

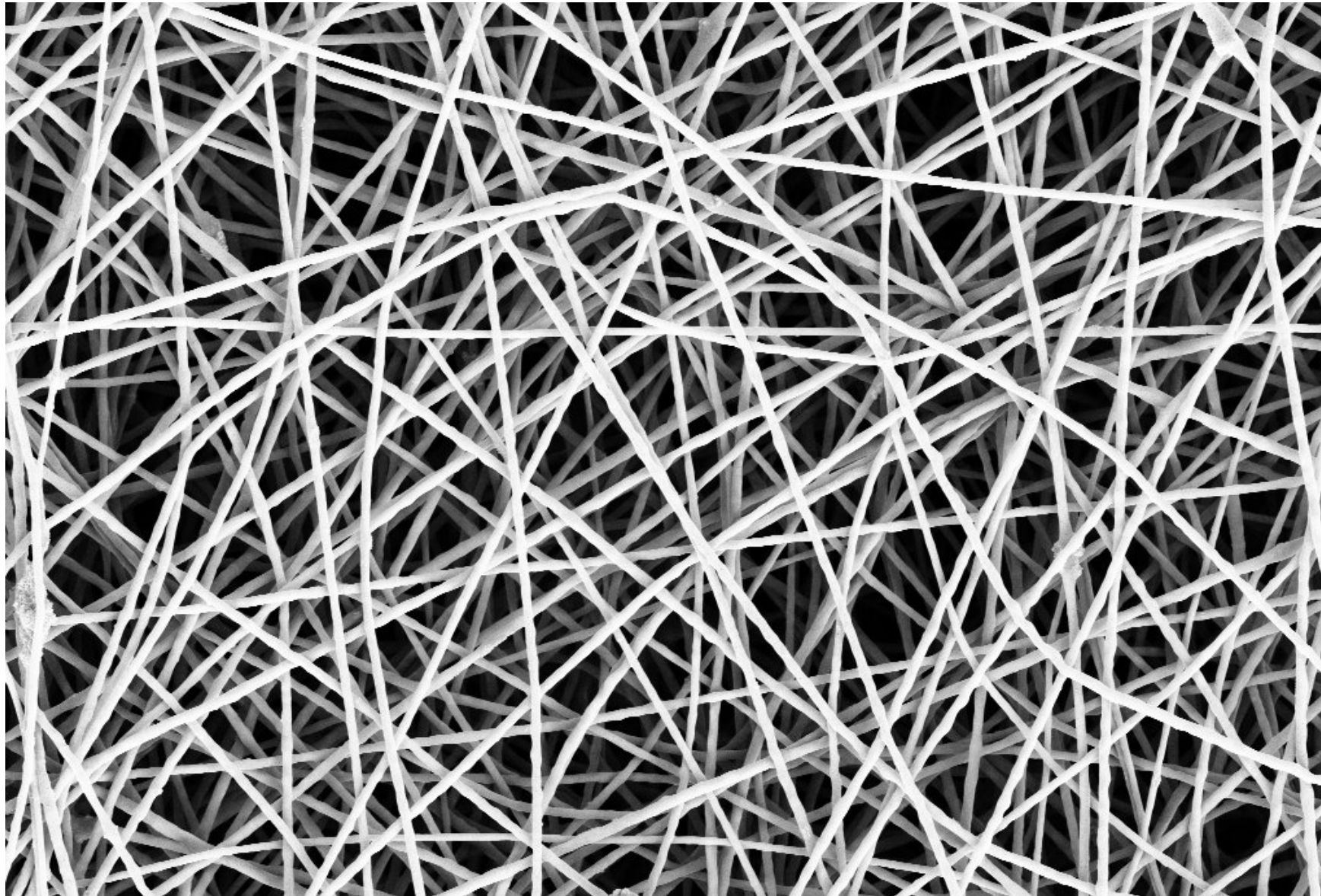
Anomaly Detection

Mathematical Models and Methods for Image
Processing

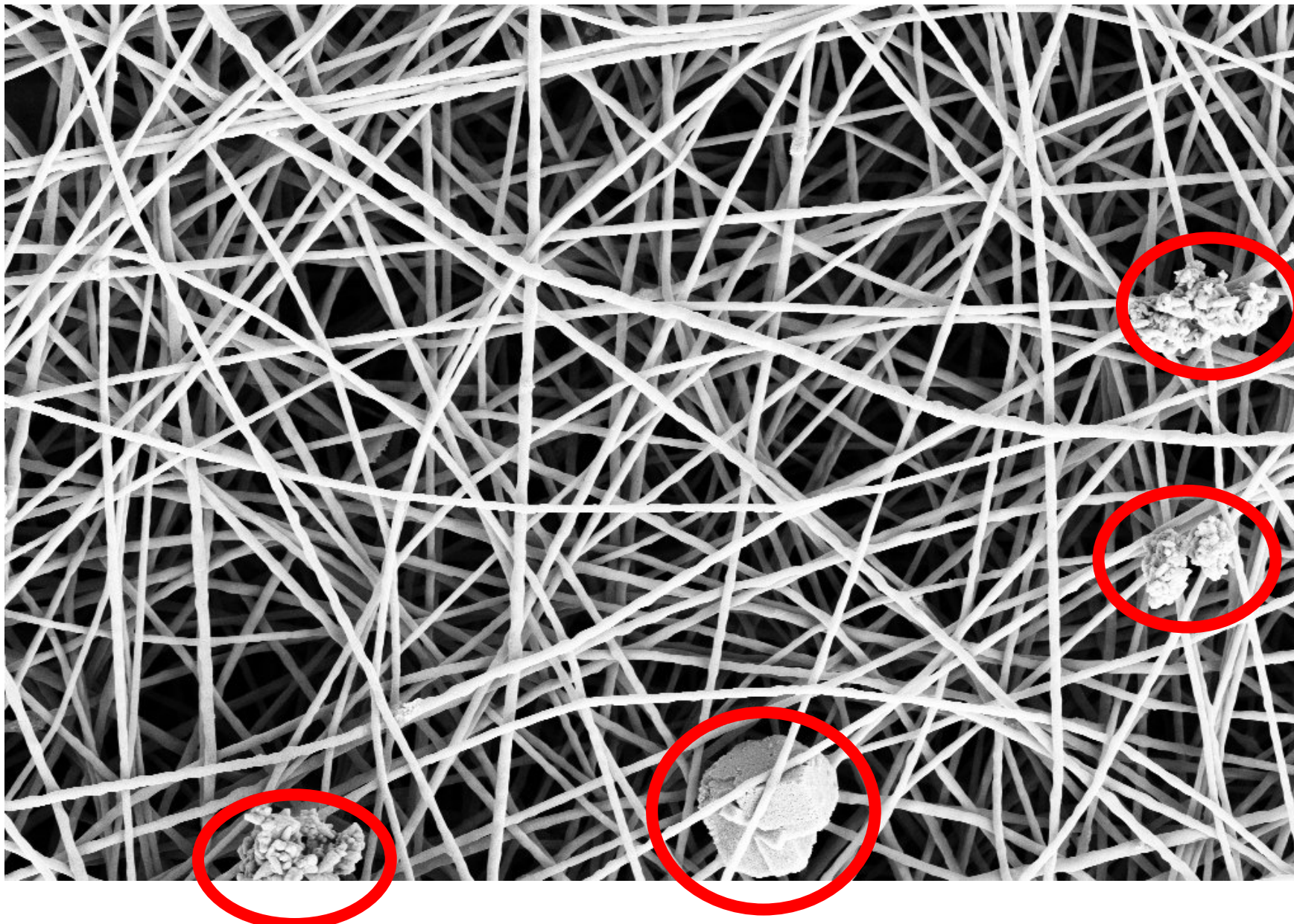
