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Guided Proofreading of Automatic Segmentations for Connectomics

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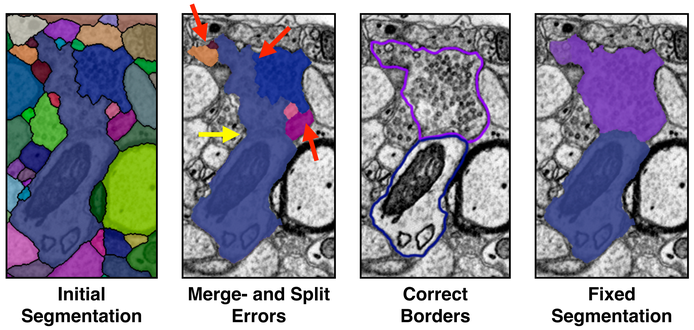
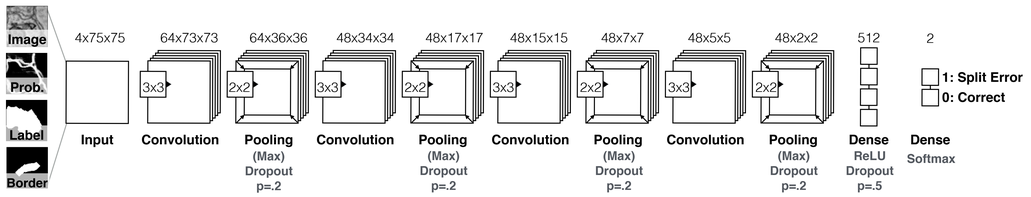
1 Automatic segmentations require proofreading by humans to fix **merge-** and **split errors**



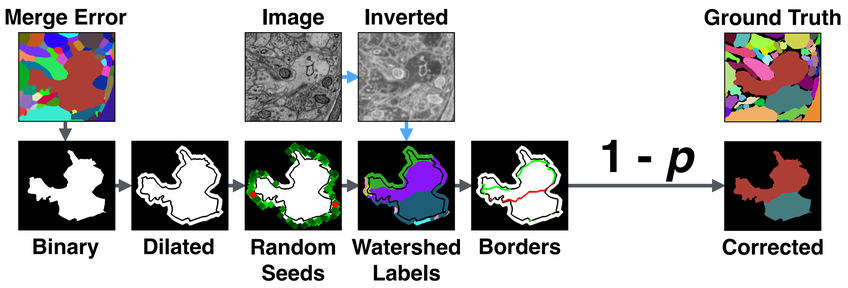
Visually inspecting the data to find errors takes most of the time!

[2]

2 We train a classifier to find and correct potential split errors based on a CNN…



…and re-use this classifier for merge errors

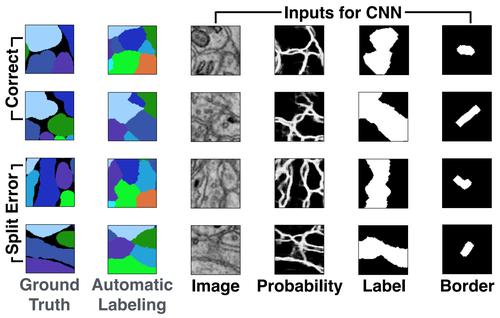


Training Data

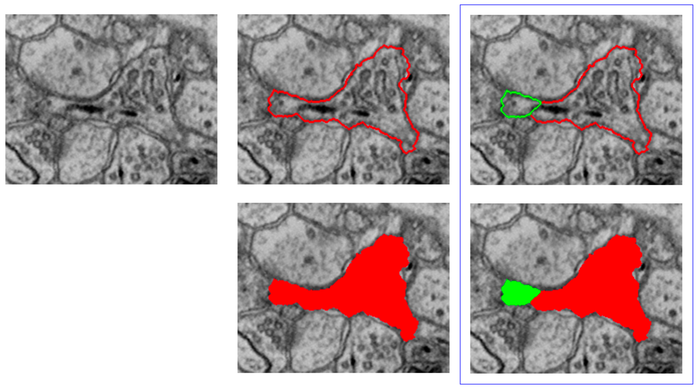
- 2048x2048x300 vx, 3x3x30nm/vx
- ground truth 180k labels
- automatic segmentation 500k labels
- 266,080 correct and 266,080 error patches

