From biological sample to quantitative data analysis

Photonics for Food and Beverages

12 december 2022, EPIC Online Technology Meeting

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inSTI – Micro-Nanotechnologie
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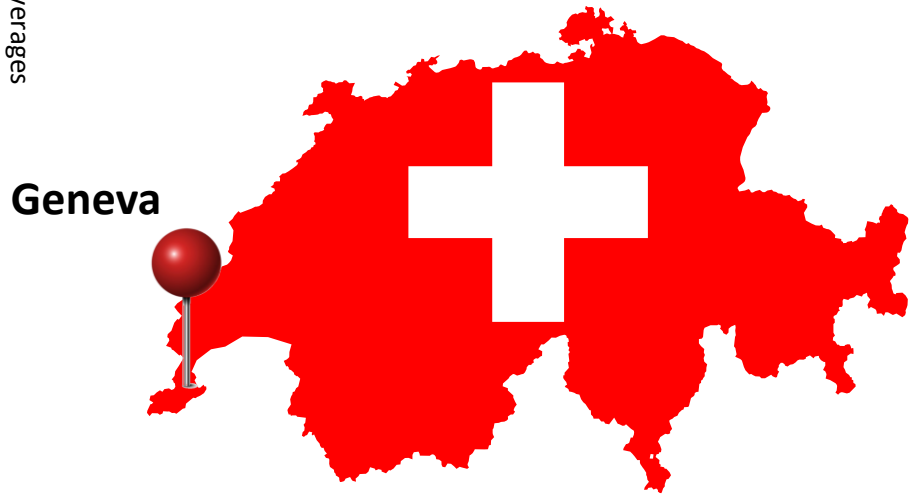
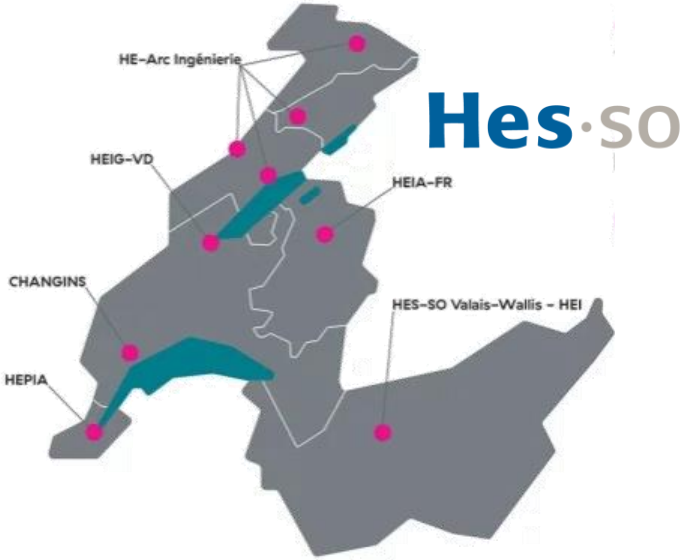


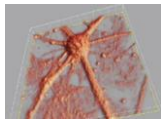


University of Applied Science
With a focus on Industrial Research

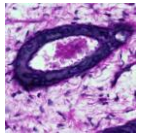
Micro-Nanotechnologie
Strategy: From biological sample to quantitative data analysis

