InSTI @ EPHJ

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Imagerie optique : format, compression et Machine Learning

Optical Imaging : format, compression and Machine Learning

Jérôme Extermann

Geneva, September 15th (2021)

Mouse small intestine – Tissue & Vasculature

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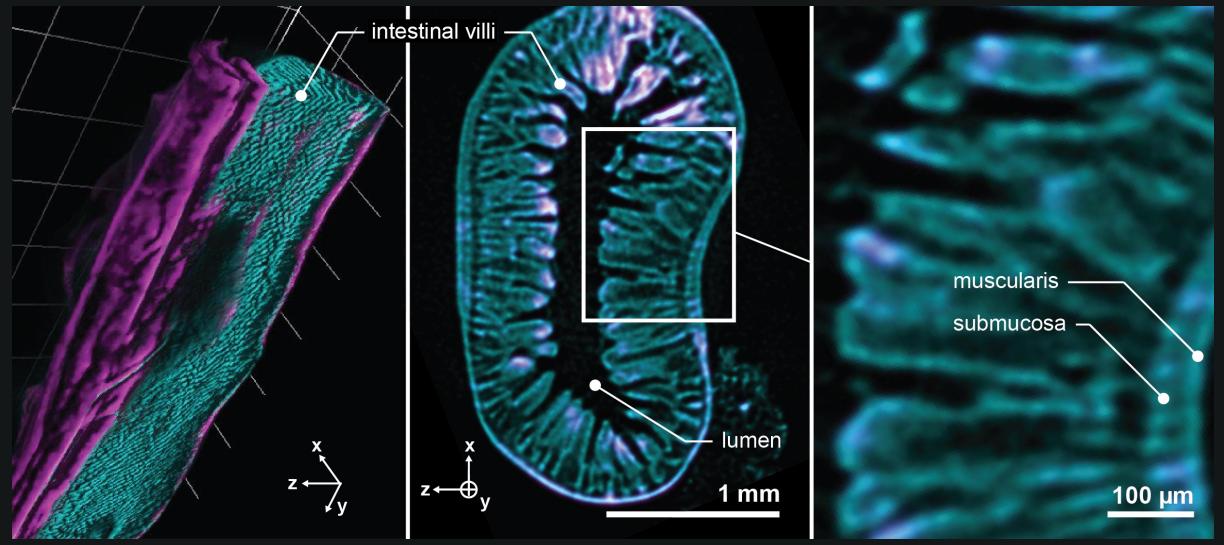
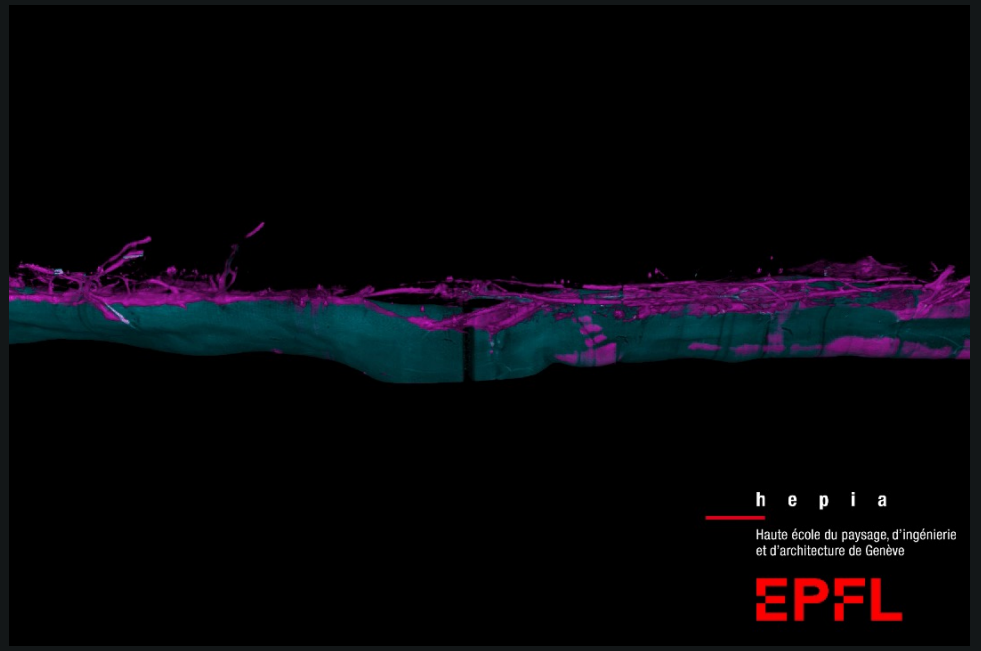
EPFL

