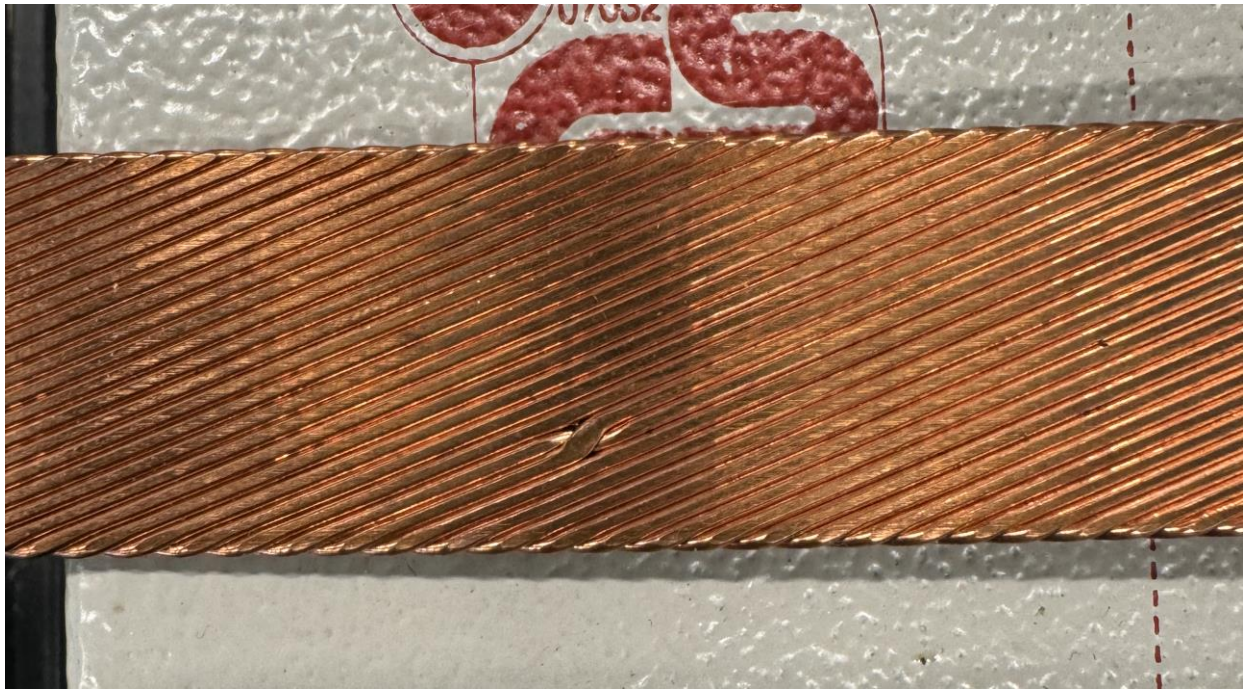
AI based inspection system for cabling anomaly detection

Javier Presmanes Cardama, TE-MSC-LSC

The problem

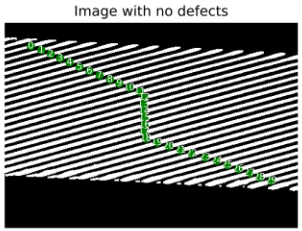


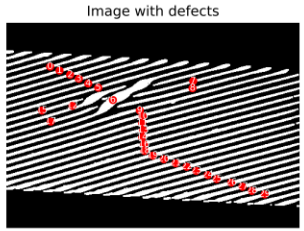
Reduced unhealthy images dataset

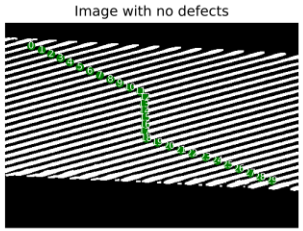
Huge healthy images dataset

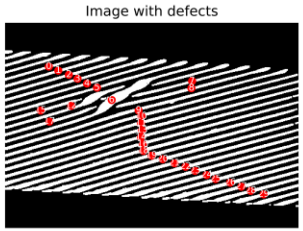
Repetitive pattern/features over timer

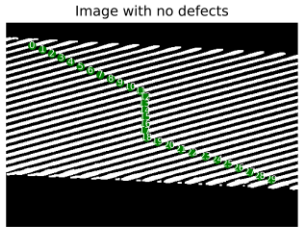
First Approach : Statistical analysis based on features