Biological Samples

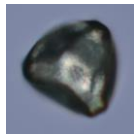
In vitro



Tissues

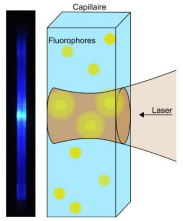


Bio-aerosols

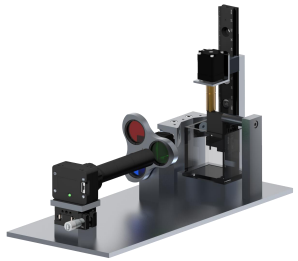


Optical Design & Setup

UV- & Vis-Spectroscopy



Imaging



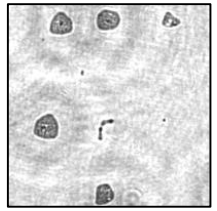
High Quality Data

Datasets

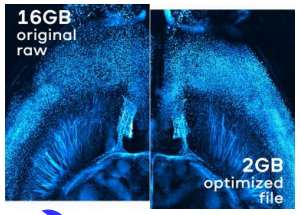
Massive datasets

Signal / Data pre/processing

Image reconstruction



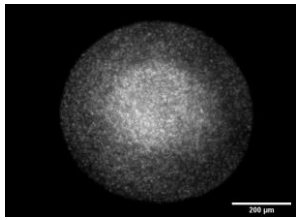
Metrological compression



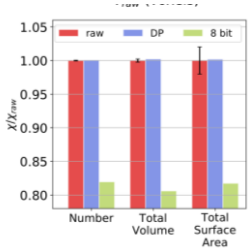
JETRAW
by Dotphoton

Quantitative analysis

Image / data



AI-based pipelines



UV- & Vis-Spectroscopy

UV- & Vis-Spectroscopy

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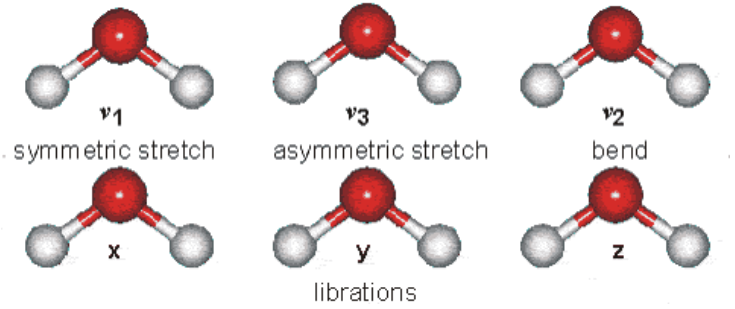
Tailored projects

Research challenges:

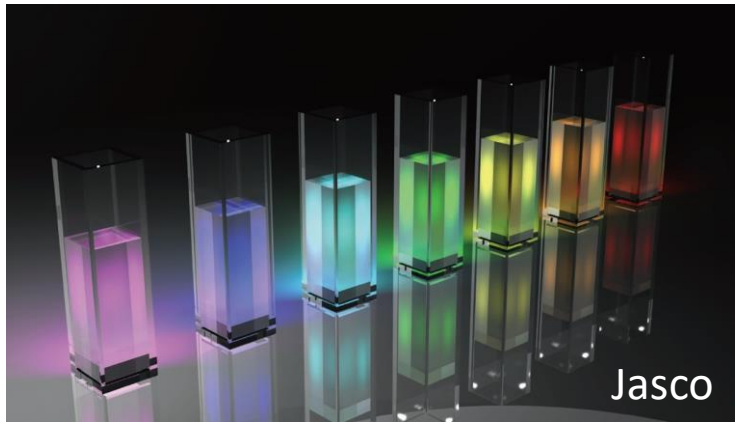
- Optical Signal Identification
- Contamination Sensing

Engineering challenges:

- Cost Optimization
- Integrable Solutions
- …

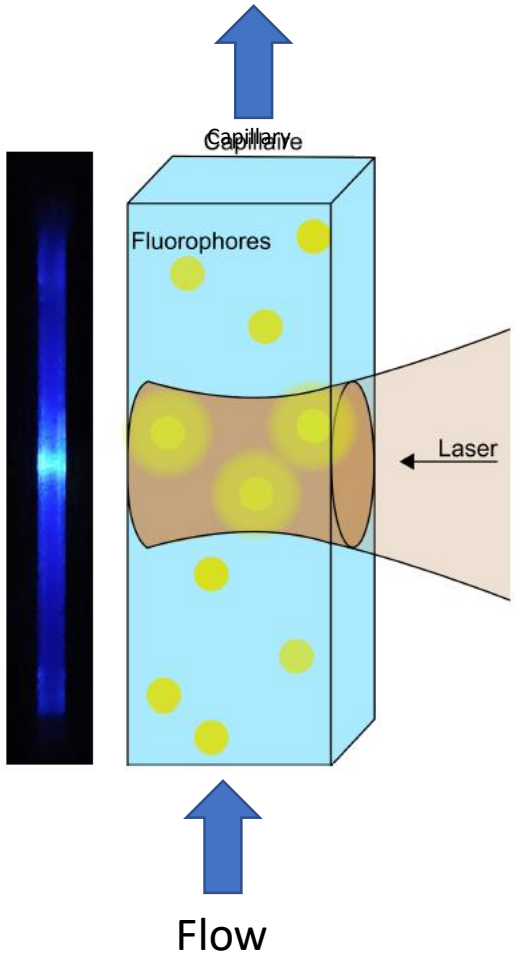


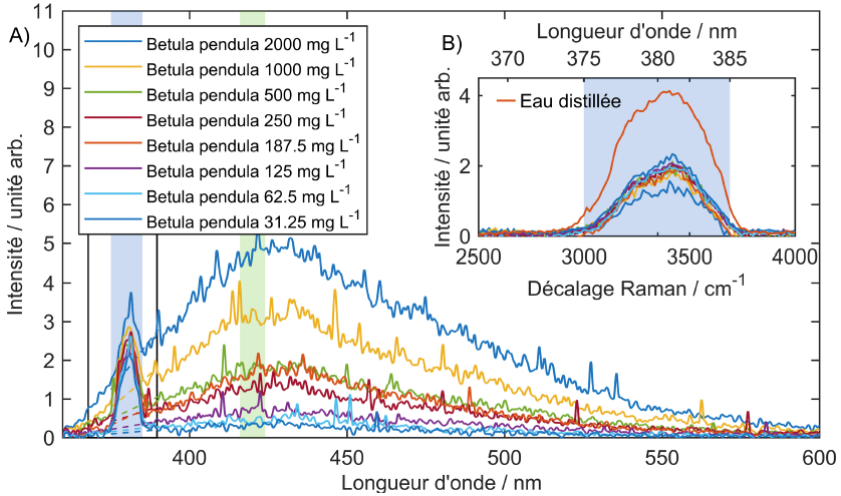
Raman Spectroscopy

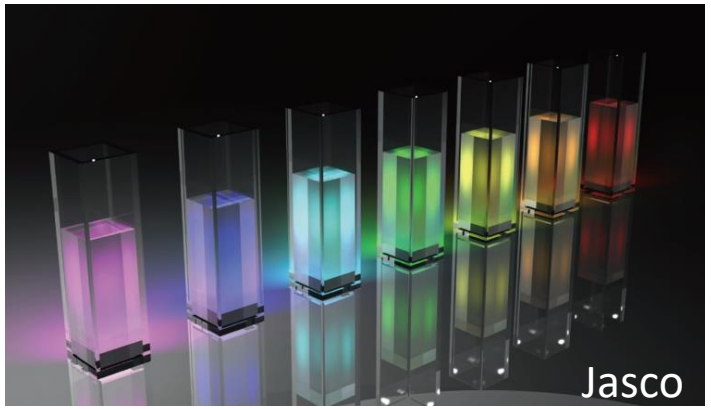


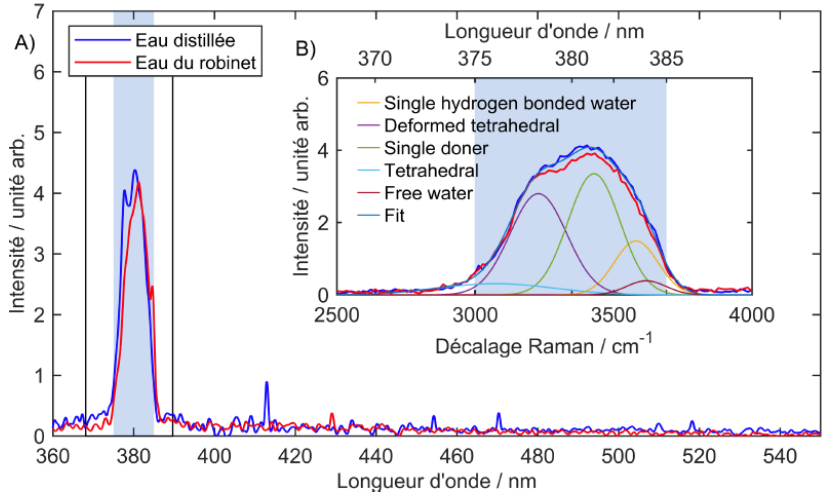
Fluorescence Spectroscopy

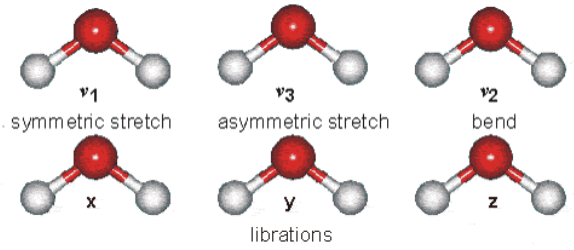
Fluorescence and Raman Emission Spectroscopy Applied to biocomponents sensing