Stefano Bertolasi

April 30th 2026

The anomaly detection problem



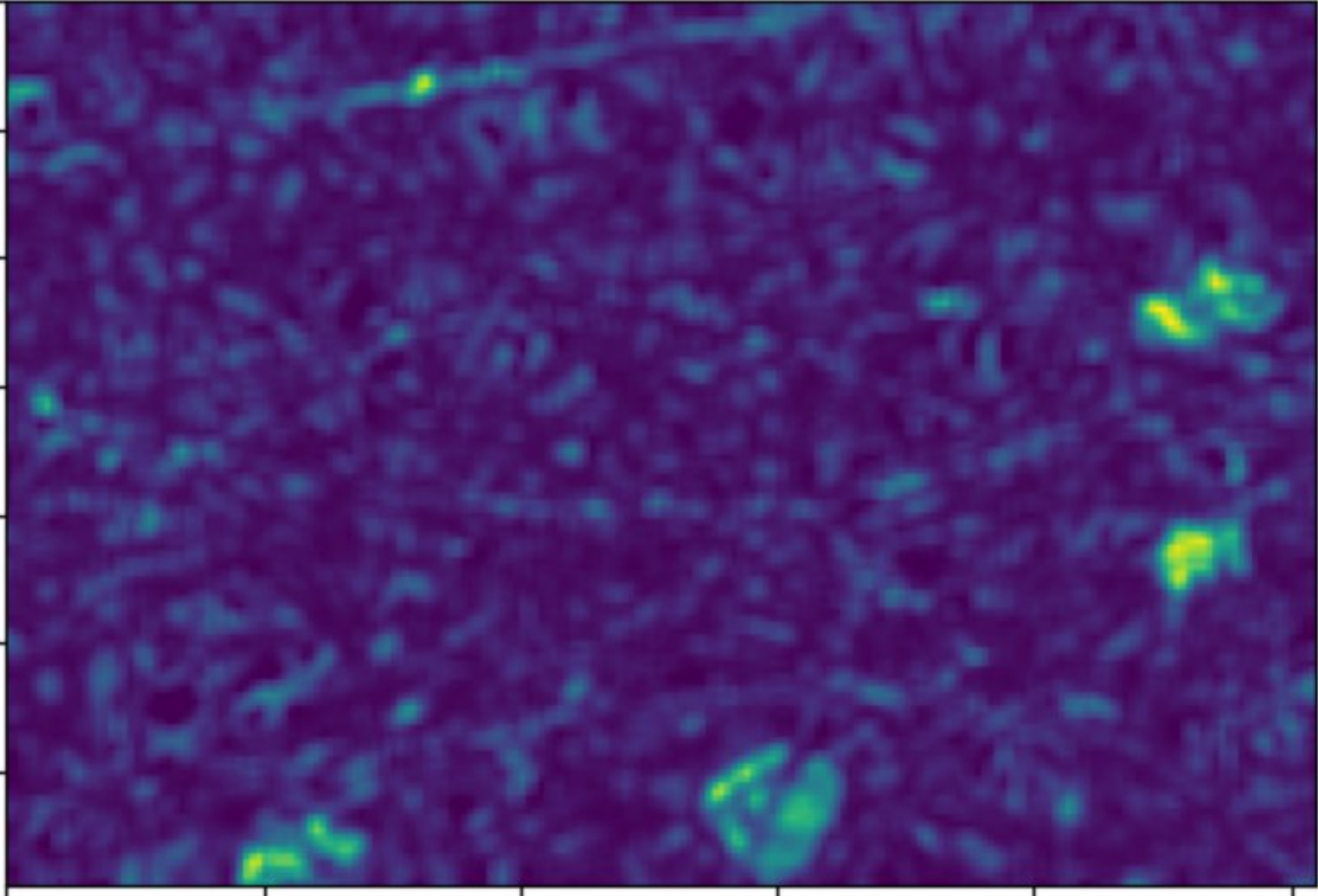
The anomaly detection problem



