

Workshop – “Processing and Analysis of Scientific Images”

Content:

The workshop – “Processing and Analysis of Scientific Images” aims to teach natural scientists from different areas of life science how to handle and process digital images starting from e.g. microscopic image acquisition until the incorporation into the final publication figure. This includes important theory about high quality digital images in general (e.g. how to achieve good resolution) as well as a broad spectrum of methods for scientifically correct image processing and specific analytical purposes according to high scientific standards. You will learn how to extract different types of information from your images and how to quantify objects and intensities. Additionally, the workshop includes a lot of hands-on sessions, methods to automate repetitive tasks to decrease time investment while reducing user bias. You will be able to revisit the learned material using the provided exercises and script also later on. **The workshop content as designed for the IRTG 914 is generally of importance for scientists working with digital images but has a strong focus on microscopy, image processing and analysis** (and not so much on publication figures)! Optional topics will be adjusted to meet the participants needs as good as possible if there is time left.

Furthermore, specific participant question regarding image processing or solutions for analysis issues can be personally discussed if communicated beforehand (e-mail with question and example images).

Specific Topics (among others):

- Basics about correct **microscopic** image acquisition
 - How to achieve good image resolution (sampling)
 - Image formats - which formats serve scientific images and which should be avoided
 - Metadata and other important information saved beyond the visible image
- The histogram and correct image adjustments avoiding alterations - contrast and brightness
- Dimension scaling of images and defining the scale bar
- Different image/purpose dependent background subtraction/correction methods.
- Use of different image filters to improve extractability and preparation for further analysis
- Image segmentation - How to extract specific objects of interest (e.g. cells positive for a certain marker stain)
- Automated object counting and measuring as well as creation of automatic ROIs (regions of interest)
- Image Quantifications (selected topics depending on participants field of interest):
 - Pre-requisites for reliable fluorescent intensity measurements and co-localization analysis
 - Procedures towards fluorescent intensity measurements
 - insight into statistical co-localization analysis

Depending on the remaining time (and interest) a selection from the following will be included:

- Particle tracking in 2D (or 3D) (including insight into image registration)
- Insight into automation of processes using macros
- Ethics in image handling, processing and publication - where are the limits?!

Target Group:

PhD Students and PostDocs which are working or plan to work with digital (micrograph) images. The workshop has a strong focus on fluorescent microscopic images and life science applications but most of the workshop content also applies for digital images of different origin in general. Some imaging experience is of advantage but not necessary. No previous software knowledge required.

Methodology

During the practical parts of the workshop we will use the professional software Fiji (customized ImageJ bundle). All necessary software will be provided and installed during the workshop. Software is free to use (open source).

Trainer:

Dr. Jan Brocher (www.biovoxxel.de)