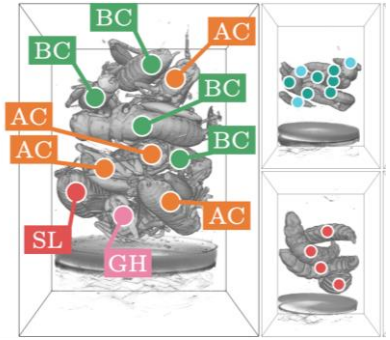
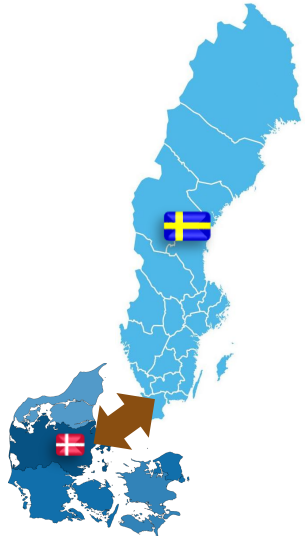
DTU Qim InfraVis

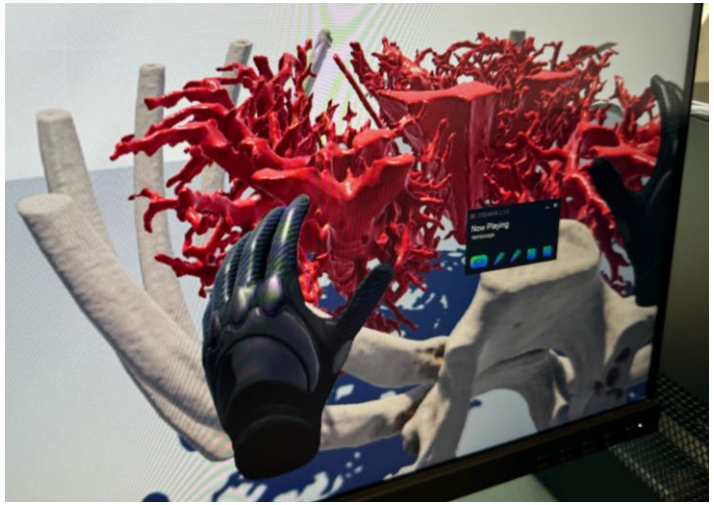
LUND UNIVERSITY

CIPA
Correlative Image Processing and Analysis





Management, analysis and visualization of imaging data – collaboration across the borders



Anders Bjorholm Dahl, Danish Technical University
Emanuel Larsson, Lund University

Interreg
Öresund-Kattegat-Skagerrak

Co-funded by the European Union

HALRIC

Outline

1. Computing Cluster in the HALRIC region
2. Infrastructures to support image analysis & Visualization between DK-SWE
3. Comparison of the imaging infrastrucures QIM and CIPA/InfraVis
4. Workflow – from image acquistion – to image analysis
5. Joint and Workshops, Hackatons, between DK-SWE
6. Joint GUI development
7. Take home messages.

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HALRIC

Maxwell HPC cluster

Total: 654 hosts

Dedicated nodes for:

CSSB Centre for Structural Systems Biology

Universität Hamburg DER FORSCHUNG | DER LEHRE | DER BILDUNG

European XFEL

CFEL SCIENCE

Helmholtz-Zentrum hereon

DESY

HELMHOLTZ IMAGING

>20 Computing Clusters and selected Imaging & Image Analysis Projects/Infrastructures in the HALRIC region and beyond

LULEÅ UNIVERSITY OF TECHNOLOGY

Kubernetes Cluster, hosted by RISE

ICE RISE SICS NORTH

RI. SE

InfraVis

UMEÅ UNIVERSITET

HPC2N

KEBNEKAISE Cluster

University of Oslo

1. 1. Sigma 2

2. TSD (Services for Sensitive Data) computing cluster Colossus

RI. SE

SIMLAB, HPC cluster

CHALMERS

Alvis cluster

SNIC

UPPSALA UNIVERSITET

Uppsala Multidisciplinary Center for Advanced Computational Science

UPPMAX

Bianca & RACKHAM Cluster

Stockholm University

Fysikum Cluster

KTH VETENSKAP OCH KONST

PDC Center for High Performance Computing

BESKOW & Dardel Clusters

ALEXANDRA INSTITUTTET

"Development of user friendly tomography software"

