Poster

# Neural Network-Assisted Crystal Detection for Automated Electron Diffraction Data Collection

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Electron diffraction acts as a powerful alternative for crystals and samples that are challenging for X-ray diffraction [1]. It can be performed in-house on a transmission electron microscope, and is also easily accessible. Automated data collection is always profitable, and the use of crystal picking algorithms can significantly reduce both the data collection time and radiation damage to the sample.

Current crystal detection methods based on threshold [2, 3] are effective on TEM grids with uniform background, such as continuous or holey grids. However, it is problematic when the methods are applied on commonly used lacey carbon grids due to their randomly distributed pore size and shapes and varying density. Therefore, this variability requires advanced crystal identification method.

We propose an improvement to the existing approach for crystal identification on lacey carbon TEM grids by subtracting the holey-carbon background from images before thresholding. Traditional image processing techniques struggle with this task, but it can be effectively addressed using neural networks. By training a neural network to recognize the lacey carbon grid background and eliminate it later, we aim to improve the accuracy of crystal identification (Fig. 1). This improvement will enable the collection of more useful data and minimize the inclusion of empty data from the grid background.

**Figure 1.** Crystal identification on a lacey carbon grid covered with ice by thresholding method without (left) and with (right) preliminary grid removal. Yellow lines represent the identified borders of the crystals, red dots show center of the crystals, blue areas mark found carbon grid.

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