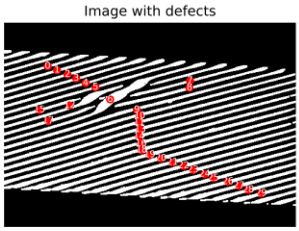


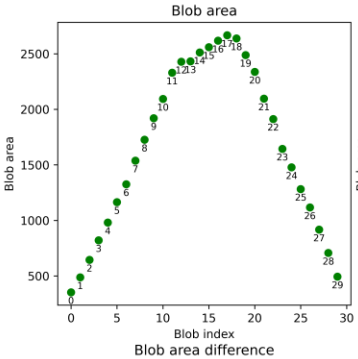


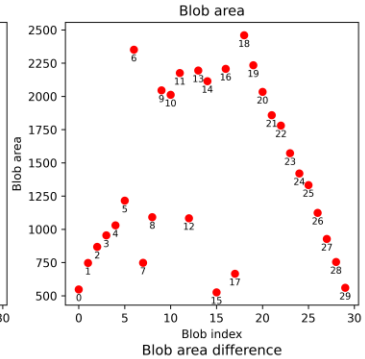


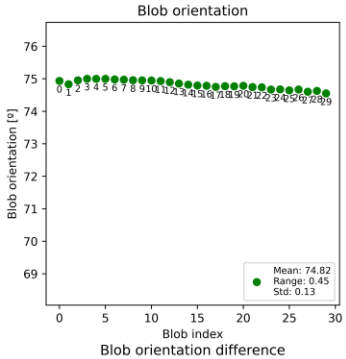


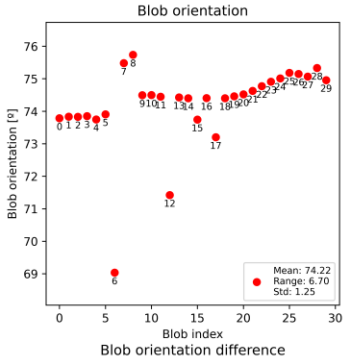


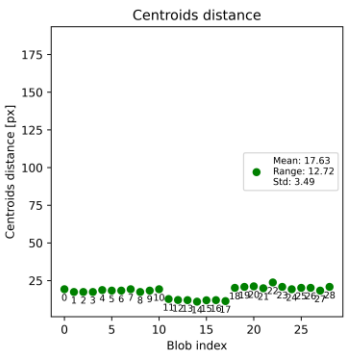


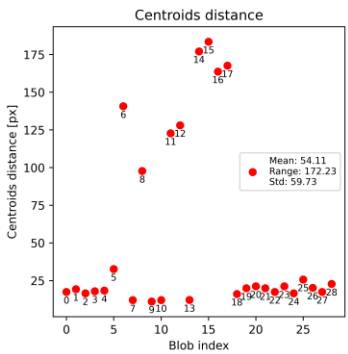


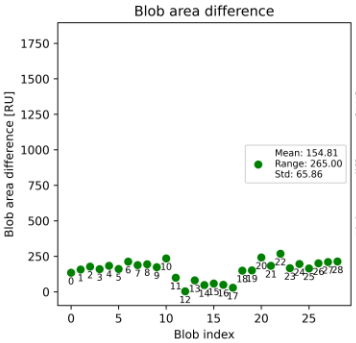


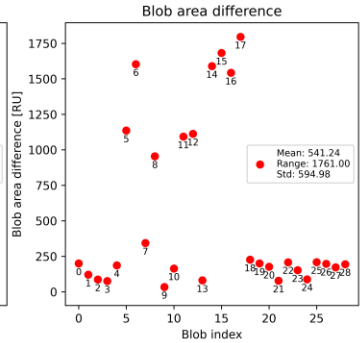


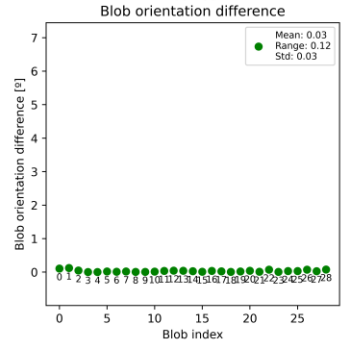


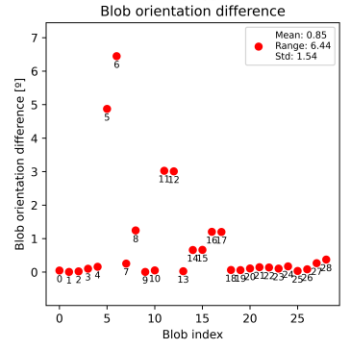






