

Vinay Saji Mathew

Industrial Engineer

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PROFESSIONAL OVERVIEW

PhD student in Industrial Engineering at The Pennsylvania State University, with a focus on the intersection of machine learning, optimization, and data analytics. Research experience includes applying mathematical models to complex problems across diverse domains such as rail transportation, biomedicine, and food insecurity. Professional background as a systems engineer.

SOFTWARE & LANGUAGE SKILLS

Python	Julia	C/C++	MATLAB
Java	Simio	IBM Rhapsody	Tivoli
English (Full Proficiency)	Hindi (Fluent)	Malayalam (Fluent)	Tamil (Spoken)

EDUCATION

Ph.D. Industrial Eng. & Operations Research | The Pennsylvania State University Exp. May 2027

- Operations, Services and Analytics Focus. Additional Coursework: Nonlinear Programming, Convex Optimization, Integer Programming.
- Graduate Assistant for the Institute for Computational and Data Sciences

M.Sc. in Industrial Eng. & Operations Research | The Pennsylvania State University | 4.0 GPA May 2024

- Thesis on utilizing word embeddings for hypothesis generation. Dual title in Operations Research. Funded by the Industrial Engineering Dept.
- Relevant course: Engineering Analytics, Network Science, Deep Learning, Causal Inference, Linear Programming, Linear Algebra, Stochastic Modelling, Design of Experiments, and Supply Chain Engineering.
- Teaching Assistant to the Engineering Analytics course (IE 330): Held office hours and provided instruction to a 90-student class on programming (Jan 2023 – Apr 2023).

Bachelor of Technology in Industrial Engineering | College of Engineering Trivandrum August 2020

- Final year project on optimizing the shunting schedules for trains in the Thiruvananthapuram Rail Yard.
- Relevant courses: Operations Research, System Simulation, Operations Management, Supply Chain Management, Layout Planning, Enterprise Resource Planning, and Meta-heuristics.
- Co-organizer ands Head of Public Relations for TEDxCET (Aug 2018 – Feb 2019) and Public Relations Officer, Literary Society – College of Engineering Trivandrum

PROFESSIONAL EXPERIENCE

Graduate Assistant | Laboratory for Intelligent Systems and Analytics, Penn State August 2022 – Present

- Developed MSc thesis project under Dr Soundar Kumara & Dr Peter Butler using word embeddings to analyze biomedical literature and uncover research directions by constructing weighted word networks.
- Conducted computations using Python primarily using the TensorFlow, Gensim, and spaCy libraries.

Systems Engineer | TATA Group Oct 2020 – Jul 2022

- Collaborated with the diagnostics team to tackle inconsistent data and unpredictable failure patterns.
- Translated raw data into actionable engineering insights. Bridged data analytics and practical engineering to enhance diagnostic tools, improve product reliability, and inform design and vendor decision-making.
- Tools used included Java, IBM Rhapsody, Python, and Jenkins.

PUBLICATIONS

- Forthcoming: *Word Embeddings for Hypothesis Generation in Biomechanics* by Mathew, V.S., Bulter, P., and Kumara, S.

- *Current State and Benchmarking of Generative Artificial Intelligence for Additive Manufacturing* in International Design Engineering Technical Conferences and Computers and Information in Engineering Conference. Vol. 88346. American Society of Mechanical Engineers, 2024. by Surovi, N. A., Witherell, P., Mathew, V. S., & Kumara, S.
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CONFERENCES

Global Open on Demand Conference 2025 | Harvard University, Cambridge March 2025

- Talk: “*AlphaFold Accessibility: An Optimized Open-Source OOD App for Protein Structure Prediction*”
 - Presented an open-source implementation of AlphaFold 2 & 3 with an optimized CPU-GPU resource separation model.
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INTERNSHIPS

Optimally Scheduling the Shunting of Trains | Indian Railways, Thiruvananthapuram Nov 2019 – Mar 2020

- Identified and formulated a comprehensive mathematical model and simulation for train scheduling, considering constraints like shunting yards, vehicles, yard capacity, workforce, and others.
- Developed and implemented heuristic algorithms for real-time schedule updating to accommodate changes and delays.
- Tools used included Simio, C++ (CPLEX library), and Python.
- This internship was converted into my final year project, and I was awarded an outstanding grade.

University Timetable Scheduling | Indian Institute of Technology, Guwahati Jun 2019 – Jul 2019

- Conducted as a research intern at the Indian Institute of Technology, Guwahati under supervision of Prof Swarup Bag.
 - Utilized genetic algorithms to automate the timetable scheduling of the Institute, taking into consideration faculty and student preferences using C.
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SELECT PROJECTS

CFRNet & Gaussian Processes for Causal Effect Estimation Jan 2023 – Apr 2023

- Utilized CFRNet and Gaussian Processes to estimate Average Treatment Effects in longitudinal data.
- Integrated Gaussian processes into CFRNet’s loss function for temporal and multilevel correlation.
- Research mentored and supported by Prof Vasant Honavar and implemented in Python.

From Health Challenges to Hunger: Insights into Food Insecurity in the US Aug 2022 – Dec 2022

- Employed health metrics to forecast food insecurity rates at state and county levels between 2016-2020.
- Utilized tree and regression-based methods to study key health factors that exacerbate food insecurity.
- Notable finding included that neighboring counties often share similar health challenges, prompting a suggestion that regional strategies might address food insecurity.

The Healthy Veggie – Graduate Project Aug 2022 – Dec 2022

- Developed and recommended a comprehensive business and logistics plan for "The Healthy Veggie" to enter the customer-direct sales market of fresh vegetables in the Greater Dallas area.
 - Conducted market analysis and drafted supply chain strategy, inventory optimization, and delivery design.
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HONORS AND AWARDS

- Received graduate assistantships in teaching and research, which included a full tuition waiver, as part of the support for my Master’s program at Penn State.
- Ranked top 1.3% in the Kerala Engineering Architecture Medical Entrance Exam (KEAM) and secured a government merit seat in College of Engineering, Trivandrum.
- School Topper in Mathematics, Issued by Kendriya Vidyalaya, Indian Institute of Technology Madras (2016)