

CR39 personal neutron dosimetry

... using 'Mask R-CNN'

Alberto Stabilini and Jeppe Brage Christensen
Paul Scherrer Institute (PSI)

`jeppe.christensen@psi.ch`

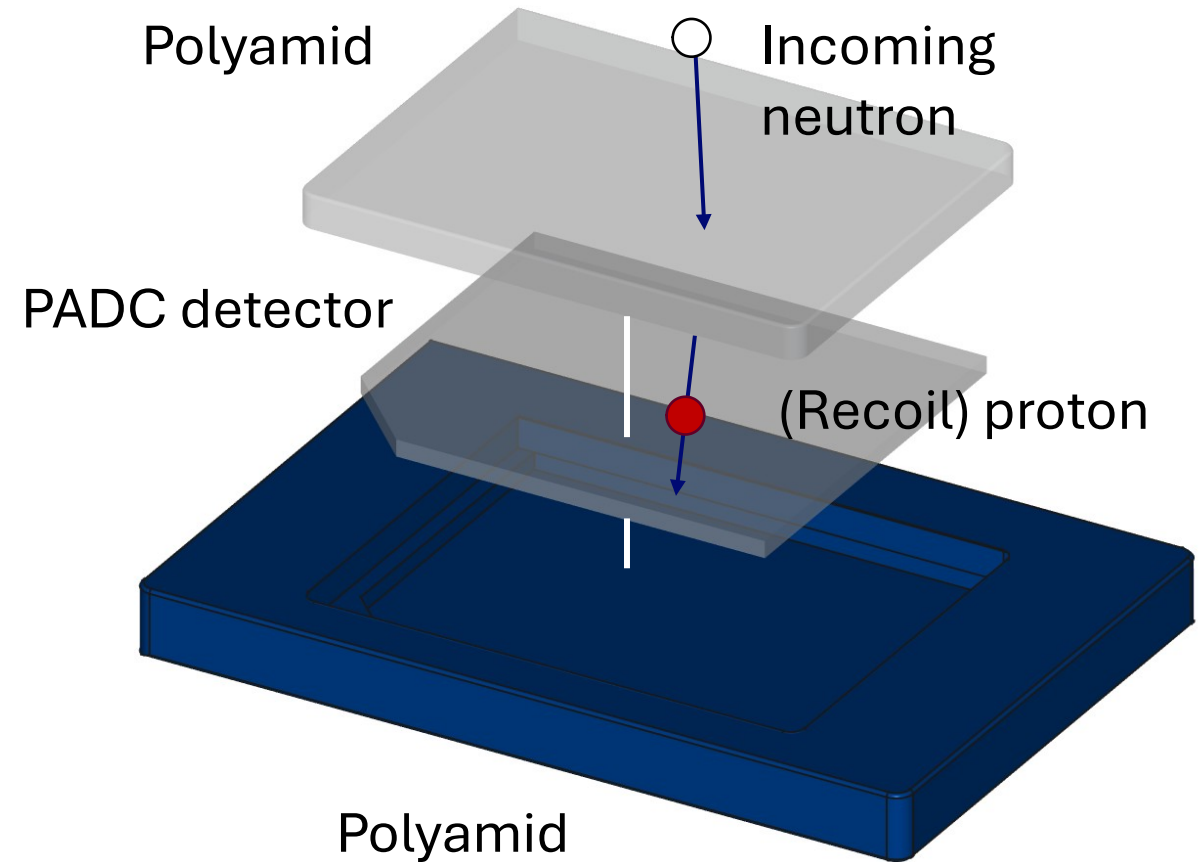
2026 EURADOS Winter School

Personal neutron dosimetry with CR39/PADC detectors

