

Machine learning scientist with domain expertise in chemicals, materials, health, and environment. Advisor and mentor. Research manager and leader. Passionate about building elegant things and finding elegant solutions.

## WORK EXPERIENCE

### MANAGER, DATA SCIENCE CORE, UNIVERSITY OF ARKANSAS

Arkansas Integrative Metabolic Research Center (AIMRC) group, 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)

### 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 exhibiting UV-blocking, scratch and chemical resistance, electrical conductivity, anti-glare, etc.
- Development of conductive coatings and pressure sensitive adhesives

## INTERNSHIPS

Georgia Tech (2011), U Akron (2011), UMass Amherst (2010) U Minnesota (2009)

17 papers published or submitted  
12 first author papers  
20 conference presentations  
21 manuscripts reviewed

## EDUCATION

### GEORGIA INSTITUTE OF TECHNOLOGY

PhD, 2011 – 2015

Materials Science and Engineering

GPA 4.0/4.0

### INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

BS and MS, 2006 – 2011

Polymer Science and Technology

GPA 8.5/10.0

## NEW SKILLS

### LARGE LANGUAGE MODELS

### BIOPYTHON

### VISION LANGUAGE MODELS

### GRAPH NEURAL NETWORKS

### CHEMICAL INFORMATICS

### DJANGO

### RDKIT

### ML PIPELINES

### RESNET

### SUPPORT VECTOR MACHINES

### ISOTHERMAL TITRATION CALORIMETRY

## SELECT AWARDS

2021 – MSE 5 year mentorship award  
2020 – Invited talk, IIT Roorkee  
2019 – Hightower Fellow, OPALL  
2017 – Chairman, Tech. Conference, Kimoto  
2014 – Second prize, auxetic conference  
2009 – Chairman for polymer conference

## 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

### MATERIALS

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

### INTERPERSONAL

DEI
ILLUSTRATION
LEADERSHIP
MENTORING
RESEARCH ADVISING
TEACHING
TEAM BUILDING

### COMPUTER LANGUAGES

C/C++
JAVASCRIPT
MATLAB
PHP
PYTHON
SQL

### CHEMISTRY

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

### INDUSTRY

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

### LAB TECHNIQUES

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

## SELECT PUBLICATIONS

- P Verma, U Nakarmi, K Nayani; Machine learning approaches to ligand discovery for viral purification; *The Journal of Chemical Information and Modeling*, 2024; (submitting next)
- P Verma, U Nakarmi, K Nayani; A new deep-learning approach for drug-like molecular classification and regression; *Nature Communications*, 2024; (submitting next)
- P Verma, E Adeogun, ES Greene, et al.; Machine-learning classification of heat-stress in organisms using CNNs; *ACS Sensors*, 2024; (under review / submitted)
- 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*, 2024; (submitting next)
- H Van, P Verma, X Wu; On large visual language models for medical imaging analysis: an empirical study; *IEEE/ACM CHASE*, 2024
- 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*, 2023 [↔](#)
- H Sun, X 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)*, 2022 [↔](#)
- P Verma, C Smith, AC Griffin, et al.; Towards textile metamaterials: A pathway to auxeticity and tensegrity in a needle-punched nonwoven stiff felt; *Materials Advances (RSC) (IF=5.0)*, 2022 [↔](#)
- P Verma, C He, AC Griffin; Implications for auxetic response in liquid crystalline polymers; *Physica Status Solidi B*, 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) [↔](#)

## SELECT PRESENTATIONS

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- 📢 CNN based rapid sensing of heat-stress in organisms; Orlando (UNITED STATES); 2023
- 📢 Pathways to Commodity Mechanical Metamaterials – Auxeticity in Nonwoven Fiber Networks; College Station (USA); 2022; Invited talk
- 📢 Constructing out-of-plane auxetic response in paper; Denver (USA); 2020
- 📢 OPALL: The open polymer active learning laboratory at Georgia Tech; Orlando (USA); 2019
- 📢 X-ray scattering from LC polymers: Implications for auxetic response; Bedlewo (POLAND); 2019
- 📢 Auxetic liquid crystalline polymers; Crete (GREECE); 2017
- 📢 Reversibility of thickness change in nonwovens; Poznan (POLAND); 2016
- 📢 Elastic moduli of polymeric thin films of nanocomposites and blends via buckling on elastomeric substrates; Boston (USA); 2012

## PROFESSIONAL SERVICE

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### PEER REVIEWING

Reviewed more than 21 manuscripts for journals such as: Computational Materials Science (Elsevier), Industrial & Engineering Chemistry Research (ACS), Materials Research Express (IOP), Physica Status Solidi (Wiley), Proceedings of the National Academy of Sciences (PNAS), Surface and Coatings Technology (Elsevier), etc.

### MENTORING

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

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

### RESEARCH ADVISING

Advised the research of 17 (direct supervisor for 14) industry members / graduates / undergraduates in the following broad areas:

- convolutional neural networks
- machine learning for molecules
- linear and logistic regression
- auxetics and metamaterials
- structure-property relationships

### SELECT LEADERSHIP

- DEI council representative for MSE staff, Georgia Tech, 2019–2021
- Co-launched Postdoc Chats, Georgia Tech, 2019–present
- Advisor/mentor for OPALL members, Georgia Tech, 2019–2022
- Team leader, Kimoto Tech, 2016–2018
- Co-manager for thermal analysis lab, Georgia Tech, 2013–2015

## REFERENCES

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### ANSELM C GRIFFIN

Professor Emeritus, Georgia Tech

✉ anselm.griffin@mse.gatech.edu

### MEISHA L SHOFNER

Associate Professor, Georgia Tech

✉ meisha.shofner@mse.gatech.edu

### PAUL S RUSSO

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### BIN LI

Senior Research Chemist, Koppers

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### KARTHIK NAYANI

Assistant Professor, U Arkansas

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## EXTRACURRICULARS

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