

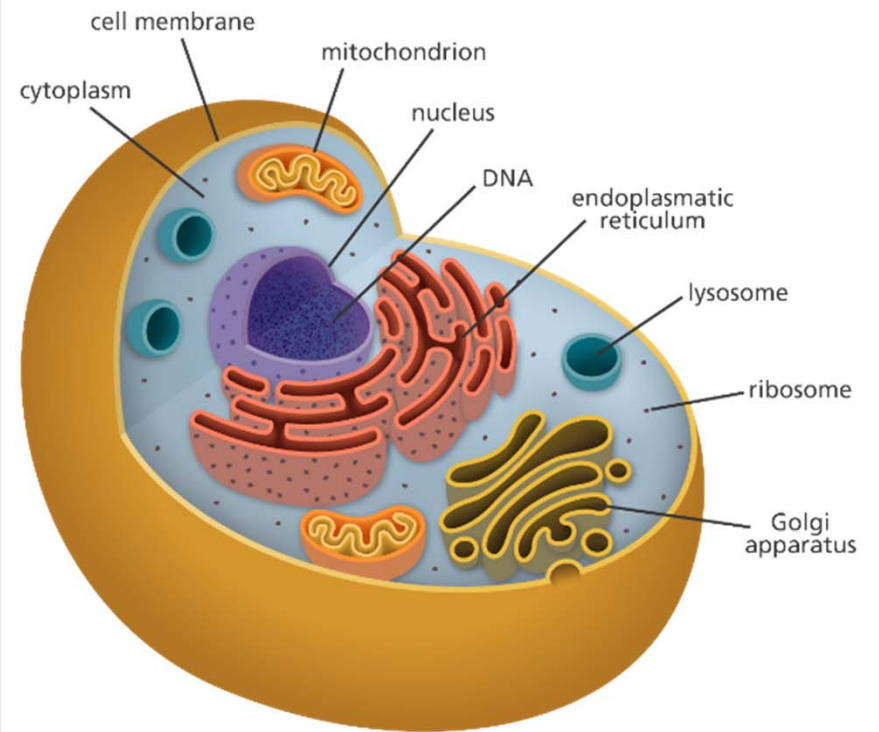
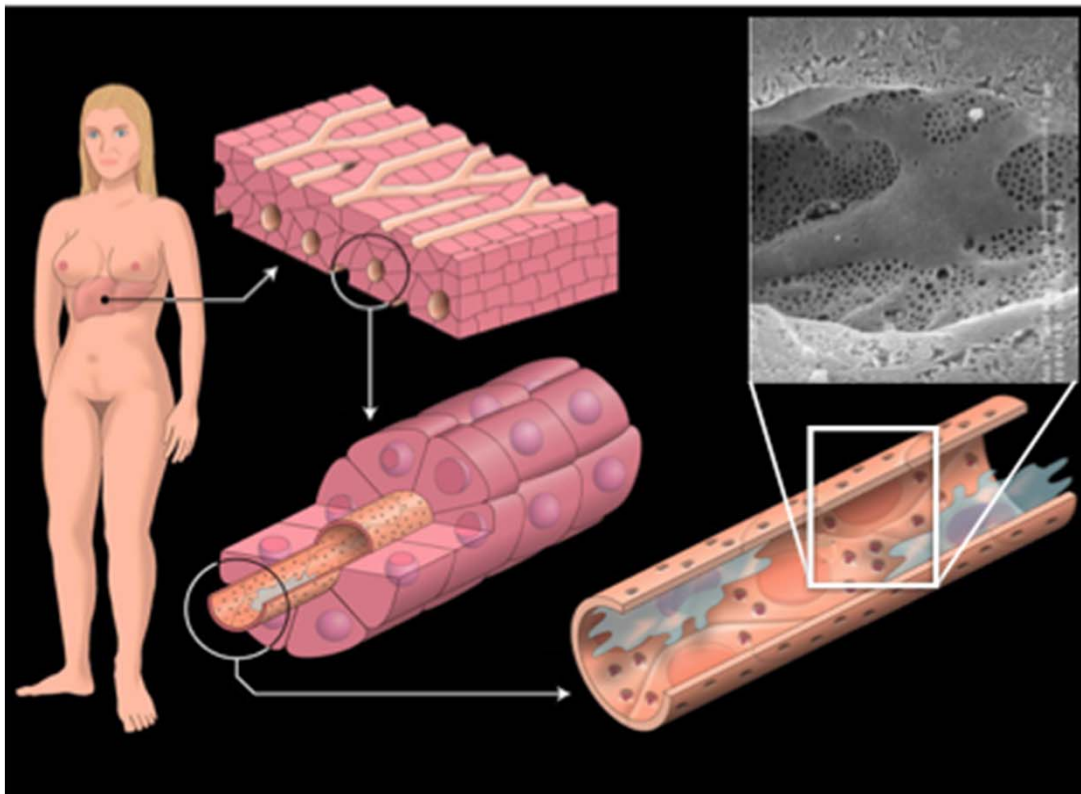


