

Basel Mostafa

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EDUCATION

- **California Institute of Technology** Pasadena, CA
Bachelor's of Science in Computer Science; GPA: 4.13 *Sep. 2019 – Present (Jun. 2023)*
- **Cupertino High School** Cupertino, CA
High School Diploma; SAT: 1550; GPA: 4.00 *Aug. 2015 – Jun. 2019*

EXPERIENCE

- **Cosmic Dawn Center** Copenhagen, Denmark
Undergraduate Summer Research Fellow *Jun. 2020 – Sep. 2020*
 - Built an automated data processing pipeline for analyzing and visualizing the results of incorporating an additional temperature-like parameter in the computation of galaxy properties. Wrote a Makefile to automatically update dependencies as necessary while minimizing execution of unnecessary subprocesses and maintaining a simple UI.
 - Used data chunking and hashing to quickly process multi-GB data files while minimizing computational expense.
- **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 multiple mechanisms for a semi-autonomous robot in the FRC 2019 season.
 - Primary designer of a ball shooter, animatronic, and robot drivetrain for R&D 2017-18. Contributed to the design of a climbing mechanism used for the FRC 2018 build season.
 - Led the design and fabrication of Sparky for the FTC 2016-17 build season, for which we won the Inspire Award.
 - Mentored middle school students through the FLL lego robotics experience for two years.

PROJECTS

- **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:** Optimal smarter brute force 2x2x2 Rubik's Cube solver reduces the number of cubes to be considered by up to 2 billion fold as compared to naive BFS. Greedy corners first 3x3x3 Rubik's Cube solver achieves 150 quarter turn solutions in a few seconds on average.
- **Ph 11 Hurdles:** Simulated hourly flight delays during SFO's 9/19 construction as a queue scheduling problem, with flight and runway data elements designed to reflect real-world conditions for Hurdle 1. Modeled the relationship between rinderpest seroprevalence, wildebeest population, fire frequency, and tree density on the Serengeti using rate-based analysis and simulation as a synchronous cellular automaton for Hurdle 2.
- **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

- **Coursework:** Data Structures, Learning Systems, Intro to Computing Systems, Decidability and Tractability, Intro to C/C++, Calculus of One and Multiple Variables, Linear Algebra, Ordinary Differential Equations.
- **Languages:** Python, Java, C, C++ **Tools:** Linux, Git, NumPy, Matplotlib, Solidworks

AWARDS

- Eagle Rank, Tombrello Fellowship