PRANAV MILIND KHANOLKAR

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OBJECTIVE

Aiming to leverage my technical knowledge, skills, and expertise specializing in AI and automation for product design, to revolutionize engineering and design processes, fostering innovation and efficiency to create impactful and sustainable products and systems.

EDUCATION

- **Doctor of Philosophy: Mechanical and Industrial Engineering** — **Expected Graduation Year: August 2024**
  University of Toronto, St. George Campus, Toronto, Canada — **GPA – 3.85 / 4**

- **Master of Science: Industrial Engineering** — **Graduation Year**: **May 2020**
  The Pennsylvania State University, University Park Campus, PA, USA — **GPA – 3.85 / 4**

- **Bachelor of Engineering: Mechanical Engineering** — **Graduation Year: May 2017**
  University of Mumbai, Fr. Conceicao Rodrigues Institute of Technology, India — **CGPA - 8.59 / 10**

RESEARCH EXPERIENCE

Graduate Researcher (Ready Lab, University of Toronto) [September 2020 – present]
(Advisor: Dr. Alison Olechowski)

- Currently conducting case studies for qualitative analysis of the decision-making process behind the selection, development, and implementation of the right automation method catered to an industry's product design process.
- Collaborating with researchers from University of Bristol to conduct interviews and qualitative coding towards generating a roadmap to automating product design processes.
- Conducted focused literature review (108 peer-reviewed publications) of different AI methods that are specifically deployed in different stages of the engineering design process.
- Assisted research supervisor in drafting proposal titled, 'A Modern Canadian Engineering Design Curriculum: Balancing Artificial Intelligence and Human Cognition' for the Social Sciences and Humanities Research Council (SSHRC) Knowledge Synthesis Grant - Skills and Work in the Digital Economy (awarded).
- Collaborating with faculties and students from University of Toronto and University of Waterloo to conduct interdisciplinary research pertaining to the prevalence of AI in Engineering curricula across Canadian universities as part of the SSHRC grant.
- Developed web-scraping algorithms to extract undergraduate-engineering courses curricula across Canadian universities.
- Utilizing natural language processing to process keywords extracted from AI and design-related research-literature and mapping them to the engineering course-descriptions of the Canadian universities.
- Mentored five undergraduate students in conducting and presenting literature review and academic writing for research.

Mitacs Accelerate Research Intern [September 2021 – August 2022]
(University of Toronto – RPS Composites)

- Drafted project proposal titled, 'A New Automated Approach for Engineering Design and Manufacturing Specification Generation' in collaboration with RPS Composites for the Mitacs Accelerate Internship Award (awarded).
- Reviewed the current FRP (fiber reinforced plastic/polymer) based flange design process.
- Developed an automation program for effective generation of manufacturing specification, bill of materials and drawing-exchange-format (DXF) files for CNC machining, that proved to be 10x faster than the company's traditional design process.
- Developing an optimization algorithm to streamline the flange design process that provides a set of best designs in accordance with the design requirements and constraints.

Graduate Researcher (THRED Lab, The Pennsylvania State University) [June 2019 – May 2020]
(Advisors: Dr. Christopher McComb & Dr. Saurabh Basu)

- Collaborated with faculties from Engineering Design and Industrial Engineering departments to conduct interdisciplinary research.
- Developed an automation algorithm that generates data pertaining to microstructures and its finite element analysis.
- Researched and analyzed various algorithms related to the research project based on Material Science and Machine Learning.
- Developed Deep Learning algorithms to predict strain fields in aluminum microstructures with 96% accuracy.
- Mentored an undergraduate student to ensure his understanding of concepts and supervised the completion of assigned tasks.
- Assisted and guided a fellow graduate student on his project related to the above-mentioned research work.

PUBLICATIONS & CONFERENCES:

Peer-Reviewed Journal Publications:

- **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. https://doi.org/10.1017/S0890060423000203

- **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. https://doi.org/10.1016/j.commatsci.2020.110068

- Yelve, N. P., Rode, S., Das, P., & **Khanolkar, P**. (2019). Some new algorithms for locating a damage in thin plates using lamb waves. Engineering Research Express, 1(1), 015027. https://doi.org/10.1088/2631-8695/ab3c17

Conference Proceedings (Peer Reviewed):

- Conference: 24th International Conference on Engineering Design, Bordeaux, France; July 24 – 28, 2023.
  Title: A case study of the decision-making behind the automation of a composites-based design process
  https://doi.org/10.1017/pds.2023.6

- Conference: Canadian Engineering Education Association (CEEA-ACEG21) Conference, Charlottetown, PEI; June 21 – 23, 2021.
  Title: A Pilot Study on the Prevalence of Artificial Intelligence in Canadian Engineering Design Curricula
  https://doi.org/10.24908/pceea.vi0.14919

- Conference: 48th North American Manufacturing Research Conference, June 22nd – 26th 2020, Cincinnati, Ohio.
  Title: Using Deep Image Colorization to Predict Microstructure-Dependent Strain Fields
  https://doi.org/10.1016/j.promfg.2020.05.138

- Conference: ISSS International Conference on Smart Materials, Structures, and Systems 2017, July 5th –7th 2017, IISc. Bangalore.
  Title: Development of a Lamb Wave Based Algorithm for Detecting a Damage in Thin Plate Structures
  https://www.researchgate.net/publication/337222802_Development_of_a_Lamb_Wave_Based_Algorithm_for_Detecting_a_Damage_in_Thin_Plate_Structures

