PRATEEK VERMA

PHD. MACHINE LEARNING SCIENTIST.

CONTACT FORM
WWW.PRATEEKVERMA.COM
HIDDEN ONLINE

Machine learning scientist with domain expertise in chemicals, materials, health, and environment. Mentor and advisor to many. Experienced research manager and team-leader. A creative at core, passionate about building elegant things and finding elegant solutions.

EDUCATION

GEORGIA INSTITUTE OF TECHNOLOGY / 2011 – 2015

PhD, Materials Science and Engineering, GPA 4.0 / 4.0

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE / 2006 – 2011

BS and MS, Polymer Science and Technology, GPA 8.5 / 10.0

EXPERIENCE

MANAGER, DATA SCIENCE CORE, UNIVERSITY OF ARKANSAS

Arkansas Integrative Metabolic Research Center (AIMRC) / 2023 – present

- Building machine learning algorithms focused on medical research
- Serving AIMRC researchers with their data science and machine learning needs
- Managing core computing facilities for the members of AIMRC

POSTDOCTORAL FELLOW, UNIVERSITY OF ARKANSAS

Nayani, Nakarmi and Wu groups / 2021 – 2023

- Fine-tuning and prompt engineering of large language models (LLMs) for the medical domain using multimodal data (ongoing).
- Built an end-to-end CNN ML pipeline for microscope images
- Built graph and generative algorithms for molecular discovery and finding functional groups on molecules and macromolecules.
- **Applications:** predicting onset of diseases, sensors for airborne bacteria and viruses, drug and molecular design, medical diagnosis

POSTDOCTORAL FELLOW, GEORGIA INSTITUTE OF TECHNOLOGY

Shofner and Russo groups / 2018 – 2021

- Developed multivariable deep neural network regression to split, interpolate, and predict total signal into constituents.
- Developing CNN and regression algorithms for noise detection in signals
- **ML applications:** Extract pollution composition (expensive measurement) from total PM2.5 (inexpensive) data; noise detection in light scattering data.
- Fabricated metamaterial composites using tensegrity/auxetic approaches.
- Executive Director for OPALL (Open Polymer Active Learning Laboratory)

17 papers published/submitted **12** first-author papers published/in-progress **20** conference presentations **7** leadership roles **13** classes taught

RESEARCH ADVISOR

for **17** industry members / graduates / undergraduates in the following broad areas

- supervised & unsupervised learning
- convolutional neural networks
- machine learning for molecules
- auxetics and metamaterials
- structure-property relationships

*direct supervisor for **14**

MENTORSHIP

Served as a mentor for Mentor Jackets, MSE Industry Mentoring and IITR's Alumni Mentorship Program since 2016.

9 Bachelor's students
7 Doctoral students
2 Master's students

DIVERSITY

Percentage of the total **35** advised or mentored

49 % women
15 % hispanics & latinos
09 % african americans
46 % internationals
20 % first-gen college goers

HONORS & AWARDS

2021 MSE 5 year mentorship award
2020 Invited talk, IIT Roorkee
2019 Hightower Fellow, OPALL
2017 Chairman, Tech. Conference, Kimoto

continued

EXPERIENCE (CONTINUED)

SENIOR COATING CHEMIST, KIMOTO TECH

2016 – 2018

- Team leader for 5 R&D chemists
- Led scale-up and production of several lab-to-market products
- Development of flexible & protective coatings, conductive coatings, and pressure sensitive adhesives

PHD CANDIDATE, GEORGIA INSTITUTE OF TECHNOLOGY

Griffin and Shofner groups / 2011 – 2015

- Synthesized intrinsically auxetic liquid crystal elastomers
- Developed protocols for accurately measuring Poisson's ratio
- Developed a new method to induce auxetic properties in nonwovens
- Modeled processing-structure-property relations for auxetic behavior in fiber networks

RESEARCH ASSISTANT (MASTER'S), UNIVERSITY OF AKRON

Karim group / 2011

- Developed a buckling-based metrology to determine strength of thin films
- Prepared and tested strength of polymer-blend films used in tissue engineering

