56 Cedar Street, Apt. 1,

Worcester, MA 01609.

JPL, Pasadena, CA, USA.

Dear Hiring Manager,

I believe there is potentially a perfect match between the Summer 2023 Robotics Engineer Intern at JPL and my skill set, research interests, background, and experience. I became fairly convinced of a strong fit after going through the job posting, and because of past industry and research experience. My experience working on different components of Robotics Engineering throughout my academic life, in addition to developing deep learning and machine learning pipelines for human-centered AI and biosignal-based upper extremity motion prediction for wearables, prosthetics, and industrial robotic interfacing and control applications at Nokia Bell Labs, Worcester Polytechnic Institute, and Georgia Tech is significantly related to this position. This, in addition to working on software & hardware in university research labs and in research and industry, suggests a very good fit for this position.

My Ph.D. research is broadly focused on human gesture recognition and human tracking for efficient human-machine interfacing. I work on designing, implementing, and enhancing two-dimensional ultrasound image processing and ultrasound data acquisition to achieve this. I am very interested in utilizing forearm ultrasound as a technology that can be used for human-computer interaction and controlling digital systems (such as interfacing with an automobile), physical (robots, prosthetics, and exoskeletons), and AR/VR interfaces. It is an extension of the work I did during my master’s at Georgia Tech (presented in [EMBC 2020](https://ieeexplore.ieee.org/document/9176483), [ISMR 2019](https://drive.google.com/file/d/13RYaXV_PtDpWr_GRoHFMnd3FJ8npFGIl/view?usp=sharing), and [BMES 2018](https://drive.google.com/file/d/1PYHPMrOLP6-12o97rCuxAX5ZVvhJofBY/view?usp=sharing)). In a paper that I presented in [IEEE ICRA 2022](https://ieeexplore.ieee.org/document/9812287), I worked on predicting finger angles and hand configurations based on ultrasound images obtained from the forearm. I was able to obtain an average finger angle prediction error of 7.35°, in addition to obtaining promising hand configuration classification results (extended version accepted to [IEEE TMRB](https://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=8253409)). I worked on all aspects of machine learning & deep learning pipeline development, namely, data acquisition, software/hardware interfacing, data preprocessing, data post-processing, model implementation, & result generation. I used Tensorflow, Keras, Scikit Learn, Numpy, Git, MATLAB, and Python to implement my pipelines. In addition to this, I developed an augmented reality system that can be used to guide an ultrasound probe on a subject’s chest ([MICCAI 2020](https://vimeo.com/463333665)), and I helped develop a software framework for acquiring relevant information from a robot that can help with ultrasound data acquisition from the lungs ([IEEE RA-L 2021](https://ieeexplore.ieee.org/document/9385962)).

During the summer of 2022, I worked as an augmented human sensing intern at Nokia Bell Labs with my work focusing on developing biosignal-based (sEMG, IMU, etc.) intelligent human-machine and human-robot interfacing. As an outcome of the short 10-week internship, I was able to submit a paper (accepted to [IEEE SII 2023](https://bimbraw.github.io/files/SII_2023_Paper_Accepted_Version.pdf)) and file multiple invention reports. My work involved human data acquisition and implementing ML/DL pipelines using TensorFlow and Scikit-Learn. My team was so happy with my work and demonstrations of the real-time control of a robotic arm using biosignals, that they extended a Co-Op offer to me, which I accepted. My work at Nokia Bell Labs and at WPI/Georgia Tech as a grad student strongly overlaps with JPL’s Robotics Engineering focus areas. Prior to starting my PhD, I acquired experience working in the automotive divisions at Bose and Panasonic. At Bose, I developed algorithms and system pipeline for electric vehicle sound enhancement using MATLAB. At Panasonic under Agile Resources Inc., I worked on implementing audio modules in C++ for automotive audio applications. Because of my experience in industry and academia, I believe that as a Robotics Engineer Intern at JPL, I can contribute effectively to cutting-edge robotics research projects focused on generating patentable intellectual property and publishing in high-impact factor conference and journals.

After my PhD, I wish to become a Research Scientist in an industry focused on similar research areas, where I am surrounded by individuals working on high-impact Robotics focused projects. I am very motivated and excited about my Ph.D. journey, and I strongly believe that the Summer 2023 Robotics Engineer Internship at JPL will significantly help me get closer to achieving my academic, professional, and personal goals. After you have been able to review my resume for additional information, I will be happy to answer any questions you may have. I’m excited that this position, my experience, & career goals appear to be very compatible.

Sincerely,

Keshav Bimbraw