Virtual Summer School: Machine Learning in Electron Microscopy

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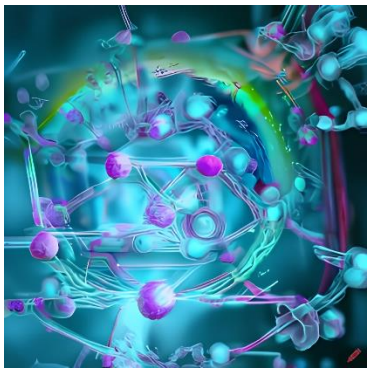

Machine learning is changing the way microscopy operates on all levels – from analysis of imaging and hyperspectral data to microscope optimization to the way instruments scan, acquire spectra, and even design and execute experiments. The purpose of this school is to provide an introduction and hands-on skills that constitute the individual elements of this transition and take it to the next level as a community.

Lectures and hands-on Colab practice sessions will be scheduled on Tuesdays and Fridays 9 am EST via Zoom. The school will be free of charge. For registration, send e-mail to sergei2@utk.edu

The information on the course and course materials will be available on GitHub: https://github.com/SergeiVKalinin/ML-ElectronMicroscopy-2023

Preliminary program (potentially subject to change).

1. Outline and structure of the course - June 6
2. Imaging in Scanning Transmission Electron Microscopy - June 9
3. Spectroscopy in STEM - June 13
4. Linear methods and dimensionality reduction for spectral data - June 16
5. High-resolution and Z-Contrast Imaging -June 20
6. Image registration methods - June 23
7. Linear methods and dimensionality reduction for imaging data - June 27
8. Diffraction and 4D STEM - June 30
9. Bringing Cloud and Edge to STEM: from tool to ecosystem July 4
10. Image simulations- July 7
11. Deep convolutional networks - July 11
12. DCNN for image data - July 14
13. DCNN case studies - July 18
14. Gaussian processes and Bayesian Optimization - July 21
15. Bayesian Inference, Structured GP, and Hypothesis Learning - July 25
16. Variational Autoencoders – 1 - July 28
17. Variational Autoencoders – 2 - August 1
18. Encoders-decoders and structure-property relationships - August 4
19. Special topic: VAE for any tasks - August 8
20. Deep kernel learning: EELS and 4D STEM – August 11
21. DKL forensics and human in the loop August 15
22. Special topics: Reinforcement learning August 18
23. Special topics: Learning physics form images - August 22
24. Special topic: Causality - August 25