# Compute- and Data-Intensive Aspects of Computational Nanoscopy

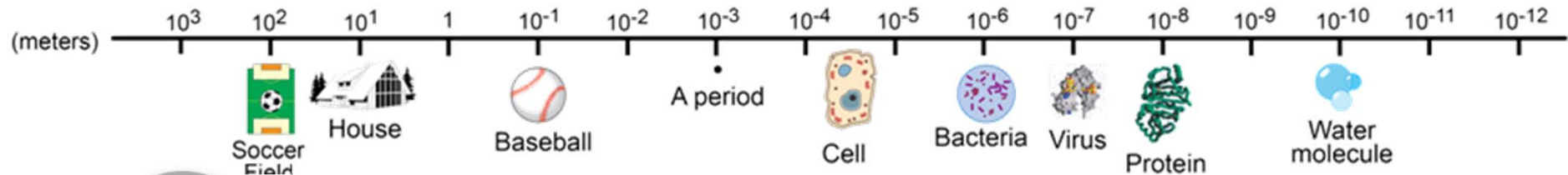
KRISHNA AGARWAL

DEPARTMENT OF PHYSICS & TECHNOLOGY, UIT THE ARCTIC UNIVERSITY OF NORWAY

# Microscopy and Nanoscopy



# Microscopy and Nanoscopy



Human eye

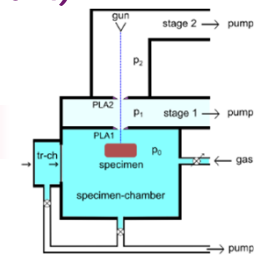


Optical microscopes



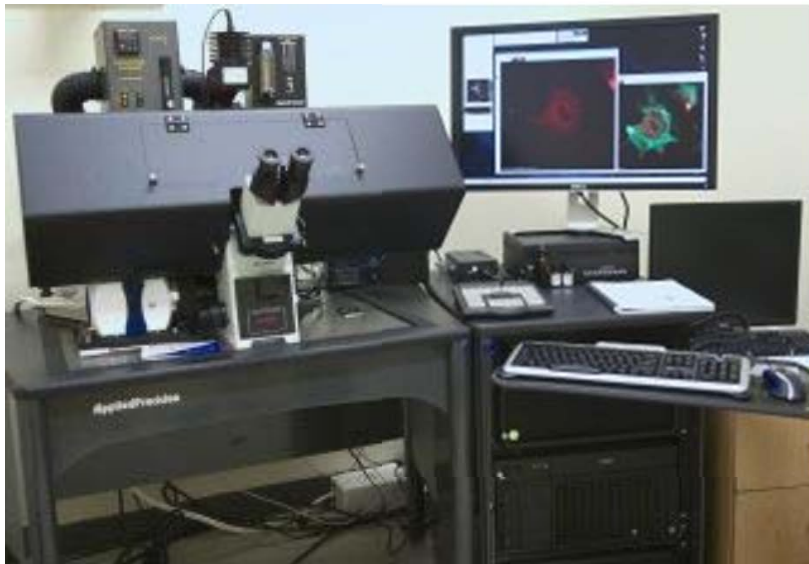
Nanoscopy  
(Nobel Prize 2014)