DANISH TECHNOLOGICAL INSTITUTE

Computing Cluster

Center for Quantification of Imaging Data from MAX IV

DTU Computing Center (DCC)

LINKÖPING UNIVERSITY

NSC

TETRALITH Cluster

And many more…

CIPA

Correlative Image Processing and Analysis

ESS DMSC cluster, Copenhagen, Denmark

ess EUROPEAN SPALLATION SOURCE

Experiment Control | Data Acquisition | Stream Events & Metadata | Data Reduction | Data Visualisation | Data Analysis | Data Management

Data Management & Software Centre

UNIVERSITY OF COPENHAGEN

SCIENCE HPC Center, University of Copenhagen

LUND UNIVERSITY

LUNARC

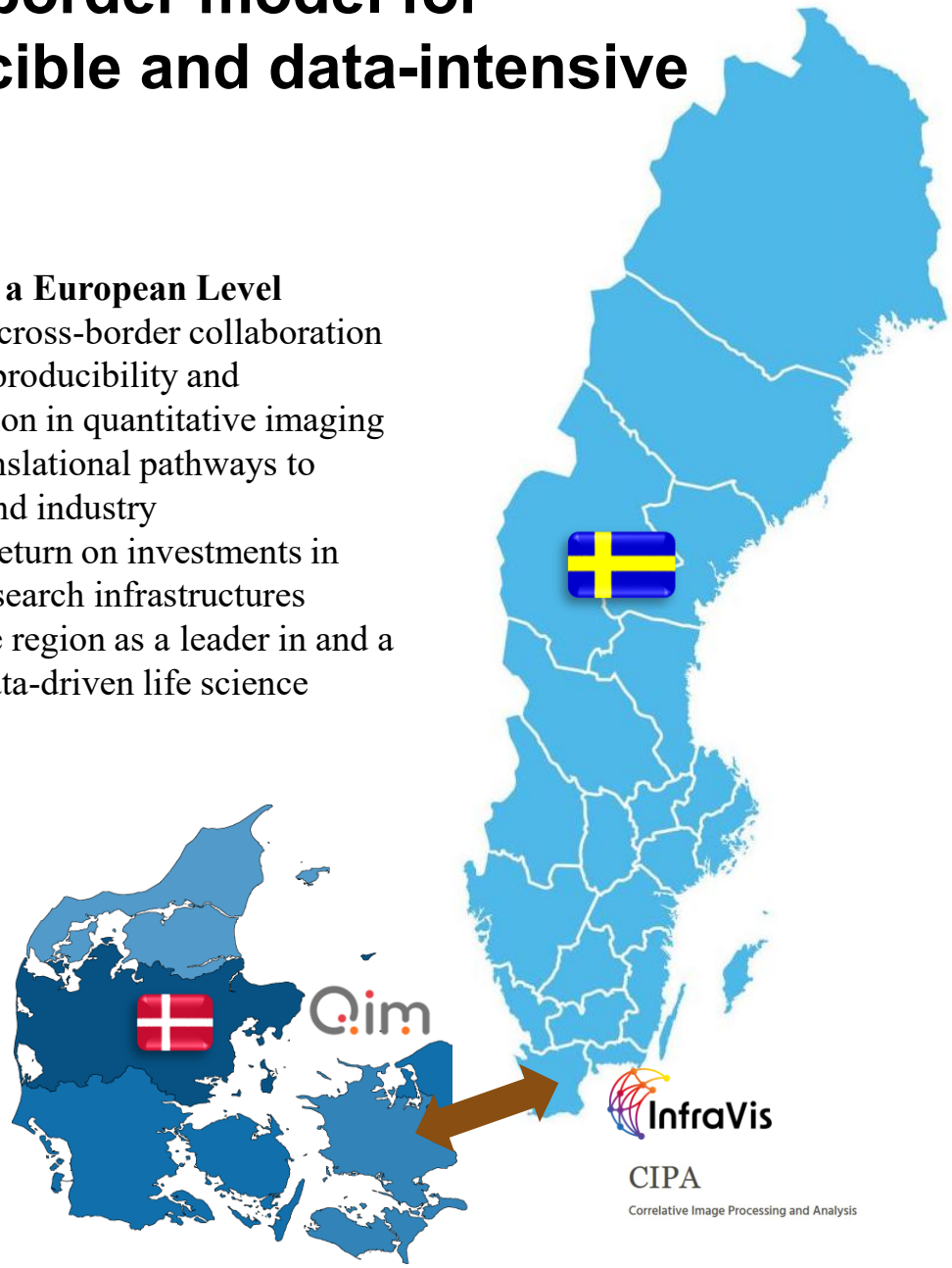
MAX IV

Aurora & MAX IV clusters

The CIPA/InfraVis–QIM bridge - a cross-border model for reproducible and data-intensive research

