. 565-571). IEEE.