Electron microscopes

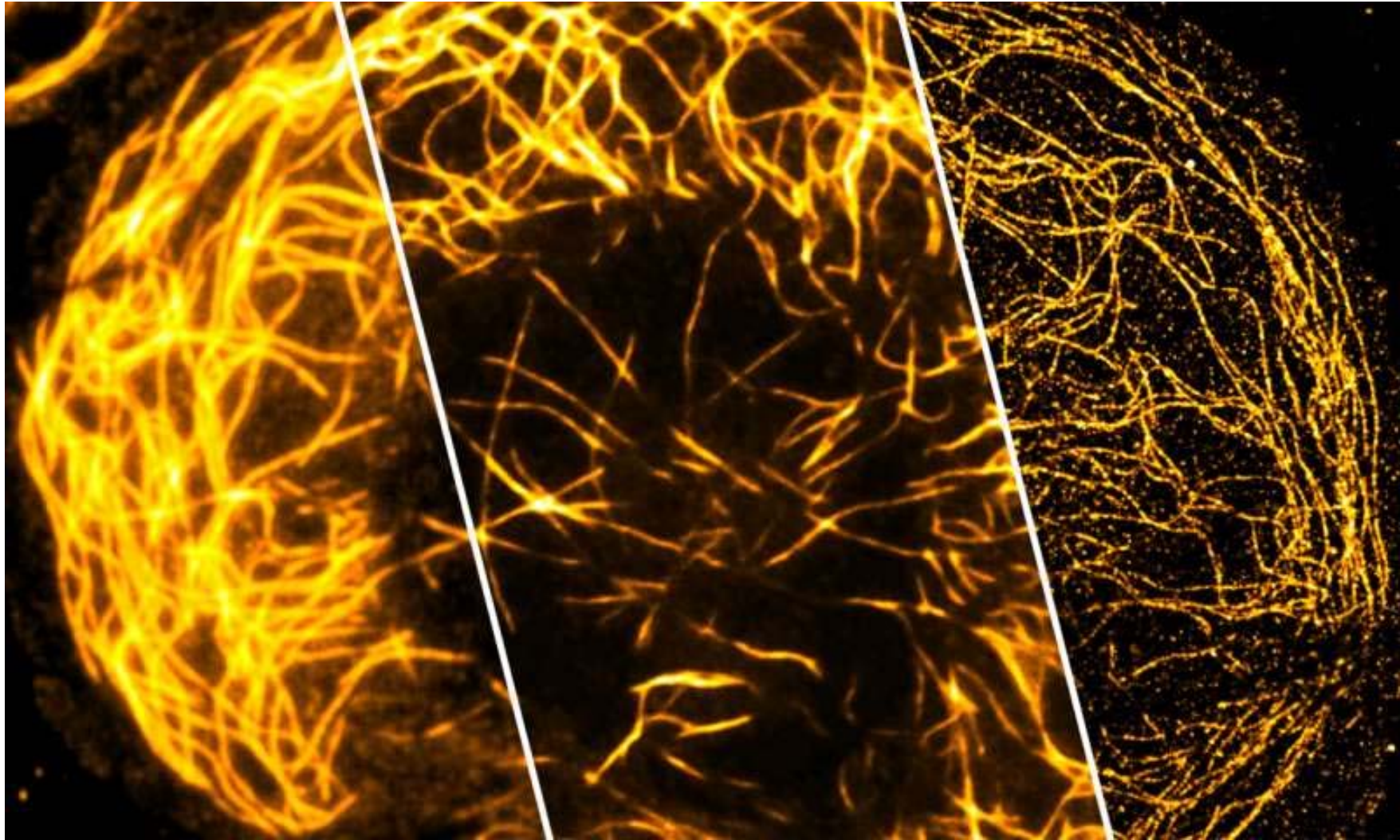


Basic ESEM gas pressure stages

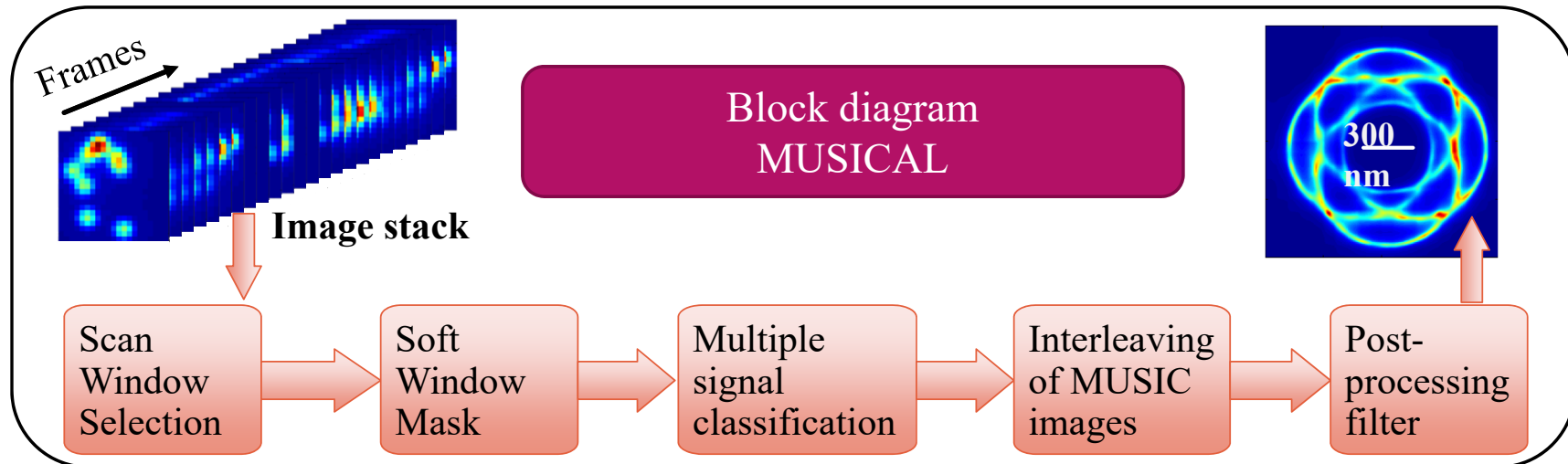
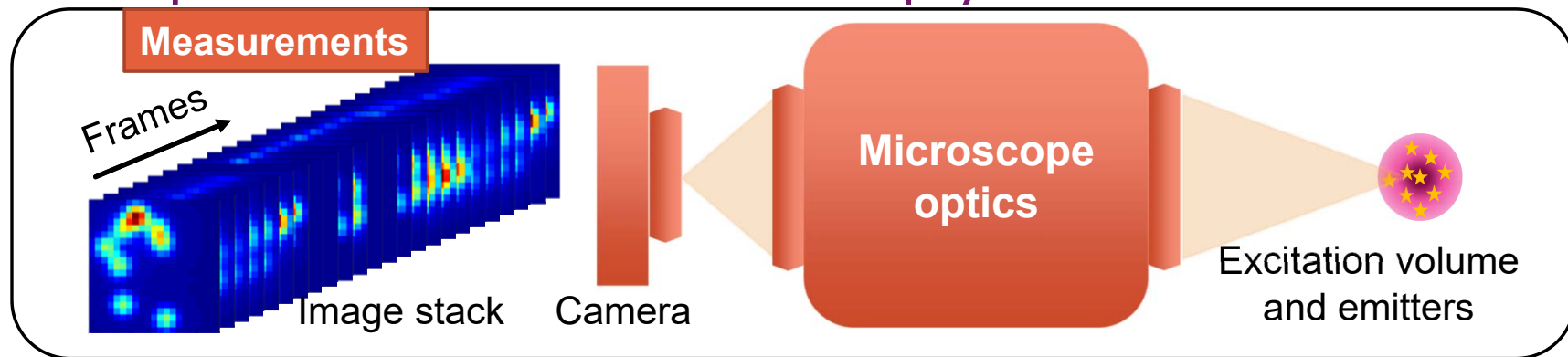
# Microscopy and Nanoscscopy