Added Value at a European Level

- Strengthens cross-border collaboration
- Increases reproducibility and standardisation in quantitative imaging
- Stronger translational pathways to healthcare and industry
- Maximises return on investments in advanced research infrastructures
- Positions the region as a leader in and a model for data-driven life science

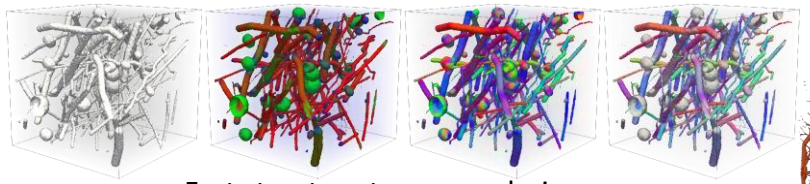


CIPA

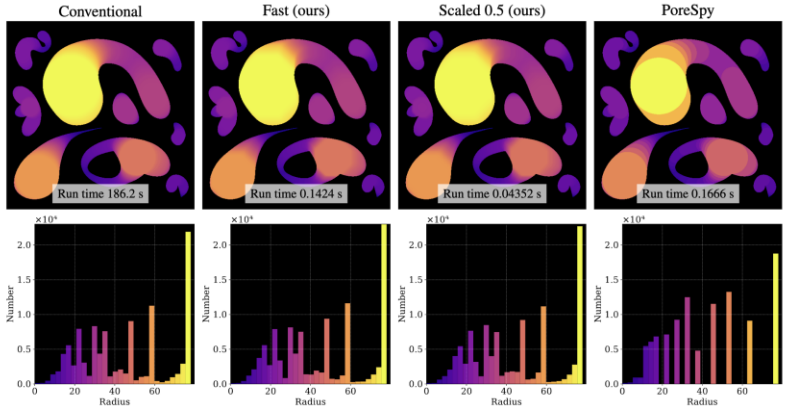
Correlative Image Processing and Analysis

QIM

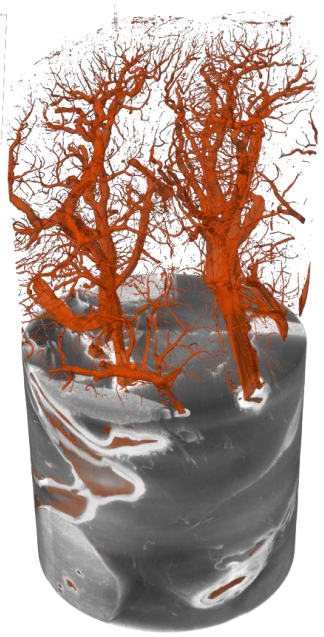
- Quantitative microscopy and imaging physics
- Calibration, validation and standardisation
- Image quantification methodologies
- Cross-site reproducibility and benchmarking
- Strong biomedical and clinical integration



Fast structure tensor analysis



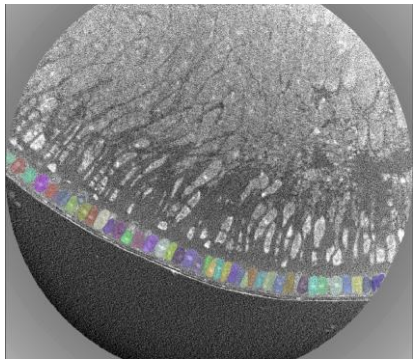
Fast local thickness



Interactive U-Net

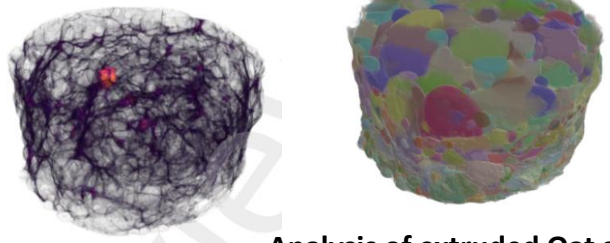
CIPA/InfraVis

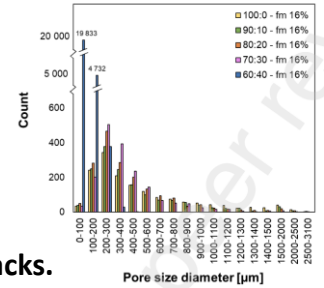
- Scalable image analysis and ML/AI-enabled workflows
- Multimodal data integration and visualisation
- Workflow engineering and reproducible computational pipelines
- Cross-disciplinary user support across research domains



