Bioimage Analysis for Quantitative Microscopy course

Sep 30 - Oct 04, 2024

BioCity Turku

WELCOME

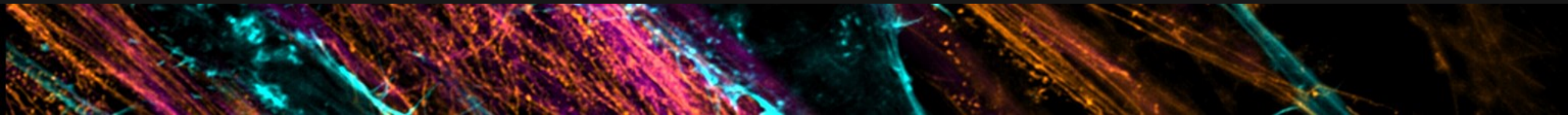
Joanna

Hanna

Stéphane

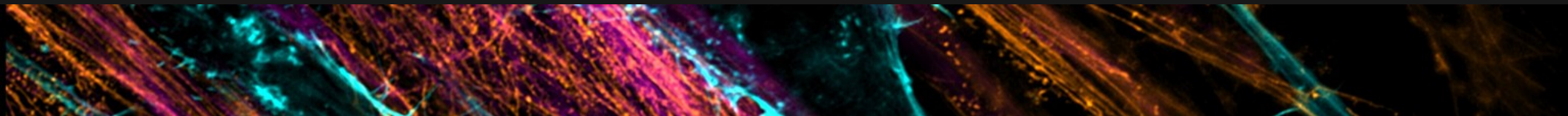
Sujan

Marcela



A bit of housekeeping

- Everyone has a computer? Everyone has access to an outlet?
- Everyone has a mouse?
- Everyone has all the software installed?
- Everyone is fed and watered and ready to go?



What to expect

Bioimage Analysis for Quantitative Microscopy

Course program
30.9-4.10.2024

Trainers:
Hanna Grobe
Elnaz Fazeli
Joanna Pylvänäinen
Sujan Ghimire
Stéphane Rigaud

*open to all interested

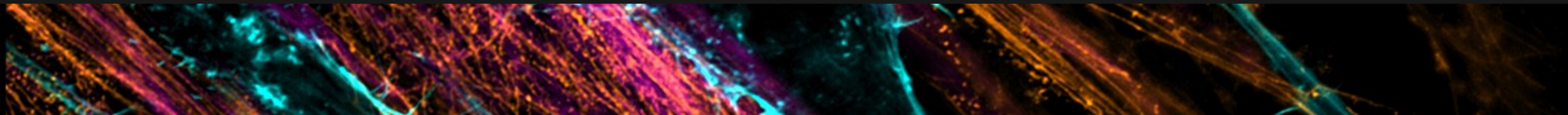
Locations:
Auditorium Biokemi, Biocity 3rd floor
Auditorium Biologi, Biocity 2nd floor
Putous Auditorium, Joki Conference Center

	Mon	Tue	Wed	Thu	Fri
9:00-10:00	**Intro + Fiji Basics** Hanna Grobe	**DL lecture** Joanna Pylvänäinen	**QuPath** Stéphane Rigaud	**TrackMate + CellTracks Colab lecture** Joanna Pylvänäinen	
10:00-10:15					**Presentation: TBI image data team** Pasi Kankaanpää
10:15-10:30	*break*	*break*	*break*	*break*	**Project presentations**
10:30-11:45	**Fiji Basics** Hanna Grobe	**DL demo annotation and training** Sujan Ghimire	**QuPath** Stéphane Rigaud	**Cell tracking with TrackMate** Joanna Pylvänäinen	
12-13	*Lunch (at own cost)*	*Lunch (at own cost)*	*Lunch (at own cost)*	*Lunch (at own cost)*	*Lunch (at own cost)*
13:00-13:15	**Presentation: Euro-BioImaging** Jiri Funda, Susanne Vainio	**Science talk *: Deep Learning in Microscopy** Guillaume Jacquemet	**Science talk *: Deep Learning in Histopathology** Pekka Ruusuvuori	**Keynote talk *: How to not lie with charts - better data visualisations for life sciences** Helena Jambor	**Science talk *: Next-generation file formats, version control, and publishing your data** Junel Solis
13:15-14:00	**Fiji Macros** Elnaz Fazeli				
14:00-15:15		**DL demo quality control** Joanna Pylvänäinen	**QuPath** Stéphane Rigaud	**Track Analysis using CellTracksColab** Hanna Grobe	**Work with your own data**
15:15-15:30	*break*	*break*	*break*	*break*	*break*
15:30-16:45	**Fiji Macros** Elnaz Fazeli	**DL demo apply to own data** Joanna Pylvänäinen	**QuPath** Stéphane Rigaud	**GPU accelerated Fiji image processing** Stéphane Rigaud	**Work with your own data** Goodbye and farewell
17:00-21:00				**Course dinner in Mauno**	