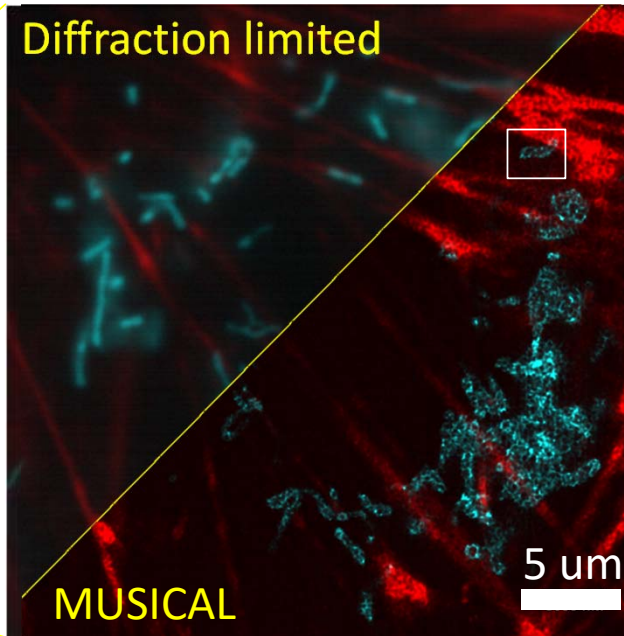
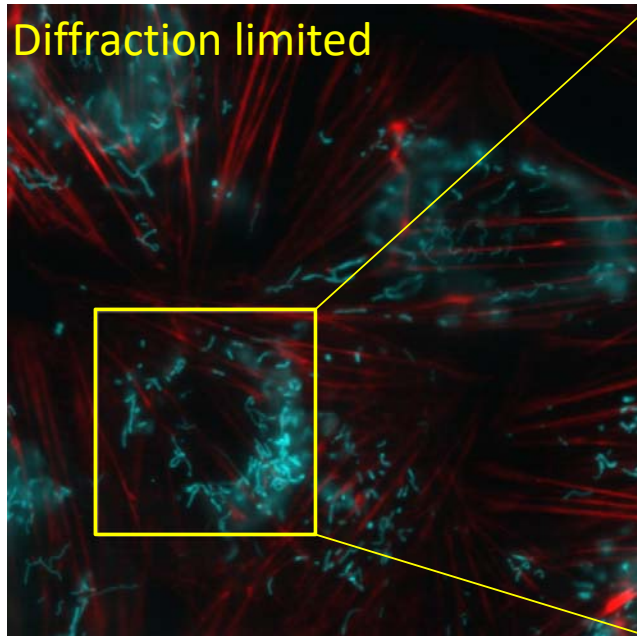
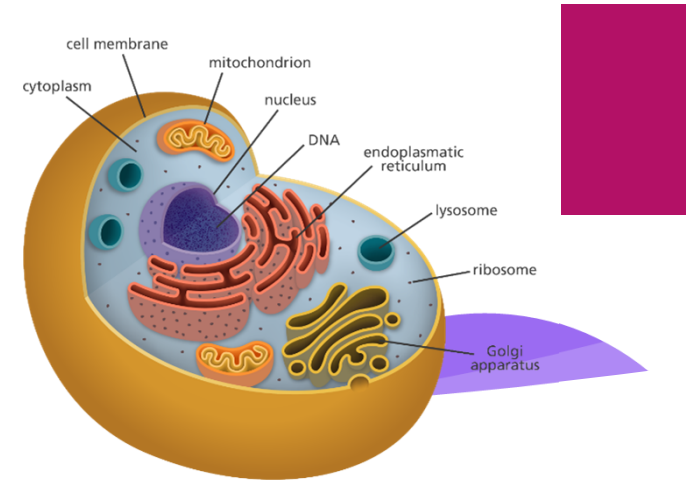
# Microscopy and nanoscopy



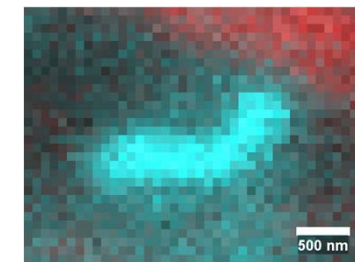
# Computational nanoscopy



# Computational nanoscopy

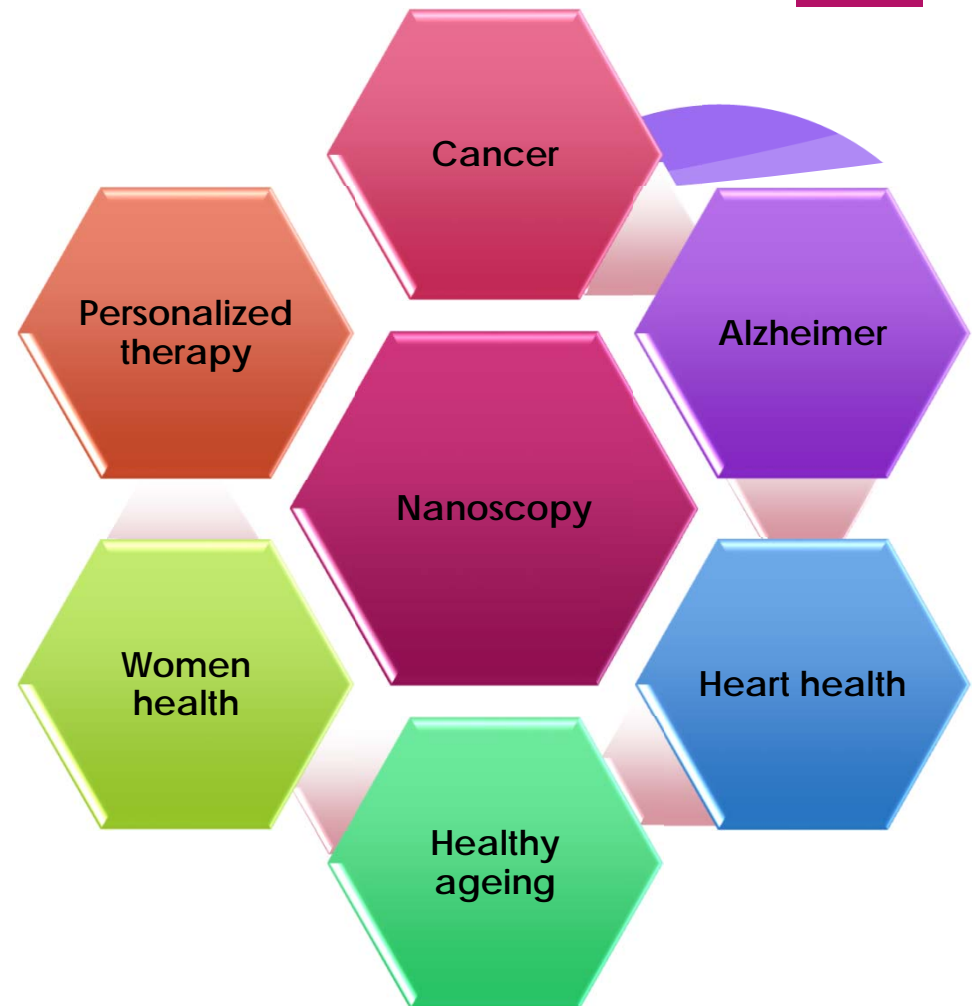


200 frames  
(2 sec, 5ms/frame)