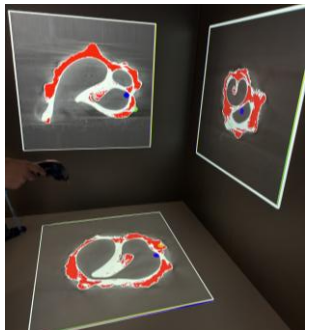
Machine learning-based segmentation of seeds.

Virtual Reality of a lung sample – outside and inside.





Analysis of extruded Oat snacks.



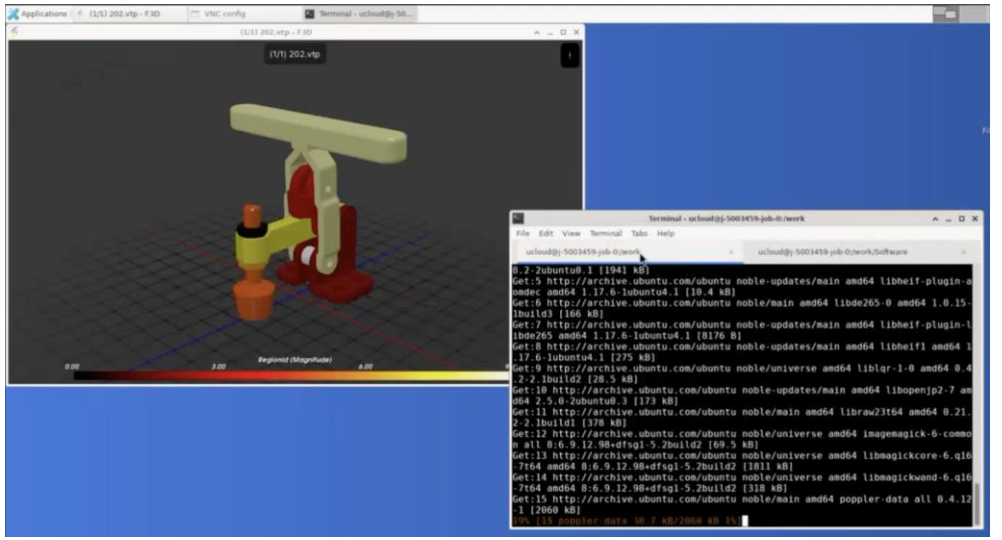
Immersive visualization in a CAVE of shell.

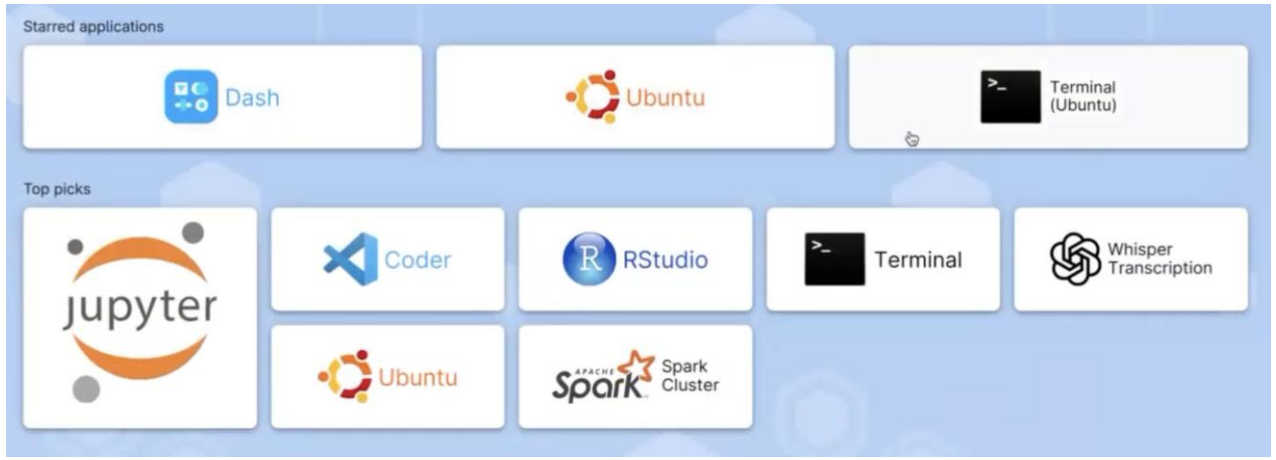
Quantitative Imaging → Reproducible Analysis → Integrated Insight → Societal Impact

