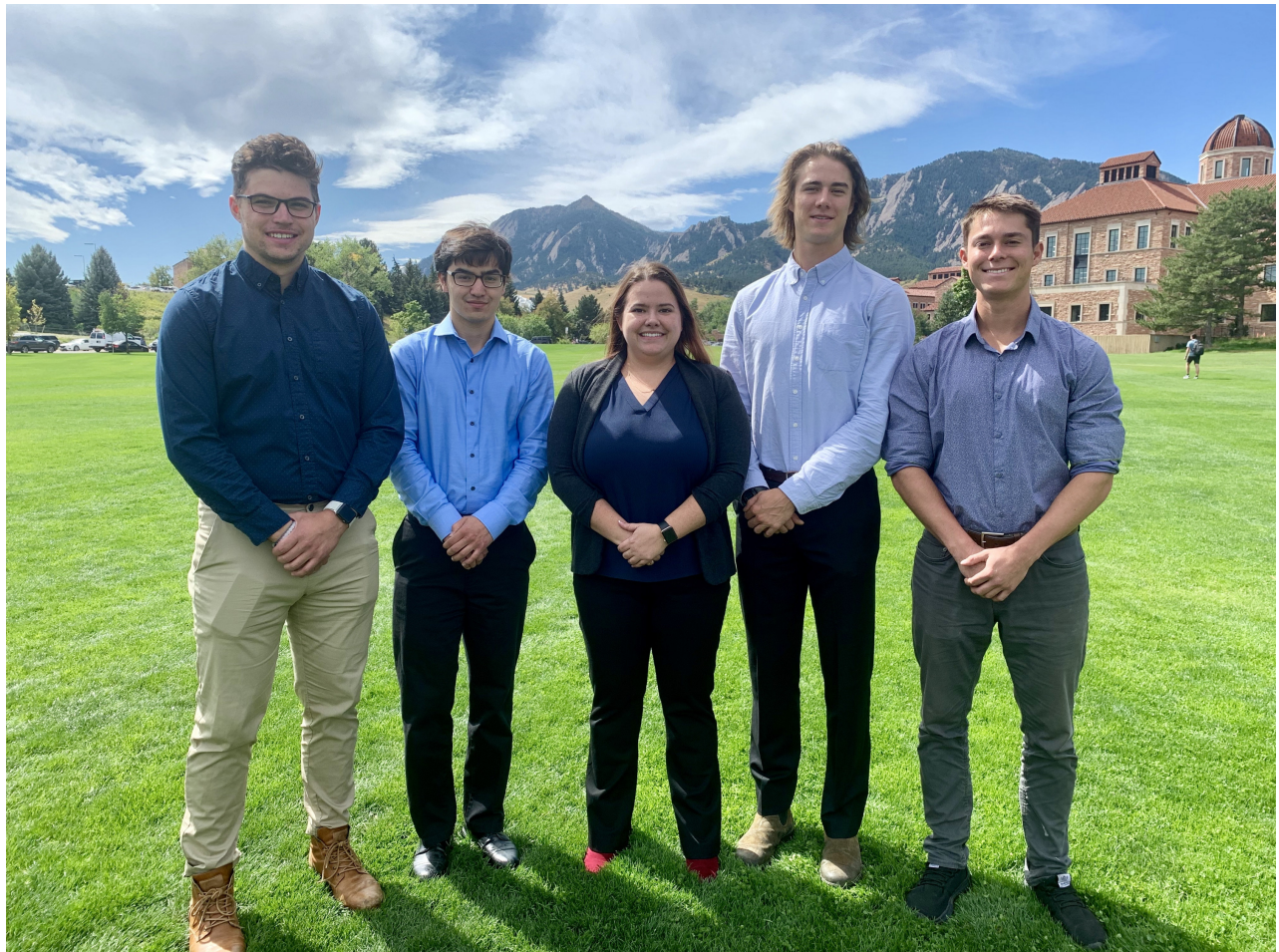




SpeakUp

Innovating to give people with Parkinson's Disease
their voice back





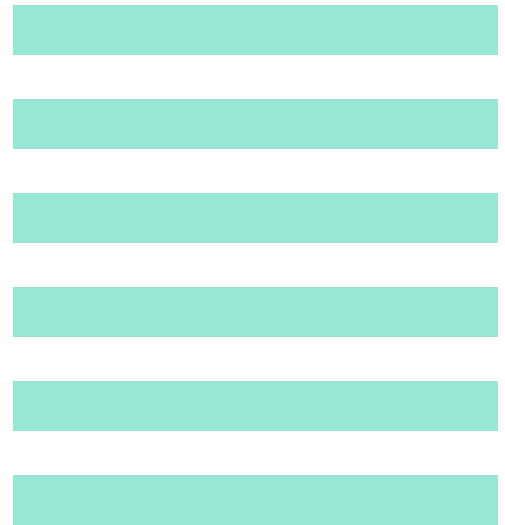
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Project Goal