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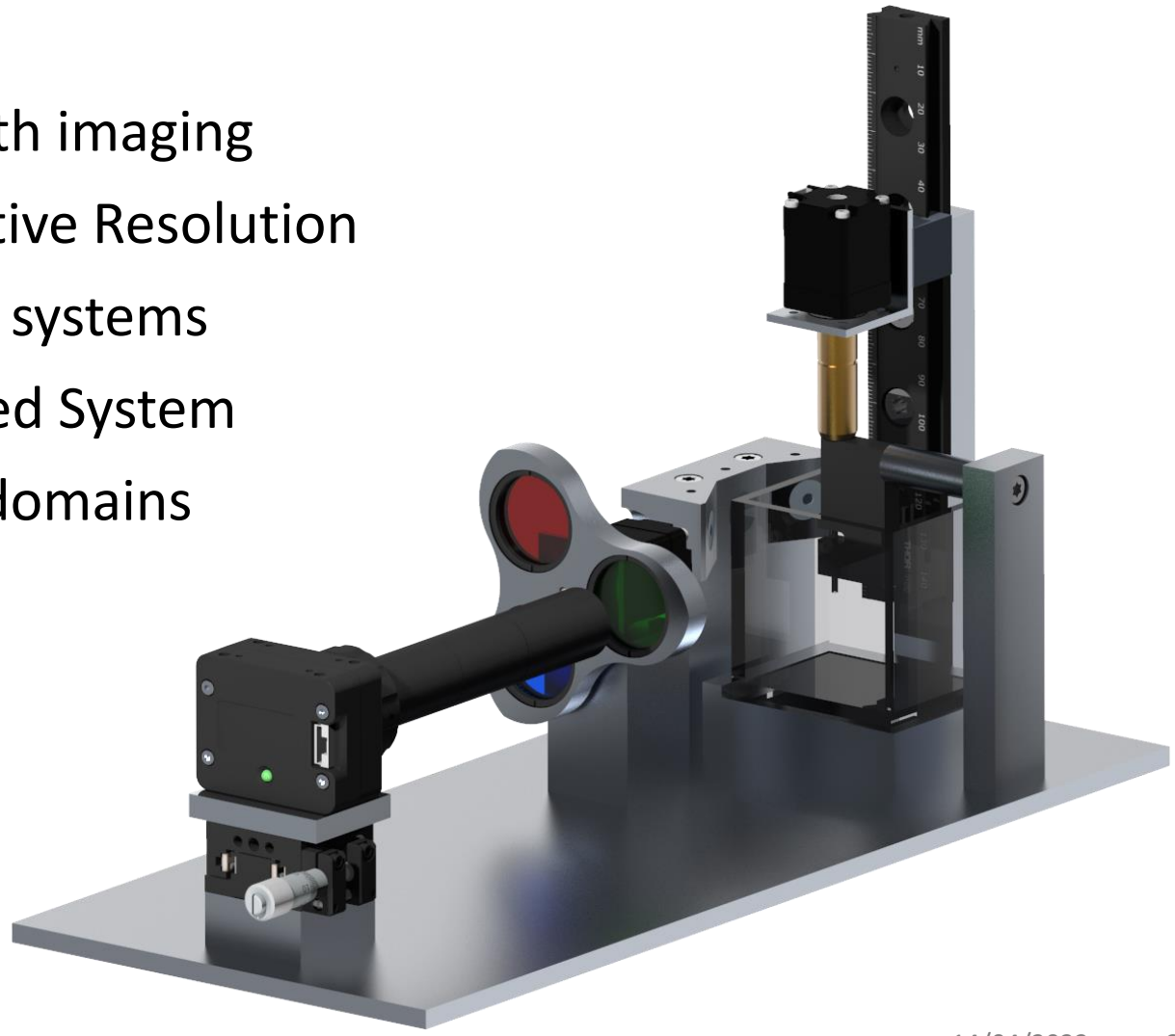
Application driven Imaging