SUMMER INTERN, UNIVERSITY OF MASSACHUSETTS AMHERST

McCarthy group / 2010

- Synthesized uniformly sized silica nanoparticles for composite applications
- Created super-hydrophobic surfaces using silanes; synthesized cross-linked silicones

SUMMER INTERN, UNIVERSITY OF MINNESOTA

Barocas group / 2009

- Synthesized epoxy networks to study flow through kidney membranes
- Synthesized and characterized collagen gels for tissue engineering

PUBLICATIONS

In the list of 22 total, 17 are published or submitted and 12 are first-author papers (Google Scholar link)

UNDER REVIEW / SUBMITTED

- **P Verma**, E Adeogun, ES Greene, S Dridi, U Nakarmi, et al.; Machine-learning classification of heat-stress in organisms using CNNs*; ACS Sensors*; **2024**

SUBMITTING NEXT

- **P Verma**, U Nakarmi, K Nayani; Machine learning approaches to ligand discovery for viral purification; **2024**
- E Adeogun, **P Verma**, D Iyer, S Srivastava, K Nayani; Formation of liquid crystalline coacervates via the complexation of chromonic mesogens and synthetic polymers; **2024**
- **P Verma**, U Nakarmi, K Nayani; A new deep-learning approach for drug-like molecular classification and regression; **2024**
- **P Verma**, DN Ansari, TU Ansari; Deep learning algorithms for extraction of aerosol chemical composition from temporal variations of total PM mass; **2024**

PUBLISHED

- 16. H Van, **P Verma**, X Wu; On large visual language models for medical imaging analysis: an empirical study*; IEEE/ACM CHASE*; **2024**
- 15. D Ansari, **P Verma**, T Ansari; Promise of machine learning techniques towards retrieving aerosol chemical composition from temporal variations of total PM mass concentrations*; Journal of Research in Atmospheric Science*; 5-1; **2023**
- 14. CW Irvin, CC Satam, K Shial, **P Verma**, NB Arroyo, et al.; Tricomponent polymer aerogels containing cellulose nanocrystals and chitin nanofibers and their use in aerogel/hydrogel hybrids as fibrocartilage replacements*; Journal of Applied Polymer Science*; **2023**
- 13. X Fang, H Sun, C Wu, ..., **P Verma**, et al.; Ag nanoparticle-thiolated chitosan composite coating reinforced by Ag–S covalent bonds with excellent electromagnetic interference shielding and Joule heating performances*; ACS Applied Materials & Interfaces (IF = 10.4)*; **2023**
- 12. **P Verma**, KB Wagner, AC Griffin, ML Shofner; Reversibility of auxetic response in polyester fiber needle-punched nonwovens*; Physica Status Solidi B*; **2022**
- 11. H Sun, X Fang, Z Fang, ..., **P Verma**, et al.; An ultra-sensitive and stretchable strain sensor based on micro-crack structure for motion monitoring*; Micro Nano (Nature) (IF = 8.1)*; 8 (111); **2022**
- 10. **P Verma**, C Smith, AC Griffin, ML Shofner; Towards textile metamaterials: A pathway to auxeticity and tensegrity in a needle-punched nonwoven stiff felt*; Materials Advances (RSC) (IF=5.0)*; **2022**
- 9. Q Kang, X Fang, C Wu, **P Verma**, H Sun, et al.; Improvement mechanism of brittle-plastic transition and residual stress in scratching 4H–SiC implanted by hydrogen ions*; Ceramics International (IF=5.2)*; **2022**
- 8. **P Verma**, C Smith, AC Griffin, ML Shofner; Corrigendum: Wool nonwovens as candidates for commodity auxetic materials*; Engineering Research Express*; 4 029501; **2022**
- 7. Q Kang, X Fang, C Wu, **P Verma**, H Sun, et al.; Mechanical properties and indentation-induced phase transformation in 4H–SiC implanted by hydrogen ions*; Ceramics International (IF=5.2)*; **2022**
- 6. **P Verma**, C Smith, AC Griffin, ML Shofner; Wool nonwovens as candidates for commodity auxetic materials*; Engineering Research Express*; 2 (4); **2021**
- 5. **P Verma**, C He, AC Griffin; Implications for auxetic response in liquid crystalline polymers*; Physica Status Solidi B*; 2000261; **2020**; (appeared in Wiley's 'Hot Topics: Liquid Crystals')
- 4. N Jappar, **P Verma**, J Holmes; Development of functional films in roll-to-roll manufacturing*; RadTech*; **2018**; (conference paper)
- 3. **P Verma**, ML Shofner, A Lin, KB Wagner, AC Griffin; Induction of auxetic response in needle-punched nonwovens: Effects of temperature, pressure and time*; Physica Status Solidi B*; 253 (7); **2016**
- 2. **P Verma**, ML Shofner, A Lin, KB Wagner, AC Griffin; Inducing out-of-plane auxetic behavior in needle-punched nonwovens*; Physica Status Solidi B*; 252 (7); **2015**
- 1. **P Verma**, ML Shofner, AC Griffin; Deconstructing the auxetic behavior of paper*; Physica Status Solidi B*; 251 (2); **2013**

