Abhinav Malhotra

INFORMATION

Delaware Energy Institute
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Scholar: bit.ly/AMPapers

RESEARCH INTERESTS

Sustainable Energy: Photon and electron mediated conversions, Nanoscale energy transport.
Simulations: Multiscale modeling, Topologically optimized systems, Predictive design.
Data Science: Machine-learning accelerated computational methods.

EDUCATION

Georgia Institute of Technology (Georgia Tech), Atlanta

Ph.D., Chemical Engineering — Aug, 2019
M.S., Chemical Engineering — July, 2018

Indian Institute of Technology (IIT), Roorkee

M.Tech., Hydrocarbon Engineering — June, 2013
B.Tech., Chemical Engineering — May, 2012

RESEARCH EXPERIENCE

Delaware Energy Institute, University of Delaware
Post-Doctoral Researcher — Sep, 2019 –

Research Theme: "Harnessing Microwave Photons for Chemical Transformations"
Advisor: Dr. Dionosius Vlachos

Georgia Institute of Technology
Graduate Research Assistant — Aug, 2014 - Aug, 2019

Dissertation: "Exploring Thermal Transport in Semiconductor Nanostructures"
Advisor: Dr. Martin Maldovan

- Developed computationally efficient techniques based on fundamental theoretical principles to predict thermal transport properties of semiconductor nanostructures.
- Successfully applied Beckmann-Kirchhoff surface scattering to phonon-structure interactions.
- Identified and elucidated the phonon-coupling mechanism in layered nanomaterials.
- Collaborations: Michael Filler, Shannon Yee (Georgia Tech); Gözde Tütüncüoglu (TU Delft)

TEACHING EXPERIENCE

Teaching Assistant — Jan, 2015 - Dec, 2016
Assisted in teaching undergraduate and graduate level courses for the Chemical Engineering program. Responsibile for weekly recitations, grading exams, and homework assignments.

- CHBE-3210 Transport Phenomenon II, Spring 2015.
- CHBE-6100 Advanced Thermodynamics, Fall 2016.

Laboratory Instructor
Duties included maintaining lab safety, designing experiments to explain concepts of process control, interactive teaching during lab and grading lab reports.

- CHBE-4400 Process Control Lab, Fall 2015.

AWARDS AND HONORS

Travel Award, Machine Learning in Science and Engineering Symposium, Atlanta — 2019
Travel Grant, College of Engineering, Georgia Tech — 2018
Travel Grant, Student Government Association, Georgia Tech — 2017

Exemplary Academic Achievement Award (4.0 GPA in core courses), Georgia Tech 2015

Ministry of Human Resources Development Fellowship (100% funded masters), India 2012-13

Dr. B.R. Varshney Award (for top chemical engineering undergraduate), IIT Roorkee 2011

Imperial College India Foundation Fellowship (∼1/yr)* 2014

* awarded – respectfully declined

Publications

(Total first author publications = 8, online at Google Scholar or `http://bit.ly/AMPapers`)

11. Malhotra, A., and Maldovan, M.; Phononic Pathways towards Rational Design of Nanowire Heat Conduction. [INVITED REVIEW] *Nanotechnology* 30, 372002, (2019).
10. Kothari, K., Malhotra, A., and Maldovan, M.; Cross-Plane Heat Conduction in III-V Semiconductor Superlattices. *Journal of Physics: Condensed Matter* 31, 345301, (2019).
9. Malhotra, A., and Maldovan, M.; Thermal Transport in Semiconductor Nanotubes. *International Journal of Heat and Mass Transfer* 130, 368, (2019).
8. Malhotra, A., Kothari, K., and Maldovan, M.; Cross-Plane Thermal Conduction in Superlattices: Impact of Multiple Length Scales on Phonon Transport. *Journal of Applied Physics* 125, 044304, (2019).
7. Malhotra, A., Kothari, K., and Maldovan, M.; Modulating Thermal Conduction via Phonon Spectral Coupling. *Journal of Applied Physics* 124, 124302, (2018).
6. Kothari, K., Malhotra, A., and Maldovan, M.; Unconventional Thermal Transport in Thin Film-on-Substrate Systems. *Journal of Physics D* 51, 365302, (2018).
5. Malhotra, A., Kothari, K., and Maldovan, M.; Enhancing Thermal Transport in Layered Nanomaterials. *Scientific Reports* 8, 1880, (2018).
4. Malhotra, A., Kothari, K., and Maldovan, M.; Spatial Manipulation of Thermal Flux in Nanoscale Films. *Nanoscale and Microscale Thermophysical Engineering* 21(3), 145, (2017).
3. Malhotra, A., and Maldovan, M.; Surface Scattering Controlled Heat Conduction in Semiconductor Thin Films. *Journal of Applied Physics* 120, 204305, (2016).
2. Malhotra, A., and Maldovan, M.; Impact of Phonon Surface Scattering on Thermal Energy Distribution of Si and SiGe Nanowires. *Scientific Reports* 6, 25818, (2016).
1. Kumar, S., Arya, D., Malhotra, A., Kumar, S. and Kumar, B.; Biodegradation of dual phenolic substrates in simulated wastewater by *Gliomastix indicus* MTCC 3869. *Journal of Environmental Chemical Engineering* 1, 865, (2013).

