

Pranav Milind Khanolkar

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RESEARCH INTERESTS

Engineering Design, Automation, Artificial Intelligence, Digital Threads, Data Science, Process Optimization, Product Lifecycle Management, Design for X, Manufacturing Processes

EDUCATION

Sept 2020 – June 2025	University of Toronto Ph.D. in Mechanical and Industrial Engineering Mentors: Dr. Alison Olechowski	Toronto, ON, Canada
Aug 2018 – May 2020	Pennsylvania State University M.S. in Industrial Engineering Mentors: Dr. Saurabh Basu, Dr. Christopher McComb	State College, PA, US
July 2013 – May 2017	University of Mumbai B.E. in Mechanical Engineering Mentors: Dr. Nitesh Yelve, Ms. Suvarna Rode	Mumbai, MH, India

AWARDS

2025	MIE Teaching Assistant Award (University of Toronto)
2023	MIE Conference Grant (University of Toronto)
2021	Mitacs Accelerate Internship Award (Mitacs)

TEACHING EXPERIENCE

Fall 2022, 2023, 2024	Teaching Assistant, MIE (University of Toronto) MIE258/358: Engineering Economics and Accounting Taught the following topics: Cash Flow Analysis, Financial Comparison Methods, Financial Accounting, Replacement Decisions, Taxes, Inflation, Dealing with Risk and Uncertainty, Emission Policy, and Business Plans. <ul style="list-style-type: none">- Designed and delivered lecture and tutorial materials and assisted in creating midterm and final exam questions to support student learning and align assessments with course objectives.- Led weekly tutorials and Q&A sessions for approximately. 50 students on the concepts of engineering economics and accounting.
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- Supervised and graded midterm and final exams—providing detailed feedback on how students can improve their understanding of concepts of engineering economics and accounting.

Fall 2023, 2024

Teaching Assistant, FASE (University of Toronto)

APS100: Orientation to Engineering

- Facilitated active online learning activities and sessions for classes of 300-325 students to assist them in early engineering management skills, such as time management and engineering ethics.
- Assessed and graded midterm and final exams, offering constructive, concept-focused feedback to help students deepen their understanding of scheduling, planning, engineering ethics, social considerations, and professionalism

Winter 2024

Teaching Assistant, MIE (University of Toronto)

MIE221: Manufacturing Engineering

- Topics taught: Machining, Injection Molding, Powder Processing, Material Handling, Metal Casting.
- Graded and provided detailed, constructive feedback on assignments and exams for over 200 students, ensuring fairness and consistency while improving students' understanding of key concepts and enhancing overall course performance.

MENTORSHIP EXPERIENCE

Sept 2020 – Dec 2022

University of Toronto, Ready Lab

RESEARCH ASSISTANT

Toronto, ON, Canada

- **Jerry Lu:** Previous undergraduate student in BASC in Mechatronics, Robotics, and Automation Engineering at the University of Waterloo. Mentored him towards developing web-scraping and natural language processing to collect and process course curricula for assessing the prevalence of AI in mechanical engineering programs. [Link to publication](#), [Link to dataset](#)
- **Mohammad Gad:** Previous undergraduate student in BASC Biomedical Engineering. Guided him in developing and applying natural language processing techniques for a study to assess AI prevalence in the 2021-2022 University of Toronto and University of Waterloo mechanical engineering course curricula. [Link to publication](#)
- **Jessica Liao:** Previous undergraduate student in BASC Architectural Engineering. Guided her in conducting and presenting an effective literature review and academic writing for the aforementioned research project. [Link to publication](#)

Sept 2019 – May 2020

Pennsylvania State University, THRED Group

RESEARCH ASSISTANT

State College, PA, US

- **Aaron Abraham:** Previous undergraduate student in B.S. Industrial Engineering at The Pennsylvania State University. Mentored him on the fundamentals of deep learning and synthetic data generation for my graduate research work.

PUBLICATIONS

JOURNAL ARTICLES

- 2025 **Khanolkar, P. M.**, Gopsill, J., & Olechowski A. (2025). Decoding the Digital Thread Digitalization Approach for Product Design and Development: Benefits, Challenges and Extensions. *Artificial Intelligence for Engineering Design, Analysis and Manufacturing Journal*, e23, 1-20. [Link to paper](#)
- 2023 **Khanolkar, P. M.**, Vrolijk, A., & Olechowski A. (2023). Mapping artificial intelligence-based methods to engineering design stages: a focused literature review. *Artificial Intelligence for Engineering Design, Analysis and Manufacturing* 37, e25, 1–18. [Link to paper](#)
- 2021 **Khanolkar, P. M.**, McComb, C. C., & Basu, S. (2021). Predicting elastic strain fields in defective microstructures using image colorization algorithms. *Computational Materials Science*, 186, 110068. [Link to paper](#)
- 2019 Yelve, N. P., Rode, S., Das, P., & **Khanolkar, P. M.** (2019). Some new algorithms for locating a damage in thin plates using Lamb waves. *Engineering Research Express*, 1(1), 015027. [Link to paper](#)