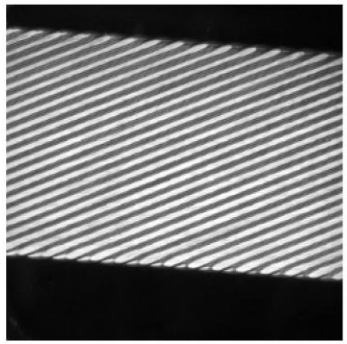




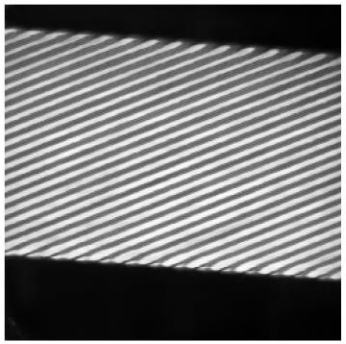


Second approach : Using Autoencoders and reconstruction error

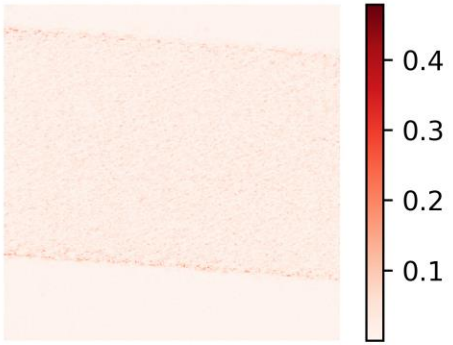
Healthy cable



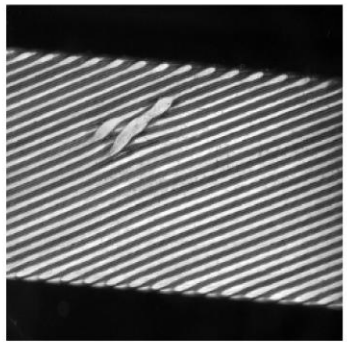
Healthy cable [RECONSTRUCTED]



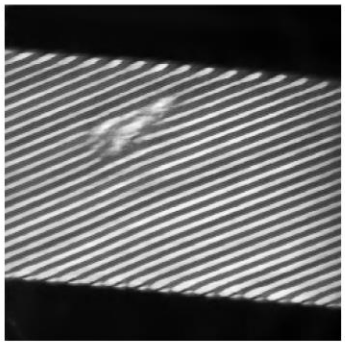
Healthy cable [ERROR HEATMAP]



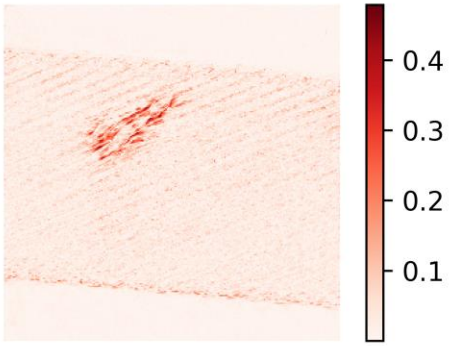
Cable with defect



Cable with defect [RECONSTRUCTED]



Cable with defect [ERROR HEATMAP]