PRESENTATIONS

Speakers are italicized

- *P Verma*, E Adeogun, ES Greene, S Dridi, U Nakarmi, et al.; CNN based rapid sensing of heat-stress in organisms; Orlando (UNITED STATES); **2023**
- P Verma, AC Griffin, *ML Shofner*; Pathways to manufacturing mechanical metamaterials by examining auxeticity in nonwoven fiber networks; Atlanta (USA); **2023**; (Invited talk)
- P Verma, *ML Shofner*, AC Griffin; Pathways to Commodity Mechanical Metamaterials – Auxeticity in Nonwoven Fiber Networks; College Station (USA); **2022**; (Invited talk)
- P Verma, AC Griffin, *ML Shofner*; Nonwoven textile structures – commodity pathways to auxeticity; Chicago (USA); **2022**
- *P Verma*, ML Shofner, AC Griffin; Constructing out-of-plane auxetic response in paper; Denver (USA); 65 (1); **2020**
- *P Verma*; Career pathways for polymer science students: industry vs higher education; Roorkee (INDIA); **2020**; (Invited talk)
- P Verma, *ML Shofner*, AC Griffin; Auxetic behavior in fiber networks; San Diego (USA); 258; **2019**
- *PS Russo*, X Zhang, P Verma, P Balding, G Parkinson, et al.; OPALL: The open polymer active learning laboratory at Georgia Tech; Orlando (USA); 257; **2019**

- P Verma, C He, *AC Griffin*; X-ray scattering from LC polymers: Implications for auxetic response; Bedlewo (POLAND); **2019**
- *P Verma*, KB Wagner, A Lin, ML Shofner, AC Griffin; Auxetic behavior in paper and nonwovens; Oak Ridge (USA); **2019**
- *P Russo*, P Verma, X Zhang et. al.; Open polymer active learning laboratory; Oak Ridge (USA); **2019**; (poster)
- P Verma, ML Shofner, *AC Griffin*; Origin of thickness change in needle-punched nonwovens; Sheffield (USA); **2018**
- P Verma, *ML Shofner*, AC Griffin; Auxetic behavior of fiber networks: Paper and nonwoven fabrics; Lake Louise (CANADA); **2017**
- P Verma, *ML Shofner*, AC Griffin; Reversibility of thickness change in nonwovens; Crete (GREECE); **2017**
- P Verma, ML Shofner, *AC Griffin*; Auxetic liquid crystalline polymers; Crete (GREECE); **2017**
- P Verma, ML Shofner, *AC Griffin*; Reversibility of thickness change in nonwovens; Poznan (POLAND); **2016**
- *P Verma*, ML Shofner, AC Griffin; Inducing out-of-plane auxetic behavior in needle-punched nonwovens; Poznan (POLAND); **2014**
- *P Verma*, ML Shofner, AC Griffin; Auxetic behavior in cellulose based fiber networks; New Orleans (USA); **2013**
- *H Yuan*, J Marszalek-Kempke, P Verma, A Karim; Elastic moduli of polymeric thin films of nanocomposites and blends via buckling on elastomeric substrates; Boston (USA); 57 (1); **2012**
- P Verma, *ML Shofner*, AC Griffin; Deconstructing the auxetic behavior of paper; Bolton (UK); **2012**

