Pranav Milind Khanolkar

Toronto, ON, Canada

Email: khanolkarpranav30@gmail.com **Phone**: +1 (647) 878-1671 **Google Scholar**: Publications
Website: khanolkarpranav30.github.io **LinkedIn**: pranav-milind-khanolkar **GitHub**: khanolkarpranav30

RESEARCH INTERESTS

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

EDUCATION

Sept 2020 – June 2025 **University of Toronto** Toronto, ON, Canada
Ph.D. in Mechanical and Industrial Engineering
Supervisor: Dr. Alison Olechowski

Aug 2018 – May 2020 **Pennsylvania State University** State College, PA, US
M.S. in Industrial Engineering
Supervisors: Dr. Saurabh Basu, Dr. Christopher McComb

July 2013 – May 2017 **University of Mumbai** Mumbai, MH, India
B.E. in Mechanical Engineering
Supervisors: Dr. Nitesh Yelve, Ms. Suvarna Rode

RESEARCH EXPERIENCE

Sept 2020 – June 2025 **Ready Lab (University of Toronto) - Dr. Alison Olechowski**
PH.D. RESEARCHER Toronto, ON, Canada

- Conducted a post-hoc review of a UK-based project on implementing Digital Thread in their product development workflows, and performed thematic analysis on the project reports and team-interviews to present a strategic roadmap and best practice guidelines for effective digitalization and AI adoption. (*in collaboration with Dr. James Gopsill, University of Bristol*) Link to publication

- 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 (NLP) and web-scraping (Selenium and BeautifulSoup4) to extract and evaluate the limited prevalence of AI education in 2195 courses offered by 28 accredited Canadian Mechanical Engineering programs (2023-2024). (*in collaboration with Dr. Ada Hurst, University of Waterloo*) 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) - Dr. Christopher McComb**
M.S. GRADUATE RESEARCHER State College, PA, US

- 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

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, Thematic 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)

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 (CEEA).* 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 REPORT

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

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.

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.

- 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.
- 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 NLP 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 at the University of Waterloo. Guided him in developing and applying NLP 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 at the University of Waterloo. Guided her in conducting and present effective literature review and academic writing for research 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. Link to publication

AWARDS

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

PRESENTATIONS AND INVITED TALKS

November 2025 **Panellist at the Engineering Economics Undergraduate Class**
University of Toronto, Toronto, Ontario, Canada
Topic: Crafting a Business Plan That Delivers Results

October 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)

August 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

August 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

June 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

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.