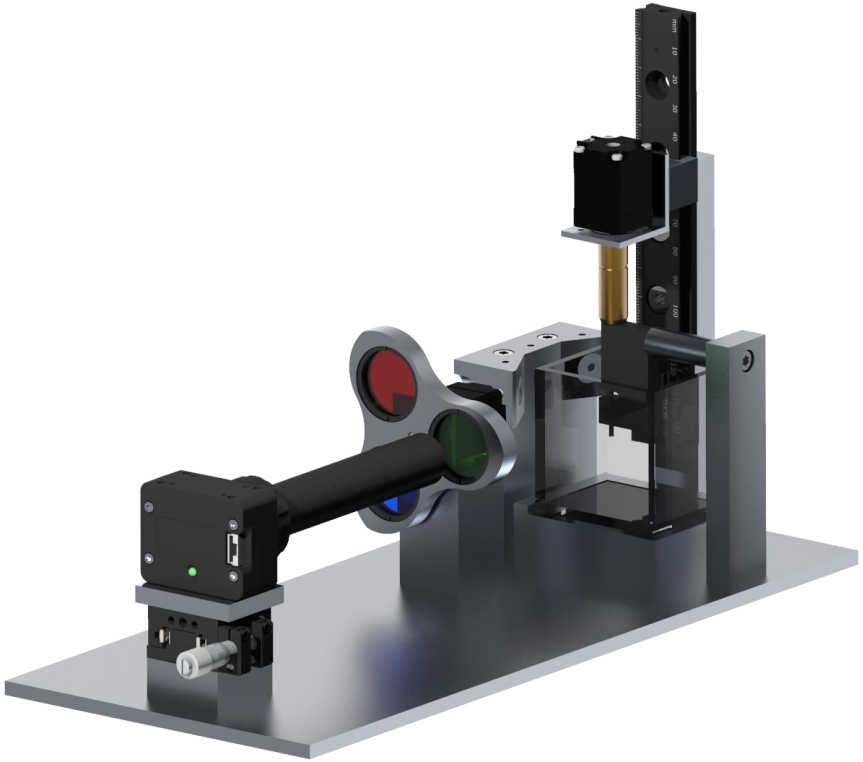
Compact Imaging

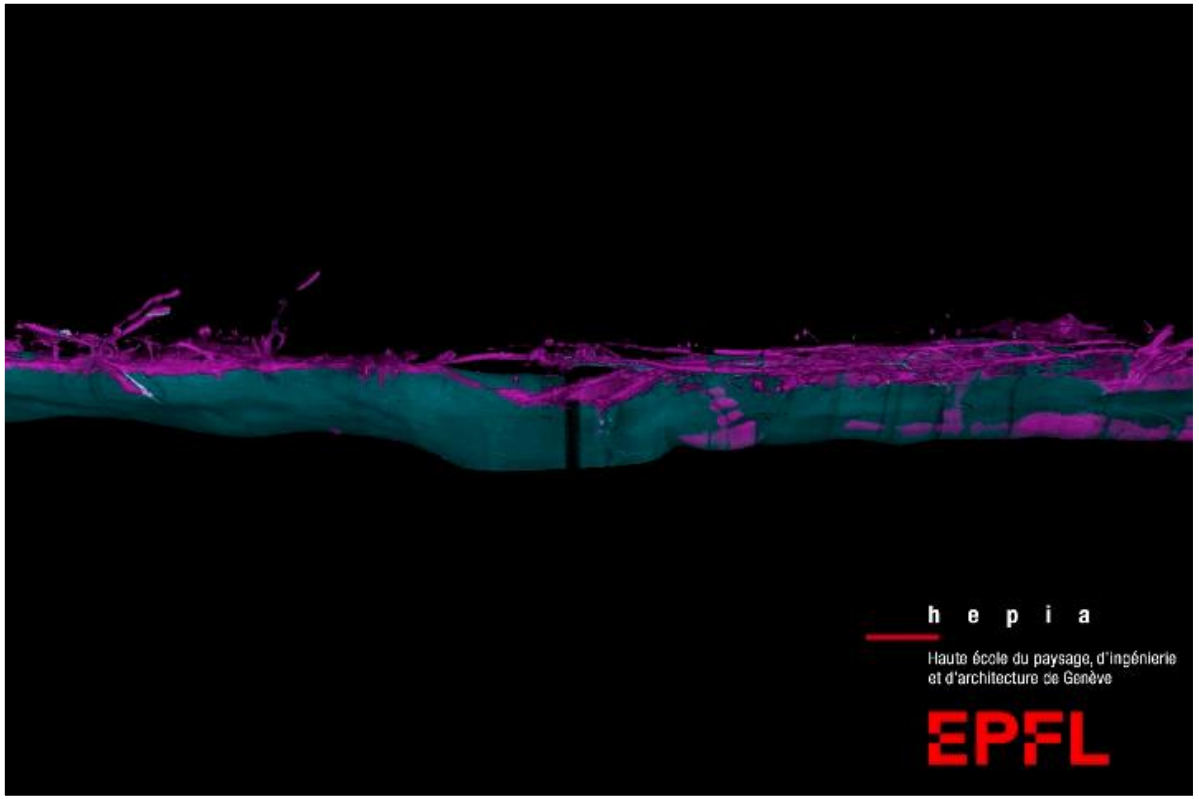
Tailored challenges

- 3D / depth imaging
- Competitive Resolution
- Low-cost systems
- Embedded System
- Flexible domains



Compact 3D Imaging : Optical Projection Tomography: *in-vitro*





Contrast: Fluorescence – Spatial resolution: 28 µm – FOV: 5x5x5 mm^3 – Data size: 288 Gb (16 Gb/volume/color)