Grant Reports:

- Olechowski, A., Khanolkar, P. M., Lu, J., & Hurst, A. (2022). Towards a Modern Canadian Engineering Design Curriculum: Balancing Artificial Intelligence and Human Cognition. https://hdl.handle.net/1807/109985

Datasets:

- Jia Sheng (Jerry) Lu, **Pranav Milind Khanolkar**, Ada Hurst, & Alison Olechowski. (2021). Keyword-Matching-for-Canadian-Mechanical-Engineering-Programs: Second Release (v1.0.1). Zenodo. https://doi.org/10.5281/zenodo.5202815

- **Khanolkar, P**., Basu, S., & McComb, C. (2021). Image-based data on strain fields of microstructures with porosity defects. Data in Brief, 34, 106627. https://doi.org/10.1016/j.dib.2020.106627

CERTIFICATIONS

- **IBM AI Engineering Professional Certificate** – Coursera
  (https://coursera.org/share/5068eca246b742da8649dd9e6d1d6c11)
- **NLP - Natural Language Processing with Python** – Udemy
  (https://ude.my/UC-6d109f95-019a-4351-a642-2d9e12c028c0)
- **Python for Data Science and Machine Learning Bootcamp** – Udemy
  (https://ude.my/UC-5d923527-c006-484c-b350-245cb0bffdae)
- **Six Sigma and Lean: Quantitative Tools for Quality and Productivity Professional Certificate offered by TU Munich** – EDX
  (https://credentials.edx.org/credentials/9ef669483a9340bbb010390e3fe46365/)
- **Product Design and Analysis** – by CADD Centre Training Services Pvt. Ltd.

SKILLS

Programming Languages: Java (Basic), Python (Intermediate), R (Intermediate), MATLAB (Basic), HTML (Basic)
Python: Machine Learning & Deep Learning (Sckit Learn, Keras, PyTorch, TensorFlow), Natural Language Processing (nltk)
Application Software: SolidWorks, OnShape, AutoCAD, Autodesk Inventor, ANSYS Workbench, Power Bi, Tableau, Mintab
Research Skills: Statistical Analysis, Literature Review and Analysis, Qualitative Coding and Analysis, Case Study Analysis, Grant Writing

MAJOR PROJECTS

Comparative Analysis of Self-Supervised Learners (CSC2515 – Introduction to Machine Learning) [December 2021]

- Reviewed and documented five self-supervised learning (SSL) algorithms (MoCo, SimCLR, BYOL, SwAV, Barlow Twins).
- Performed qualitive analysis using T-SNE plots and on these five SSL algorithms using CIFAR10 dataset and their comparison with supervised learning method for classification.
- Performed quantitative analysis of these self-supervised learning (SSL) algorithms by evaluating their models' transfer learning ability using out-of-distribution testing for image classification.
- Developed an ensemble of these five SSL methods and supervised learning method to assess the improvement in image classification compared to the individual methods.

Statistical analyses of the BRFSS for effective monitoring of weight related concerns [December 2020]

- Analyzed the Behavioral Risk Factor Surveillance System (BRFSS) dataset, containing information of 276 variables that include interview information, location, and demographics, health, and medical information of 437436 respondents.
- Performed K-means clustering to observe the patterns based on the US states-population and Body Mass Index (BMI).
- Created logistic regression models, predicting Heart Attack Diagnosis, Cancer Diagnosis, and Diabetes Diagnosis, with Drinking and Smoking as the predictors.
- Conducted logistic regression tests to analyze if adding BMI score to the prediction models with only Drinking and Smoking as the predictors of such disease diagnoses, will render the model a better fit.

Remote Order Taking – Discrete Event Simulation [May 2019]

- For a given dataset, analyzed and optimized the number of servers required for a drive-through restaurant- chain in the area to improve efficiency according to desired performance standards using discrete event simulations in Python.
- Performed a sensitivity analysis to observe the change in the required number of operators if more branches are added.
- Quantified the uncertainty based on input distributions models fitted according to given data.

Non-Destructive Testing of Thin Plates using Ultrasonic Guided Waves (*Thesis: B.E. Mechanical Engineering*) [March 2017]

- Unanimously elected as the Group Leader for this project and mentored the team of four students in this project.
- Developed two new algorithms for damage detection, localization, and refinement.
- Also, documented entire project, drafted the corresponding technical paper 'Development of a Lamb Wave Based Algorithm for Detecting a Damage in Thin Plate Structures' and presented in the conference proceedings.

Business Communications and Ethics Project Report on BEST as a Transport Service [October 2015]

- Chosen as the Group Leader to efficiently iterate the plan of action, oversee and report the project progress to project advisors.
- Compiled, documented, and presented the research collected during the internship at The Brihanmumbai Electric Supply and Transport (BEST) Undertaking.
- Provided a detailed report to the Department of Mechanical Engineering highlighting the potential drawbacks and their respective remedies.

TEACHING EXPERIENCE

TA – APS100 Orientation to Engineering [Fall 2023]

(University of Toronto)

- Facilitate and support active online learning activities and sessions for classes of 300-325 students.
- Grade and provide student feedback on course assignments.

TA – MIE258 Engineering Economics and Accounting [Fall 2023, Fall 2022]

(University of Toronto)

- Conducted weekly tutorials and Q&A sessions for approx. 50 students on concepts of engineering economics and accounting.
- Supervised and graded midterm and final exams.
- Prepared video lectures featuring revision of concepts and assignment details.