Optical Projection Tomography





Spatial resolution <28 µm
Acquisition time: 5 min
1 volume 5x5x5 mm^3 = 16 Gb

9 volumes stitched = 9 x 16 Gb =144 Gb
2 couleurs = 2x144 Gb = 288 Gb

C. Schmidt *et al.*, , "High resolution Optical Projection Tomography platform for multispectral imaging of the mouse gut" Biomed. Opt. Express, 12(6), 3619-3629, (2021)

Images : acquisition storage, transfer

Data volumes increase at a faster rate than disk capacity

Challenge for data management, handling and transfer

More data is digitized and kept

- Storage over long time periods (financial & energetical costs)
  AWS: 200 CHF/Tb/year
- Transferred (time consuming)
- Acquisition and processing on high computing capacity

-> IMAGE COMPRESSION

Sensor calibration → Compression up to 10x

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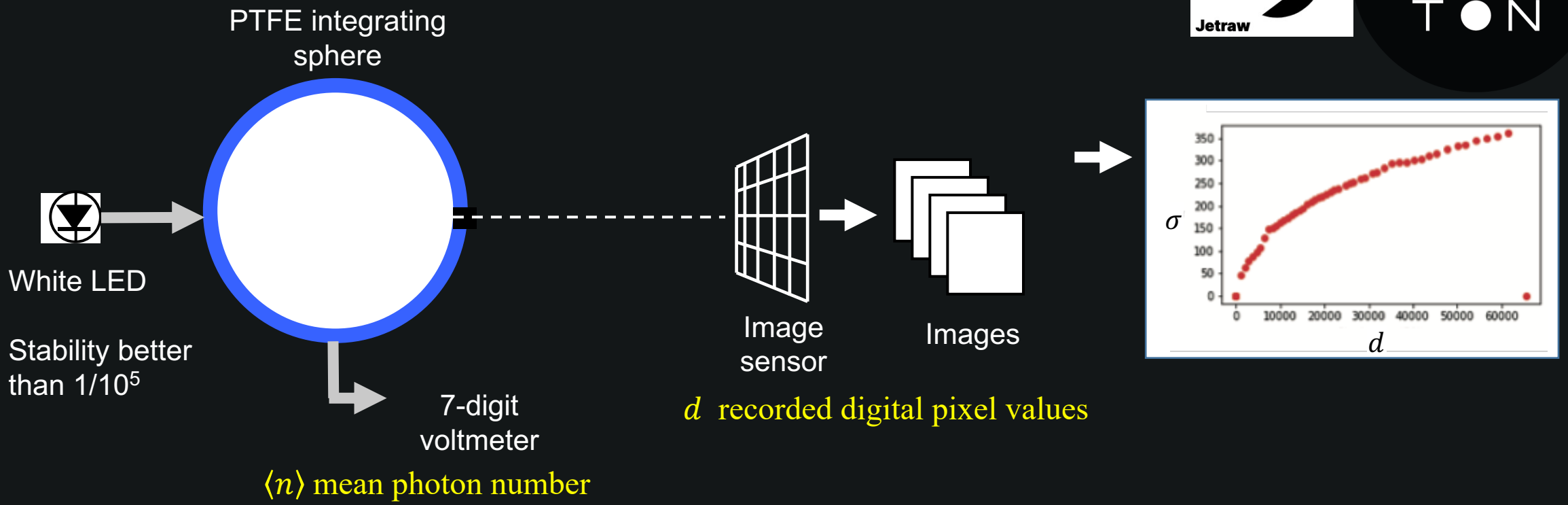
Calibration of the sensor to extract the # of photons hitting sensor:

Quantum efficiency, Sensor electronic noise & Quantum shot noise



E. Pomarico *et al.*, "Quantifying the effect of image compression on supervised learning applications in optical microscopy", arXiv:2009.12570

Mouse brain – Automated segmentation

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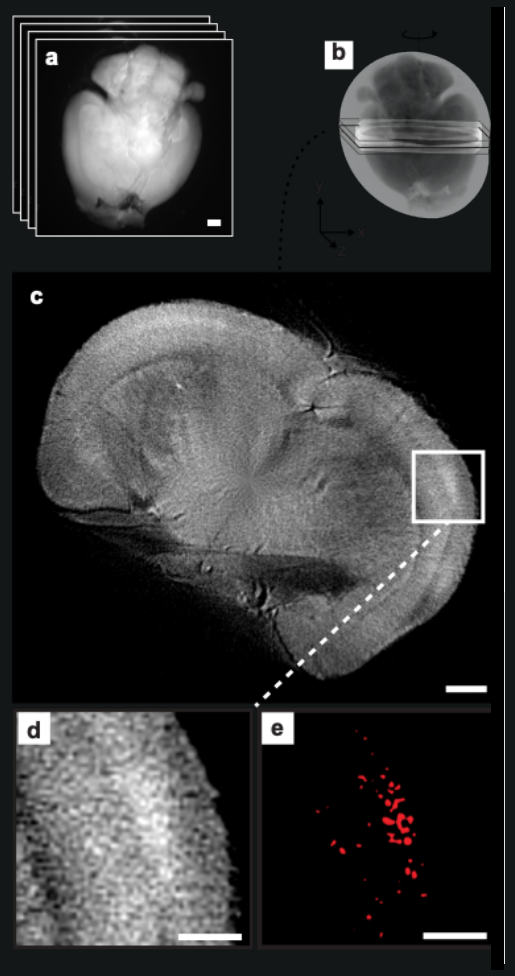
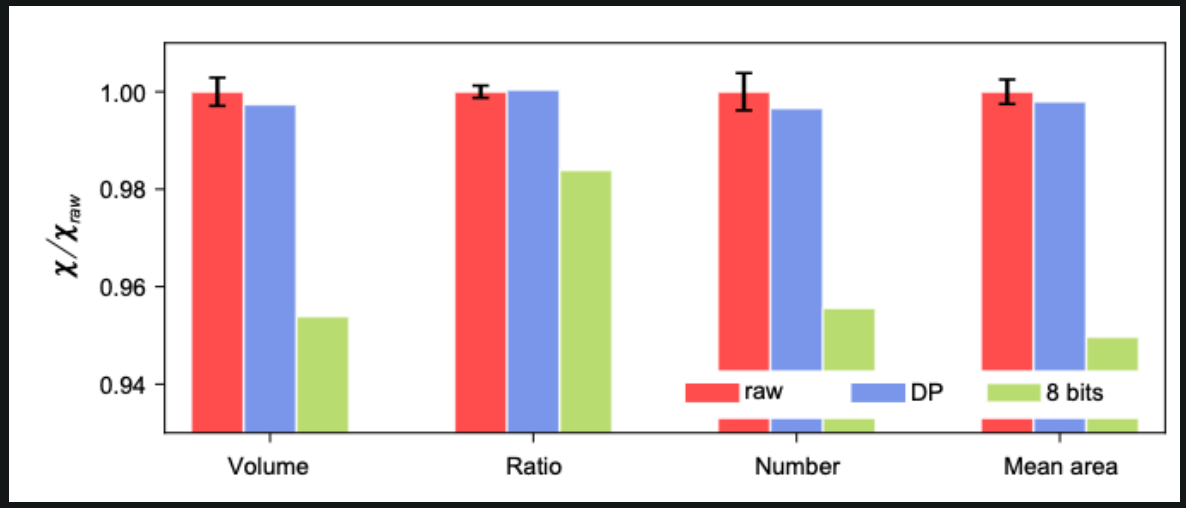
Mice brain: amyloid plaques *(Methoxy-X04 staining)*



Scalebar (a-c) 1 mm / (d-e) 300 µm

Supervised learning segmentation



According to application
-> Up to 15% - 20% difference !