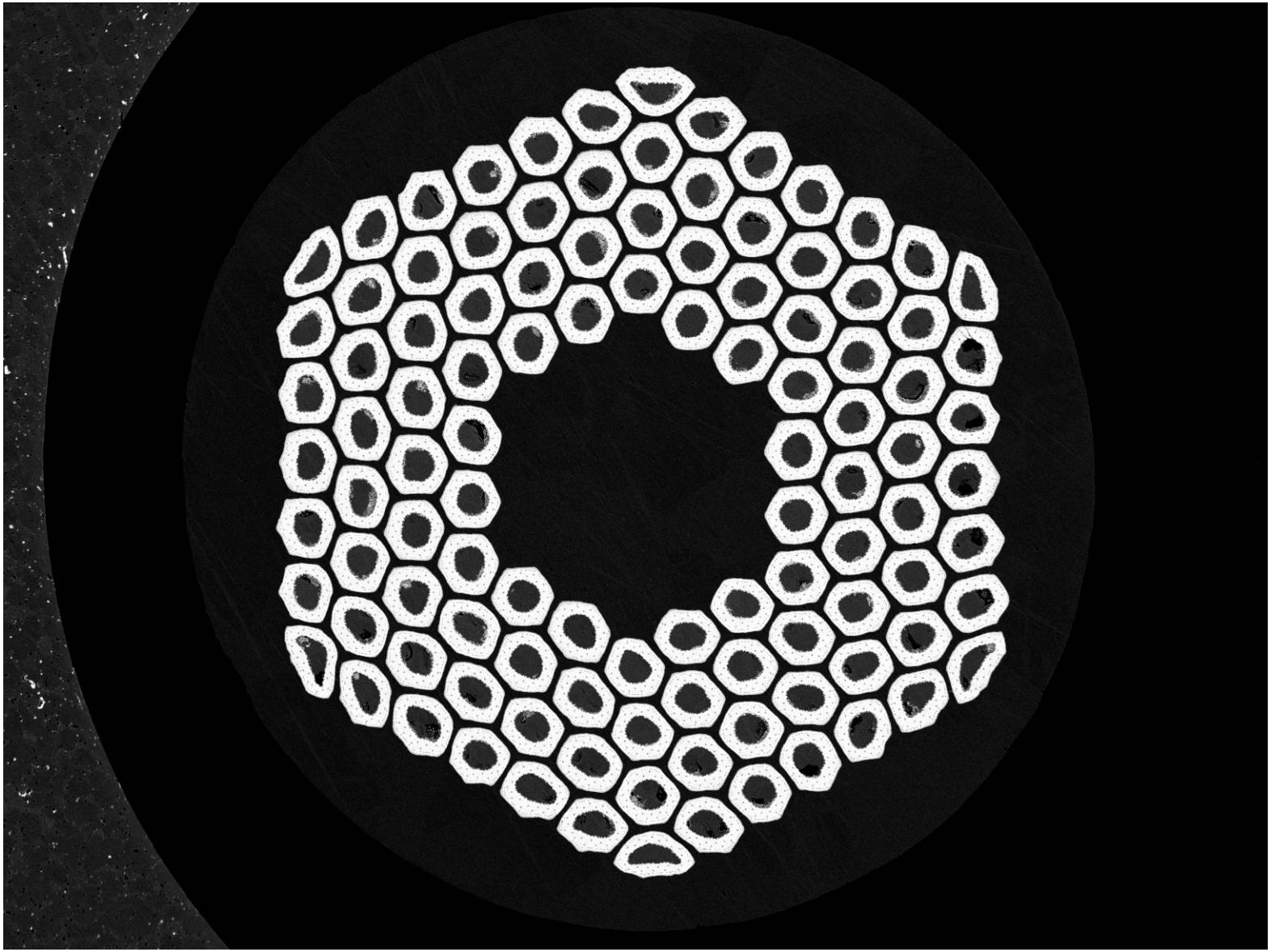
Comparison

Feature statistical analysis	Autoencoders
+ Real-world data calibration	- Sensitive to setup changes
+ Allows parametrization and algorithm control	- “Blackbox”
+ Easy to modify the algorithm	- Training time can be a handicap for development
- Can be slow	+ Very fast
- Software complexity	+ Easy to integrate in existing software

