

Shuhul Mujoo, Pasadena, CA
408 886 0958, smujoo@caltech.edu

Dear Recruiting Manager,

My name is Shuhul Mujoo, and I'm writing to express my interest in a research summer internship at the Lawrence Berkeley National Laboratory in the field of Quantum Hardware and Devices. As a freshman at Caltech majoring in applied physics, I would love this chance to conduct research with the Quantum Application Network Testbed. I am available in the summer from June to August in person at LBL, full time.

My specific area of interest is quantum engineering and the QUANT-NET group. I found the idea of a three-node distributed quantum computing network with an entanglement swapping substrate over optical fiber fascinating. The quantum network protocol stack is similar to the Quantum Communication algorithms I developed. Additionally the quantum teleportation of a CNOT gate is something I have discussed in my paper. Moreover, I am enthusiastic about the potential applications of the research on quantum computing, and implementing advanced algorithms.

As an applied physics major, I love experimental physics, and strongly believe that experiments will lead to new theories of physics that change how we understand the universe. I would like to highlight my research experience so far.

In the realm of quantum computing, I have written a paper on Quantum K Nearest Neighbors (<https://www.jsr.org/hs/index.php/path/article/view/3431/1679>). As part of the research, I developed implementations of Novel Enhanced Quantum Representation (NEQR) and Quantum Teleportation (QT) algorithms. After being challenged by the unavailability of Quantum RAM while creating an implementation of quantum computing subroutine (Amplitude Estimation), one of my life goals is to help invent and develop Quantum RAM.

Another one of my experiences is an internship at the Search For Extraterrestrial Intelligence (SETI) Institute. I completed a research project and a [final presentation](#) on Gas Temperature Prediction For Accretion Disks. I coded simulations using Fortran and Python, and worked with Mathematica. I went through the entire machine learning workflow, from cleaning (exponent overflows), to training (64 neuron 3 layer RELU) architecture, to testing (3d input space plots and precision recall curves).

Additionally, I wrote a research paper (<https://arxiv.org/abs/2209.08608>) on Simultaneous Localization and Mapping (SLAM), specifically a novel loop closure detection system that integrates geometric and human salient features. Building off the state of the art system, ORB-SLAM, I was able to improve the algorithm in organic environments where there were few features. I then tested my localization algorithm on a robot that I built for a robotics competition. With the improved accuracy, my robotics team won first place in California and became a world finalist.

Please let me know if there are any opportunities available. I am extremely interested in working at the LBL!

Sincerely, Shuhul