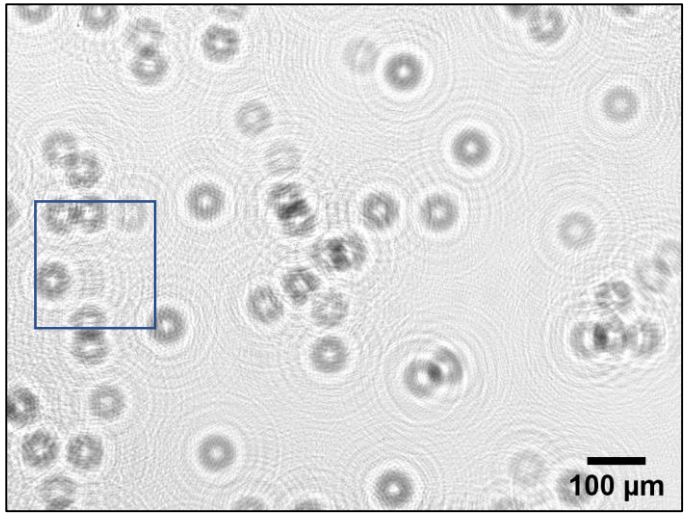
C. Schmidt et al., "*High resolution optical projection tomography platform for multispectral imaging of the mouse gut*" *(2021)*

Application driven Microscopy: Digital holography

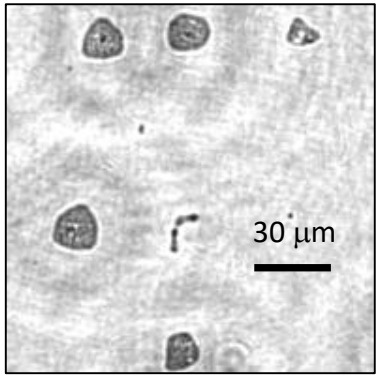
Imaging specificity

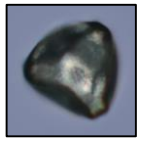
- Embedded System
- Autonomous Imaging
- Virtually Infinite depth of field
- Competitive Resolution

