

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.

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

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

16 papers published/submitted 12 first-author papers published/in-progress 19 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

EXPERIENCE (CONTINUED)

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, 16 are published or submitted and 12 are first-author papers (Google Scholar link)

UNDER REVIEW / SUBMITTED

- P Verma, E Adegun, 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**

PUBLISHED

- 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**

- 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** ⇌
- **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)* (IF = 8.1); 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** ⇌
- **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*, 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

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
BIOPYTHON

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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