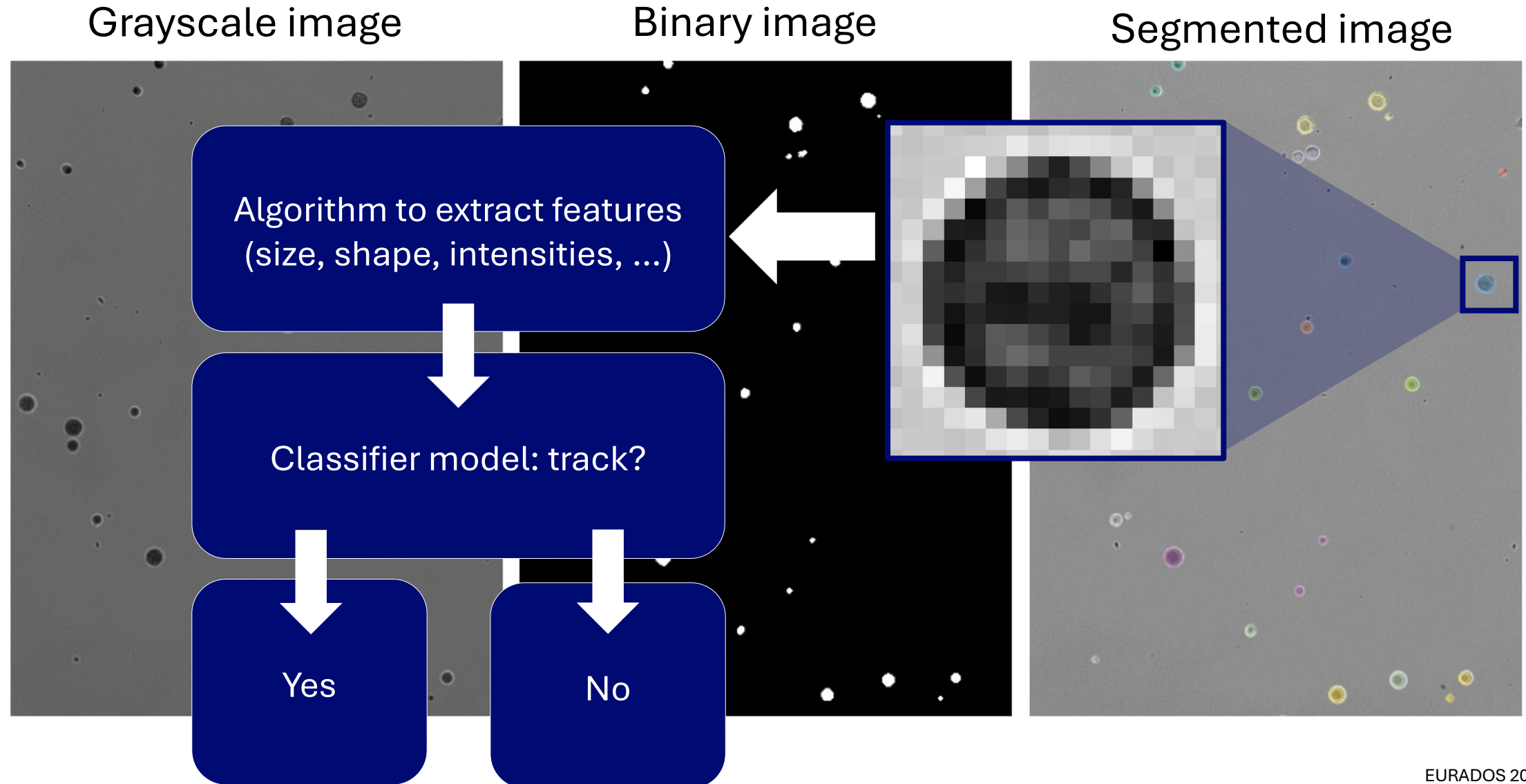
Photon dosimeter



Neutron dosimeter



Conventional track counting algorithms



Track counting using deep learning

Mask Regional Convolutional Neural Network
(Mask R-CNN):

- Instance segmentation
- Classification

In a single step.

2017-paper, 48k citations!

