Nikhil R. Agrawal - Curriculum Vitae

Process Engineer 3
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EDUCATION

Ph.D. in Chemical Engineering August 2018 - August 2024
University of California, Berkeley, USA
Advisor: Prof. Rui Wang
Thesis title: *Modified Gaussian Renormalized Fluctuation Theory for Electrolytes at Interfaces*
Thesis committee: David T. Limmer, Kranthi K. Mandadapu, and Clayton J. Radke

B.S. and M.S. (Dual Degree) in Chemical Engineering July 2013 - July 2018
Indian Institute of Technology (IIT), Delhi, India
Master's thesis title: *Minkowski Tensors to Characterize Particle Packings in Packed Bed Reactors*
Master's thesis advisor: Prof. Shantanu Roy
Institute medal for highest GPA in the program

WORK EXPERIENCE

Designing high throughput processes for synthesis of novel thin film materials *Oct '24 - Present*
Process Engineer 3 | Deposition Product Group, Lam Research, Oregon, USA

- Identify and screen new processes for commercially feasibly manufacturing of thin films
- Engineer and optimize hardware configuration of chemical reactors
- Ensure smooth integration of the new process with existing processes in semiconductor manufacturing
- Engage with Lam's customers to understand their needs and accommodate them into business strategy of Lam

Thermodynamics and transport modeling of electrolytes at interfaces *Aug '18 - Aug '24*
Ph.D. Candidate | Mentor: Prof. Rui Wang, UC Berkeley, California, USA

Deep Gaussian Processes for uncertainty quantification of machine-learned free energies *Mar '24 - June '24*
Research Intern |, Lawrence Livermore National Laboratory, California, USA

Hybrid Kinetic Monte-Carlo and MD simulations to study mitotic spindle formation *June '23 - Aug '23*
Summer Predoctoral Researcher | Flatiron Institute, New York, USA

Microscopic characterization of particle packings in packed bed reactors *Jan '17 - July '18*
Master's Candidate | Mentor: Prof. Shantanu Roy, Chemical Engineering, IIT Delhi, India

Sequential Particle Deposition to simulate overdamped granular systems *May '17 - July '17*
Visiting Researcher | Mentor: Prof. Dr. Thorsten Pöschel University of Erlangen-Nuremberg, Germany

Image processing and pore network modeling for multiphase flows in porous media *May '16 - July '16*
Summer Intern | Mentor: Dr. Paul Duru, Institut de Mecanique des Fluides de Toulouse (IMFT), France

Design and characterization of visible light photo-catalysts for CO_2 reduction *May'15 - April '16*
Undergraduate Researcher | Mentor: Prof. Suddhasatwa Basu, Chemical Engineering, IIT Delhi, India

JOURNAL PUBLICATIONS AND PREPRINTS

1. Electrostatic Correlation Augmented Self-Consistent Field Theory and Its Application to Polyelectrolyte Brushes
   Chao Duan, **Nikhil R. Agrawal**, and Rui Wang, *Physical Review Letters (2025) 134, 048101*
2. Understanding long-range opposite-charge repulsion in multivalent salt solutions
   Nikhil R. Agrawal, Carlo Carraro and Rui Wang, *J. Chem. Phys. 161, 204902 (2024)*
3. Nature of overcharging and charge inversion in electrical double layers
   Nikhil R. Agrawal, Chao Duan, and Rui Wang, *J. Phys. Chem. B 2024, 128, 1, 303–311*
4. Ion correlation-driven like-charge attraction in multivalent salt solutions
   Nikhil R. Agrawal, Ravtej Kaur, Carlo Carraro and Rui Wang, *J. Chem. Phys. 159, 244905 (2023)*
5. Non-monotonic salt concentration dependence of inverted electrokinetic flow
   Nikhil R. Agrawal and Rui Wang, *AIChE Journal, e18269, 2023.*
6. Self-consistent description of vapor-liquid interface in ionic fluids
   Nikhil R. Agrawal and Rui Wang, *Physical Review Letters (2022), 129, 228001.*
7. Electrostatic correlation induced ion condensation and charge inversion in multivalent electrolytes
   Nikhil R. Agrawal and Rui Wang, *Journal of Chemical Theory and Computation (2022), 18, 6271-6280*
8. A first-order segregation phenomenon in fluid-immersed granular systems
   Prapanch Nair, LAT Cisneros, CRK Windows-Yule, **Nikhil R. Agrawal**, Shantanu Roy, and Thorsten Pöschel, *Powder Technology 373 (2020): 357-361.*
9. Isotropy of sphere packings in a cylindrical confinement
   Nikhil R. Agrawal, Prapanch Nair, Thorsten Pöschel and Shantanu Roy, *Chemical Engineering Journal 377 (2019): 119820.*

