De-noising of Fluorescence Microscopy Images using ML Methods

- Image segmentation using clustering.
- Regional de-noising using image-specialist ML methods.

Dataset: A Poisson-Gaussian Denoising Dataset with Real Fluorescence Microscopy Images

Work Division:

- Venkatesh: Literature review on traditional image de-noising techniques, Data Pre-processing & Analysis of Algorithms
- Prayag: Literature review on ML based image segmentation and de-noising, Data Pre-Processing & Implementation of Algorithms
- Both: Reports, Implementation & Analysis of Algorithms

Algorithms to be Implemented: vanilla ANNs, CNNs (surprise), Random Forests, k-Means, DBSCAN, HDBSCAN

Midway Targets:

Image segmentation using k-Means, DBSCAN & HDBSCAN, Implementation of ANN model for image de-noising, Comparison of ANN model with benchmarked CNN models.

Expected Results:

HDBSCAN will outperform DBSCAN & k-Means for image segmentation.

ANN models won't be able to outperform benchmarked CNN models. (meh)

Relevant Papers

- Wählby, C. (2015). Image Segmentation, Processing and Analysis in Microscopy and Life Science. In: Zazzu, V., Ferraro, M., Guarracino, M. (eds) Mathematical Models in Biology. Springer, Cham. `https://doi.org/10.1007/978-3-319-23497-7_1`
- K. Zhang, W. Zuo, and L. Zhang. (2018). FFDNet: Toward a fast and flexible solution for CNN based image denoising. *IEEE Transactions on Image Processing*
- S. Lefkimmiatis. Universal denoising networks: A novel CNN-based network architecture for image denoising. In *CVPR, 2018*.
- J. Lehtinen, J. Munkberg, J. Hasselgren, S. Laine, T. Karras, M. Aittala, and T. Aila. Noise2Noise: Learning Image Restoration without Clean Data. In *ICML, 2018*.