Riley Vickers, PhD

rileyvic@umich.edu

Creating novel quantitative methods for solving tough problems. See more about me: rileyvickers.com

Education and Awards

PhD Environmental Sciences and Engineering   08/2017 – 08/2023
The University of North Carolina at Chapel Hill
Dissertation: Molecular-Scale Analysis of the Morphology, Topology, and Performance of Crosslinked Aromatic Polyamide Used in Reverse Osmosis Membranes.
Advised by: Dr. Orlando Coronell and Dr. Cass T. Miller

- Received NSF Graduate Research Fellowship, UNC Royster Doctoral Fellowship, and Environmental Sciences and Engineering Departmental Fellowship (Total Value: $168,300) in support of research on mass transport in reverse osmosis membranes for desalination and wastewater reuse.
- Awarded 25 million core-hours of NSF XSEDE and NSF ACCESS high-performance computing resources (Total Value: $198,540) for molecular simulations of reverse osmosis membrane materials.

BS Civil Engineering   08/2012 – 12/2016
The University of Texas at Austin
Thesis: Electrophoretic Mobility of Silica Nanoparticles in Produced Water

Experience

Postdoctoral Research Fellow   08/2023 – Present
The University of Michigan, Department of Chemical Engineering

- Creating advanced molecular-scale simulations of membranes in fuel cells, lithium-ion batteries, and electrodialysis water treatment to determine relations between material properties and performance.
- Developing composite supervised, unsupervised, and reinforcement learning methods to optimize simulation methods and determine ideal features for regression of membrane performance metrics.
- Designing shared/distributed memory parallel statistical mechanics particle analysis package.
- Presented this research via one invited presentation, one conference talk, and one conference poster.
- Mentoring ten graduate students in research, data science, code development, and scientific writing.

Graduate Research Fellow   08/2017 – 08/2023
The University of North Carolina at Chapel Hill, Environmental Sciences and Engineering

- Designed and validated molecular-scale computational physics simulations to identify fundamental determinants of reverse osmosis membrane performance.
- Developed a shared/distributed memory parallel image processing package and implemented statistical mechanics analyses for the morphological and topological quantification of porous media.
- Utilized principal component analysis, clustering analysis, and neural net regression analysis to analyze over 100 TB of particle trajectory data to quantify water transport behavior in membranes.
- Published this research in four peer-reviewed journal articles, and further disseminated via three invited presentations, four conference talks, and three conference poster presentations.
- Represented graduate students in matters of diversity, equity, and inclusion at the university level as Graduate and Professional Student Federation Senator.

Proficiencies

Development: Python, Cython, C++, JavaScript, SQL, MATLAB, R, scikit-learn, PyTorch, TensorFlow, high-performance computing
Data Science: ETL, statistical mechanics, supervised, unsupervised, and reinforcement learning, image processing, time series analysis
Data Visualization: pyplot, Bokeh, Seaborn, Plotly, powerBI
Computational Physics: LAMMPS, GROMACS, openFOAM, molecular dynamics, finite element method
Communication: Microsoft Word, PowerPoint, Excel, Outlook

Miscellany

Riley loves: cooking dinners, baking desserts, roasting coffee, pulling espressos, growing houseplants, throwing ceramics, mountain biking, downhill skiing, trail running, new places, watching movies.