Brennon L. Shanks

Curriculum Vitae

Department of Chemical Engineering
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⚬ Github   in Linkedin

Professional Summary Statement

- Engineering Ph.D. candidate with a strong expertise in statistical mechanics, quantum mechanics, molecular simulations, neutron scattering, and machine learning. My in-depth knowledge and experience in these fields have resulted in publications and presentations at international conferences, specifically focused on neutron scattering analysis.

- Versatile and innovative researcher with a wide range of experiences in academic and industry settings. My background encompasses fundamental scientific research, process engineering and design, intellectual property strategy, marketing, and manufacturing. This diverse skill set enables me to approach problems from multiple perspectives and deliver comprehensive solutions that bridge the gap between theory and practical applications.

- Thoughtful and driven team member who prioritizes building strong professional relationships. I strive to foster an interdisciplinary, inclusive, and productive work environment where collaboration and open communication thrive. By promoting a positive and supportive atmosphere, I aim to bring out the best in myself and my colleagues, leading to enhanced teamwork and successful outcomes.

Education

2019 – 2024 **Doctor of Philosophy in Chemical Engineering**, *University of Utah*, Salt Lake City, UT.
Neutron scattering analysis, statistical and quantum statistical mechanics, materials science, molecular simulation, thermodynamics, Bayesian statistics and machine learning

2019 – 2021 **Master of Science in Chemical Engineering**, *University of Utah*, Salt Lake City, UT.

2015 – 2019 **Bachelors in Chemical and Biomolecular Engineering and Mathematics**, *Ohio State University*, Columbus, OH.
Protein complex synthesis and chemical processing, chemical informatics, computational quantum chemistry, electronic transitions in strongly correlated systems

Research Experience

2019 – 2024 **Neutron scattering analysis with molecular simulation and machine learning**, *University of Utah*, Salt Lake City, UT, **Dr. Michael Hoepfner**, *Associate Professor* (*link*).
Application of statistical and quantum statistical mechanics to determine interatomic forces from microstructure of condensed matter.

2017 – 2018 **Theoretical quantum chemistry of strongly correlated systems**, *Ohio State University*, Columbus, OH, **Dr. Alexander Sokolov**, *Assistant Professor* (*link*).
Quantum mechanical properties of charged excited states in strongly correlated electronic systems.

2015 – 2017 **Apohemoglobin processing and reconstitution for novel cancer therapies**, *Ohio State University*, Columbus, OH, **Dr. Andre Palmer**, *Professor* (*link*).
Developed an improved method to separate heme from hemoglobin and initiated project aimed to determine the most likely drug candidates for apohemoglobin cancer therapeutic reconstitution as a treatment for leukemia.

Industry Experience

2019 **Process Engineer**, *Honda Motor Company, Ltd.*
Heat exchanger network design to improve thermal efficiency and recovery for a body paint process.

2017 **Process Engineer**, *The Procter & Gamble Company*.
Development of dye mixing model that recovers an estimated net loss of $\sim$ \$ 1.3 million/year.

2016 **Strategic Innovation and Technology Engineer**, *The Procter & Gamble Company*.
Molecule development and intellectual property filing strategy in China and Brazil.

Publications

Dec 5, 2022 **B. L. Shanks,** J. J. Potoff, and M. P. Hoepfner, *Transferable Force Fields from Experimental Scattering Data with Machine Learning Assisted Structure Refinement*, J. Phys. Chem. Lett., 13, 49, 11512–11520 (*link*).

Conference Presentations

Contributed Talks

Aug, 2023 **Computers in Chemistry: Machine Learning in Chemistry**, *ACS*, San Francisco, CA.
Machine learning accelerated methods to predict interatomic forces from experimental structure measurements

Jan, 2022 **Combining Multi-scale Simulation and Scattering for Structural Analysis of Complex Systems**, *Centre Européen de Calcul Atomique et Moléculaire*, Lausanne, CH.
Transferable force fields with structure-optimized potential refinement

Jan, 2021 **Utah Biomedical Engineering Conference**, Salt Lake City, UT.
Characterizing self-assembly in biological liquids with machine learning

Poster Sessions

Aug, 2023 **Computers in Chemistry: Molecular Mechanics**, *ACS*, San Francisco, CA.
Constructing transferable force fields from neutron scattering measurements with structure optimized potential refinement

Mar, 2022 **Recent Advances in Machine Learning Accelerated Molecular Dynamics**, *Centre Européen de Calcul Atomique et Moléculaire*, Trieste, IT.
Bayesian optimized force fields enabled by a radial distribution function surrogate model

Oct, 2021 **US Total Scattering School**, Oak Ridge National Laboratory, TN.
Transferable force fields with structure-optimized potential refinement

Jan, 2021 **Combining Multi-scale Simulation and Scattering for Structural Analysis of Complex Systems**, *Centre Européen de Calcul Atomique et Moléculaire*, Lausanne, CH.
Neutron scattering predicts emergent thermodynamic behavior in noble gas liquids

Fellowships & Awards

Fellowships

Jan, 2023 **University Teaching Assistantship Award** at the University of Utah.

Aug, 2019 **Graduate Research Fellow** at the University of Utah.

Grant Proposals

Sept, 2016 **Undergraduate Research Scholar Grant** at the Ohio State University.

Leadership

Jun, 2023 **Research Leader Award** at the *Energy Frontier Research Center for Multi-scale Fluid-Solid Interactions in Architected and Natural Materials*, University of Utah.

Academic Excellence

Feb, 2021   **1st Place Presentation** at the **Graduate Engineering Symposium**, University of Utah.

Positions of Responsibility

Internal

April, 2023   **Chair**, *Retention, Promotion, and Tenure Decisions Committee*, University of Utah.

April, 2021   **Member**, *Retention, Promotion, and Tenure Decisions Committee*, University of Utah.

2019 – 2023   **Vice President**, *Graduate Student Advisory Committee*, University of Utah.

External

2023 – 2024   **Early Career Network Representative**, *Basic Energy Sciences*, United States Department of Energy.

Teaching Experience

Courses

Fall, 2023   **CHEN 5960 | Molecular Simulations**, *University of Utah*, (*link*).

Mentorship

2021 – 2023   **CHEN 7973 | Research Mentor**, *University of Utah*, Harry W. Sullivan.

Teaching Assistantship

Fall, 2022   **CHEN 6853 | Advanced Thermodynamics**, *University of Utah*, Guest Lecturer.

Fall, 2021   **CHEN 6853 | Advanced Thermodynamics**, *University of Utah*, Guest Lecturer.

Fall, 2021   **CHEN 7703 | Uncertainty Quantification and Machine Learning**, *University of Utah*.

Fall, 2020   **CHEN 6853 | Advanced Thermodynamics**, *University of Utah*.

Spring, 2019   **C&BE 2523 | Separation Processes**, *Ohio State University*.

Fall, 2018   **C&BE 2420 | Transport Phenomena I**, *Ohio State University*.