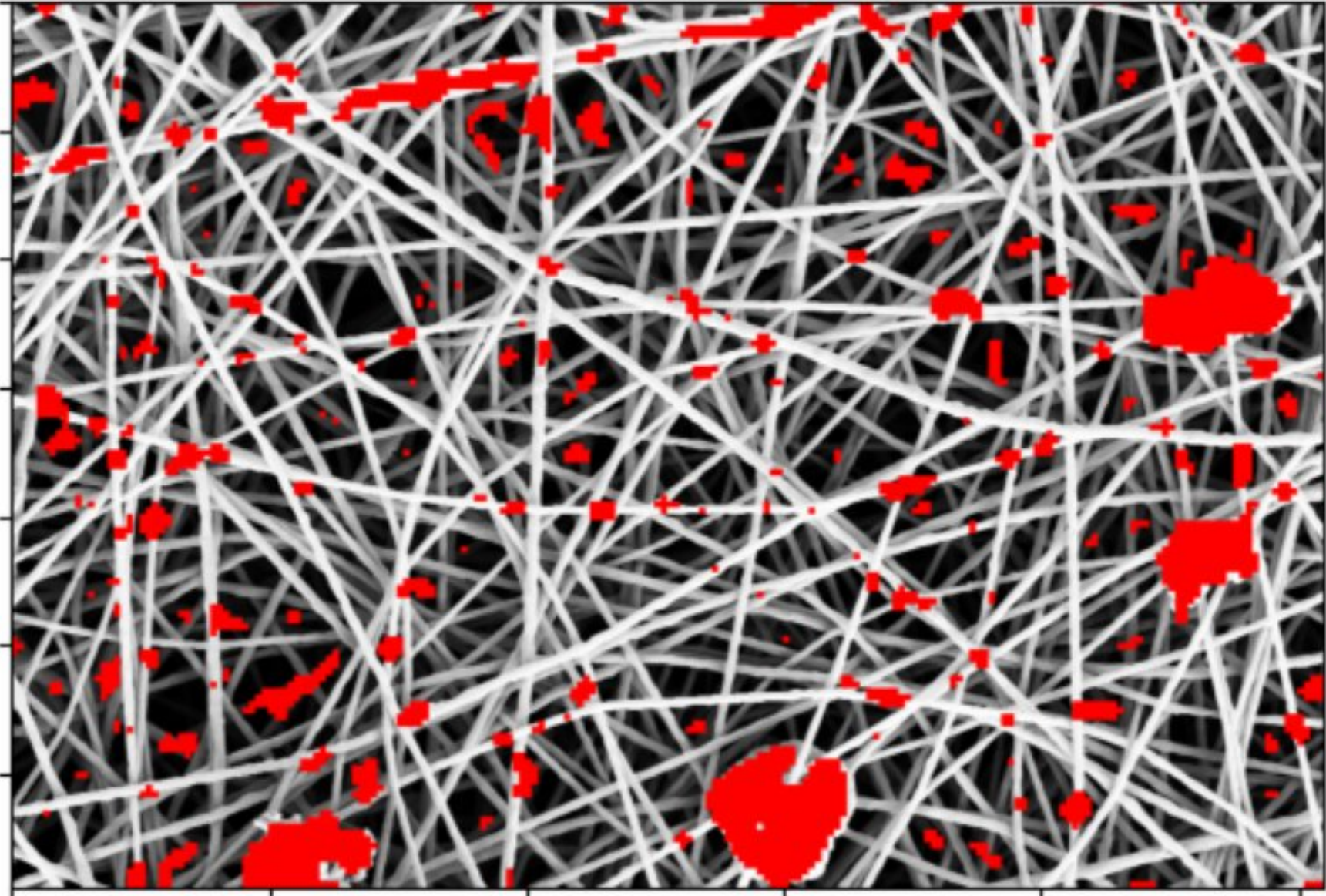
The anomaly mask



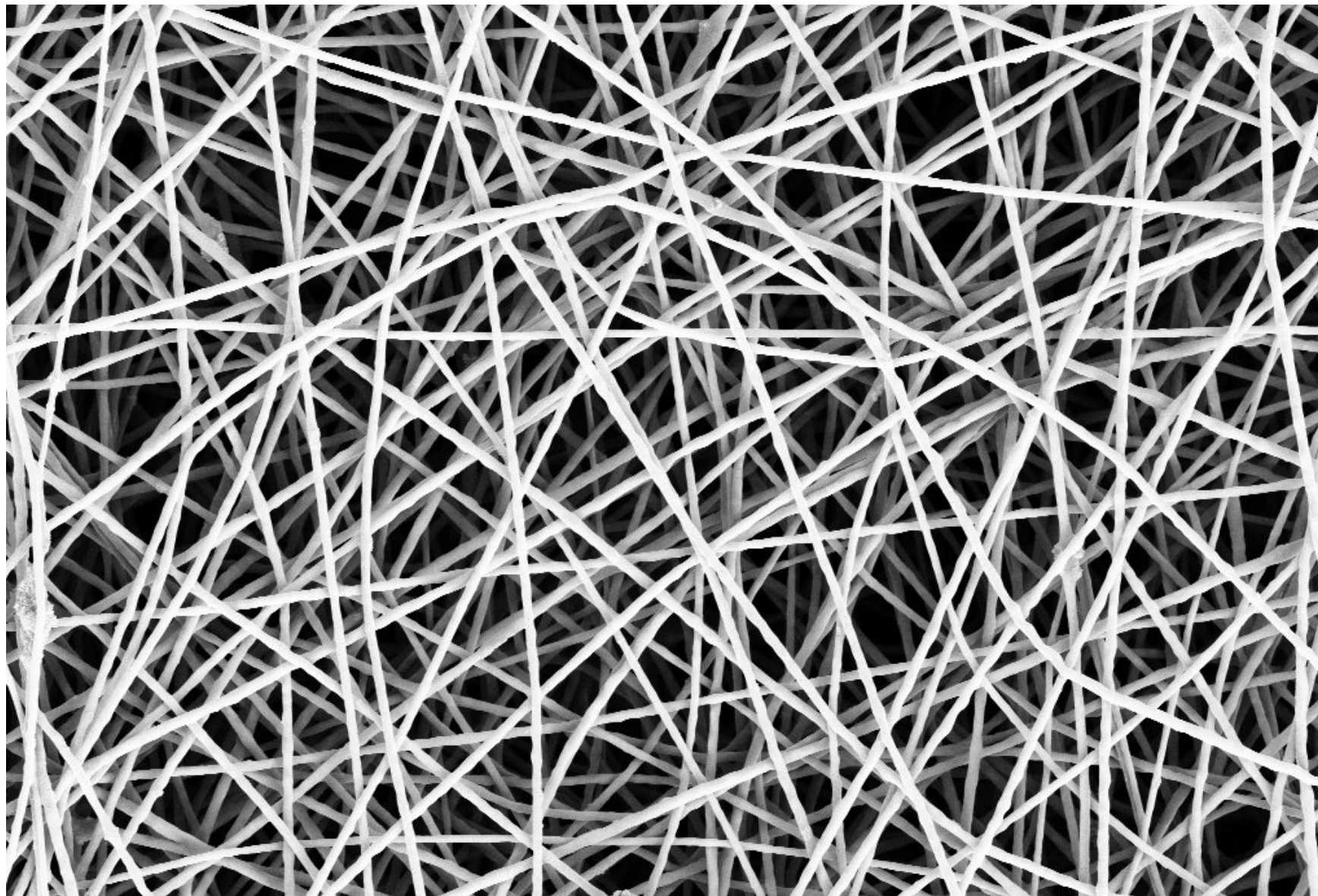
Heatmap



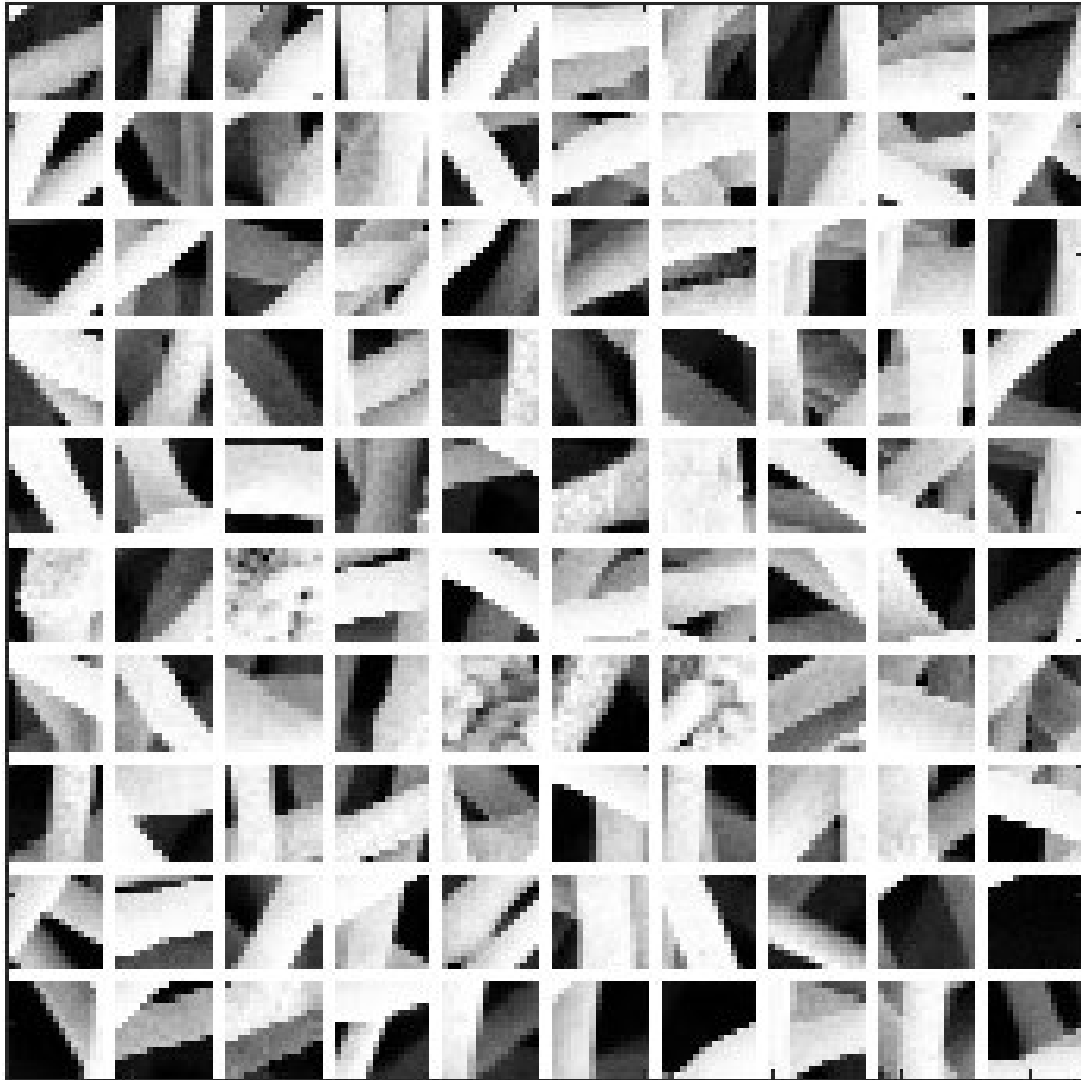