TEACHING EXPERIENCE

YEAR	COURSE	SCHOOL	TOPIC
2022	CSCE 4013	U Arkansas	Guest lecturer / Introduction to CNNs
2020	MSE 4476	Georgia Tech	Guest lecturer / Thermal analysis of polymers
2019	MSE 4476	Georgia Tech	Guest lecturer / Mechanical properties of polymers
2019	MSE 4476 (lab)	Georgia Tech	Guest instructor / DSC and TGA of polymers
2019	MSE 3225 (lab)	Georgia Tech	Guest instructor / Rheology of detergent
2019	MSE 3225	Georgia Tech	Guest lecturer / Polymer rheology
2015	MSE 4476 (lab)	Georgia Tech	Teaching Assistant / DSC and TGA of polymers
2014	MSE 4476 (lab)	Georgia Tech	Teaching Assistant / Step, chain-growth, and emulsion polymerization
2014	MSE 3720	Georgia Tech	Teaching Assistant / Introduction to polymer/fiber enterprise
2014	MSE 4022 (lab)	Georgia Tech	Teaching Assistant / Thermal analysis, processing and rheology of polymers
2013	MSE 4476 (lab)	Georgia Tech	Teaching Assistant / Step, chain-growth, and emulsion polymerization
2013	MSE 4022 (lab)	Georgia Tech	Teaching Assistant / Thermal analysis, processing and rheology of polymers
2012	MSE 1111	Georgia Tech	Teaching Assistant / Introduction to materials science and engineering

HONORS AND AWARDS

1. Postdoctoral Fellowship / U Arkansas / 2021 – 2023
2. 5 year GT MSE mentorship award / Georgia Tech / 2021
3. Invited talk & career counselling for polymer graduates and undergraduates / IIT Roorkee / 2020
4. Executive Director, OPALL (Open Polymer Active Learning Laboratory) / Georgia Tech / 2019 – 2021
5. Hightower Fellow, OPALL (Open Polymer Active Learning Laboratory) / Georgia Tech / 2019 – 2021
6. Postdoctoral Fellowship, from Renewable Bioresources Institute / Georgia Tech / 2018 – 2020
7. Chairman, Technical Conference / Kimoto Tech / 2017
8. Second prize, poster competition (auxetic conference) / Georgia Tech / 2014
9. PhD Fellowship, from Institute of Paper Science and Technology / Georgia Tech / 2012 – 2015
10. Chairman, National Polymer Conference, Cognizance / IIT Roorkee / 2009
11. Merit-based scholarship with tuition waiver / IIT Roorkee / 2007 – 2011

RESEARCH FUNDING

Contributed to the planning, writing, editing and/or review of the following research funding proposals.

1. Developing liquid crystal based rapid optical sensors for detecting airborne viruses with SARS-CoV-2 and alpha-coronaviruses, NSF PIPP, PI: K Nayani, 2021
2. Awarded, Imaging and quantification of mitochondrial dynamics in response to mechanical stress, AIMRC, PI: K Nayani, 2021
3. Development of liquid crystal based wearable sensors for detecting airborne coronaviruses, PEW Biomedical, PI: K Nayani, 2021
4. Purification and rapid assessment of filled adeno-associated viral vectors, MAST UCRC, PI: K Nayani, 2021
5. Awarded, Development of convolutional neural networks that connect molecular signatures to rapid optical readouts on the health of chickens, USDA NIFA, PI: K Nayani, 2020
6. Zero-angle depolarized scattering (ZADS) and data analytics to determine molecular weight distributions of conjugated polymers, DOE FOA, PI: PS Russo, 2020
7. Awarded, Open Polymer Active Learning Laboratory: enhancing Georgia Tech's polymer profile in the residential higher-educational institution of tomorrow, GT COE, PI: PS Russo, 2020

RESEARCH ADVISING

Direct supervisor for members marked with an * . Last name has been hidden for the sake of privacy online.

