

# QIM and 3D Image Analysis

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# Center for Quantification of Imaging Data from MAX IV

At QIM we develop algorithms for quantitative image analysis in order to support the research carried out at large-scale imaging facilities.







UNIVERSITY OF COPENHAGEN



Stephen Hall, Lund



Rebecca Engberg, DTU



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### Triangle of imaging science





#### Information – structure tensor

The structure tensor gives information about orientation and how strong the signal is



• Red: linear





Fiber sample

#### Fiber tracking



Segmented center points

Tracked fibers



## Deep learning benchmark data

- Topic: Object detection and segmentation
- Problem: Annotation is difficult and timeconsuming
- Idea: Create a setup where annotation is easy
- Dataset for deep learning:
  - 9087 individual bugs reflecting shape variation
  - 400 volumes of mixtures
  - Scans with background material (no bug scans)
  - Publish data and baseline solution for object detection







## Data analysis platform

- NNF Data Science Infrastructure: QUAITOM
- Challenge: Scale to support growth in the number of users
  - 150+ yearly users at lab facilities
  - DanMAX and ForMAX opening user program
- Solution: Data analysis platform
  - High-performance computing platform
  - Data and computing resources in one place not moving data but software
  - Focus on the interface and ease of use compute resources later



Felipe Delestro



Hans Martin Kjer



#### **QIM** platform

**Design requirement:** Platform for image analysis that is used by our research group for research.

#### Easy access to analysis resources

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#### Jupyter launcher

abda



#### Online platform – browser access

Easy access	to	files
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	A You need to Login to access remote tools. Local tools are available without login.	gbar > dtu > 3d-imaging-center > projects (NEW FILE) (NEW FOLDER)	ڻ ج 🖿 ¢
Qim platform vo.2.1 We're still in the early development s Login Login	<ul> <li>3D Visualization (isosurfaces)</li> <li>Local thickness</li> <li>Jupyter launcher</li> <li>Data Explorer</li> <li>Local JupyterLite</li> </ul>	2020_DANFIX_37_Fingerprints	20/06/2022
		2020_DANFIX_Vascular_Flows 2020_LINX_rockwool	17/01/2022 08/06/2022
		2020_QIM_05_liver1	19/05/2021
		2020_QIM_22_rat_kidney	08/02/2023
	Local ImageJ	2021_DANFIX_04_EUROFUSION	20/06/2022
	Local Pyodide	2021_DANFIX_05_WhiteWind	20/06/2022
		2021_DANFIX_075_KMC_Cheese	18/04/2023



#### Vision



Scientific hub for 3D quantitative image analysis





New research field Fast from experiment to quantification Methods

Benchmark data

Infrastructure







### Conclusion

- QIM science hub for 3D image analysis
- Research in quantitative methods that can handle large images
- Support users from large-scale imaging
- Create interest from vision community for 3D images beyond medical data

Thank you abda@dtu.dk