Solutions Tech was formed in the Engineering for Social Innovation (ESI) section of Mechanical Engineering Senior Design. The team set out to improve the quality of life for the elderly population, focusing primarily on the people with Parkinson's Disease (PD). This project gave us the opportunity to connect with the Parkinson's community around Boulder, Colorado.



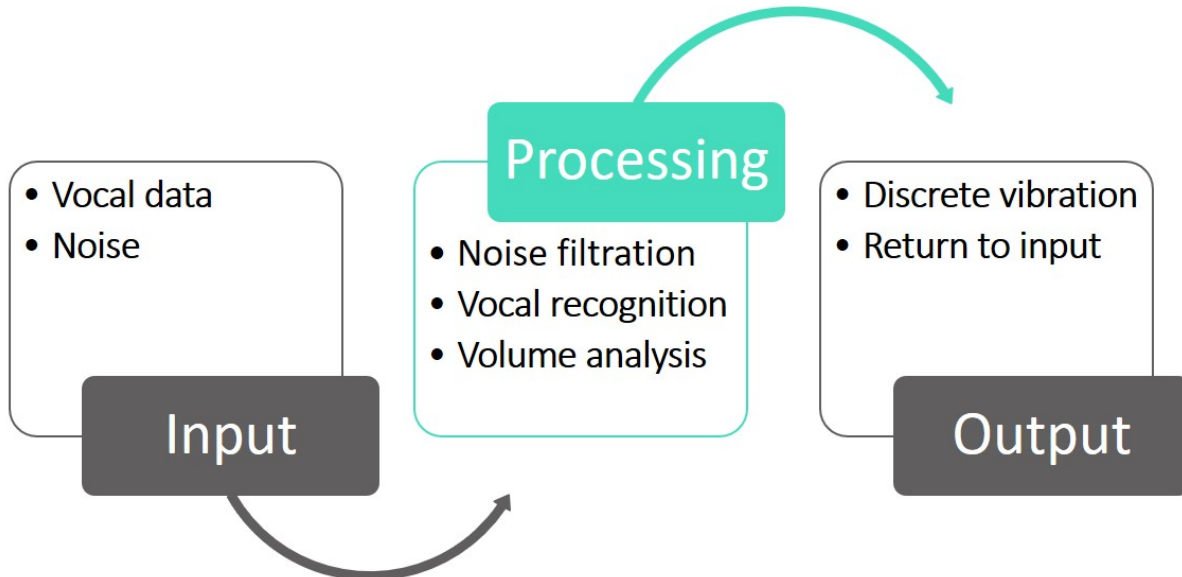
After speaking with over 30 Parkinson's patients, caregivers and medical professionals, we learned that approximately 90% of those living with PD (9 million world-wide, 1.1 million in the US) struggle to speak loudly enough to be heard, a symptom known as hypophonia. The disease makes patients unaware of the volume of their voice, and therefore unable to raise it when they begin speaking too quietly. Those who struggle with the symptom limit their speech and isolate themselves from social interaction due to embarrassment or stigma. Two devices on the market address this issue, however they are both expensive earpieces which our users told us they would not like to use, so we needed to create a novel solution. We wanted to create a device that would give Parkinson's patients their voice back.



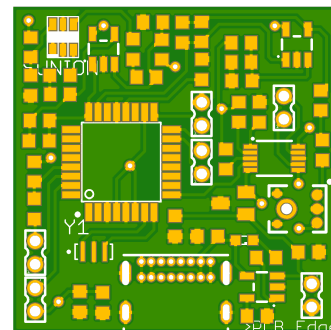
Engineering Design



SpeakUp integrates an adaptive technology that can process real-time vocal data at high speeds, simulating vocal recognition, and outputs discrete vibrational feedback. The device is a small (~ 1" x 1"), rechargeable unit that clips to a shirt and can last for up to 4 days.



We were able to accomplish the feat by designing and manufacturing our own custom PCB made specifically for our components and sensors. In tandem with carefully selected multi-sensor technology, this allowed us to implement a simpler form of vocal recognition. The detection uses a proprietary algorithm analyzing chest vibrations.