Raw data

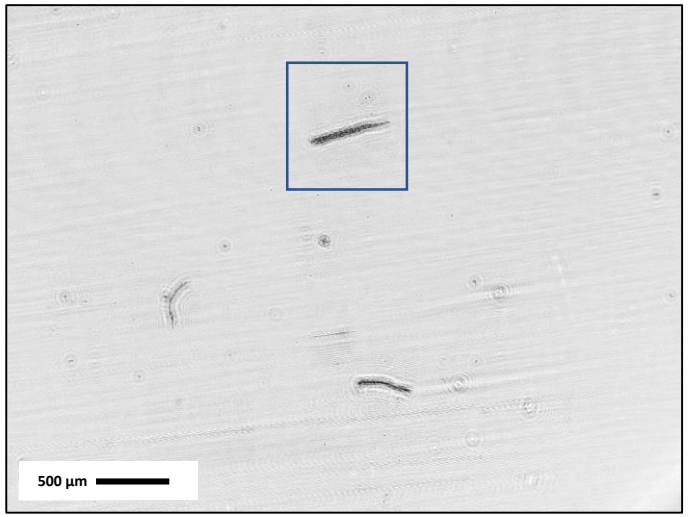


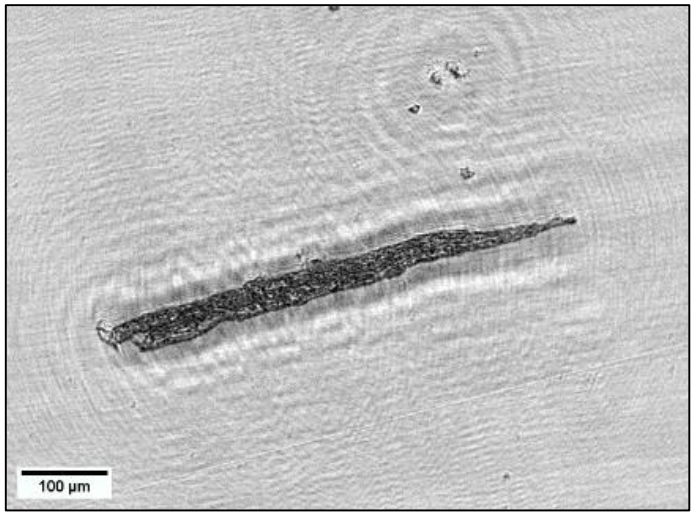
Region of interest reconstructed





Raw data





Data Compression

Metrological compression

Tailored challenges

- Provide Microscopy expertise for product development
- Minimize data losses
- Cost reduction for data storage

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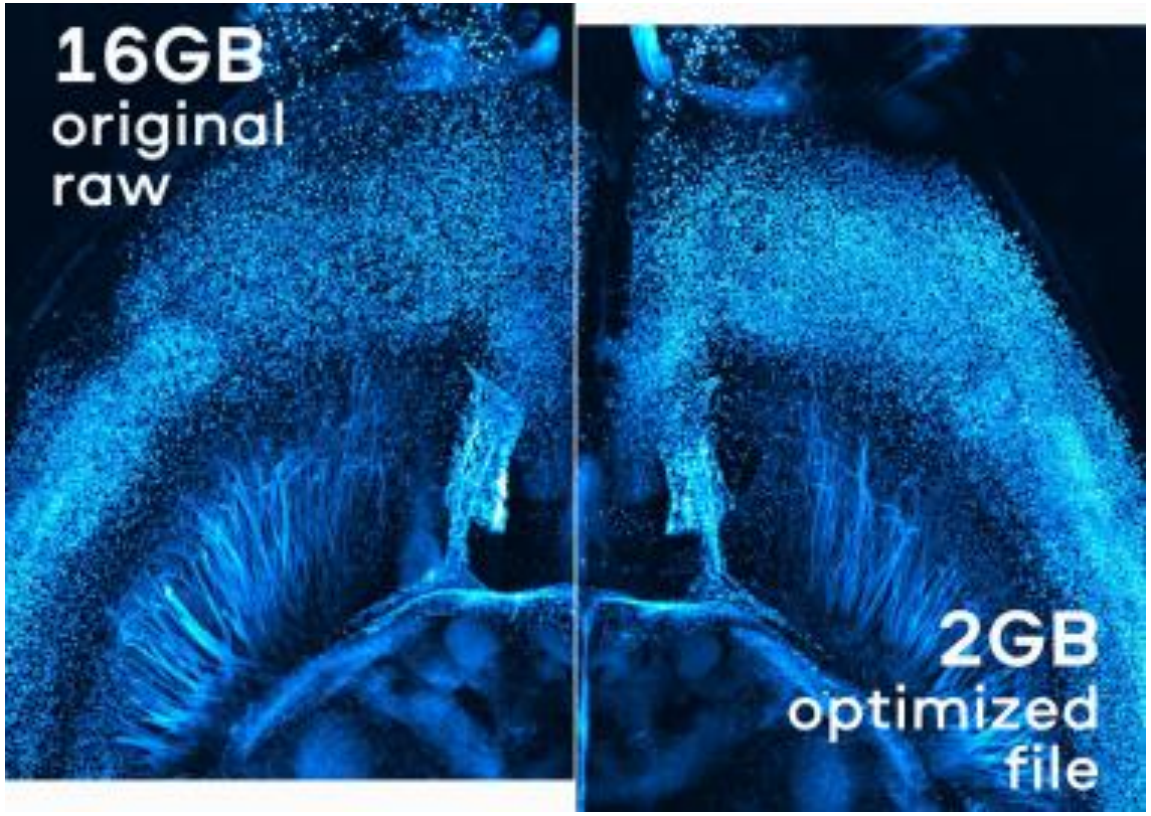
Data Compression