NAME	TOPIC	YEAR	JOURNEY
Sydnee*	Molecular discovery using machine learning	2022 – present	Senior (University of Arkansas)
Honglin	Machine learning models for noise detection in light scattering data	2021 – 2022	PhD candidate (Georgia Tech)
Evan*	Building custom convolutional neural networks	2021 – 2021	Sophomore (University of Arkansas)
Brandon	Isothermal titration calorimetry	2021 – 2022	Junior (University of Arkansas)
Lauren*	Nanocellulose dispersion and auxetic composites	2019 – 2020	Freshman (Georgia Tech)
Marilyn*	Polyurethane and silicone auxetic composites	2019 – 2020	Sophomore (Georgia Tech)
Casey*	Auxetic behavior in wool and stiff-felt fabrics	2018 – 2019	Senior > PhD candidate (Georgia Tech)
Daniel*	Gloss and haze control in coatings	2017 – 2018	Formulations Chemist (Kimoto Tech) > Development Chemist (Birla Carbon)
Carly*	Color correcting coatings for electronic displays	2017 – 2018	R&D Chemist (Kimoto Tech) >>> Data Scientist (Takeda Pharmaceuticals)
Joseph*	Anti-glare and anti-sparkle coatings for touch screens	2016 – 2018	R&D chemist (Kimoto Tech)
Thomas*	Protective hardcoats with adhesive backings	2016 – 2018	R&D Chemist (Kimoto Tech) > Formulation Scientist (Meggit Aerospace)
Jennifer*	Silicone pressure sensitive adhesives	2016 – 2017	R&D Chemist (Kimoto Tech) >>> Associate Senior Scientist (Pharmaceutical Associates Inc)
Stephen*	Antiglare, but also high-clarity, coatings	2016 – 2018	R&D Chemist (Kimoto Tech)
Karla*	Auxetic behavior in needle-punched nonwovens	2013 – 2014	Sophomore > PhD candidate (Georgia Tech)
Tony*	Measurement of auxetic responses	2013 – 2014	Sophomore (Georgia Tech) > PhD candidate (MIT)
Emily	Cellulose and PVA based nanocomposites	2013 – 2015	Junior >>> Senior Engineer (Exponent)
CJ*	Auxetic response of paper	2012 – 2012	Sophomore (Georgia Tech) > Vice President (Electrical Cable Specialists)

LEADERSHIP

1. DEI council representative for research scientists and postdocs in the department / Georgia Tech / 2019 – 2021
2. Co-launched, Postdoc Chats, series of social and professional development gatherings for postdocs campuswide / Georgia Tech / 2019 – present
3. Advisor, to graduate and undergraduate members and users, OPALL Polymer Makerspace / Georgia Tech / 2019 – 2022
4. Team Leader, for 5+ industry research scientists / Kimoto Tech / 2016 – 2018
5. Co-manager, Polymer Thermal Analysis Lab / Georgia Tech / 2013 – 2015
6. Student President (elected, Saharanpur Campus) / IIT Roorkee / 2008 – 2009
7. Founder and Team Leader, intranet web development / IIT Roorkee / 2007 – 2010

MENTORSHIP

Serving as a mentor for GT Mentor Jackets, GT MSE Industry Mentorship Program and IITR Alumni Mentorship Program. Last name has been hidden for the sake of privacy online.

