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Dear Professor Dan Stamper-Kurn,

My name is Shuhul Mujoo, and I'm writing to express my interest in summer research at UC Berkeley in the field of Atomic, Optical and Molecular Physics. As a freshman at Caltech majoring in applied physics, I would love this chance to conduct research in this field. I am available in the summer from June to August in person at Berkeley, full time.

My specific area of interest is quantum engineering and cavity quantum electrodynamics (CQED). I found the idea of placing a quantum gas within a high-finesse optical cavity fascinating. I am excited by the possibility for high-sensitivity quantum measurements of atomic systems, and a means for atom-atom interactions mediated by the exchange of cavity photons. Application of this could lead to coherent control in a many-body quantum system, eventually leading to better coherence qubits.

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 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 with you!

Sincerely,
Shuhul