Hanseatic Science Cloud

- A joint cluster for data analysis.
- Running workshops to collect feedback from users
- Users installed their own scripts for various applications (tomography, cryo-electron microscopy) and evaluate the user-friendliness.

https://halric.eu/hanseatic-science-cloud/





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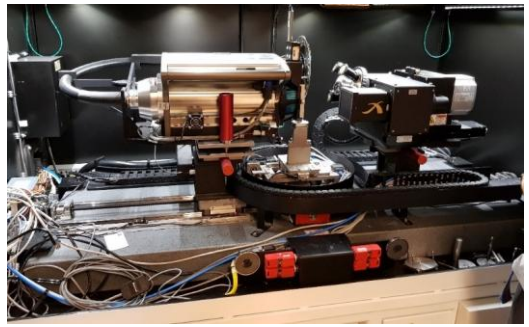
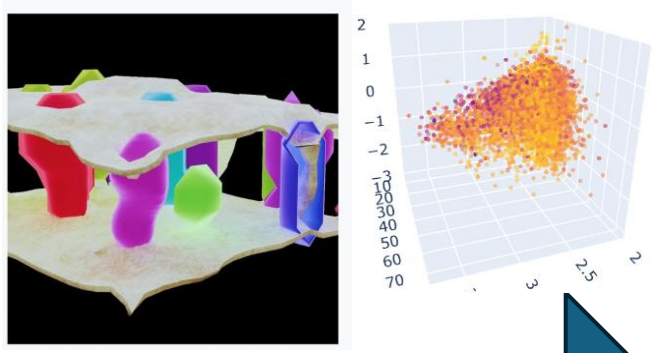
Work-flow of X-ray and Neutron experiments





Preparatory lab-based scans & beamtime proposal writing

Beamtime, Collection of datasets (Terrabytes of data)

Post Processing & Data Analysis, also incl. Machine Learning

Visualise and Explain the findings, plotting, 3D renderings

Publication

- Sample preparation labs
- Lab-based equipment available in academia and industry

MAX IV, ESS EUROPEAN SPALLATION SOURCE

Facilities offer the acquisition techniques.

NAISS, Qim, InfraVis

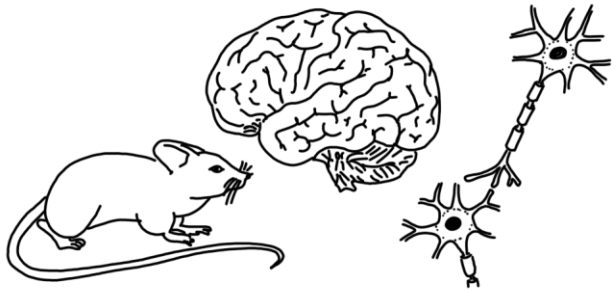
Need of Computation on High Performance Clusters (HPCs) at infrastructures or academia.

Responsibility of the PI and research group.

LINXS

LINXS will also organize future data clinics – where infrastructures will be invited to teach users.

Imaging-based science



Biomedical question

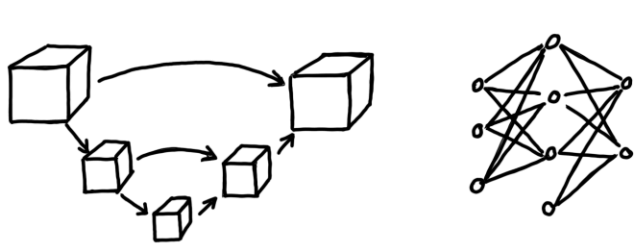
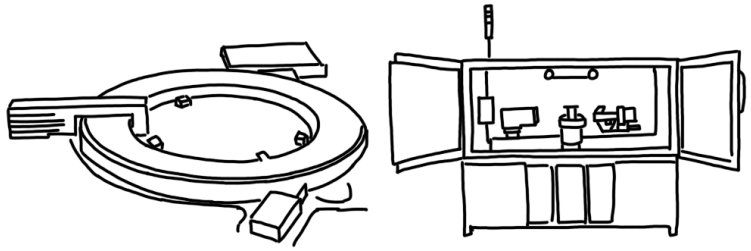
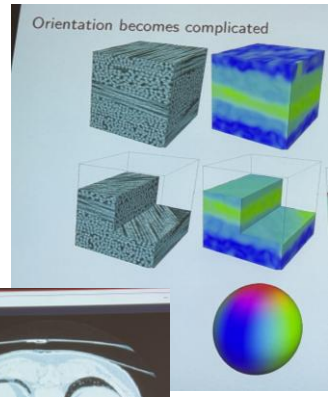