PEER-REVIEWED CONFERENCE PROCEEDINGS

- 2024 **Khanolkar, P. M.**, Lu, J., Hurst, A., & Olechowski A. (2024). Assessing The Prevalence of Artificial Intelligence in Mechanical Engineering And Design Curricula. *In International Design Engineering Technical Conferences and Computers and Information in Engineering Conference, American Society of Mechanical Engineers, 2024*. [Link to paper](#)
- 2023 **Khanolkar, P. M.**, Vrolijk, A., & Olechowski A. (2023). A Case Study of the Decision-Making Behind the Automation of a Composites-Based Design Process. *Proceedings of the Design Society*, 3, 49-58. [Link to paper](#).
- 2021 **Khanolkar, P. M.**, Gad, M., Liao, J., Hurst, A., & Olechowski, A. (2021). A Pilot Study on The Prevalence of Artificial Intelligence in Canadian Engineering Design Curricula. *Proceedings of the Canadian Engineering Education Association (CEEAA)*. [Link to paper](#)
- 2020 **Khanolkar, P. M.**, Abraham, A., McComb, C., & Basu, S. (2020). Using deep image colorization to predict microstructure- dependent strain fields. *Procedia Manufacturing*, 48, 992-999. [Link to paper](#)
- 2017 Rode, S., Yelve, N., **Khanolkar, P. M.**, Thube, M., Thampy, A., & Thomas, C., (2017). Development of a Lamb Wave-Based Algorithm for Detecting a Damage in Thin Plate Structures. *ISSS International Conference on Smart Materials, Structures, and Systems*. [Link to paper](#)

DATASETS

- 2021 Lu, J., **Khanolkar, P. M.**, Hurst, A., & Olechowski A. (2021). Keyword-Matching-for-Canadian- Mechanical-Engineering-Programs: Second Release (v1.0.1). *Zenodo*. [Link to paper](#)

Khanolkar, P. M., Basu, S., & McComb, C. (2021). Image-based data on strain fields of microstructures with porosity defects. *Data in Brief*, 34, 106627. [Link to paper](#)

GRANT REPORTS

2022 Olechowski, A., **Khanolkar, P. M.**, Lu, J., & Hurst, A. (2022). Towards a Modern Canadian Engineering Design Curriculum: Balancing Artificial Intelligence and Human Cognition. *SSHRC: Knowledge Synthesis Grant*. [Link to paper](#)

RESEARCH EXPERIENCE

Sept 2020 – June 2025 **Ready Lab (University of Toronto)**

Mentors: Dr. Alison Olechowski

- Developed strategic roadmaps to implement digital threads and AI in Canadian and UK industry partners' product development workflows using cloud data management and virtual machines—projected to save over CAD 337,500 annually.
- Qualitatively and quantitatively analyzed 108 published AI-based methods—including generative AI (GenAI) models, large- language models (LLMs), Agentic AI models, and Machine Learning— that are specifically deployed in different stages of the engineering design process and demonstrated how these methods assist engineers. [Link to publication](#)
- Leveraged Natural Language Processing and web-scraping to extract and evaluate the limited prevalence of AI education in 2195 courses offered by 28 accredited 2023-2024 Canadian Mechanical Engineering programs. [Link to publication](#), [Link to dataset](#)
- Drafted and managed three project proposals totaling CAD 375,250, submitted to NSERC, SSHRC, and MITACS, supporting industry-partnered research initiatives in product design, engineering education, and aerospace design systems.

June 2019 - May 2020 **THRED Group (Pennsylvania State University)**

Mentors: Dr. Christopher McComb

- Researched and implemented AI-based solutions to accelerate finite element analysis of material microstructures, focusing on image-based deep learning methods to enhance computational efficiency without sacrificing accuracy.
- Automated the generation of 6,000 diverse microstructure designs and structural simulations using Abaqus API scripting—creating a robust labeled dataset for training deep learning-based image colorization models using TensorFlow and Keras. [GitHub](#)
- Developed and trained a CNN-based image colorization model in Python that predicted strain fields in aluminum microstructures with 96% accuracy, achieving results 20x faster than conventional FEA methods. [Link to publication](#), [Link to dataset](#)

INDUSTRY EXPERIENCE

Sept 2021 – Aug 2022 **University of Toronto & RPS Composites**

MITACS ACCELERATE RESEARCH INTERN

Toronto, ON, Canada

- Conducted a comprehensive review of traditional composite design workflows and software limitations using sensitivity analysis (50+ variations) and engineer interviews to identify inefficiencies and recommend actionable improvements.
- Developed Python-based automation frameworks that generated manufacturing specifications, Bill of Materials, and CNC machine-compatible DXF files—replacing manual design tasks and improving design cycle speed by 10x.
- Integrated automation solutions into the company's production workflow, contributing to an estimated CAD 10,500 annual savings per product, demonstrating strong ROI and scalable potential across product lines. [Link to publication](#)

June 2015 – July 2015

BEST Undertaking

ENGINEERING INTERN

Mumbai, MH, India

- Delivered technical insights on chassis, braking, and steering systems to inform design refinements, reducing recurring product issues by 10%—improving overall product reliability and client satisfaction.
- Identified and addressed supply chain inefficiencies influencing product design-to-delivery timelines, driving a 12% productivity gain in workshops and reducing client order lead times—shortening the design-to-market cycle.