E. Pomarico *et al.*, "Quantifying the effect of image compression on supervised learning applications in optical microscopy, arXiv:2009.12570

Data Quality - Towards Datacentric AI

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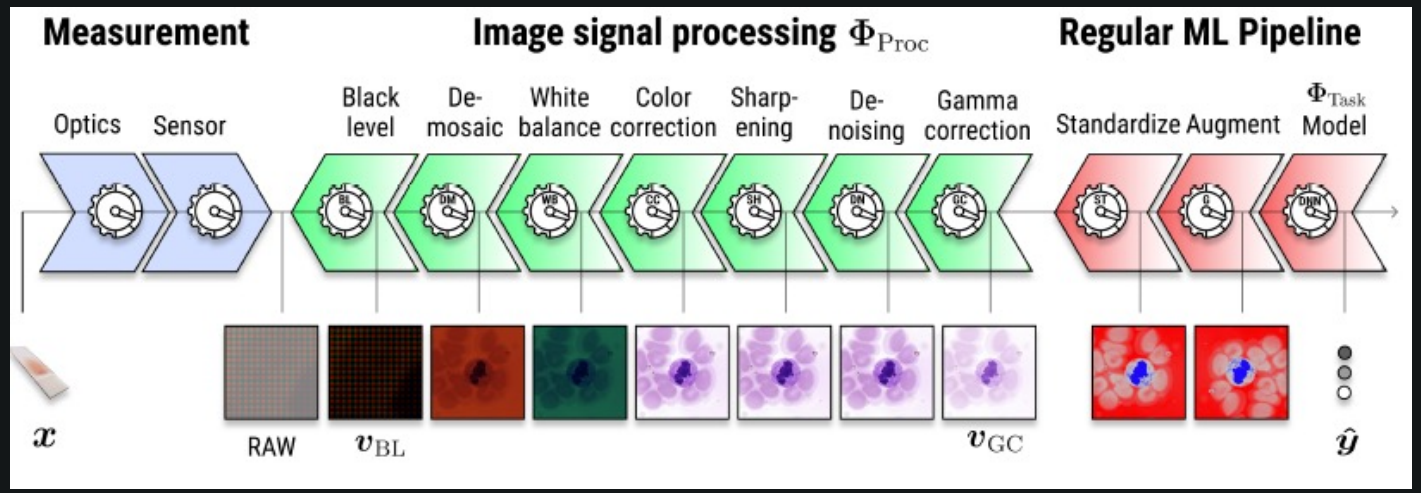
"Data is food for AI".
"Shift the focus of AI practitioners from model/algorithm development to the quality of the data they use to train the models.

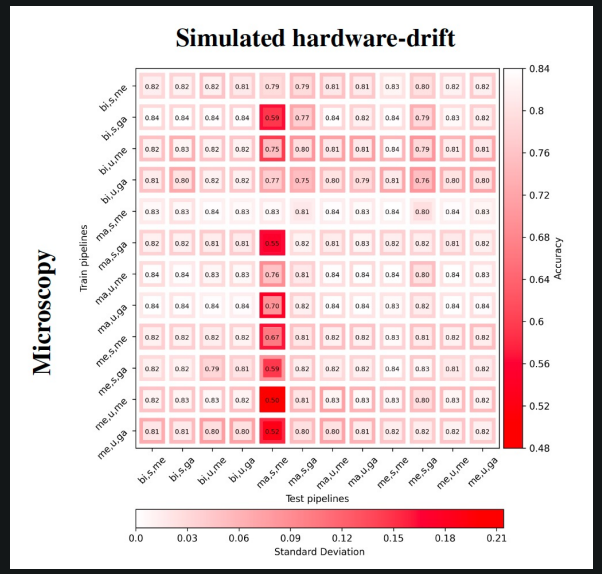
Andrew Ng, Forbes, June 2021

"Paradoxically, data is the most under-valued and de-glamorised aspect of AI"

Nithya Sambasivan et al., *Google research* CHI '21

Assessment of Blood smear





L. Oala *et al.*, , "From Lens to Logit: Addressing Camera Hardware-Drift Using Raw Sensor Data ", submitted, 2021