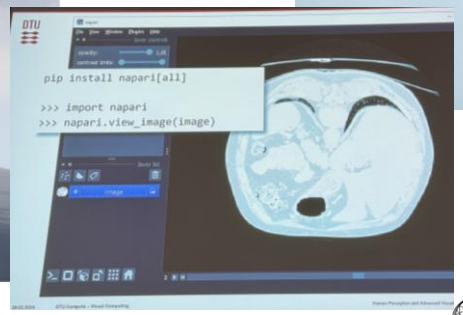
Image analysis



3D imaging

Workshop: Human Perception and Advanced Visualization of 3D Medical Imaging Data





LINXS

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InfraVis

DANISH BIOIMAGING NETWORK

PhD Summer School
CINEMAX X
3D Modelling and Imaging of Material Microstructure

25-29 August
DTU Lyngby Campus

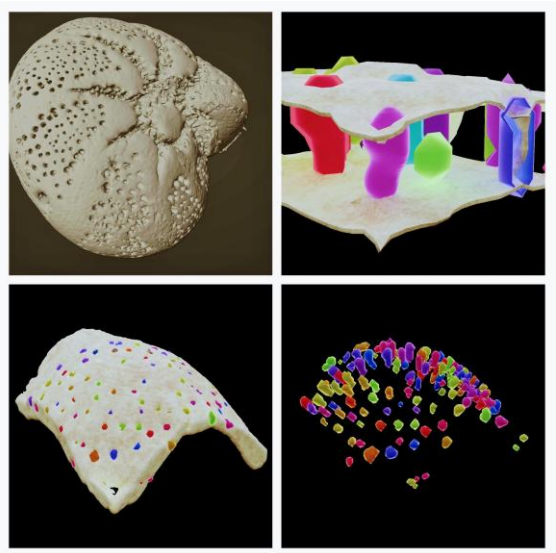
Qim

LINX

DANISH CENTER FOR APPLIED MATHEMATICS AND MECHANICS DCAMM

LINXS

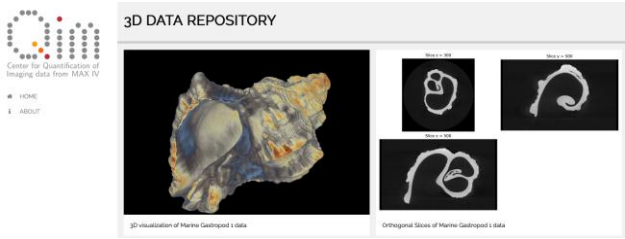
Hackathon: SynchroMage: 3D Tomography and Visualisation for Earth's Hidden Treasures – Environment and Climate theme



InfraVis

Qim
Center for Quantification of Imaging data from MAX IV

LINXS



Augmented and Virtual Reality of microfossils.

Carl Troein Emanuel Larsson

Designing user-friendly GUI:s (Graphical User Interfaces) for image processing and analysis

