Tareq “Torque” El Dandachi

tareq@mit.edu
hi.itstorque.com

EDUCATION

Massachusetts Institute of Technology (MIT)

M.Eng. in Electrical Engineering and Computer Science (2023)
B.S. in Electrical Engineering and Computer Science (2022)
B.S. in Mechanical Engineering and Quantum Information and Computation (2022)
GPA: 4.9/5.0

SKILLS

Hardware & Circuits

FPGA Design, Hardware Simulation, PCB Design, Processor Design, Nanoelectronics, Embedded Systems, Signal Processing, Electromagnetism, Solid State Circuits, SPICE Simulation

Software

Computational Photography, Computer Vision, Controls, Machine Learning, Security Research, Web Design

Physics

Circuit QED, Quantum Simulation, Optics, Superconductivity, Semi-Conductor Physics, Quantum Systems Control, Quantum Measurement, Nanophotonics

Mathematics

Linear Algebra, Group Theory, Complexity Theory, Information Theory, Calculus, Probability, Differential Equations

Mechanical Skills

Mill, Lathe, 3D printing, Robotics, Thermodynamics, Fluid Dynamics

Languages

Software: C, C++, Julia, Python, Swift, JavaScript, Ruby, Kotlin, MATLAB, Java, Objective-C, PHP, bash
Hardware: BlueSpec, Verik, SystemVerilog

EXPERIENCE

- **Superconducting Devices Researcher**
  MIT Quantum Nanostructures and Nanofabrication *May 2022 - Now*
  Designing and fabricating superconducting electronics. Working on the application of theory to design better large-scale non-linear simulations of complex devices. Simulation driven redesigning of various nanoelectronics - such as single photon detectors, imagers and time-to-digital converters. Developing new equipment and techniques for analyzing fabrication defects.

- **Electro-thermal Modelling of Superconducting Devices**
  MIT Quantum Nanostructures and Nanofabrication *May 2021 - May 2022*
  Developed mathematical methods and implemented an electro-thermal model in Python to efficiently simulate superconducting wires and superconducting nanowire single photon detector (SNSPDs).

- **QuantumClifford.jl GPU Kernel Developer**
  MIT Quantum Photonics Group *Feb. 2022 - May 2022*
  Implemented fast GPU quantum stabilizer formalism simulations for a Julia quantum simulation package *QuantumClifford.jl*

- **Multiplexed optimal control of spin quantum memories**
  MIT Quantum Photonics Group *Sept. 2020 - Oct. 2021*
  Built tensorflow optimizers that generate optimal microwave control pulses for diamond-based quantum computers with a web tool to view simulation results. Developed models simulating arbitrary arrangements of color centers and waveguides. Implemented optimal control theory to find control pulses that increase the number of qubits we can control on a diamond-based quantum computer by 3 orders of magnitude. Published a paper.

PROJECTS

- **FPGA Depth Estimation using a Camera Array**
  Programmed an FPGA to estimate depth information from two camera feeds.
  Jan. 2022

- **Eclipse - *glasses that modulate epileptic triggers***
  Developed and launched an alpha prototype with a team of product designers. I worked on sensing and modulation, user interaction, designing and performing EEG trials, coding in Microchip Studio and choosing PCB components.
  Sept. - Dec. 2021

- **Non-Photorealistic Renderer**
  Developed a C++ project that processes images and converts them into detailed multi-layered paintings with the ability to interpolate and incorporate design styles from a reference image.
  May 2020

- **Computer Vision and LIDAR Based Obstacle Avoidance**
  Programmed a self-driving car using ROS to race on a track while avoiding obstacles for MIT’s Robotics Systems and Science. Leveraged image segmentation and classification to build the navigation space and path-find around obstacles. Implemented SLAM on LIDAR data with a team to assist navigation.
  Feb. - May 2020