# Computational nanoscopy - strengths

- ▶ Fast imaging
- ▶ Capable of live cell imaging
- ▶ Over minutes to hours
- ▶ High consequence to human society

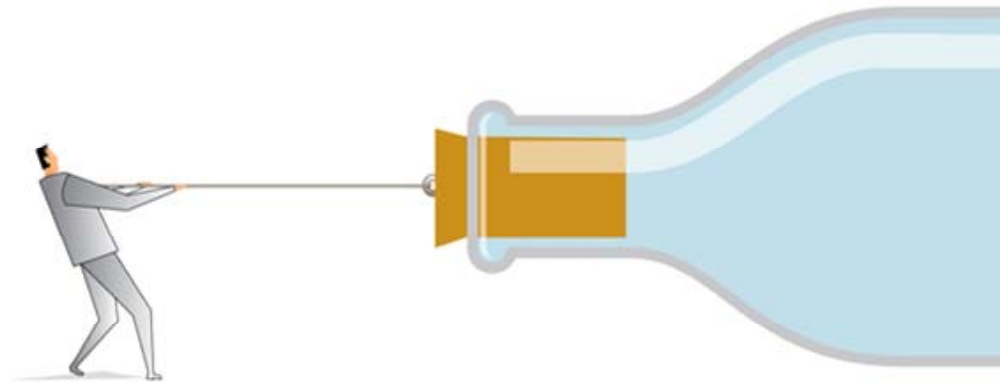


# Computational nanoscopy - challenges

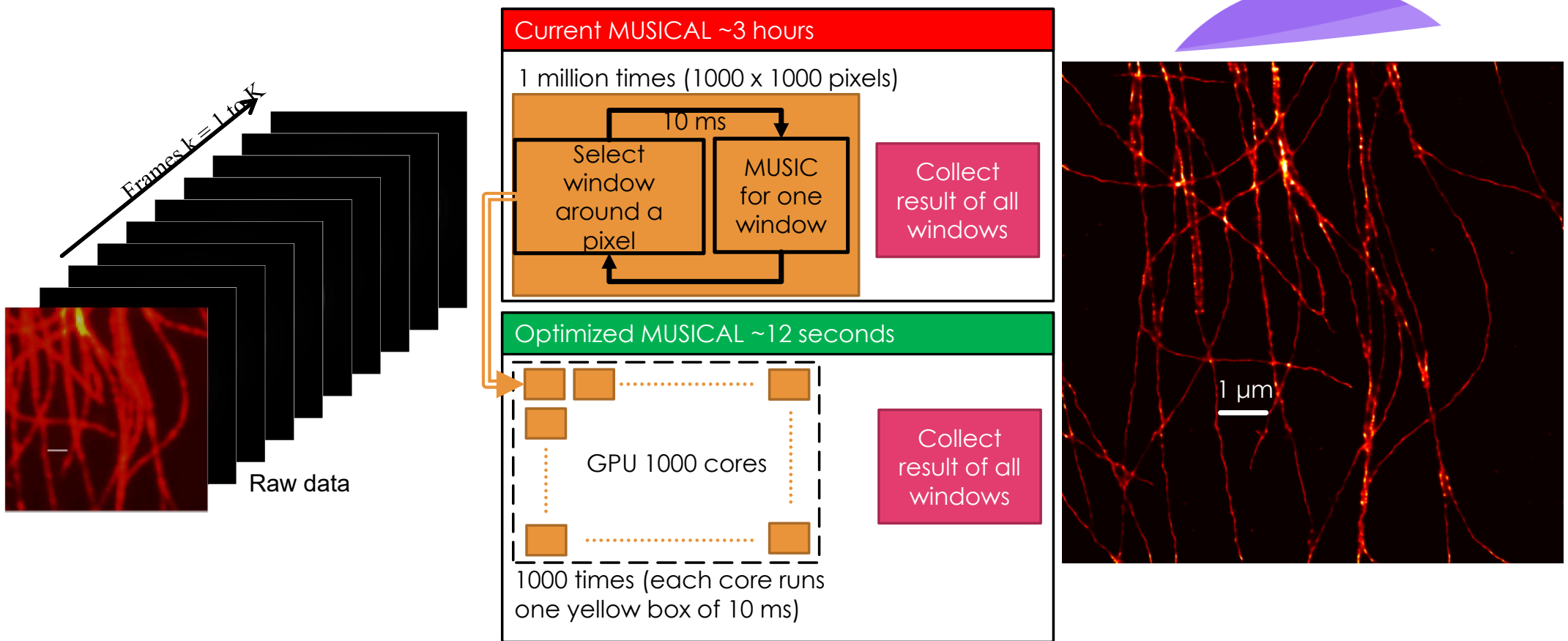
Compute intensiveness

