Sebastian Baldini

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To Whom It May Concern,

I am interested in applying for Summer Research Program Intern at Lincoln Labs as my prior work experience in research labs and internships have given me a lot of good experience in an R&D environment. In addition to that I have had an accelerated courseload resulting in me starting my master's degree at the end of my junior year and now taking advanced graduate-level courses. I am currently a senior Robotics Engineering major at Worcester Polytechnic Institute and will graduate with my Bachelor's degree in May of 2025 followed by my master's in December of 2025.

I have been working in robotics research labs for the last 2 academic years at Worcester Polytechnic Institute, first in the Robotics Materials Group and now in the Soft Robotics Lab. In the Robotics Materials Group, under Professor Markus Nemitz, I worked with a variety of soft conductive TPU/ TPE filaments, both copper and carbon-infused to test capacitive and resistive sensors for encoding soft robotic linkages. I used my electrical engineering knowledge to verify the unviability of capacitive sensing, as proposed by a journal paper for MIT's Metasense laboratory. I then moved into using the filaments for resistive "strain gauge" encoding which utilized cyclic encoding to replace the magnetic hall-effect encoders that were in use on the robot at the time. This experience was greatly beneficial to me as it helped me learn about how to perform research and how to read and review research papers.

At the end of the year, the Robotics Materials group moved to a different university so I moved to the Soft Robotics Lab, under Professor Cagdas Onal, where I continued my research into an application for soft conductive filaments in robotics. In this lab, I had greater freedom to find a novel use for this material. From my research, I have narrowed down my focus to two different uses. Firstly I have been exploring the usage of these materials in soft robotic bodies to provide direct feedback from the deflection and compression of this body that could be used in the control loop for this system. Secondly, I have been exploring using conductive filaments in an antenna-like shape to feel the topology of surfaces that they brush against. I have gotten functional proof of concepts of both of these systems which I plan to move into functional prototypes and I aim to write either a conference or journal paper on my work before the end of this academic year.

In my internship last summer at Sig Sauer I got industry experience with both mechanical and software development within the structure of a larger team. I worked on mechanical design and part fabrication for their remote weapon systems team. Alongside this, I was the solo-developer of computer vision software for marker tracking in their high-speed video used during product evaluation. My tool was a replacement for the tracking software provided by Phantom Cameras as their tool provided less precise integer data output whereas my tool provided sub-pixel floating point estimates for each point which resulted in much more precise data output. This was my first time working on software development on my own, but it was a great learning experience where I got to gain a better understanding of proper practices in regards to writing code for larger

organizations. Overall this experience at Sig Sauer was extremely valuable to my development as an engineer and gave me good experience that I feel I could apply to this position.

During my time at WPI, I have pushed myself to take harder courses to accelerate and improve my knowledge of robotics. This has resulted in me having taken my first graduate-level courses as a Junior and taking entirely graduate-level robotics courses in my Senior year. I have taken graduate-level robotic dynamics, multi-robot controls, and computer vision along with other courses all of which have deepened my knowledge of their respective subjects along with challenging me academically, making me want to learn more about related subjects and apply this knowledge.

Overall I feel that this experience makes me a good fit for this position at Lincoln Labs. Thank you for taking the time to read this and I hope to hear from you regarding this position in the near future.

Sincerely,

Sebastian Baldini