PRESENTATIONS AND INVITED TALKS

Nov 2025

Panellist at the Engineering Economics Undergraduate Class

University of Toronto, Toronto, Ontario, Canada

Topic: Crafting a Business Plan That Delivers Results

Oct 2024

Panelist at DAIR to Innovate 2024

Bombardier Centre for Aerospace & Aviation, Centennial College – Downsview Campus, Toronto, Ontario, Canada

Topic: Unlocking new potential with digital technologies and Product Lifecycle Management (PLM)

Aug 2024

Conference Presenter at IDETC-CIE 2024

International Design Engineering Technical Conferences & Computers and Information in Engineering Conference, Washington, DC, US

Topic: Assessing the Prevalence of Artificial Intelligence in Mechanical Engineering and Design Curricula

June 2024

Poster Presenter at MIE Graduate Symposium

University of Toronto, Toronto, Ontario, Canada

Topic: Digital Thread-Enabled Data Management Framework for Modelling and Simulation of Electric Vehicle Battery Thermal Management Systems

Aug 2023

Conference Presenter at ICED23

The 24th International Conference on Engineering Design, University of Bordeaux, France

Topic: A Case Study of The Decision-Making Behind the Automation of a Composites-Based Design Process

June 2023

Poster Presenter at MIE Graduate Symposium

University of Toronto, Toronto, Ontario, Canada

Topic: Deep Co-design: Streamlining the Electro-Thermal Design Process for Future Automation

April 2022

Guest Speaker at Engineering Education Research Roundtable 2022

University of Toronto - Institute for Studies in Transdisciplinary Engineering Education and Practice, Toronto, Ontario, Canada

Topic: Navigating frameworks and methodologies for analyzing engineering curriculum

Jun 2021

Conference Presenter at CEEA 2021

The Annual Conference of the Canadian Engineering Education Association, University of Prince Edward Island, PEI, Canada

Topic: A Pilot Study on The Prevalence of Artificial Intelligence in Canadian Engineering Design Curricula

November 2019

Guest Presenter at THRED Group

The Pennsylvania State University, State College, Pennsylvania, US

Topic: Using Deep Image Colorization to Predict Microstructure-Dependent Strain Fields

July 2017

Conference Presenter at ISSS 2017

International Conference on Smart Materials, Structures and Systems, IISc Bangalore, India

Topic: Development of a Lamb Wave-Based Algorithm for Detecting a Damage in Thin Plate Structures

SKILLS

Programming

Python, R, Git, MATLAB, SQL

AI

Machine Learning & Deep Learning (Scikit-learn, Keras, PyTorch, TensorFlow), Natural Language Processing (NLTK)

Applications

AWS, SolidWorks, Onshape, AutoCAD, Autodesk Inventor, ANSYS Workbench, Abaqus, Power BI, Tableau, NVivo

Research

Statistical Analysis, Literature Review, Qualitative Coding and Analysis, Case Study Analysis, Grant Writing

CERTIFICATIONS

AWS Fundamentals Specialization (Amazon Web Services–AWS, Cloud Computing, AWS Management Console)

Generative AI Engineering with LLMs Specialization (Prompt Engineering, LLMs, RAG, LangChain, Database Management)

IBM AI Engineering Professional Certificate (Tensorflow, PyTorch, Keras, Apache Spark, Deep Learning, Big Data)

NLP - Natural Language Processing with Python (Spacy, LDA, Word2Vec, NLTK, NER, Topic Modelling, Sentiment Analysis)

Python for Data Science and Machine Learning Bootcamp (Pandas, Seaborn, SciKit-Learn, NumPy, Matplotlib, Plotly)

Lean Six Sigma Yellow Belt: Quantitative Tools for Quality and Productivity Professional Certificate (DMAIC, Critical-to- Quality, Failure Modes & Effects, Root Cause Analysis, Heijunka, Kanban, Jidoka, Poka Yoke, Quality Control)

Sustainability Consulting (Product Lifecycle Management, Corporate Sustainability, Environmental Management Systems)

Product Design and Analysis – by CADD Centre Training Services Pvt. Ltd. (SolidWorks and ANSYS)

VOLUNTEERING

July 2022 – June 2024

The Canadian Science Fair Journal

SECTION EDITOR, ENGINEERING

Toronto, ON, Canada

- Led a team of five graduate students and researchers across different universities in Canada to review and publish research projects conducted by high-school students (aged 12-18 years).

- Reviewed and published research articles by mentoring young authors through the process of writing their first scientific paper.