Mask R-CNN

Kaiming He Georgia Gkioxari Piotr Dollár Ross Girshick
Facebook AI Research (FAIR)

Bachelor thesis project,
PSI + AGH University, Krakow, Poland



Szymon Rybski

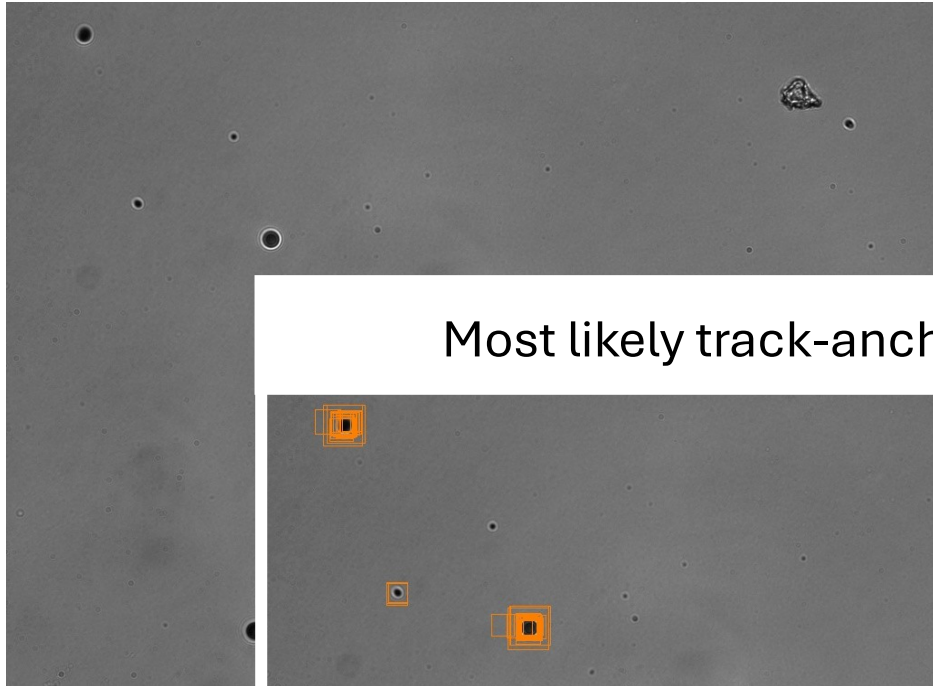


Michał Rejdak