Data intensiveness

Interpretability



# Compute intensive – space parallel



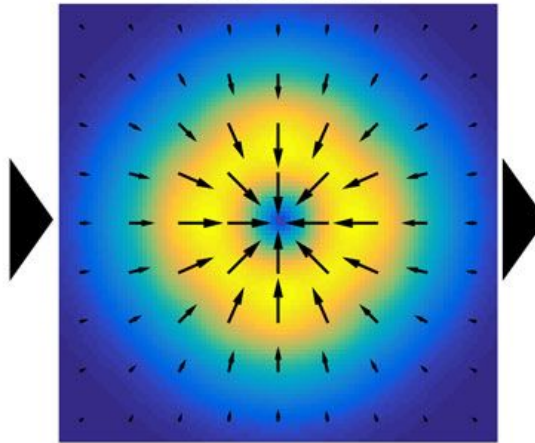
# Compute intensive – time parallel



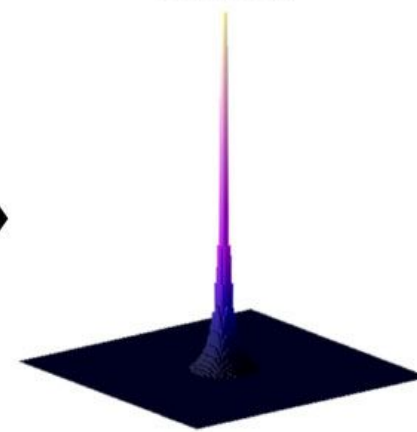
**a** Pixelated Gaussian



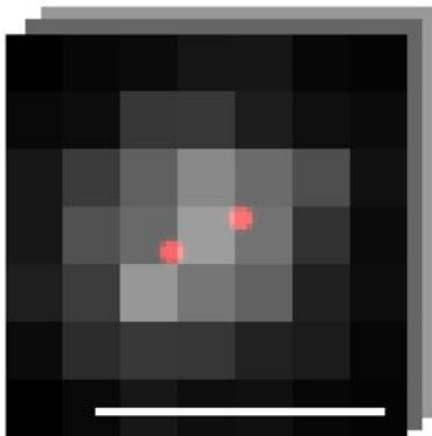
Gradient field