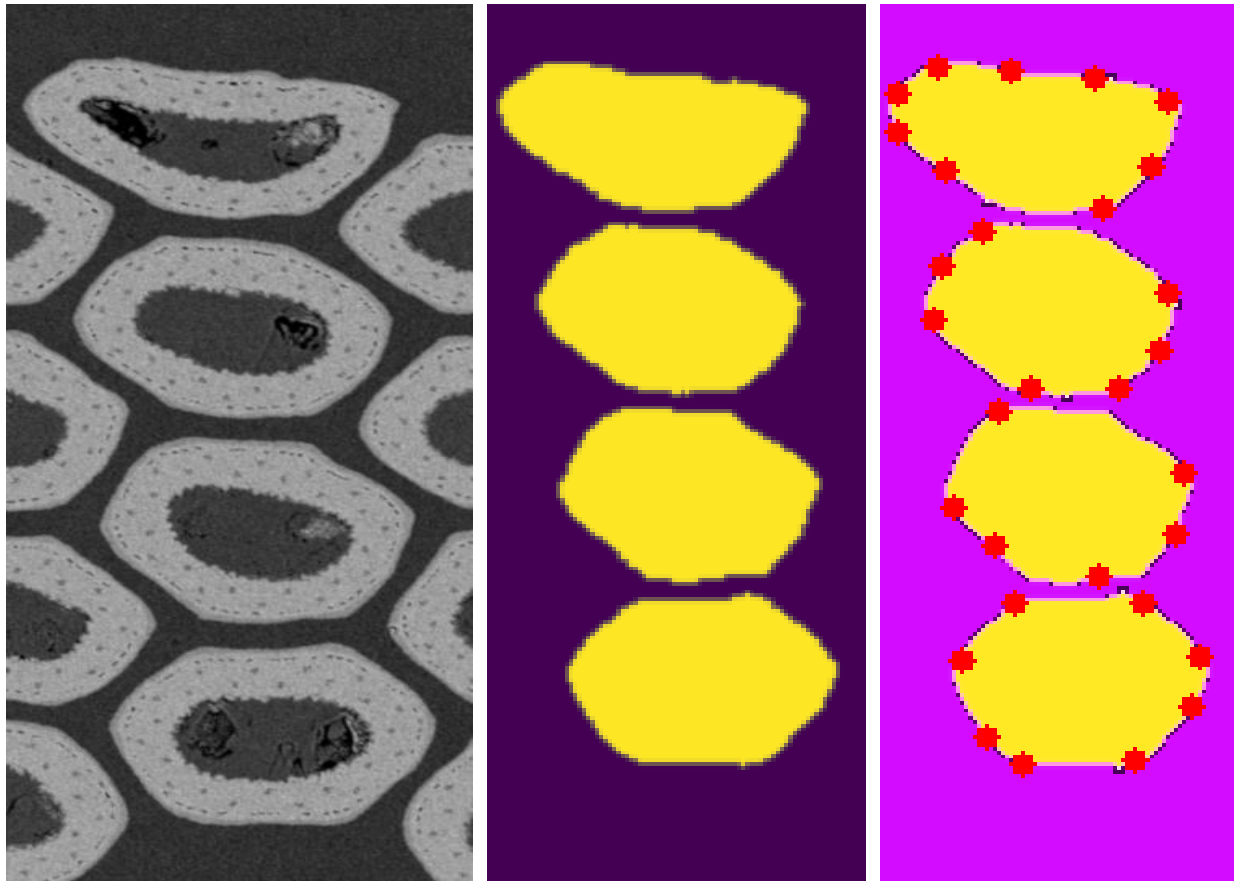
Extracting the geometry of Nb_3Sn wires for Quench simulations using AI