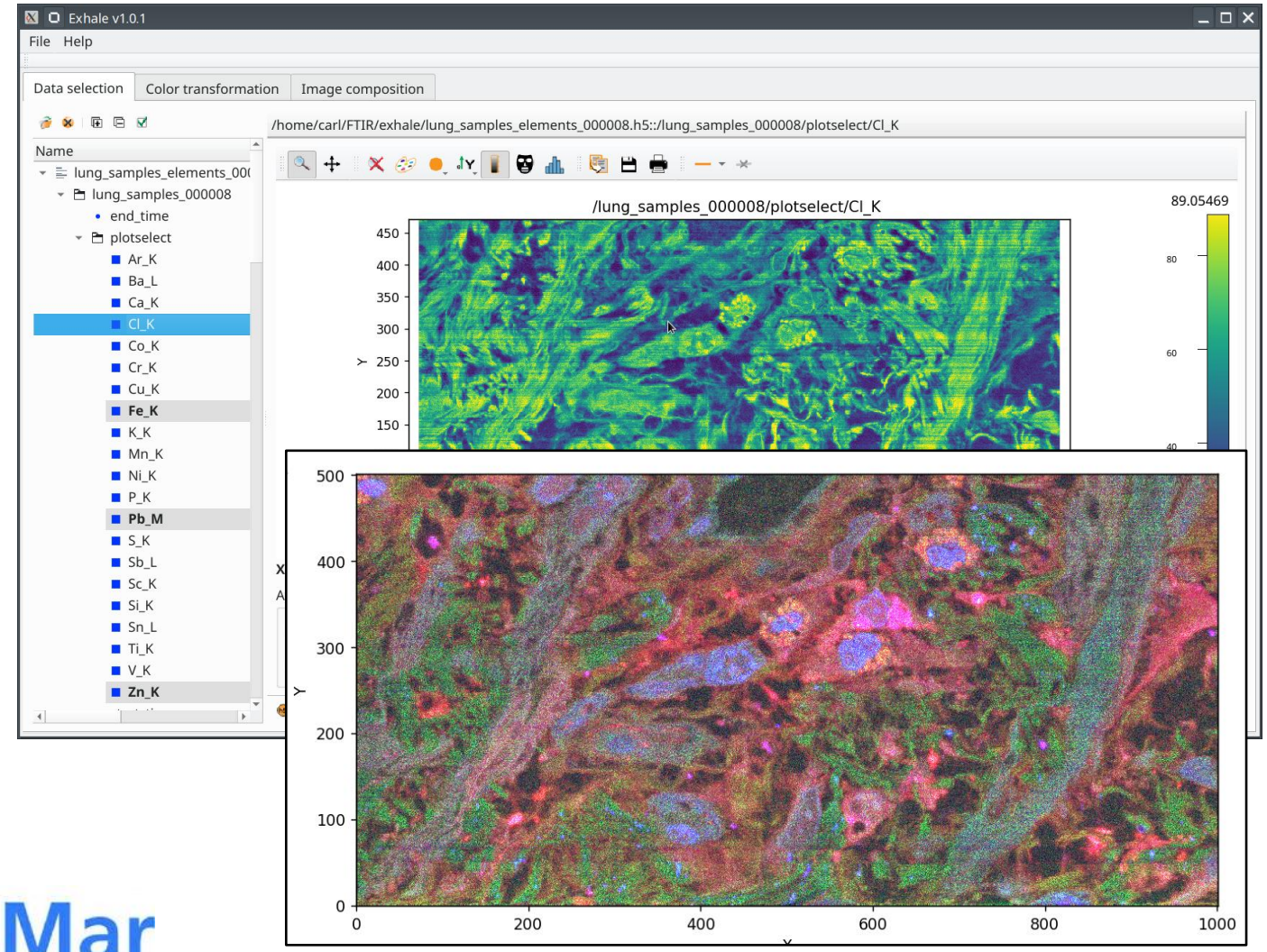
http://www.silx.org

- Load, correct & combine images
- Qt GUI with Silx widgets
- Tailored to the needs of NanoMAX users

