Title:

Enhancing 3D reconstruction accuracy of multi-voltage FIB tomography images using multimodal machine learning

Keywords:

Multimodal machine learning, Multi-voltage images, FIB-SEM, Over deterministic systems, 3D reconstruction

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Abstract of the paper:

FIB-SEM tomography is a powerful technique that integrates a focused ion beam (FIB) and a scanning electron microscope (SEM) to capture high-resolution imaging data of nanostructures. This approach involves collecting in-plane SEM images and utilizing FIB to remove material layers for imaging subsequent planes, creating image stacks. However, these image stacks in FIB-SEM tomography are subject to the *shine-through effect*, due to which structures become visible from posterior regions of the current plane. This artefact introduces an ambiguity between image intensity and structures in the current plane, making traditional segmentation methods like thresholding or the k-means algorithm challenging. In this study, we propose a multimodal machine learning approach that combines intensity information from different accelerating voltages to improve the 3D reconstruction of nanostructures. By treating the increased *shine-through effect* at higher accelerating voltages as a form of *additional* information, our proposed method significantly improves segmentation accuracy and leads to more precise 3D reconstructions.