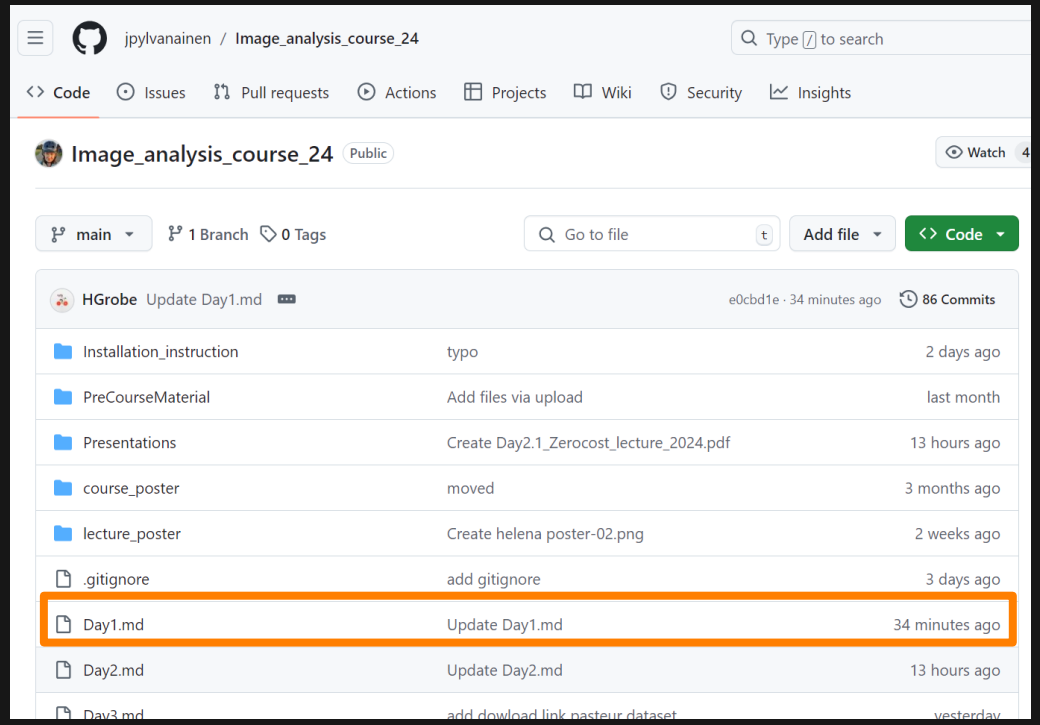
The info for each day can be found on the GitHub page for this course:

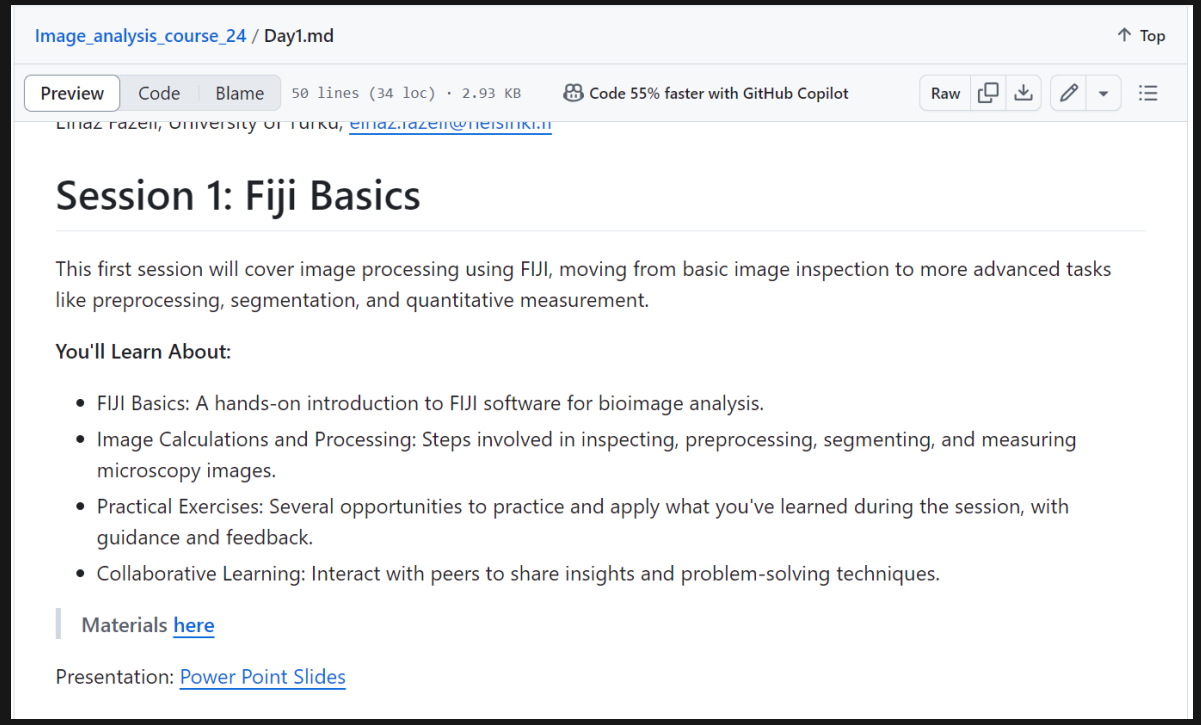
.../Image_analysis_course_24

(You should also have an email with the link in your inbox.)



How the GitHub works

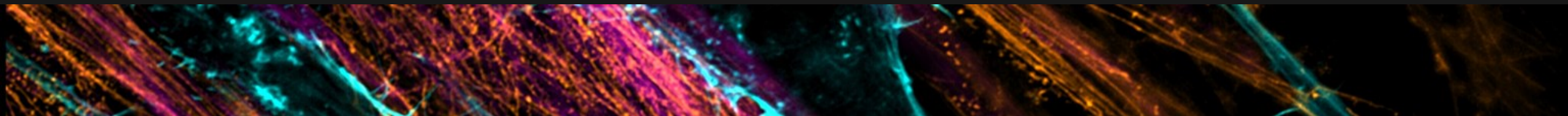




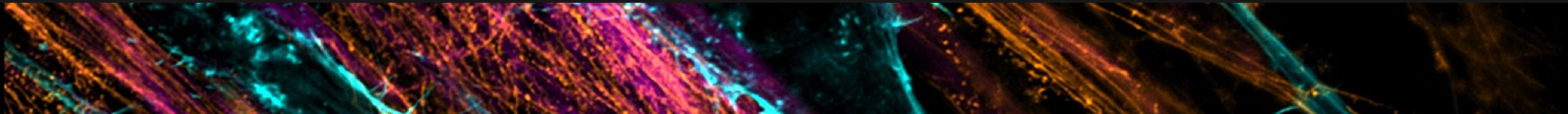
Before we get started for real...

