Classification of Atomic Defects in Semiconductor Material Systems by Machine Learning

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Visualizing and identifying defects present on the semiconductor material surface is an important application of the scanning tunnelling microscope (STM). However, it can be difficult to interpret these images as the images show a convoluted picture of the local electronic structure and topography. Identifying the correct defect require comparisons to theoretical predictions and is often highly dependent on the skill of human experts. Thus, the identification of a large dataset is not only time consuming but may also result in inconsistency in the classification of experimental STM images due to human bias. In this work, we compare the performance of a convolutional neural network (CNN) trained solely using theoretical simulated defect images with human classifiers and discuss the implications of our results.