Other parameters

- 75x75 pixel patches, center on membrane
- Learning rate 0.03-0.00001
- Momentum 0.9-0.999
- Mini-Batchsize 128

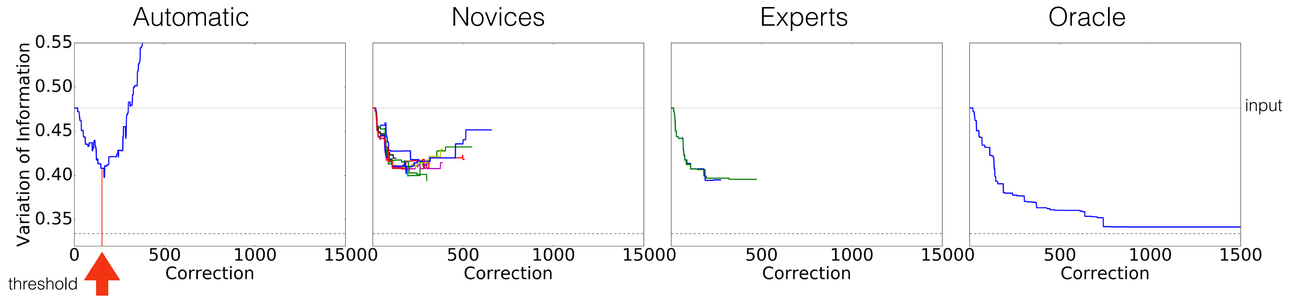


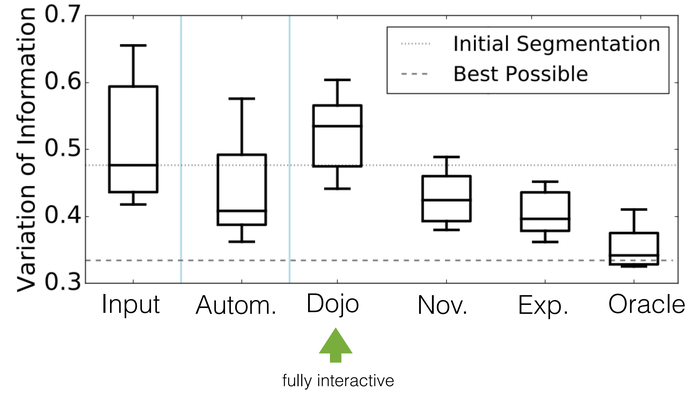
3 Users see the most likely errors and can correct them using yes/no decisions



4 User Study: Proofreading of AC4 subvolume (400x400x40 vx)

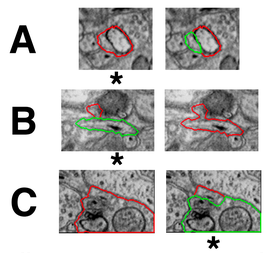
10 Novices, 2 Experts (30 minute time limit) (VI: the lower, the better)





Better results than existing proofreading methods!

Examples



all participants correctly chose A, but had problems with B and C

5 Data / Code / Results available

http://github.com/VCG/guidedproofreading

References

[1] J. A. Bogovic, G. B. Huang, and V. Jain. Learned versus hand-designed feature representations for 3d agglomeration. *CoRR*, abs/1312.6159, 2013

[2] D. Haehn, S. Knowles-Barley, M. Roberts, J. Beyer, N. Kasthuri, J. Lichtman, and H. Pfister. Design and evalua- tion of interactive proofreading tools for connectomics. *IEEE Transactions on Visualization and Computer Graphics (Proc. IEEE SciVis 2014)*, 20(12):2466–2475, 2014.