Josef Baumann, TE-MSC-LSC

The problem

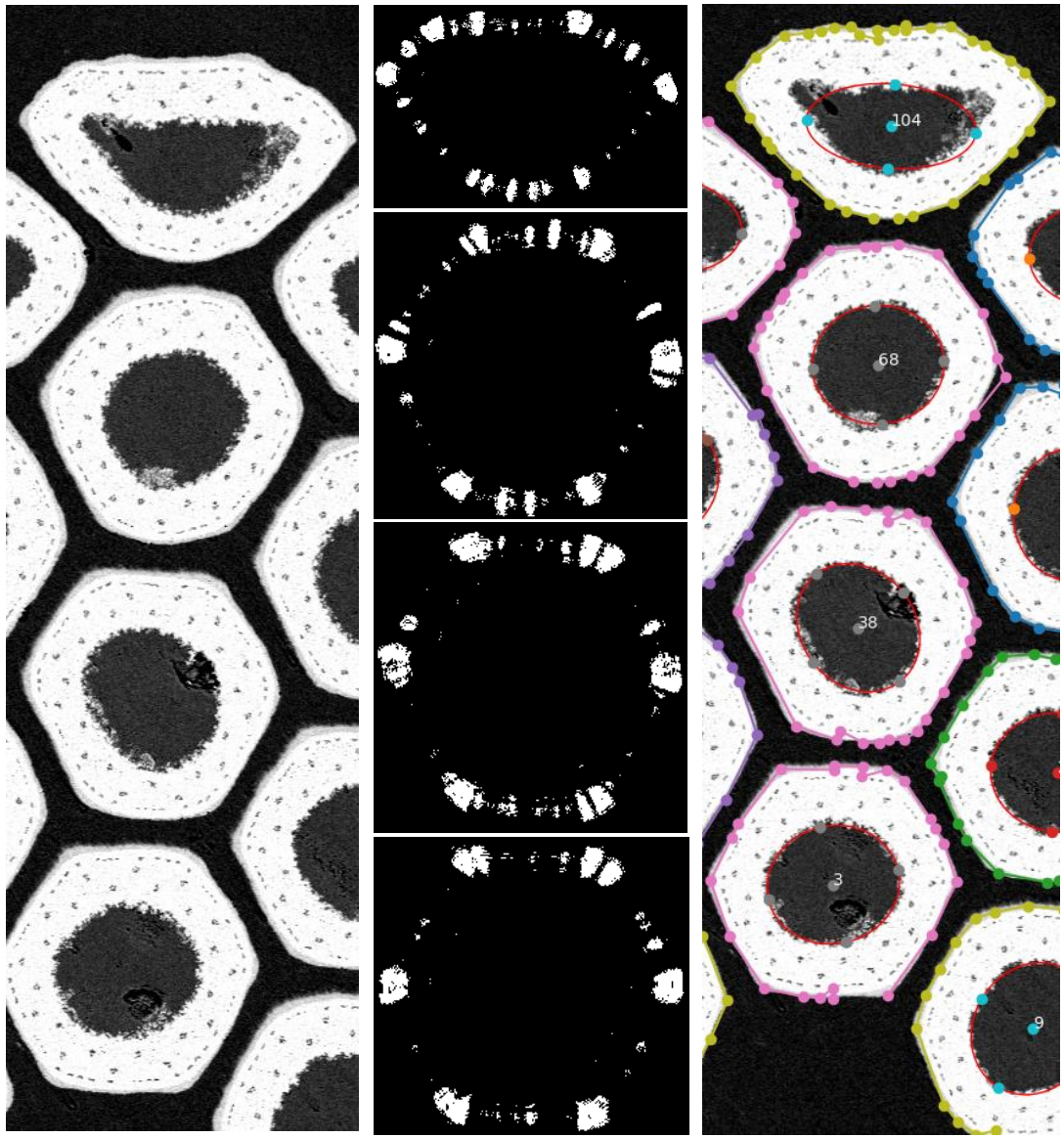


First approach: Harris corner detector



Jianbo Shi and Carlo Tomasi. Good features to track. In Computer Vision and Pattern Recognition, 1994. Proceedings CVPR'94., 1994 IEEE Computer Society Conference on, pages 593–600. IEEE, 1994.

Second approach: Machine learning



Arganda-Carreras, I., Kaynig, V., Rueden, C., Eliceiri, K. W., Schindelin, J., Cardona, A., & Sebastian Seung, H. (2017). Trainable Weka Segmentation: a machine learning tool for microscopy pixel classification. *Bioinformatics*, *33*(15), 2424–2426.

Comparison Harris corner detector and Weka Segmentation

Harris (mathematical)	Weka (AI)
+ well known algorithm	- “black box”
+ low computational requirements (faster)	- high computational requirement (slower)
+ no training needed	- needs to be trained
- sensitive to scale and rotation	+ adaptable
- careful parameter tuning needed	- overfitting
- Not robust to noise and low contrast areas	+ more flexible