Science Communication

1. Entering the Matrix: ELI5 Introduction to Eigenvalues and Eigenvectors, *medium.com* (June 2019).

Oral Presentations

American Physical Society (APS) March Meeting, Boston, USA. 2019

American Institute of Chemical Engineers (AIChE) Annual Conference, Pittsburgh, USA. 2018

American Physical Society (APS) March Meeting, Los Angeles, USA. 2018

American Physical Society (APS) March Meeting, New Orleans, USA. 2018

Georgia Tech ChBE Annual Colloquium, Atlanta, USA. 2017

Materials Research Society (MRS) Fall Meeting, Boston, USA. 2017

Georgia Tech ChBE Graduate Symposium, Atlanta, USA. 2016

Materials Research Society (MRS) Fall Meeting, Boston, USA. 2015

Service

Reviewer, President Undergraduate Research Award proposals at Georgia Tech. 2019

Elected Representative of Graduate Students to Georgia Tech Student Government. 2017

Treasurer, Association of Chemical Engineering Graduate Students of Georgia Tech. 2016

Chair, Hospitality Committee, ChBE Graduate Research Symposium at Georgia Tech. 2015

Scientific Memberships

American Institute of Chemical Engineers (AIChE); American Physical Society (APS); Materials Research Society (MRS)

Other Projects

Master's Project
"Oxidative reforming of methane: Thermodynamic and Modeling Study"

- Modeled the thermodynamics of methane to syngas conversion in MATLAB to narrow down the feasible state-space.
- Solved PDEs for a Ni-based tubular reactor in the feasible state-space to identify optimal operating conditions.

Course: Data Analytics for Chemical Engineers

- Developed supervised machine-learning models to predict bandgaps and formation energies of transparent semiconductors using a DFT generated material database.

Course: Machine Learning for Trading

- Trained a machine-learning based stock trading algorithm on time-series data to optimize performance in a simulated trading scenario.

Course: Artificial Intelligence Systems

- Implemented A* search, Dynamic Bayes Nets and Q-learning in Python to improve the performance of a Pacman AI agent.

Course: Computations in Material Science

- DFT calculations using VASP package to calculate electronic bandgap in graphene with molecules adsorbed.

Professional Experience

Jeevomics Pvt. Ltd., New Delhi, India

Research Engineer Feb, 2014 - Aug, 2014

Created libraries of potential reaction kinetics and integrated them with in-house machine learning tools to help identify viable drugs for clients.

ITC Ltd., Haridwar, India

Assistant Manager June, 2013 - Jan, 2014

Managed the production lines of carton packaging unit, including machine scheduling, machine crewing and skill development, to achieve production targets exceeding $1.2M/yr.

Relevant Skills

Languages: FORTRAN, Python, MATLAB, Unix shell scripting, some use of C++, MPI.

Applications: COMSOL, LaTeX, some use of Mathematica, QuantumEspresso and OpenFOAM.

Proficiency in Machine Learning Algorithms and Tools in Python and MATLAB.