



# Pranshu Malik

Robotics Enthusiast

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## Interests

Robotic Systems & Automation · Medical Devices · Computer Vision · Signal Processing · Circuit Design

## Education

### University of Toronto

Toronto, ON

*Bachelor of Applied Science in Electrical Engineering; GPA: 3.87/4.0* Sept. '17 – June '21 (Exp.)

- Engineering International Scholar: Received full tuition-fee waiver for the entire duration of the program
- Key Courses: Control Systems, Signals & Systems, Electronics, E&M Fields, Digital Systems, Linear Algebra
- Minor in Robotics and Mechatronics; candidate for Certificate in Artificial Intelligence Engineering

## Research & Professional Experience

### aUToronto, Self Driving Car Team

Toronto, ON

*Electrical Team Lead*

Feb. '19 – Present

- Synchronizing system clock, cameras, LIDAR, & GPS using chrony NTP with PPS signals received over RS232
- Designed an expandable controller PCB to create a software switch for the autonomous-mode indicator lights
- Built testing equipment, including traffic lights; setup power safe power distribution and routed data cables

*Planning and Controls Team Member*

Aug. '19 – Present

- Developing framework for standardized testing of controller in simulation and generating performance reports
- Learning about model predictive controller (MPC) to update current implementation for new requirements

### Teaching Assistant, Department of Mathematics

Toronto, ON

*MAT188, Linear Algebra*

Sept. '19 – Present

- Facilitating 3 weekly tutorials; engaging with students to help them learn and apply concepts in linear algebra
- Using the "ask, not tell" philosophy of teaching; involved in invigilation duties for quizzes and midterm exams

*MAT135, Calculus 1A*

Sept. '18 – Dec. '18

- Held weekly tutorials and office hours to help students learn various concepts in calculus
- Graded weekly assignments and midterm examinations; assisted with invigilating midterm and final exams

### Software Engineering Intern, Rocscience Inc.

Toronto, ON

*Geotechnical Software Tools Design*

May '19 – Aug. '19

- Developed an interactive geometry-import tool that supports file import within the software suite as well as several external formats like DXF and DWG, thereby improving synergy between the products
- Designed diagnostic tools to perform mesh queries and inspection to identify book-keeping and numerical errors

### Undergrad. Research Assistant, Rehabilitation Engineering Lab, TRI

Toronto, ON

*Advisors: Prof. Kei Masani and Prof. Paul Yoo*

May '18 – Aug. '18

- Developed finite element models (FEMs) of lower leg for computational study of neurostimulation applications
- Streamlined workflow for developing FEMs using Autodesk Inventor, COMSOL Multiphysics, and MATLAB
- Documented framework on using MRI datasets to develop FEMs; applicable for other bio-electric studies too

## Projects

**CollabBots:** A robotic system consisting of 2 robotic arms, built from scratch, that uses visual-servoing to collaboratively pick-up and stack blocks to make a structure. The sub-modules are partially complete and are under development.

**Object-tracking robotic arm:** Programmed to locate a cup in its radius and drop a coin into it; video from a camcorder, mounted on the arm, is processed in real-time by an FPGA which communicates with an Arduino to control the robot's actions. The system allows for calibration of thresholds to suit any environment.

**TRAECY:** Traffic and Emission Control System, aims to conjoin traffic management with real-time vehicle emission tracking & regulation, to ultimately reduce air pollution; it comprises of 3 disparate devices embedded in vehicles and street infrastructure that collect data for traffic-light control & traffic rerouting algorithms, and update users' quota.

## Skills

### Programming Languages:

Proficient: C, C++, C#, MATLAB, Verilog, Arduino

Intermediate: Python, Java, ARMv7 Assembly, Visual Basic, L<sup>A</sup>T<sub>E</sub>X, PHP, HTML, CSS, JavaScript

Packages and Libraries: OpenCV, ROS, Git, .NET, WPF, GTK, Eyeshot, DevExpress

### Softwares:

EDA and Simulation Tools: KiCad, EAGLE, LTspice, Pspice, NI Multisim, ModelSim, Quartus Prime

3D CAD and CAE: SolidWorks, Autodesk Inventor, Autodesk Fusion 360, ANSYS, COMSOL Multiphysics, CATIA

Graphic design: Photoshop, Illustrator, Inkscape, GIMP

### Hardware familiarity:

Modules and Sensors: PCA-9685 (12bit-PWM servo driver), TB6600 and A4988 (stepper motor drivers), HC-05 (serial Bluetooth transceiver), MQ-135 (gas sensor), LTC-3108 (ultra-low voltage step-up), LTC-3588 (nano-power harvesting)

Hardware Development Platforms and Boards: DE1-SoC, ESP-8266, ESP-32, Arduino (Due, Mega/Uno/Nano, MKR-1000, Intel Galileo Gen-2), Raspberry Pi 3B, STEM-Du RDC-102 MCU

Data Acquisition and Computing Platforms: Muse headband, NI myDAQ, redpitaya, Hantek 6022-BL

## Professional Development & Certifications

Fundamentals of Image and Video Processing, Coursera: 2D signals and systems, sampling and filtering, motion estimation, color representation and processing; image enhancement, recovery, and compression

A Hands-on Introduction to Engineering Simulations, edX: Finite-element analysis and computational fluid dynamics simulations on ANSYS for real-world problems; verification and validation of results

Mechanical CAD Certification (in SolidWorks), CadZone India: Solid and sheet-metal modeling, advanced modeling tools, assembly modeling, SolidWorks Motion and Simulation tools

CATIA Certification, Institute for Multidisciplinary Design & Innovation, UofT: Solid part design, assembly design, and drafting workbench for models

Basic, Advanced Machining, & Machining III, George Brown College: Machine shop safety; use of hand tools, lathe, mill, grinder, drill press, band saw; machine feed rates and cutting speeds

Introduction to Welding, George Brown College: Oxy-acetylene, manual-arc (stick), and gas-metal-arc (MIG) welding techniques; safety training

## Awards & Achievements

<u>First Place</u>	GM/SAE Autodrive Challenge	2019
<u>First Year Summer Research Fellowship</u>	Faculty of Applied Science and Engineering	2018
<u>Runner Up</u>	NASA Space Apps Hackathon, New Delhi	2017
<u>Pete Conrad Scholar Finalist</u>	Conrad Spirit of Innovation Challenge	2016
<u>First Prize (Grade XI, Large Team)</u>	NASA Ames Space Settlement Contest	2016
<u>First</u>	Intel Make-a-thon, New Delhi	2015
<u>Second</u>	Google Developers Group (GDG) College Hack	2014

## Other Interests & Activities

**Sports:** Love playing cricket and racket sports like squash and badminton; enjoy cycling, hiking, camping activities, and going on long walks. Have also played cricket competitively, at the state level.

**Spiritualism/Culture:** Have been attending Bhagavad Gita classes each week at ISKCON Temple for the past 13 years. Also associated with the Institute for Science and Spirituality at ISKCON; actively contribute to the newsletter and attend scientific conferences on the matter.