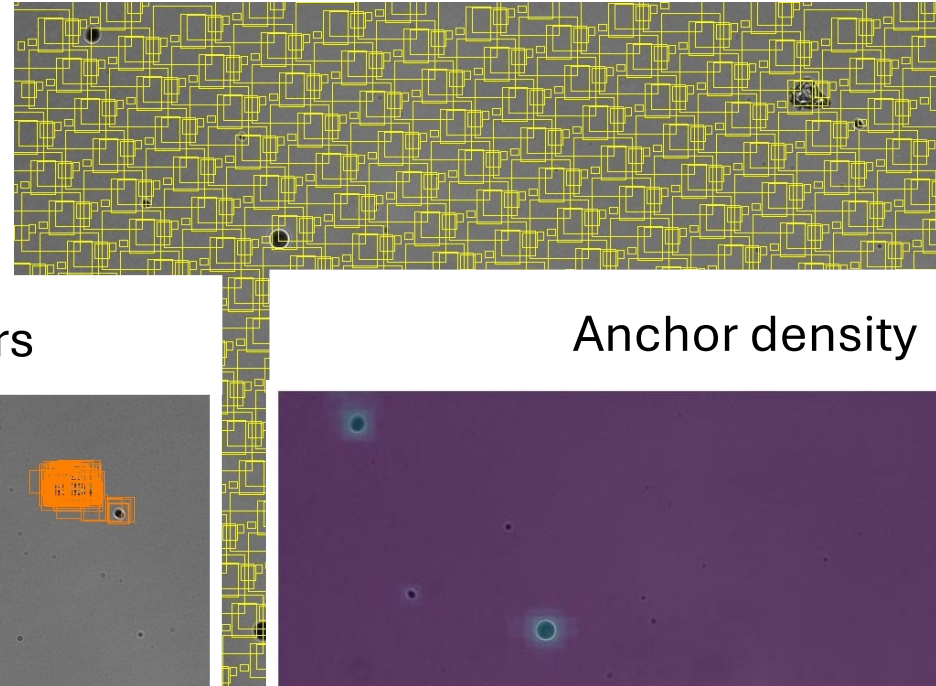
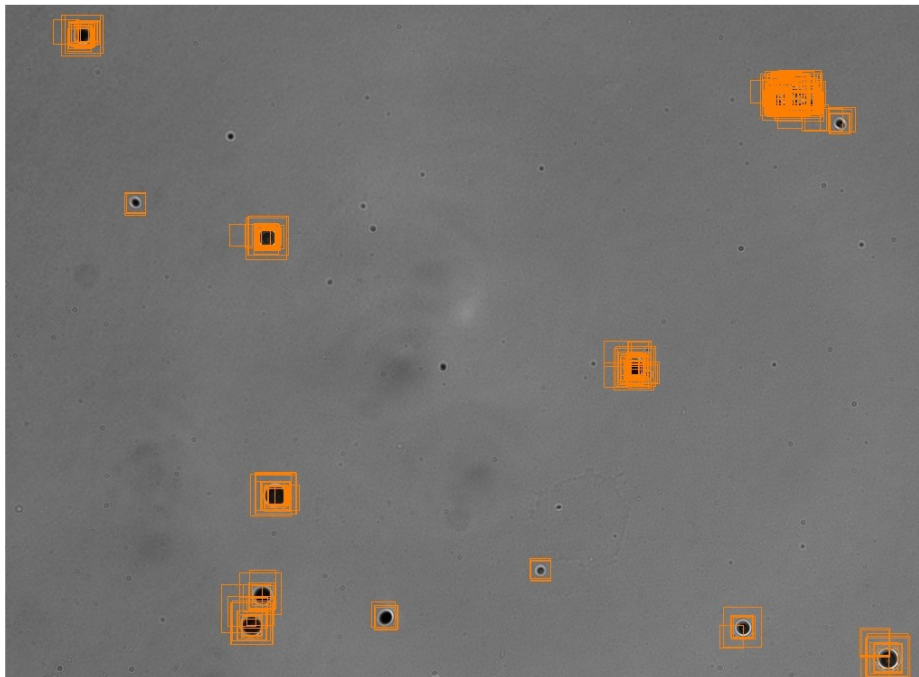
Region Proposal Network

Aim: Identify possible tracks

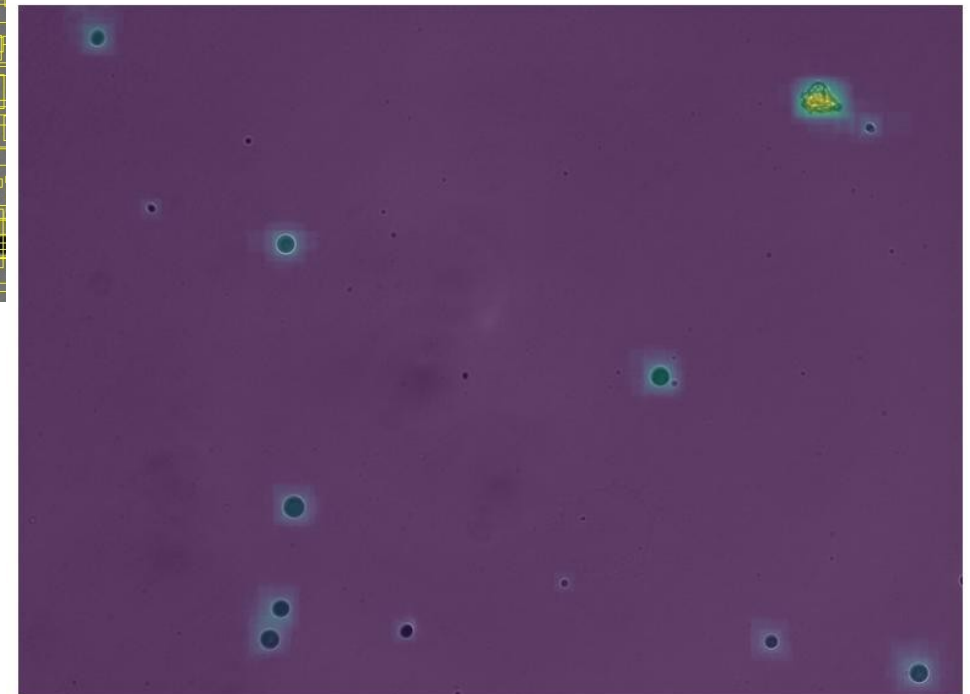
~ **586k** anchor suggested (only 0.2 % drawn)



