Image Restoration and Downstream Processing - old problems and new solutions.

The necessity to analyze scientific images is as old as the ability to acquire such data. While this analysis did initially happen by observation only, modern microscopy techniques now enable us to image at unprecedented spatial and temporal resolutions, through the 'eyes' of many and very diverse imaging modalities.

The unfathomable amounts of data acquired in the context of biomedical research endeavors cannot any longer be analyzed by observation alone. Instead, algorithmic solutions help researchers to study and quantify large image data.

In the past 5 years, our abilities to use artificial neural networks (ANNs) for the automated analysis of scientific image data gained significant traction, and many important analysis problems have now much improved solutions based on ANNs. At the same time, we start being aware of limitations that come with this new set of machine learning approaches.

In my talk I would like to update you on some of the latest algorithmic developments from our lab. More specifically, I will talk about improved but easy to use denoising and segmentation methods. Furthermore, I will show how downstream processing tasks can benefit from the properties of our new methods. Finally, I will introduce you to the BioImage.IO Model Zoo -- a much needed and useful infrastructure we are currently building together with several other labs. The Model Zoo will help to improve the useability and sharability of ANN-based analysis solutions.