PRATEEK VERMA

PHD. MACHINE LEARNING SCIENTIST.

✉ CONTACT FORM
🖥 WWW.PRATEEKVERMA.COM
📞 HIDDEN ONLINE

Machine learning scientist, especially for chemicals, materials, multi-omics, health, and environment. A creative at core, passionate about building elegant things and finding elegant solutions. Previous background in structure-property relationships in polymers, metamaterials, industrial formulations and processes.

15 papers published/submitted 12 first-author papers published/in-progress 18 conference presentations 7 leadership roles 13 classes taught

EDUCATION

GEORGIA INSTITUTE OF TECHNOLOGY / 2011 – 2015

PhD, Materials Science and Engineering, GPA 4.0 / 4.0
Thesis – Auxetic behavior in polymer/fiber network structures

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE / 2006 – 2011

BS and MS, Polymer Science and Technology, GPA 8.5 / 10.0
Thesis – Nanomechanics of tissue engineering polymer blend scaffolds

EXPERIENCE ➔☰

POSTDOCTORAL FELLOW, UNIVERSITY OF ARKANSAS

Nayani and Nakarmi groups / 2021 – present
  – Built an end-to-end CNN ML pipeline for microscope images
  – Building CNN, GNN, and GAN based algorithms for molecular discovery and finding hotspots (aka functional groups) on molecules and macromolecules.
  – **Applications:** predicting onset of diseases, detecting heat-stress in organisms with >97% accuracy, sensors for airborne bacteria and viruses, discovering ligands for virus capture membranes.

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 noise detection and removal in instrument signals using regression and CNN approaches.
  – **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)

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

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

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 21 total, 15 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 CNN's; *ACS Sensors*; 2023

SUBMITTING NEXT

- ✏ P Verma, DN Ansari, TU Ansari; Deep learning algorithms for extraction of aerosol chemical composition from temporal variations of total PM mass; *Environmental Science and Technology*; 2023
- ✏ P Verma, U Nakarmi, K Nayani; A new deep-learning approach for drug-like molecular classification and regression; *Nature Communications*; 2023
- ✏ P Verma, U Nakarmi, K Nayani; Machine learning approaches to ligand discovery for viral purification; *The Journal of Chemical Information and Modeling*; 2023
- ✏ K Copenhaver, S Pennell, S Jain, PS Russo, P Verma; Classic Ubbelöhde intrinsic viscosity laboratory exercise made simple and fast; *Journal of Chemical Education*; 2023
- ✏ X Fang, H Sun, C Wu, ..., P Verma, et al.; Ag nanoparticles-thiolated chitosan composite coating reinforced by Ag–S covalent bonds with excellent electromagnetic interference shielding and Joule heating performances.; *ACS Applied Materials & Interfaces*; 2023

PUBLISHED

- P Verma, KB Wagner, AC Griffin, ML Shofner; Reversibility of auxetic response in polyester fiber needle-punched nonwovens; *Physica Status Solidi B*; 2022 ⇔

- 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)*; 8 (111); 2022 ⇔

- TU Ansari, DN Ansari, P Verma; Statistical and machine-learning approaches towards retrieving aerosol chemical composition from temporal variations of total PM mass concentrations: Theoretical approach and insights.; *Earth and Space Science Open Archive*; 2022 ⇔

- 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)*; 2022 ⇔

- 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*; 2022 ⇔

- 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*; 2022

- P Verma, C Smith, AC Griffin, ML Shofner; Corrigendum: Wool nonwovens as candidates for commodity auxetic materials; *Engineering Research Express*; 4 029501; 2022 ⇔

- 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*; 2022 ⇔

- P Verma, C Smith, AC Griffin, ML Shofner; Wool nonwovens as candidates for commodity auxetic materials; *Engineering Research Express*; 2 (4); 2021 ⇔

- 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') ⇔

- N Jappar, P Verma, J Holmes; Development of functional films in roll-to-roll manufacturing; *RadTech*; 2018; (conference paper) ⇔

- 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 ⇔

- 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 ⇔

- P Verma, ML Shofner, AC Griffin; Deconstructing the auxetic behavior of paper; *Physica Status Solidi B*; 251 (2); 2013 ⇔

IN PROGRESS

- E Adeogun, P Verma, D Iyer, S Srivastava, K Nayani; Formation of liquid crystalline coacervates via the complexation of chromonic mesogens and synthetic polymers; *PNAS*; 2023

PRESENTATIONS

Speakers are italicized

- 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

CNNS	
GNNS	
IMAGE PREPROCESSING	
K-MEANS CLUSTERING	
LINEAR REGRESSION	
LOGISTIC REGRESSION	
ML PIPELINES	
CHEMICAL INFORMATICS	
NETWORK VISUALIZATION	
RESNET	
SVMS	

COMPUTER LANGUAGES

C/C++	
JAVASCRIPT	
MATLAB	
PHP	
PYTHON	
SQL	

COMPUTATIONAL

MATLAB	
AWS	
DJANGO	
LAMMPS	
MATPLOTLIB	
MYSQL	
NUMPY	
PANDAS	
RDKIT	
TENSORFLOW	
SCIKIT	

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

AFM	
DSC TGA DMA	
ENVIRONMENTAL TESTING	
FTIR	
ITC	
MECHANICAL TESTING	
MICRO-CT	
SEM	
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)
– 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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