NAME	YEAR	JOURNEY
BACHELOR'S		
Jaejung	2021 – 2022	Sophomore (Georgia Tech)
Tanmay	2020 – 2021	Sophomore (IIT Roorkee)
Nadia	2019 – 2021	Junior (Georgia Tech) > PhD candidate (MIT)
Steven	2019 – 2021	Senior > Master's student (Georgia Tech)
Dillan	2018 – 2019	Senior (Georgia Tech) > Engineer (Universal Alloy)
Michael	2017 – 2018	Freshman (Georgia Tech) > Intern (Lockheed Martin Space)
Amanda	2017 – 2018	Senior (Georgia Tech) > QA Coordinator (ALPLA Group)
Ankit	2016 – 2017	Freshman (Georgia Tech) > PhD candidate (UC Los Angeles)
Sabrina	2016 – 2017	Sophomore (Georgia Tech) > Senior Quality Engineer (Mainstay Medical)
DOCTORAL		
Jude	2022 – present	PhD candidate (U Arkansas)
Elizabeth	2021 – present	PhD candidate (U Arkansas)
Homa	2021 – present	PhD candidate (U Arkansas)
Krishna	2019 – 2020	PhD candidate (Georgia Tech)
Hongmo	2017 – 2018	PhD candidate (Georgia Tech)
Sahitya	2017 – 2018	PhD student (Georgia Tech) > Process Engineer (Intel Corporation)
Helen	2016 – 2017	PhD student (Georgia Tech) > Process Engineer (Intel Corporation)
MASTER'S		
Pragya	2021 – 2021	Master's student (IIT Roorkee)
Ada	2018 – 2021	Master's student (Georgia Tech) > Senior Research Associate (Tessera Therapeutics)

SKILLSETS

MACHINE LEARNING

- CONVOLUTIONAL NEURAL NETWORKS
- GRAPH NEURAL NETWORKS
- IMAGE PREPROCESSING
- K-MEANS CLUSTERING
- LINEAR REGRESSION
- LOGISTIC REGRESSION
- ML PIPELINES
- CHEMICAL INFORMATICS
- LARGE LANGUAGE MODELS
- RESNET
- SUPPORT VECTOR MACHINES
- VISION LANGUAGE MODELS

COMPUTATIONAL

- MATLAB
- AWS
- DJANGO
- LAMMPS
- MATPLOTLIB
- MYSQL
- NUMPY
- PANDAS
- RDKIT
- TENSORFLOW
- SCIKIT
- BIOPYTHON

COMPUTER LANGUAGES

- C/C++
- JAVASCRIPT
- MATLAB
- PHP
- PYTHON
- SQL

CHEMISTRY

- FREE RADICAL POLYMERIZATION
- LCE SYNTHESIS
- POLYURETHANE SYNTHESIS
- SILANES & SILICONES
- THERMAL & UV CURING

MATERIALS

- AUXETIC MATERIALS
- BIOPOLYMERS
- CHARACTERIZATION
- LIQUID CRYSTALS
- METAMATERIALS
- NANOTECHNOLOGY
- POLYMER PROCESSING
- STRUCTURE-PROPERTY RELATIONSHIPS
- THERMAL ANALYSIS
- VISCOELASTICITY

INDUSTRY

- ADHESIVE COATINGS
- PROCESS DEVELOPMENT
- CHEMICAL MIXING
- CHEMICAL FORMULATIONS
- PROTECTIVE COATINGS
- SCALE-UP OPERATIONS
- THERMAL & UV CURING

INTERPERSONAL

- DEI
- ILLUSTRATION
- LEADERSHIP
- MENTORING
- RESEARCH ADVISING
- TEACHING
- TEAM BUILDING

LAB TECHNIQUES

- ATOMIC FORCE MICROSCOPY
- DSC TGA DMA
- ENVIRONMENTAL TESTING
- FTIR
- ISOTHERMAL TITRATION CALORIMETRY
- MECHANICAL TESTING
- MICRO-CT
- ELECTRON MICROSCOPY
- VISCOMETRY

SCIENTIFIC REVIEWING

Reviewed manuscripts for the following journals:

- Applied Sciences (MDPI)
- Computational Materials Science (Elsevier)
- Industrial & Engineering Chemistry Research (ACS)
- Journal of Engineered Fibers and Fabrics (Sage)
- Journal of Micromechanics and Microengineering (IOP)
- Journal of Rheology (AIP)
- Machines (MDPI)
- Materials Research Express (IOP)
- Physica Status Solidi (Wiley)
- Proceedings of the National Academy of Sciences (PNAS)
- Sensors (MDPI)
- Surface and Coatings Technology (Elsevier)

EXTRACURRICULARS

- Gets way too excited about graphics design and web development
- Is the best table tennis player in the break room
- Paints and draws

REFERENCES

ANSELM C GRIFFIN
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