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 - BI Commerce Products Integrity Team (CPI Team) — *Jun. 2022 – Sep. 2022*
  - Worked on projects related to reviewing products for compliance with Meta's commerce policies, including:
    - Enhancing logs to store more comprehensive info about events which triggered product reviews
    - Using new information about user interaction with dynamic ads to trigger product reviews. Estimated the new trigger to be 3x more effective at reducing policy-violations shown to users.
    - Identified and addressed deficiencies in review-triggering framework. Outcomes include:
      1. Review trigger conditions are often detected hours earlier, keeping reviews in sync with user activity.
      2. Reduced load on the most pressing system bottleneck by up to 3x, among other resource savings.
  - Wrote code in Hack, python, and SQL.
- **Amazon Web Services** — Seattle, WA
  SDE Intern - Web Application Firewall Team (WAF Team) — *Jun. 2021 – Sep. 2021*
  - Added rules for inspecting HTTP request headers and cookies during detection of malicious web requests. The header inspection rule is used in the Log4JRCE rule for detecting Log4j vulnerability exploits.
  - Augmented web server code written in C to evaluate and flag malicious HTTP requests as per the new request processing 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 data 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
  - 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.

Projects

- **PintOS Virtual Memory:** Implemented the virtual memory abstraction used by the PintOS instructional OS.
- **Covid-19 Vaccine Efficacy Model:** Collaborated in a team of four to analyze vaccine efficacy for multiple 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 alpha 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, Operating Systems, Relational Databases, Intro to C++
- **Languages:** Python (proficient), C (proficient), Java (proficient), C++ (basic), HTML/CSS (basic), OCaml (basic)
- **Tools**: Linux, Git, NumPy, Matplotlib, Scikit-learn, Keras, PyTorch