Challenges

The team faced several challenges over the course of the project. Unlike teams in the industry section of Senior Design, we did not begin our year with a pre-scoped project. Our first challenge was to find a meaningful challenge by quickly connecting with stakeholders. We reached out to over 30 Parkinson's patients, caretakers and medical professionals in the area, fostering a relationship so that their input continually informed our designs.

A constant challenge over the course of the year was time. We had to balance deliverables, presentation milestones, design and manufacturing, and user interviews. We quickly learned to maximize our efficiency by utilizing a range of scheduling and project management software and strategies.

Covid-19 presented an unforeseen challenge. Because of the quick changes on short notice, the team had to be flexible. We quickly shifted our communication to video conferencing, and found an effective way to present for the New Venture Challenge Championships. The shop closures halted our manufacturing schedule, so we have begun outsourcing our manufacturing, and changed our test plan to incorporate at-home tests.



Impact

We approached the course hoping to gain “real-world” engineering experience, and to create a meaningful impact through design. We ended up achieving much more than that. We’ve developed a product that exceeds expectations, established an LLC, and won over \$10,000 from the New Venture Challenge. Nobody on our team could have imagined the heights we would reach, but we continue to excel and have no plans of slowing down.

This project has given our team invaluable experience working with under-served communities and using human-centered design to create a product that will positively benefit its' users. We have loved getting to know our users and seeing how our engineering knowledge can improve people's lives. This project forced us to learn about fields outside of mechanical engineering, better enabling us to work on more diverse projects in the future. Going forward, we plan on continuing the development of our device, and we're excited to see the lasting impact that it will have on the Parkinson's community.





Meet the Team



Cameron Stupansky is the Director of Systems Integration and Testing. He plans on graduating from CU Boulder in May 2020 with a BS in Mechanical Engineering. He is currently working as a lab-assistant in an on-campus laboratory researching the mechanics of cancer in bone. He has interned at Ball Aerospace helping with mechanical design and working on projects to improve test efficiency. He also has experience working at a sign company designing and helping manufacture large electric signs. In the future, he plans on pursuing mechanical design and entrepreneurship in the aerospace and/or medical industry. Cameron continues a 4+ year-long battle with cancer but does not let that deter him. He loves playing/watching/analyzing/debating sports, traveling, and playing the piano and guitar.



Daniel Rahn is the Director of Software Design for the team. He plans on graduating from CU Boulder in December 2020 with a BS in Mechanical Engineering and a minor in Computer Science. Daniel has extensive experience in product design, manufacturing, testing, and research. He has worked at NIST for almost 3 years researching and developing new methods for measuring high powered lasers. He has also built skis for over 7 years and is the owner of a custom ski company, Offset Skis LLC. In his free time, he loves doing anything outside, playing guitar, and working on unique engineering-related side projects.



Jennifer Kracha is the Chief Executive Officer for the team. She plans on graduating from CU Boulder in May 2020 with a BS in Engineering Plus - Mechanical Engineering emphasis - and a minor/concentration in Engineering Management. She has experience working in the motorization department at a commercial manufacturing company where she designed and manufactured a motor testing apparatus. She also has extensive experience managing teams ranging in size from 4 people to over 30 people. In the future, she plans on utilizing her engineering and management skills to continuing to develop SpeakUp. In her free time, she enjoys traveling to find unique places in Colorado and plans to take up epoxy resin art.



Meet the Team



Reece Jones is the Director of Mechanical Design for the team. He plans on graduating from CU Boulder in May 2020 with a BS in Mechanical Engineering and a minor in Economics. He has experience as an intern working for an architectural firm where he designed and optimized mechanical systems for commercial buildings. He also has field experience participating in an independent research project with the Fluid Mechanics department that focused on relating blood flow properties to cardiac disease. In the future, he hopes to combine his technical background with his business expertise. He currently has plans to start as an intern of Enterprise Risk Management at TIAA over the Summer 2020. In his free time, he is a member of the CU club golf team and volunteers as a snowboard instructor for the blind and cognitively-disabled.



Tanner Shiohita is the Director of Human Factors Engineering. He plans on graduating in May 2020 from CU Boulder with a BS in Mechanical Engineering, a BA in Music, and a minor in Biomedical Engineering. He has experience working as an intern on the R&D team of a medical device company where he worked on design optimization and standards compliance. He has also worked at a contract manufacturing company and has worked extensively in the human-centered design and research space on projects ranging from mental health to accessibility. In the future, he plans on using engineering design to focus on social impact. In his free time, he plays in the CU symphony orchestra and enjoys rock climbing and snowboarding.