

Competition details:

- Ultrasound Nerve Segmentation competition, 2016
- 923 competitors during the competition and many more afterwards
- 5636 training images with masks
- 5508 test images
- Dice coefficient accuracy metric:

$$DSC \stackrel{\text{def}}{=} \frac{2|X \cap Y|}{|X| + |Y|}$$

- Best competition score: 0.732
- Baseline scores
 - Top-left pixel: 0.0
 - Empty submission: 0.534

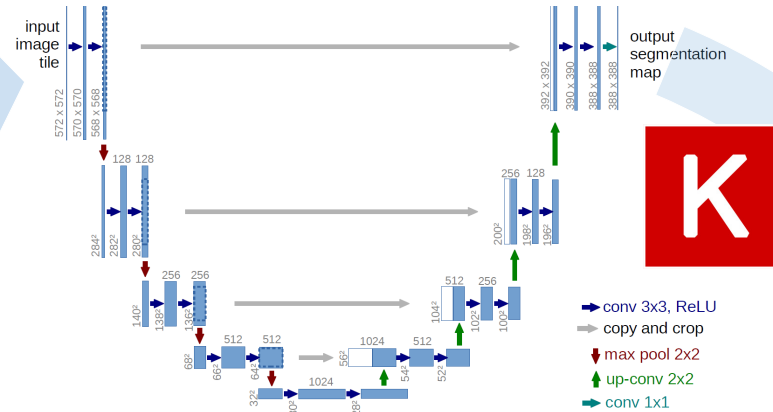


Figure 1: U-net architecture from original paper

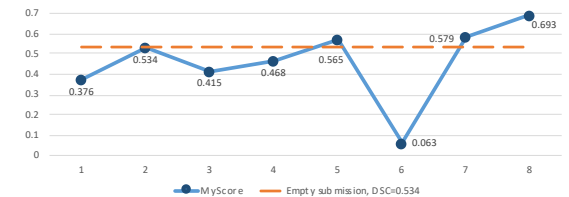
Warning:

- The final result is very dependent on the learning rate optimizer - the only difference between submissions 6 and 7. This shows, how sensitive Machine Learning models can be.

Results:

- My best score: 0.693
- Score's percentile: top 6%
- Training time on Kaggle GPU: 11 minutes
- Kaggle: <https://www.kaggle.com/gbatchkala>
- GitHub: <https://github.com/GeorgeBatch>

Score progression over submissions



Contributors:

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Based on:

- Marco Jovic's work: <https://github.com/jocimarko/ultrasound-nerve-segmentation>
- Edward Tyantov's work: <https://github.com/EdwardTyantov/ultrasound-nerve-segmentation>

References:

- Data, <https://www.kaggle.com/c/ultrasound-nerve-segmentation/overview>
- Dice coefficient, https://en.wikipedia.org/wiki/S%C3%B8rensen%E2%80%9393Dice_coefficient
- Original U-net paper, <https://arxiv.org/abs/1505.04597>

Kaggle competition: Ultrasound nerve segmentation

Machine detection:

- Machine labels are more consistent
- It takes time for an expert to label many images
- Trained software can output new labels instantly
- Takes weeks to create a model and hours to train it
- Training machines on cloud platforms is cheap

Nerve Detection required

Human detection:

- Human labels suffer from inconsistency
- Human-labeled data contains noise, artefacts, and mistakes
- It takes a lot of time for an expert to label new images
- Takes years to teach a doctor
- It is expensive to train humans

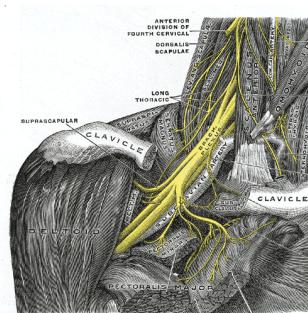


Figure 2: Brachial plexus

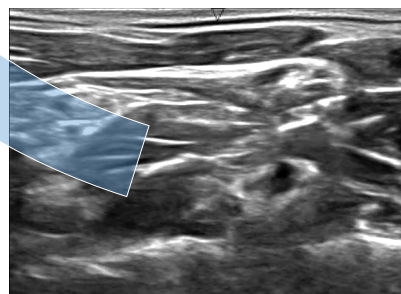


Figure 4: MRI scan example

Warning! Approaching nerves!



Figure 3: Doctors during operation

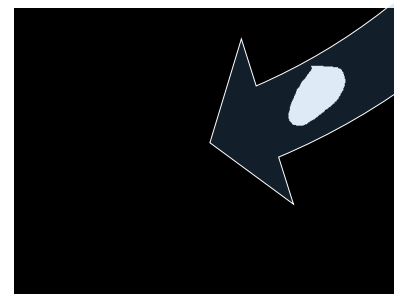


Figure 5: Labelled MRI scan