Set a goal for the week

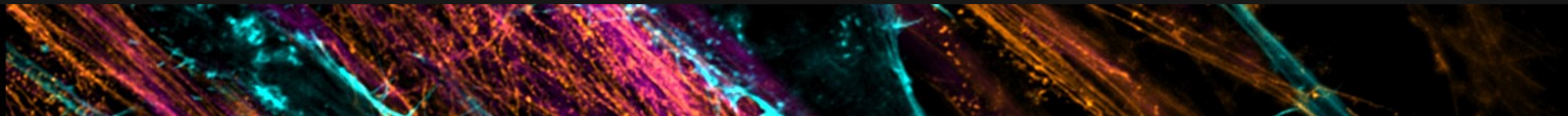
Get to know your neighbor



Get to know your neighbor



… now to the real stuff



FIJI Basics

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17.00-21.00	

Part 1

Take homes from the precourse material
A walk through the image analysis pipeline

Part 2

The struggle is real - get your FIJI warmed up

Take home from the pre course

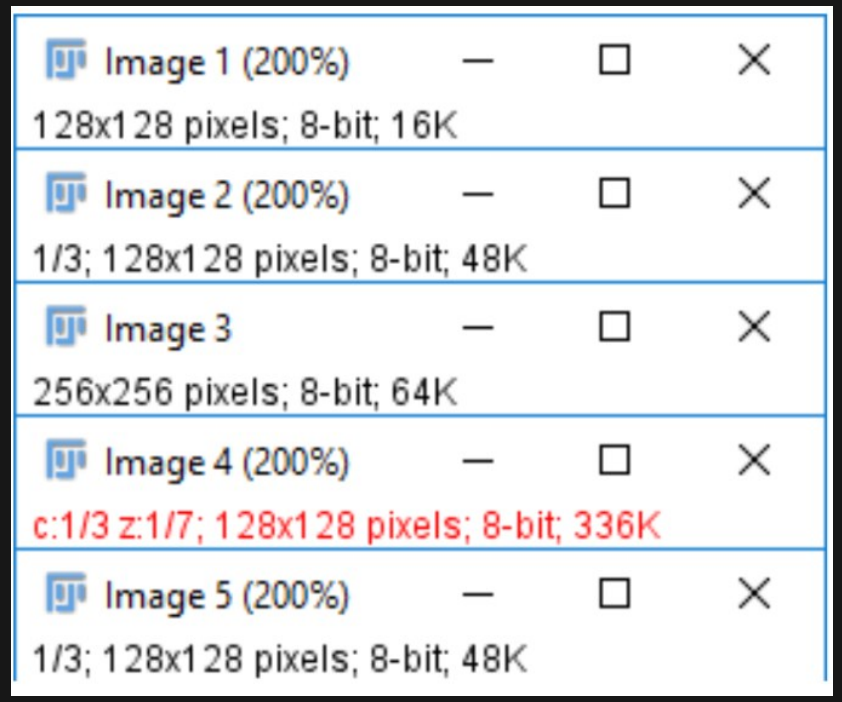
? Image conversion is affected by the image display
YES (here's why)