NanoMax:
Bryan Falcones
Karina Thånell
Mike Kahnt

Truly Labs:
Karin von Wachenfeldt
Charlott Brunmark

Lund Bioimaging
Gunilla Westergren-Thorsson



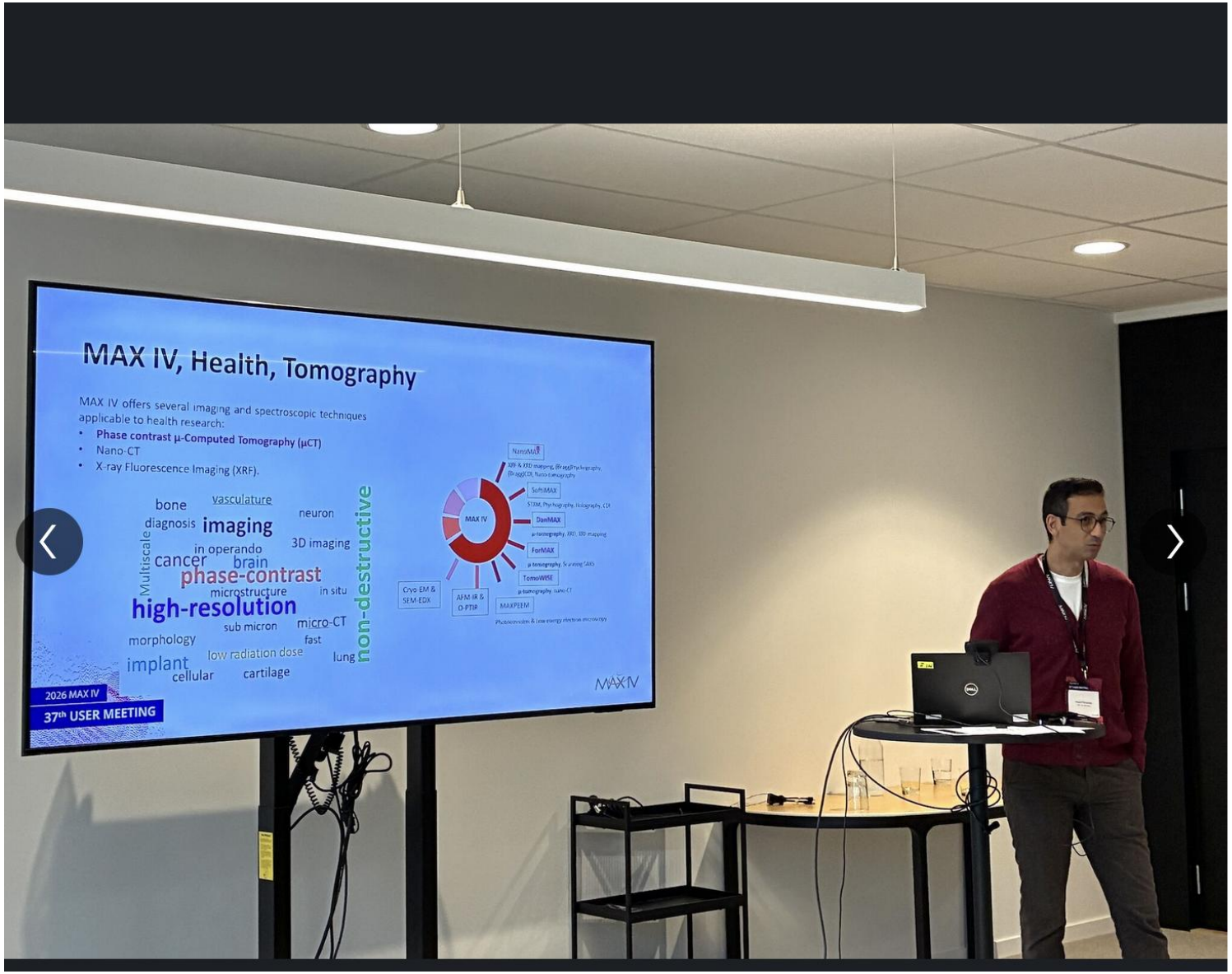
EXHALE Efficient X-ray Hub Aiding Lung Explorations
https://www.vinnova.se/en/p/exhale--efficient-x-ray-hub-aiding-lung-explorations/

VINNOVA Sweden's Innovation Agency

CIPA Correlative Image Processing and Analysis

Lund University MAX IV truly labs AnaMar

MAX IV 37th User Meeting, at the Loop, 19-21st of January, 2026



MAX IV Laboratory
16,226 followers
1mo • Edited •

"Collaboration is key," said Arash Panahifar of #DanMAX and #MedMAX as he opened the session on #Health at #UM37. In their talks, Elizabeth Duke (EMBL), Ahmed al Khafaf (Rigshospitalet), Hanna Isaksson (Lund University) and Julia Herzen (Technical University of Munich) explored how they use #synchrotrons in their study of #biologicaltissue, from cancerous #tumours to cartilage and mosquito guts. The speakers' collaborations reached across research groups, institutions, and countries, underscoring Arash and Selma Maric's (session chairs) point that #community is key to developing #medical exploitation of synchrotron facilities.
#usermeeting #maxiv #event #xrays #research #biom

You and 53 others 2 reposts

Take home messages

1. Collaboration is the key – excellence in science, imaging, and data analysis
2. Computational infrastructure needs
    - Fast transfer and storage of TB-sized images
    - Powerful computation where the data is stored
    - AI research for extremely large images
3. Training needed
    - Analysis training to prepare for beamtime
    - Test tools and investigate (similar) data before beamtime
    - Investigate data analyzability (quality) during experiment
    - Plan for post-experiment analysis

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CIPA
Correlative Image Processing and Analysis

InfraVis

Thank you for listening!

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