Abstract Submitted
for the CUWIP22 Meeting of
The American Physical Society

A Comparison Between Tree-Based and Deep Learning Algorithms in the Identification of Thin Materials LAURA ZICHI, Department of Physics, University of Michigan, TIANCI LIU, Department of Statistics, University of Michigan — First isolated in 2004, graphene monolayer sheets display unique properties of promising technological potential and the cutting edge methodologies used for their fabrication have expanded to create two-dimensional (2D) analogues from other bulk materials. However, current techniques for locating exfoliated materials have low-throughput and often rely on inefficient manual identification. Integration of high-performance machine-learning and optical microscopy can accelerate flake identification. Although Convolutional Neural Network (CNN) based deep learning algorithms significantly advance object recognition, their high computational complexities, large dataset requirements and the lack of comprehensive theoretical understandings of their mechanisms limits their accessibilities. We propose an alternative approach, tree-based methods, with features that mimic color contrast, and compare them to ResNet, a CNN model, for identification of exfoliated $MoSe_2$ under different optical settings. We show with Gradient-weighted Class Activation Mapping, a standard visualization technique for CNNs, that despite achieving high accuracies CNNs usually failed to identify flakes in many images which jeopardizes their generalizability and reliability for 2D material modeling.

Laura Zichi
Department of Physics, University of Michigan

Date submitted: 11 Jan 2022 Electronic form version 1.4