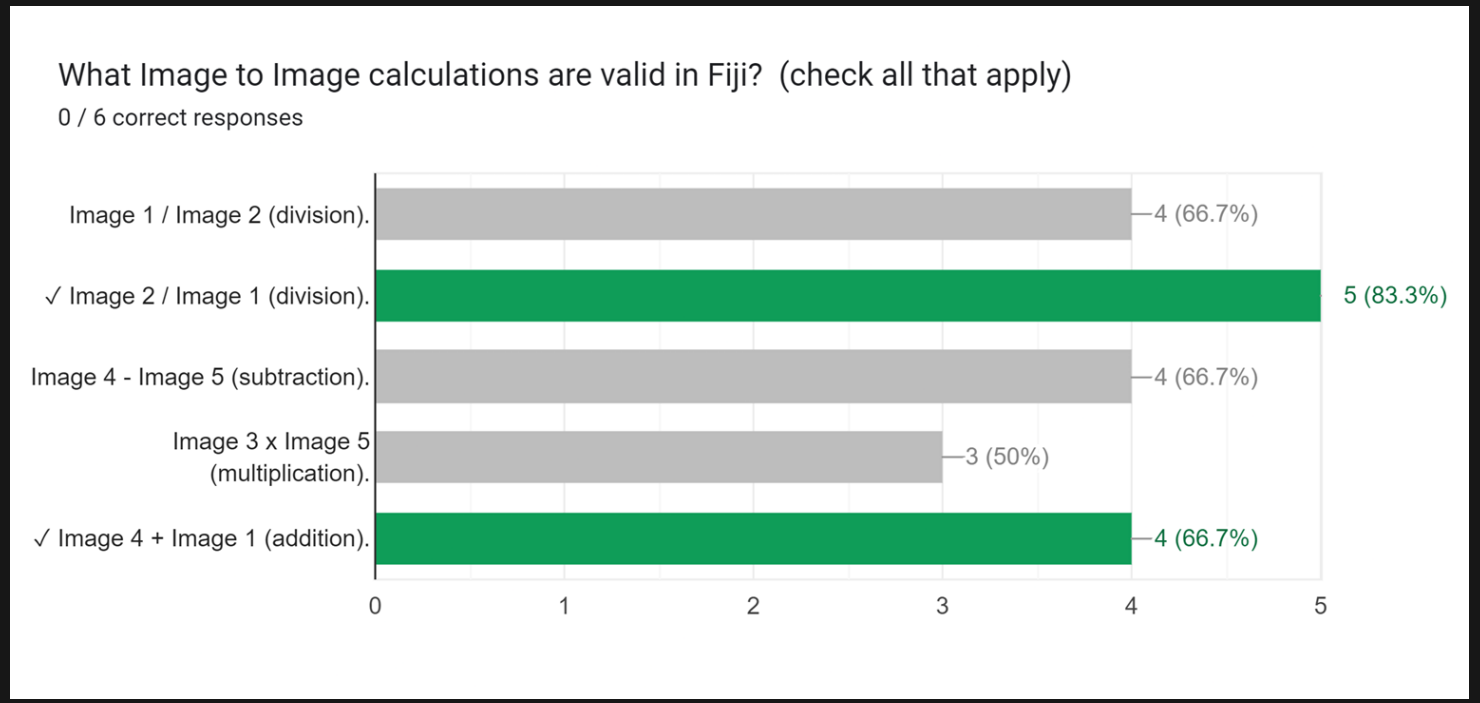
? What Image to Image calculations are valid in Fiji? (check all that apply)
[1/3; 128x128pix; 8bit] / [128x128pix; 8-bit]
[c:1/3; z:1/7; 128x128pix; 8bit] + [128x128pix; 8-bit]

? What is the normalization factor for a 3 x 3 filter kernel, where all elements are 1?
1/9 (here's why)

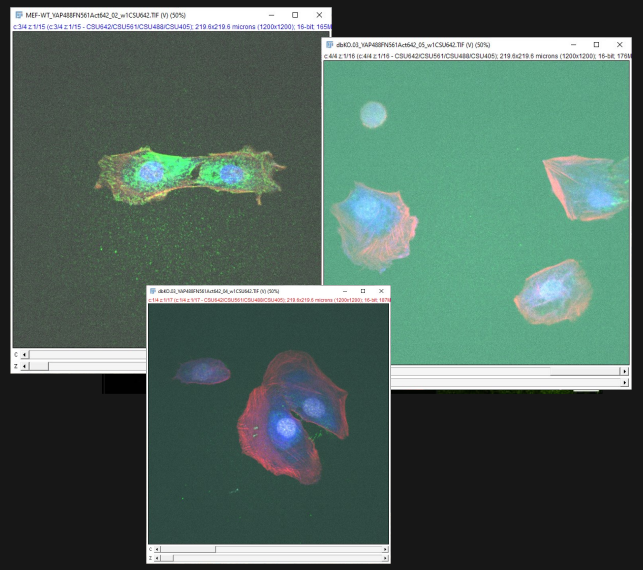
! Saving an image with an ROI in TIFF format from Fiji also saves the ROI.

