Universitätsklinikum Hamburg-Eppendorf

Open Master-Project/Thesis Biomedical Image Processing

Problem-adapted variational deconvolution of temporal fluorescence microscopy image sequences

Background: Fluorescence microscopy allows tracking dynamic behavior of subcellular components in living samples. However, its ability to sufficiently resolve subcellular detail in the presence of noise is limited by the applied deconvolution approach.
In a collaboration project of the Dept. of Biochemistry and Molecular Cell Biology, the Dept. of Computational Neuroscience (both UKE, Hamburg) and the Inst. of Medical Technology (TUHH), we developed and currently use a framework for processing and analysis of fluorescence microscopy image sequences. The implemented deconvolution methods are, however, standard approaches.[1]

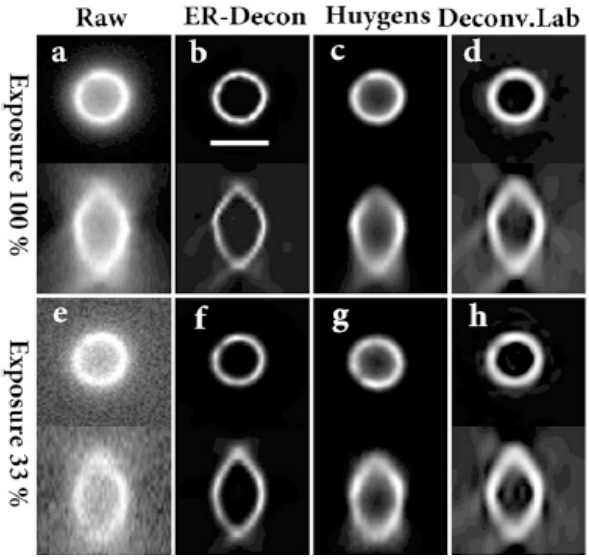

Fig. 1: Synthetic example for illustration of the performance of the entropy-based regularization (ER) deconvolution of Arigovindan *et al.*[2] (image from corresponding publication).

Thesis Topic: Recently, more advanced deconvolution methods have been published, with especially an optimized variational deconvolution[2] considered promising (see Fig. 1 b, f). The thesis aims at adapting the approach to our fluorescence microscopy data: The assumptions underlying the deconvolution approach are to be evaluated and optimized. Finally, the new method should be integrated into our existing framework.

You are interested in working in an exciting interdisciplinary research project?
You have a solid understanding of programming (e.g. Matlab, C++)?
You are interested in a thesis in biomedical imaging and image processing?

Then, this is the perfect thesis topic for you!

Contact:

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[1] Schetelig et al.: "Development of a modular post-processing and analysis framework for fluorescence microscopy image sequences of subcellular calcium dynamics." In: Proc. BVM 2015, pp. 401-6, 2015.
[2] Arigovondan et al. „High-resolution restoration of 3D structures from widefield images [...]." PNAS 110(43): 17344-49.