

Quantitative Imaging and Analysis for Biologists (QIAB) – 2019

Location: Room 104 Stellar-Chance

Lecture Dates & Times: Tuesdays & Thursdays, Sept. 17 – Oct. 31, 2019, 10 am – 12 noon

TA Office Hours: Thursdays, 1-2 pm in room 600 CRB or by appointment

Organizer: Andrea Stout (astout@pennmedicine.upenn.edu) and Melike Lakadamyali (melikel@pennmedicine.upenn.edu)

TA: Stephen Coscia (scoscia@pennmedicine.upenn.edu)

Required materials: a laptop with the free software Fiji (<http://imagej.net/Fiji#Downloads>) installed.

Schedule of topics and speakers

| Day | Tuesday 9/17/19 | Thursday 9/19/19 | Tuesday 9/24/19 | Thursday 9/26/19 |
|--------------------------------|---|--|--|--|
| Speaker | Andrea Stout | Andrea Stout | Andrea Stout | Melike Lakadamyali and Pantelis Rompolas |
| Topic for 10-12 lecture | Fundamentals: light, image formation, fluorescence; widefield vs confocal | Image data properties: signals, noise, sampling. | Intro to Fiji & digital data: display adjustments and some simple measurements | Fluorescence labeling, probes; sample prep for live or fixed cells, Pantelis doing tissue considerations |
| Activity for this week | | | Establishing good practices for quantitative imaging | |

| Day | Tuesday 10/01/19 | Thursday 10/03/19 | Tuesday 10/08/19 | Thursday 10/10/19 |
|--------------------------------|--|------------------------------------|--|--|
| Speaker | Andrea Stout | Andrea Stout | Andrea Stout | Andrea Stout and Sandra Maday |
| Topic for 10-12 lecture | Image processing: filters, background subtraction, shading correction, alignment | Intro to macros in ImageJ and Fiji | Introduction to segmentation and object-based measurements | More segmentation in Fiji; machine learning with ilastik |
| Activity for this week | First Fiji exercises – figure prep and measurements | | Fiji exercises: measurements and macros | |

| Day | Tuesday 10/15/19 | Thursday 10/17/19 | Tuesday 10/22/19 | Thursday 10/24/19 |
|-------------------------|---|--|---|---|
| Speaker | Andrea Stout | Melike Lakadamyali | Andrea Stout | Melike L. and Liz Rhoades |
| Topic for 10-12 lecture | Working with 3D and 4D data in Fiji | Tracking concepts (simple object tracking, manual tracking, Trackmate) | Colocalization basics (Pearson's Manders, area overlap) | Advanced methods (super-res, FRET, FLIM, FCS) |
| Activity for this week | Fiji exercises: segmentation and measurements | | Fiji exercises: Tracking and colocalization | |

| Day | Tuesday 10/29/19 | Thursday 10/31/19 |
|-------------------------|--------------------------------|-------------------|
| Topic for 10-12 lecture | 5-minute student presentations | |

Grading for the course:

Your final grade for the course will be based on the following:

Participation: This includes participation during class sessions as well as on Canvas quizzes and Fiji exercises

Out-of-class homework: The Fiji exercises will include questions to be answered on Canvas and some file submissions. We will not assign grades but we will keep track of each student's submissions.

End-of-class presentations: The last two class sessions are set aside for student presentations: each student must give a very short (no more than 10 minutes) presentation using image data you have acquired for your research or for this class (if you need help acquiring images ask an instructor or TA for help and we can work with you). This presentation should not be dedicated to the entire research project. Rather, you should pick one image (or small set) and (a) prepare a presentation-quality image using guidelines we've discussed in class; and (b) carry out a measurement from this image (or set of images) from which you can extract useful quantitative information aimed at answering a very specific question. A simple example would be to measure areas of particular structures in a group of images and plot a histogram.