Image calculations



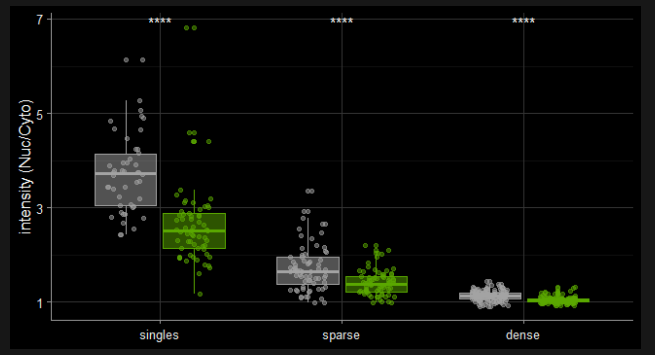


Let’s get going



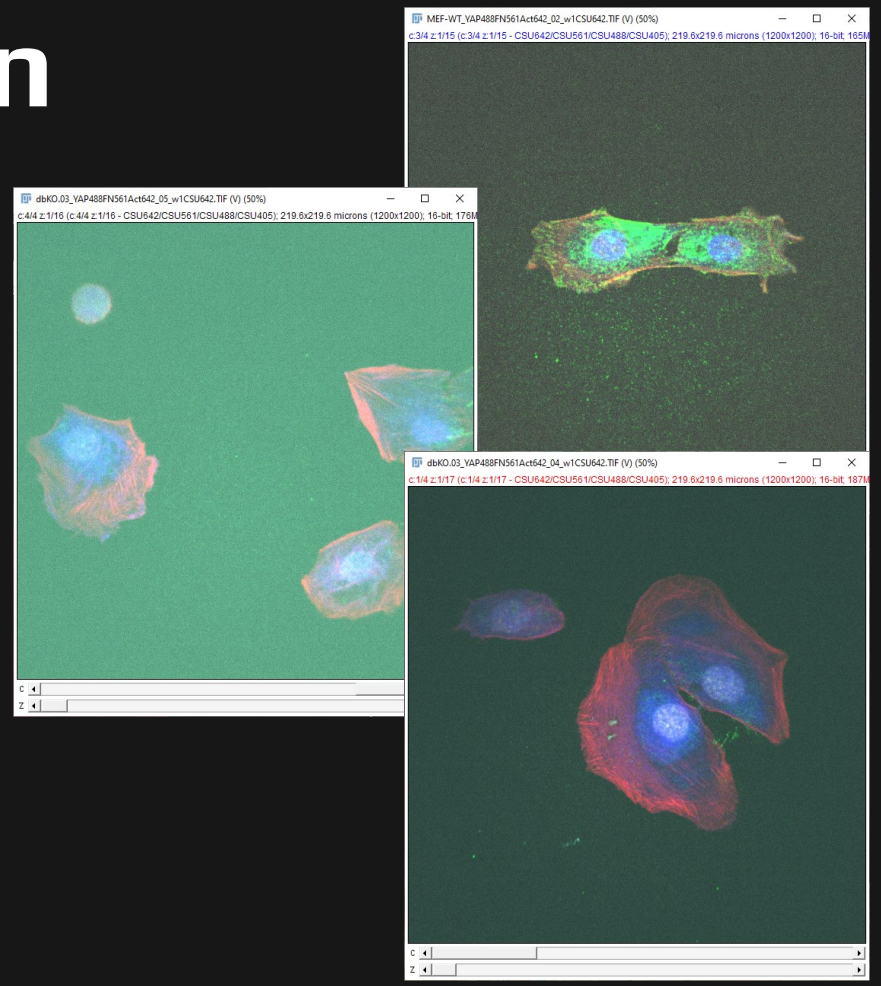
AIM: Analyze YAP localization

What are the steps?



