Basel Mostafa

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Education

- **California Institute of Technology** — Pasadena, CA
  Bachelor's of Science in Computer Science; GPA: 4.2 — *Sep. 2019 – Present (Jun. 2023)*

Experience

- **Meta** — Menlo Park, CA
  SWE Intern - Commerce Products Integrity Team — *Jun. 2022 – Present*

- **Amazon Web Services** — Seattle, WA
  SDE Intern - Web Application Firewall Team (WAF Team) — *Jun. 2021 – Sep. 2021*
  - Implemented the Header FieldToMatch feature which enables WAF to parse HTTP request headers in new ways, thereby expanding the set of malicious requests that WAF can detect. For instance, the Header FieldToMatch feature is used in the Log4JRCE rule for detecting HTTP requests that attempt to exploit the Log4j vulnerability.
  - Augmented web server code written in C to parse and perform threat-detection on HTTP request headers as per the new parsing options. Wrote Java and C++ code to incorporate the new feature into the WAF infrastructure.

- **Cosmic Dawn Center** — Copenhagen, Denmark
  Summer Undergraduate Research Fellow — *Jun. 2020 – Sep. 2020*
  - Investigated the implications of adding a temperature-like parameter called T_{IMF} to models of galaxy formation.
  - Built an automated pipeline for fitting T_{IMF} to a catalog of galaxies, revising the estimates of various galaxy properties based on the new T_{IMF} fits, and analyzing and visualizing the effects on the star-forming main sequence. Equipped the pipeline with a Makefile to allow small modifications to be made with ease.
  - Featured publications: Implications of a Temperature-dependent Initial Mass Function. I. II. III.

- **Caltech Robotics Team** — Pasadena, CA
  Software Team Member — *Sep. 2019 – Jan. 2020*
  - Optimized object detection neural network speed on CPU for autonomous submarine; achieved 36% speedup with minimal loss of precision over CRT's previous vision system by enabling int-8 weight quantization, AVX, and SSE.
  - Used OpenCV to follow an underwater cart through a stream of images as seen by a moving submarine.

- **CHS Robotics Team** — Cupertino, CA
  Project Coordinator, Mechanical Designer, Mentor — *Sep. 2015 – Mar. 2019*
  - Led the design and fabrication of an award-winning robot for the FTC 2016-17 season, an animatronic, and three major mechanisms on a semi-autonomous robot for the FRC 2019 season.
  - Mentored lego robotics teams for the FLL Animal Allies and Hydro Dynamics challenges.

Projects

- **Covid-19 Vaccine Efficacy Model:** Collaborated in a team of four to analyze vaccine efficacy for the B.1.1.7, B.1.351, and P.1 variants using ML. Constructed a LSTM-VAR ensemble model for predicting the future prevalence of each variant from vaccination rates and auxiliary factors. Achieved an out-of-sample MAE of 0.08 for the B.1.1.7 variant.
- **TeenyBASIC Compiler:** Compiles a simplified version of BASIC in O(n) time on the parse tree size, optimized to pre-evaluate constant expressions, replace multiplication with bit shifts where possible, and maximize register use.
- **Python Rubik's Cube Solver:** 2x2x2 Rubik's Cube solver finds implements a brute force algorithm which considers up to 2 billion times fewer states compared to naive BFS. 3x3x3 Rubik's Cube solver implements a corners first algorithm.
- **DAMMIT:** Collaborated in a team of three using git to create a top-down monster survival game using JavaFX. Used OOP principles of inheritance and polymorphism to build a consistent and intuitive software architecture.

Programming Skills

- **Courses:** Algorithms, Data Structures, ML and Data Mining, Computing Systems, Operating Systems, Intro to C++
- **Languages:** Python (proficient), C (proficient), Java (proficient), C++ (basic), HTML/CSS (basic)
- **Tools**: Linux, Git, NumPy, Matplotlib, Scikit-learn, Keras, PyTorch