Detections



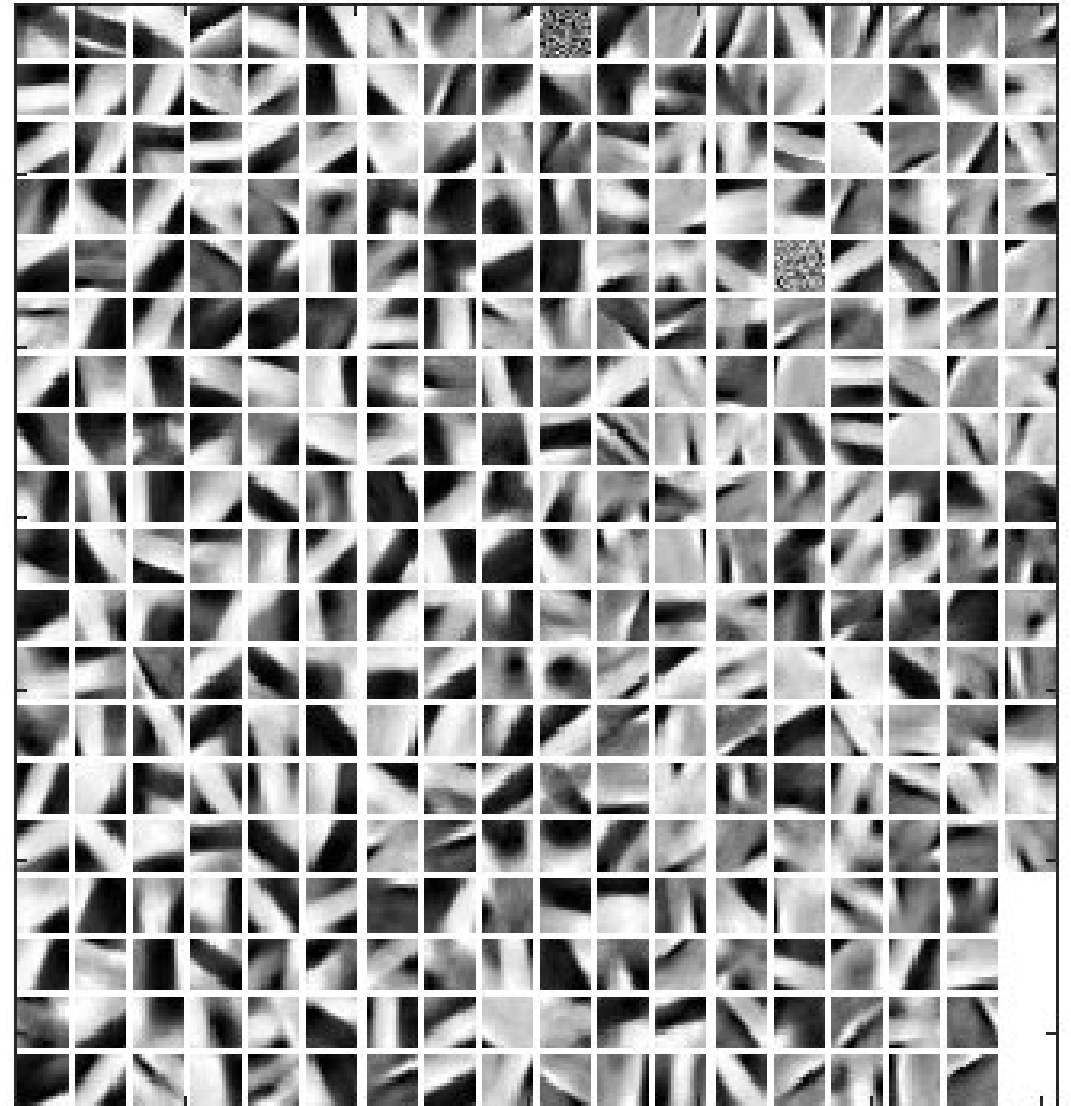
Training Image



Normal Patches



Learned Dictionary



Assignments

- Implement the anomaly detection based on ℓ_1 sparse coding
 - Use 15x15 patches
 - You can improve the results by fine tuning all the parameters

References

- Carrera, Diego, et al. "Defect detection in SEM images of nanofibrous materials." IEEE Transactions on Industrial Informatics 13.2 (2016): 551-561.
- Carrera, Diego, et al. "Scale-invariant anomaly detection with multiscale group-sparse models." 2016 IEEE International Conference on Image Processing (ICIP). IEEE, 2016.