E4 project : Maximin Affinity Learning of Image Segmentation

Quentin Garrido, Tiphanie Lamy Verdin, Josselin Lefèvre, Annie Lim

January 2020

Contents

1 Introduction

2 Theoretical background

3 Maximin Affinity learning

4 Implementation

4.1 Computing the affinity graph

4.2 Training the neural network

5 Results

5.1 Evaluation method

5.2 CREMI

5.3 ISBI 2012

6 Going forward

7 Teamwork

7.1 Team organization

7.2 Task distribution

7.3 Obstacles and overcoming them

8 Conclusion

References

[1] L. Najman, J. Cousty, and B. Perret, "Playing with Kruskal: Algorithms for Morphological Trees in Edge-Weighted Graphs," in *Mathematical Morphology and Its Applications to Signal and Image Processing*, vol. 7883, pp. 135–146, Berlin, Heidelberg: Springer Berlin Heidelberg, 2013.

[2] G. Chierchia and B. Perret, "Ultrametric Fitting by Gradient Descent," *arXiv:1905.10566 [cs, stat]*, Oct. 2019. arXiv: 1905.10566.

[3] A. Challa, S. Danda, B. S. D. Sagar, and L. Najman, "Watersheds for Semi-Supervised Classification," *IEEE Signal Processing Letters*, vol. 26, pp. 720–724, May 2019.

[4] J. Funke, F. Tschopp, W. Grisaitis, A. Sheridan, C. Singh, S. Saalfeld, and S. C. Turaga, "Large Scale Image Segmentation with Structured Loss Based Deep Learning for Connectome Reconstruction," *IEEE Transactions on Pattern Analysis and Machine Intelligence*, vol. 41, pp. 1669–1680, July 2019.

[5] S. Wolf, L. Schott, U. Köthe, and F. Hamprecht, "Learned Watershed: End-to-End Learning of Seeded Segmentation," *arXiv:1704.02249 [cs]*, Sept. 2017. arXiv: 1704.02249.

[6] S. C. Turaga, K. L. Briggman, M. Helmstaedter, W. Denk, and H. S. Seung, "Maximin affinity learning of image segmentation," *arXiv:0911.5372 [cs]*, Nov. 2009. arXiv: 0911.5372.

[7] S. Turaga, "Learning image segmentation and hierarchies by learning ultrametric distances," Apr. 2010.