JETRAW
by Dotphoton



E. Pomarico *et al.*, , “Statistical distortion of supervised learning predictions in optical microscopy induced by image compression”, Scientific Reports, 12, 3464 (2022).

Final words…

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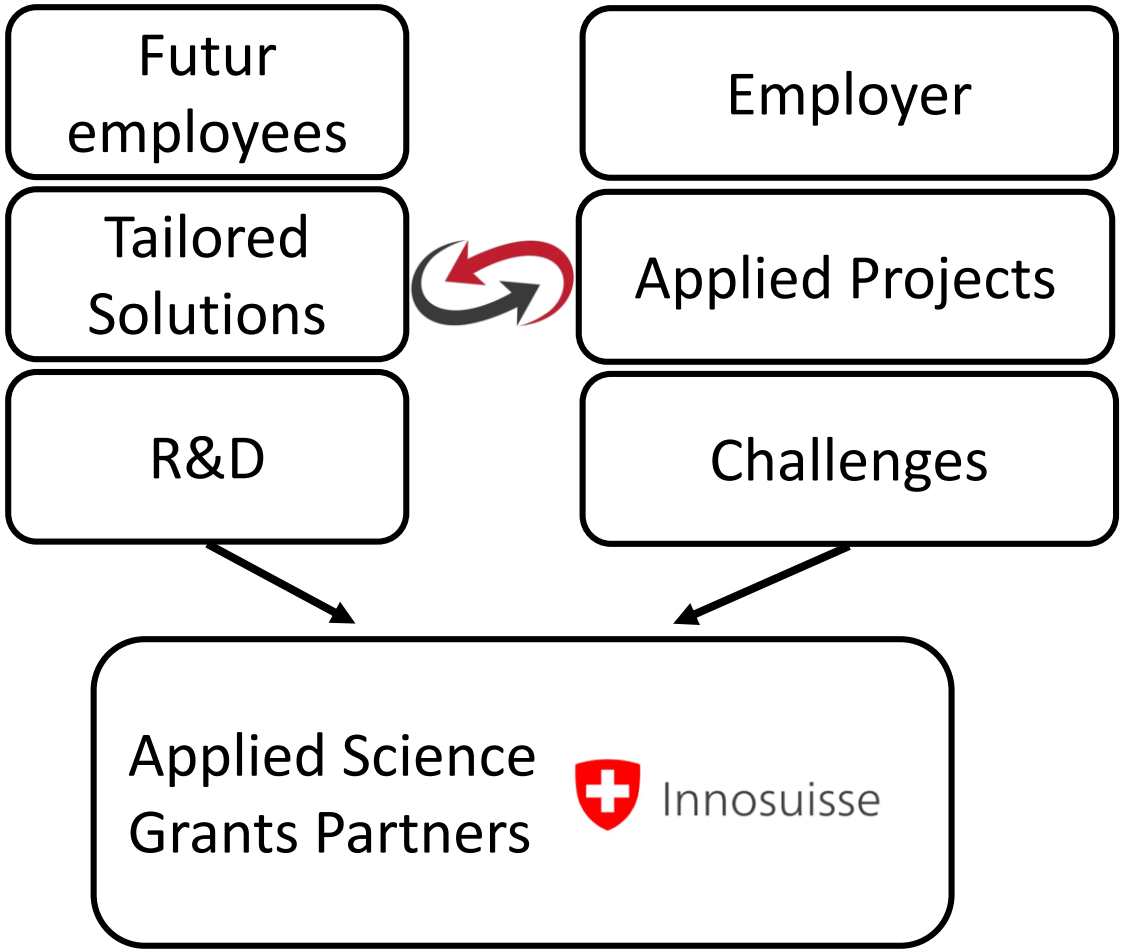

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