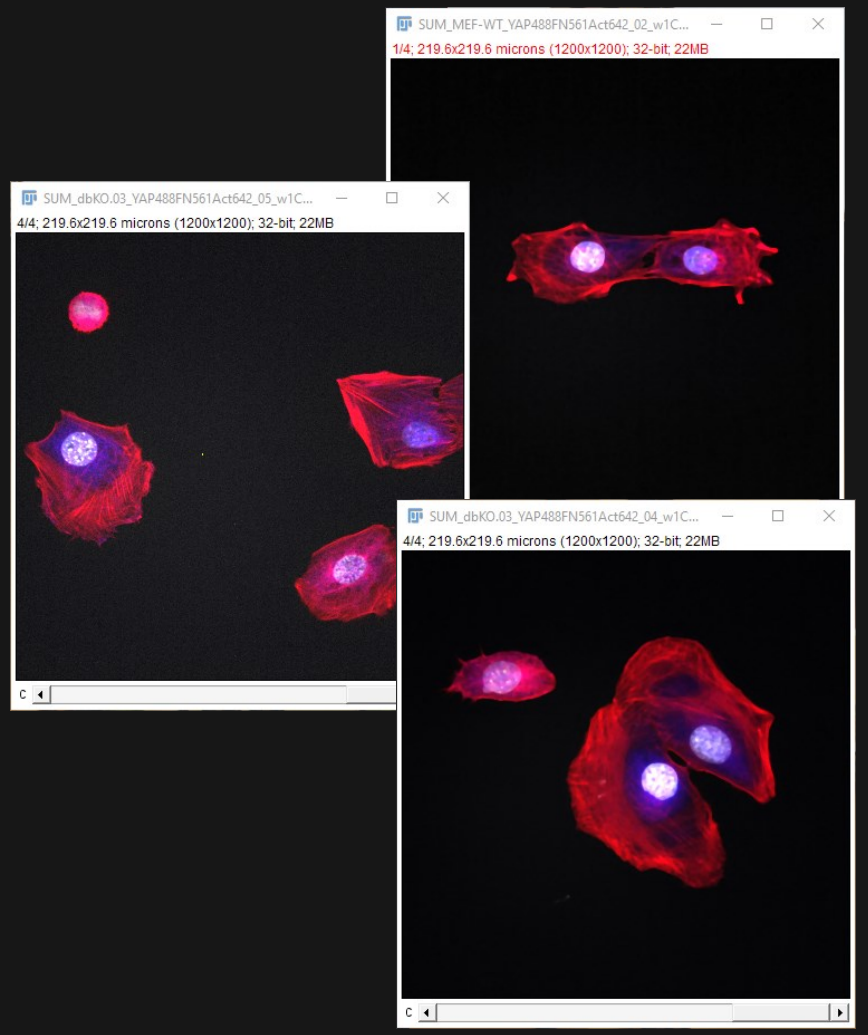
Step 1 - Image inspection

- Channels - what was stained
- Stack - do we have z stacks (and do we need them)
- Are there artefacts
- Are the images calibrated
- Did our traget stay in focus
- …