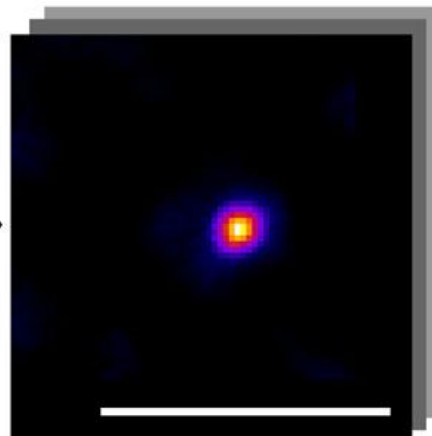
Riality



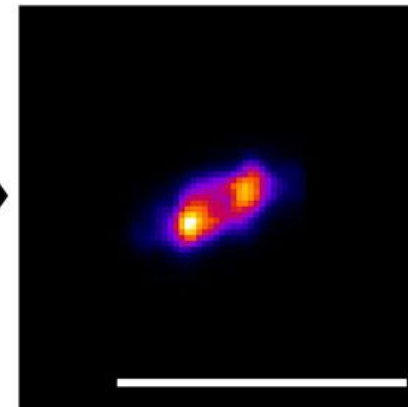
**b** Raw stack



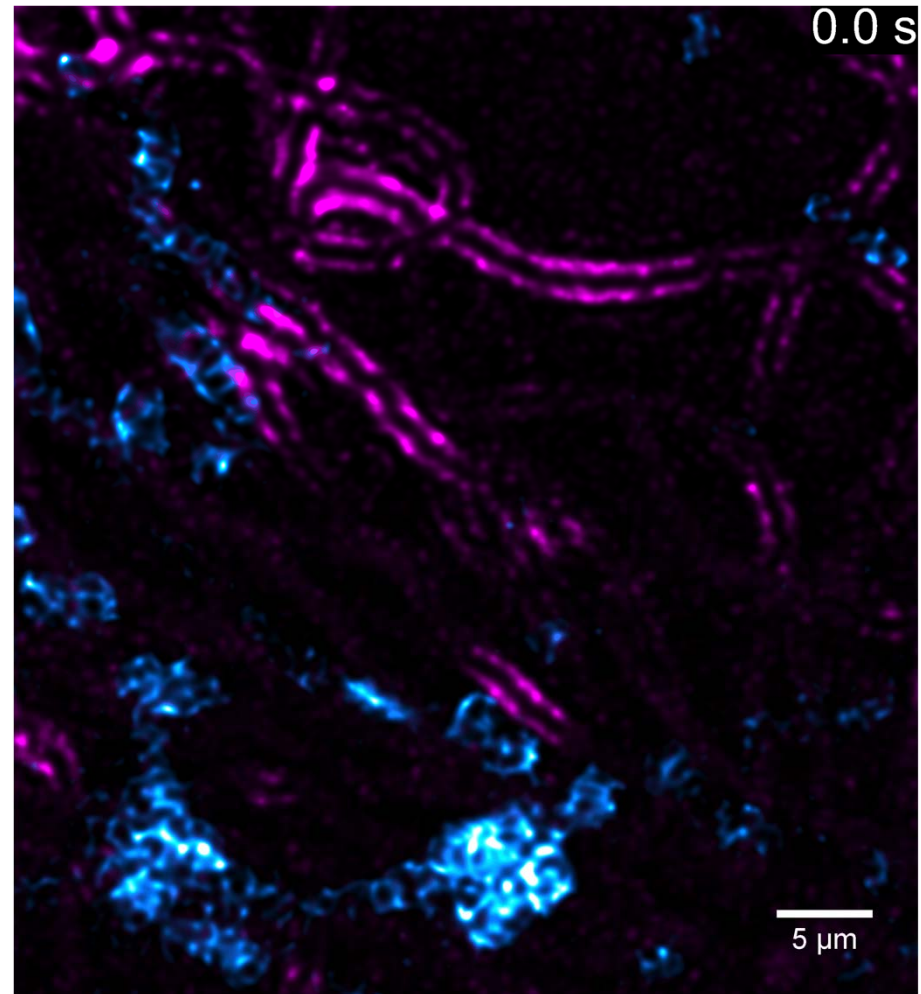
Riality stack



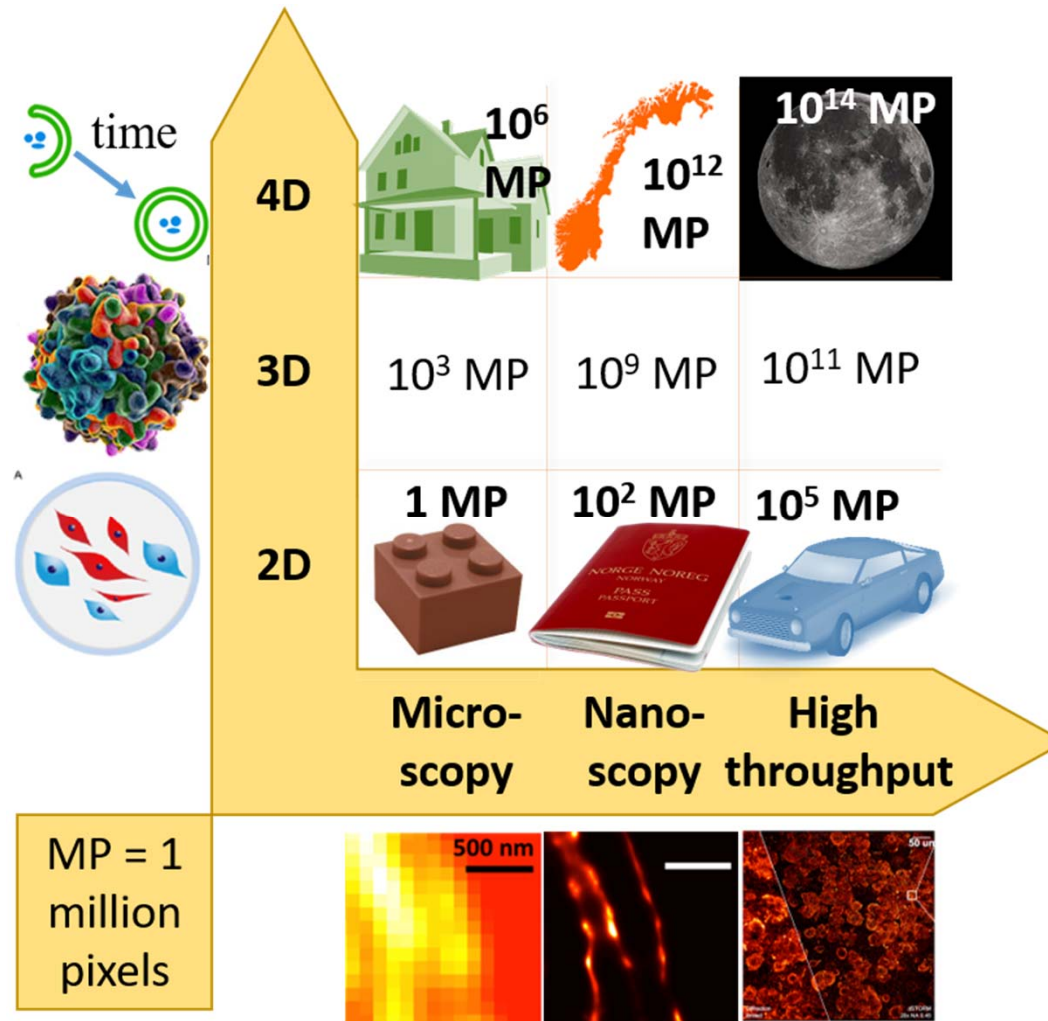
SRRF frame



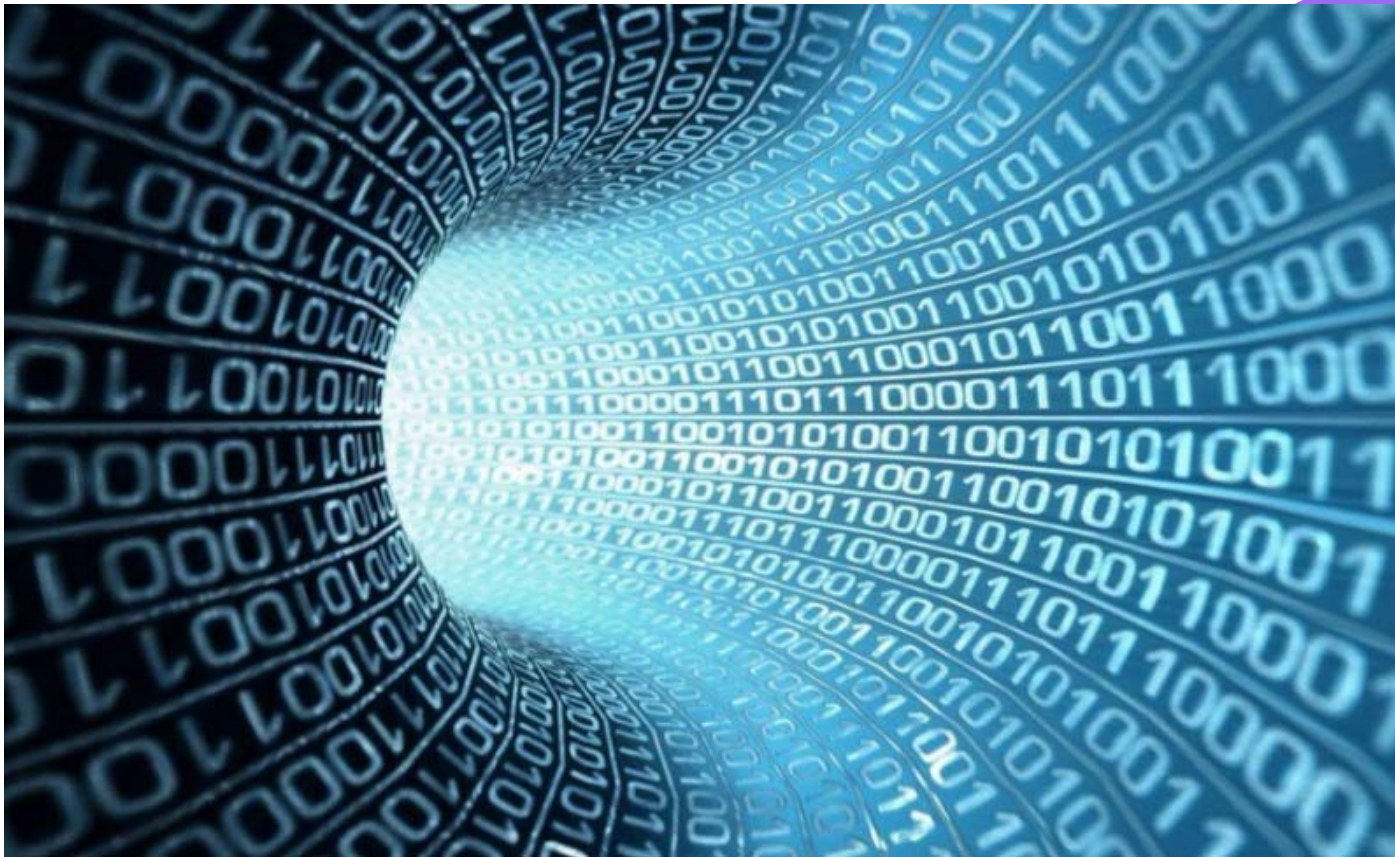
Compute  
intensive – stream  
processing