   In preparation:

10. Sturm–Liouville theory inspired method to solve the Modified Gaussian Renormalized Fluctuation theory for electrolytes
    Nikhil R. Agrawal, Carlo Carraro and Rui Wang.

COURSEWORK AND CERTIFICATIONS

- Statistical Thermodynamics & Transport Phenomena
- Applied Surface and Colloidal Chemistry
- Numerical Methods in Chemical Engineering
- Bayesian Data Analysis and Machine Learning for Physical Sciences
- Machine Learning, Statistical Models, and Optimization for Biological and Chemical Problems
- Chemical Reaction Engineering I and II
- Thermodynamics for Chemical Product and Process Design
- Fundamentals of Deep Learning (NVIDIA)
- Data Parallelism: How to Train Deep Learning Models on Multiple GPUs (NVIDIA)
- Model Parallelism: Building and Deploying Large Neural Networks (NVIDIA)

SELECTED PRESENTATIONS

1. Beyond mean-field Poisson-Boltzmann: A self-consistent theory for electrical double layers
   2023 American Physical Society March Meeting, Poster Presentation

2. A self-consistent theory for complex electrostatic phenomena at interfaces
   2022 American Chemical Society Colloid and Surface Science Symposium, Oral Presentation
3. Ion correlation induced non-monotonic height change and microphase separation of polyelectrolyte brushes
   2024 American Physical Society March Meeting, Oral Presentation
4. Electrostatic wetting transition: charge inversion and like charge attraction
   2021 American Chemical Society Colloid and Surface Science Symposium, Oral Presentation
5. Correlation Induced Electrostatic Wetting and Charge Inversion
   2020 American Institute of Chemical Engineers Annual Meeting, Oral Presentation

AWARDS AND HONOURS

- Langmuir Graduate Student Oral Presentation Awards Finalist, American Chemical Society 2022
- *Institute Silver Medal* from IIT Delhi for highest GPA in the dual degree program in Chemical Engg. 2018
- IIT Delhi *Semester Merit* Award for 9 out of 10 semesters for being among *top 7%* meritorious students across the dual degree program, *consecutively for 8 semesters* 2013-2017
- *Significant Contribution to Research Activities* Award by Chemical Engineering Society, IIT Delhi 2017
- *Kishore Vaigyanik Protsahan Yojana* (KVPY) Fellowship by Department of Science and Technology, Govt. of India 2013
- Was among the *Nation's Top 1%* merit holders in National Standard Examination in Physics (NSEP) conducted by the Indian Association of Physics Teachers (IAPT) 2013

ACADEMIC ADVISING

- Julien Kehon, Undergraduate majoring in Chemical Engg. at UC Berkeley (Jan 2022 - May 2022)
- Ravtej Kaur, Undergraduate majoring in Chemical Engg. at UC Berkeley (Jan 2023 - August 2023)

SERVICE & OUTREACH

Secretary, SPIC MACAY, IIT Delhi *April '15 - April '16*
SPIC MACAY: *Society for Promotion of Indian Classical Music And Culture Amongst Youth*

Led a team of 13 to organize marketing, publicity, and hospitality of club events like dance workshops and music concerts for eminent artists including Grammy Awardee Pt. Vishwa Mohan Bhatt.

SKILLS

Domain Knowledge	Process Design, Thermodynamics, Transport Phenomena, Applied Machine Learning, Computational Modeling
Programming Skills	Python, C++, PyTorch, GPyTorch ,TensorFlow, Scikit Learn, Bash
Technical software	JMP, MATLAB, Aspen, COMSOL, FLUENT, ParaView, Autodesk Inventor
Languages	English and Hindi

HOBBIES AND INTERESTS

Sociology, Psychology, listening to classical music, and a keen interest in philosophical discussions