Kirby Broderick

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Open to immediate Bay Area/Greater Boston relocation

Professional Summary

Computational materials and automated design engineer (5 yrs) applying convolutional neural networks and high throughput modeling expertise to high-volume research and manufacturing.

Skills

Core: Python • PyTorch • Graph/Convolutional NNs • C++ • Slurm • Git
Familiar: Rust • Pymatgen • ASE • dask • VASP • ILT • OPC • k8s

Experience

Software Research Engineer/Scientist
Intel Corporation; Hillsboro, OR — Apr 2024–present

- Developed and implemented algorithm to reduce arbitrary-degree mask vertex counts by 30% while preserving manufacturability
- Implemented production-ready inverse lithography curvilinear hotspot repair capability with 100% acceptance rate relative to optical proximity correction on a production layer
- Optimized pytorch training loop to accelerate neural network training speeds by 4x, cutting model development cycle time from 8 to 2 hours on an A100 GPU
- Optimized OPC convolutional neural network to improve edge predictive accuracy by 2x

Graduate Student Researcher
Carnegie Mellon University; Pittsburgh, PA — Aug 2019–Feb 2024

- Designed and developed protocols to combine machine learning and density functional theory for surface property prediction of heterogeneous catalysts for sustainable energy technologies
- Worked with chemists to design and optimize catalysis experiments and interpret results

Projects

Ternary surface segregation simulations (code) **2023**

- Worked with vacuum lab chemists to determine the ability of DFT+ML to predict experimental surface expression of noble metal ternary alloys
- Generated 5000 DFT relaxations of 60-atom slabs with disordered compositions
- Trained a DFT surrogate GNN and ran high-throughput Monte-Carlo simulations across composition space to predict atomic surface composition within ~0.1 across 3 systems

Cleavage energy transfer learning - (code) **2022–2023**

- Designed and developed transfer learning protocols for predicting intermetallic cleavage energies across functionals, materials, and simulation settings using foundation models
- Improved regression accuracy of facet energy by 52%; termination classification by 2.4x

Design of experiments for hydrogen evolution reaction system - 2019–2021

- Designed Bayesian optimization/active learning loops for nanocatalysis experiments
- Used multifidelity modeling to aggregate ML predictions and DFT and experimental data
- Worked with wet lab chemists to understand and interpret experimental results

Education

Carnegie Mellon University | Pittsburgh, PA | *PhD Chemical Engineering* | *Feb 2024*
Georgia Inst. of Technology | Atlanta, GA | *BS Chemical Engineering*. | *Apr 2019*