Most likely track-anchors



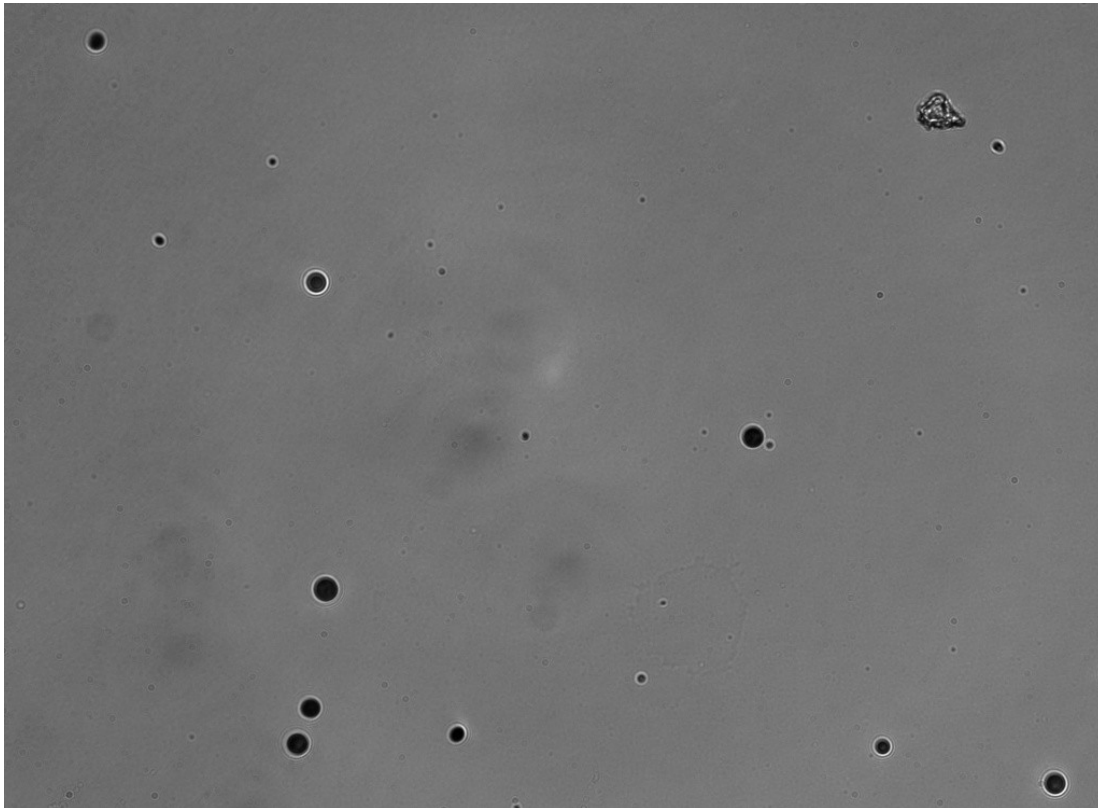
Anchor density



Track counting in CR39/PADC detectors