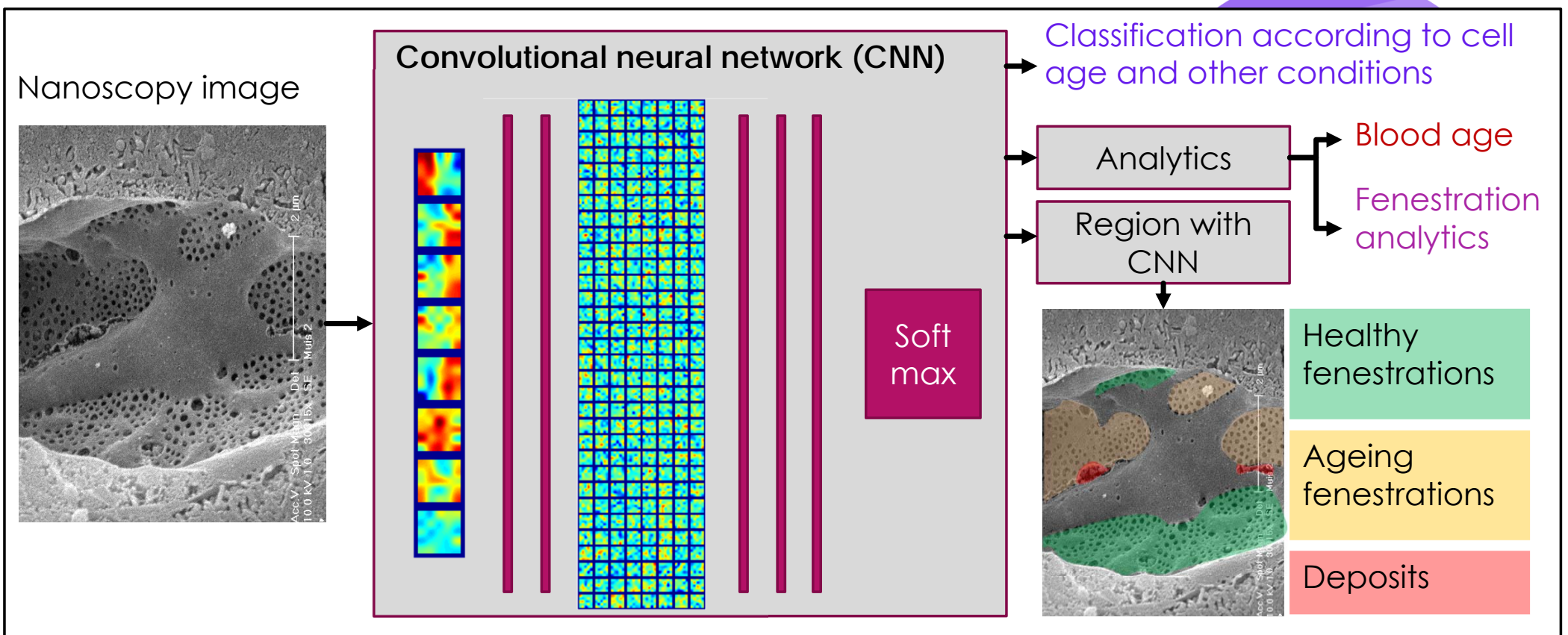
# Data intensive – data volume



# Data intensive – store and transfer challenge



# Interpretation challenge

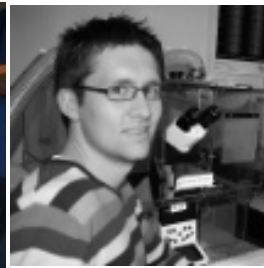
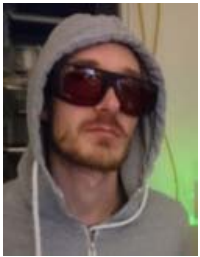


Moment  
of  
reflection





Instrumentation  
Computation  
Label-free

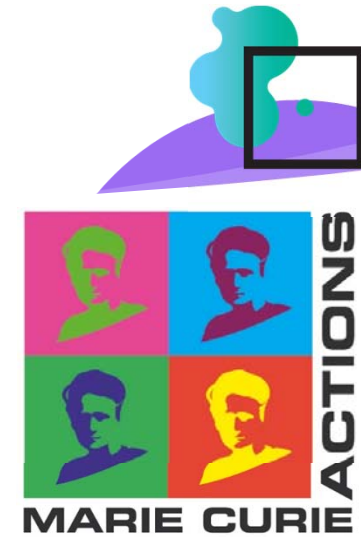


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Thanks



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