Aman Bhargava

Curriculum Vitae

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Education

Sep 2018 – Ongoing

University of Toronto
BASc. Engineering Science, Machine Intelligence Option, Robotics & Mechatronics Minor.
Relevant Coursework: Matrix Algebra and Optimization, Probabilistic Reasoning, Systems Software, Artificial Intelligence, Control Theory I, Digital & Computer Systems.

Sep 2014 – June 2018

Trinity College School
OSSD, 99% Graduating Average. AP Capstone Diploma & Governor General's Bronze Medal.

Research Experience

Feb 2021 – Ongoing

Neural System & Brain Signal Processing Lab – Krembil Research Institute
Researcher: Neuronal Learning Mechanisms, Brain Signal Decoding

- Led investigation on **reinforcement learning** approaches for revserse-engineering **learning rules** in neural networks.
- Designed and optimized large scale neural network simulations in **Julia**.
- Generated a **robust, biologically feasible synaptic** learning policy for rate-based neural networks using novel reinforcement learning approach [2].

Jun 2021 – Aug 2021

Turaga Lab – HHMI Janelia
Research Intern: ML-Based Protein Engineering

- Designed and tested a variety of **large scale deep learning** models for GCaMP **protein functionality prediction** task.
- Leveraged **pre-trained** transformer (ESM-1b) and RNN-LSTM (UniRep) language models for semantically rich sequence representations.
- Introduced data **transformations** and **dimensionality reduction** techniques to increase final model performance on key prediction targets.

Oct 2019 – Jan 2021

MannLab – University of Toronto
Researcher: ML, BCI, Signal Processing

- **Collaborated with and lead** teams of masters students, undergraduates, and industry professionals to produce a variety of publications on **machine learning, signal processing, brain-computer interface**, and **wearable technology** [4, 1, 5, 3].
- Generated research questions, designed systems and apparatus, performed experiments, and published results in **peer-reviewed venues.**
- Rapidly acquired mathematical and scientific skill sets in order to carry out research objectives.

Awards and Honors

- 2021: **Janelia Undergraduate Scholars Fellowship**, Howard Hughes Medical Institute.
- 2020: **Undergraduate Student Research Award**, Natural Sciences and Enginenering Research Council of Canada (NSERC USRA).
- 2020: **Shaw Design Scholarship**, University of Toronto Faculty of Engineering Science.
- 2019: **Engineering Alumni Network Scholarship**, University of Toronto Faculty of Applied Science and Engineering.

- 2018: **President's Scholarship**, University of Toronto.
- 2018: **Global Top Scoring Thesis Paper & Presentation**, AP Capstone Diploma.

Publications

2021

1. **Bhargava, A.** & Mann, S. *Adaptive Chirplet Transform-Based Machine Learning for P300 Brainwave Classification* in *2020 IEEE-EMBS Conference on Biomedical Engineering and Sciences (IECBES)* (2021), 62–67.
2. **Bhargava, A.**, Rezaei, M. R. & Lankarany, M. Gradient-Free Neural Network Training via Synaptic-Level Reinforcement Learning. arXiv: `2105.14383 [cs.NE]` (2021).
3. **Bhargava, A.**, Zhou, A. X., Carnaffan, A. & Mann, S. Deep Learning for Enhanced Scratch Input. arXiv: `2111.15053 [cs.HC]` (2021).

2020

4. **Bhargava, A.**, O'Shaughnessy, K. & Mann, S. *A Novel Approach to EEG Neurofeedback via Reinforcement Learning* in *2020 IEEE SENSORS* (2020), 1–4.
5. Mann, S. *et al. Sensing of the Self, Society, and the Environment* in *2020 IEEE SENSORS* (2020), 1–4.

Skills

- **Programming**: Python, Julia, MATLAB, C, JavaScript, Java, HTML5/CSS3, ARM Assembly, Verilog.
- **Software**: PyTorch, NumPy, Pandas, SciKit Learn, Git, Arduino, ESP32, OpenCV, Vue.js, Firebase, Vim.
- **Techniques**: Supervised/Unsupervised/Statistical Machine Learning, Deep Learning, Reinforcement Learning, Supercomputing, Object-Oriented Programming.

Professional and Leadership Experience

Apr 2020 – Apr 2022

University of Toronto Consulting Association
Consulting Group Director

- Recruited & onboarded a group of 90 University of Toronto students (undergraduate, Masters, and Ph.D.) over 2 years to solve management consulting problems for local **non-profits and startups** at UofT's largest consulting club.
- Worked with client organizations to understand issues in their operations and draft **problem statements.**
- Mentored 15 independent teams working to solve problems for real-world clients.

Jul 2019 – Ongoing

CareTrack
Co-Founder & CEO

- Designed and implemented a full-stack web-based **medical data entry & analytics platform** for assisted living facilities.
- Leverages modern UI, data visualization, and predictive algorithms to improve patient outcomes and nurse, doctor, and administrator productivity. Currently in **private beta** for data collection.
- Utilizes Angular, Firebase, Chart.js, Python/Flask.

Jun 2019 – Aug 2019

Venture13
Software Developer

- Conceptualized and developed **full-stack web applications** using Angular and Firebase incorporating Google Calendar, Maps, Directions API's for **TheWeekendRoute, Venture13**, and the **Cobourg Police Force.**
- Created **robotics software suite** for CrossWing Solutions using OpenCV, Python, and JavaScript.
- Performed **microprocessor programming**, implementing low power machine learning and signal processing with Nordic Semiconductor's SDK for wearable personal security device.