Step 2 - Preprocessing

- Filter
- Remove background
- Make projections
- Change bit depth
- Crop
- …

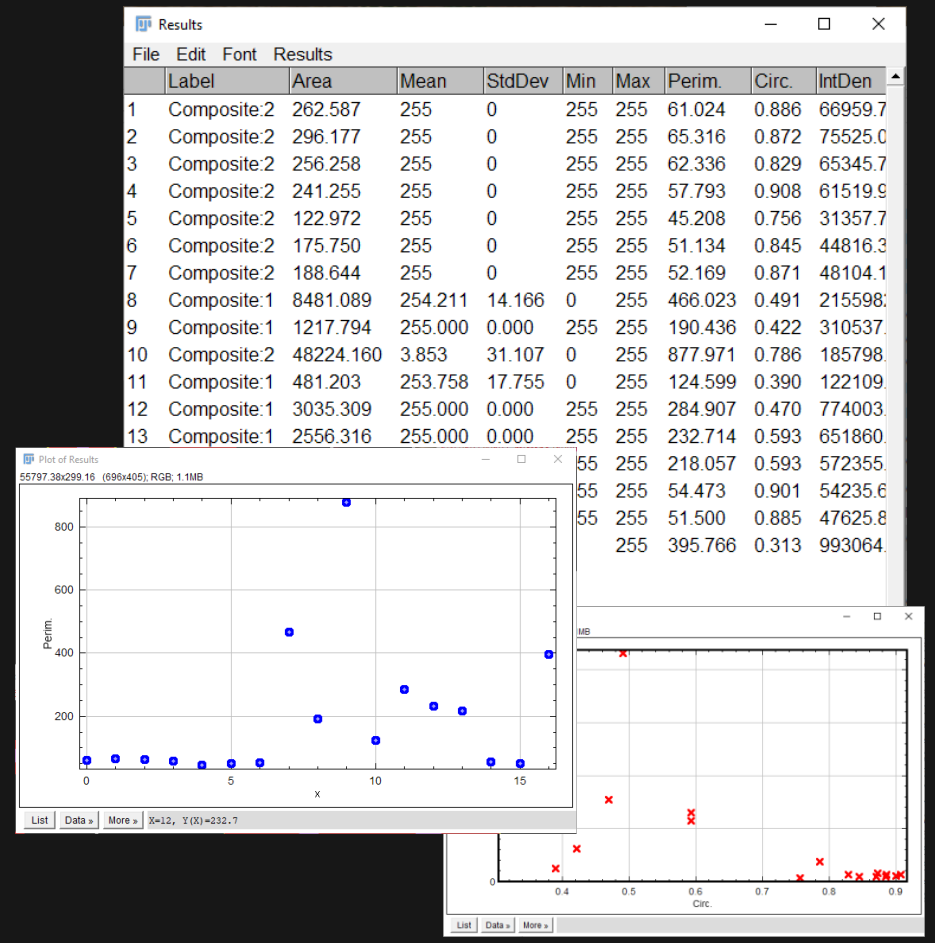


Step 3 - Segmentation

- What needs to be segmented?
- What kind of thresholding
- Binary operations

Step 4 - Image measurement

- Set measurements
- Analyse particles
- Inspect results table



Break time

Now you go!

Sample data - Raw

https://tinyurl.com/BAQM-D1raw

Data inspection

Preprocessing

15 min (10:45) work time
5 min check in

Now that you went:

TASK	MY SOLUTION	YOUR SOLUTION
Reduce z dimensions	Sum slices (Z-Project > SUM slices)	…
Duplicate channels for manipulations	Duplicate nuclei and actin	…
Filter	Median filter for both nucleus and actin (radius = 5px)	…

See “Script_1.ijm”

Now you go!

Sample data - Filtered /
Your own processed data

https://tinyurl.com/BAQM-D1filtered

Segmentation

Binary operations

15 min (11:00) work time
5 min check in

Now that you went:

TASK	MY SOLUTION	YOUR SOLUTION
Duplicate channels for manipulations	Duplicate nuclei and actin	…
Thresholding nuclei	Adaptive threshold	…
Thresholding actin	MinError	…

See “Script_2.ijm”

Now you go!

Sample data - Segmented /
Your own segmented data

https://tinyurl.com/BAQM-D1labelled

Image measurements

15 min (11:15) work time

Now that you went:

TASK	MY SOLUTION	YOUR SOLUTION
Duplicate channels for manipulations	Duplicate nuclei and actin	…
Measure nuclear YAP intensity	Analyse particles on thres. DAPI (size = 50 - Infinity) Measure on YAP signal	…
Measure cytoplasmatic YAP intensity	Create selection on thres. actin Add to ROI manager ROI manager XOR Measure on YAP signal	…

See “Script_3.ijm”

Lunch time







BREAK