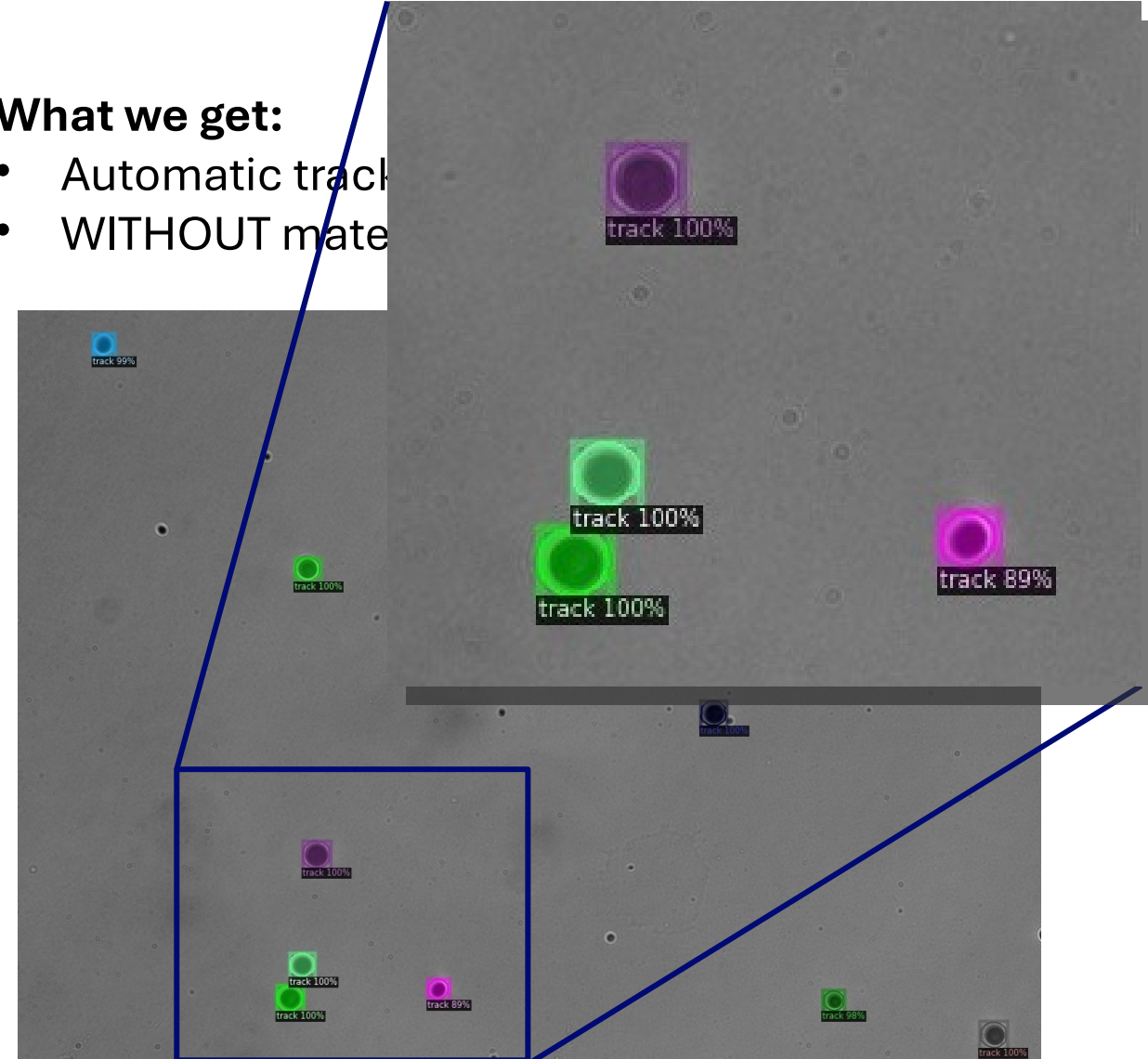
What we have:

- 300 images per detector



What we get:

- Automatic track
- WITHOUT mate



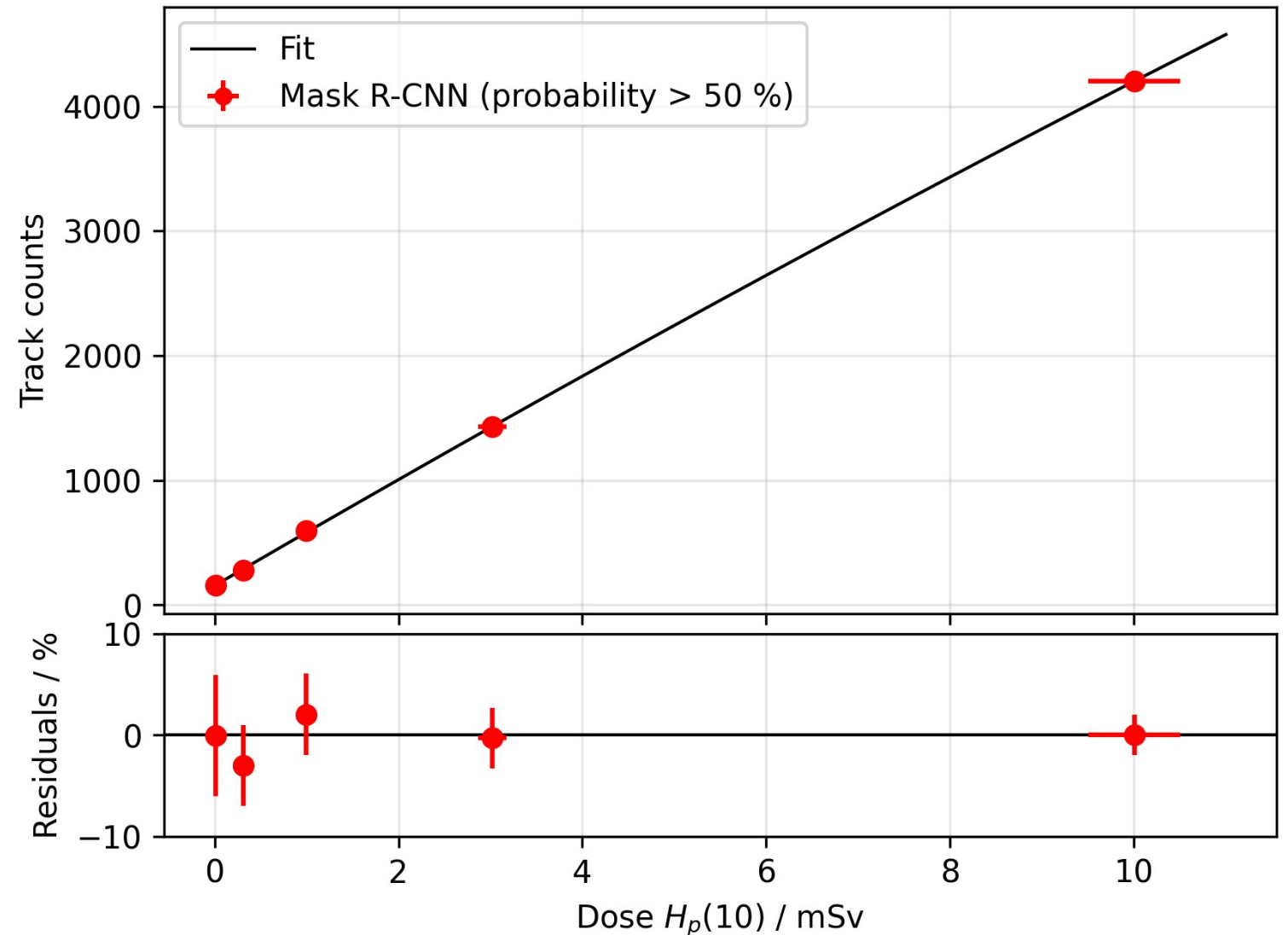
Algorithm linearity: preliminary results

Mask R-CNN:

Linearity within 5 %,
within requirements

for

- ISO 21909
- Swiss regulations



Summary

Pros:

- Quick segmentation and track counting ($\ll 1$ s/image)
- Independent of the routine algorithm

Cons:

- For training: Still need to guide the CNN what it should look for

Next steps:

- Replace 'Mask R-CNN' by non-Facebook software
- Benchmark against ISO 21909:
 - Reproducibility, energy response, ...