MIT CSAIL Alliances

Case Study

Autonomous Living Technologies

Written by Audrey Woods

It is estimated that one in four Americans have some type of disability. Over twelve percent of the population has limited mobility, 7.2% have difficulty living independently, and 3.2% struggle to do basic self-care tasks by themselves, such as dressing or bathing. This means that there are millions of Americans—not to mention people around the globe—who need technology that can assist them with everyday activities. However, the assistive technology that is currently available is exorbitantly expensive, difficult to access, and, in many cases, has not been significantly updated in decades.

To meet this widespread need and bring the exciting gains of AI research to the world of assistive technology, Spero Koulouras co-founded Autonomous Living Technologies, or Auli.tech, which aims to use technology to offer those with disabilities affordable options for autonomous living.

GETTING THEIR START

In the fall of 2019, Koulouras was diagnosed with ALS, also known as Lou Gehrig's disease. At the time, he was the founder of a startup that was using AI to create multi-camera videos of sporting events, writing code that could detect motion and automatically sense which angle was the best shot in a given moment. After his diagnosis, Koulouras decided to apply his experience with sensors, algorithms, and AI programs to assistive technology instead. He'd worked on assistive switches for Apple II computers in the early 1980's, so he was familiar with the area. But he says, "It bummed me out about the state of the tech. I basically saw very little progress in 40 years." The available tools, such as feeding arms and eye tracking sensors, were glitchy, unreliable, and unaffordable. Koulouras saw an opportunity because, as he says, "I spent 40 years in Silicon Valley and I know what things cost and how to apply cutting edge AI and robotics."

To get his idea off the ground, Koulouras contacted Finn Biggs, who was then a physics student at UC San Diego. Biggs brought in another UCSD student Michael Fierro, and together they created a working prototype of Auli.tech's first product, Cato. Cato is a motion-based wearable device that can control a computer, phone, tablet, smart home, or other assistive technology via Bluetooth. Koulouras wears the device on his glasses, which allows him to type, click, drag, and operate a computer with head and mouth movements, but the device can be trained with other gestures and configurations to account for different disabilities. Cato is the diameter of a quarter, weighs only 8 grams, and costs about twenty dollars.

With a prototype in hand, Koulouras, Biggs, and Fierro—now co-founders of Auli.tech—brought Cato to various assistive technology conferences around the country, spreading the word of what they'd created. They spoke to hospital experts, members of the disabled community, and technologists, many of whom were shocked at what they'd accomplished. Koulouras says, "people couldn't believe what we were doing for the price." Koulouras's story was also featured in a short PBS film created by RadioWest called "Autonomous," which helped promote his mission to "build devices that keep me and many other people with disabilities independent as long as possible."

Having created their company as a Benefit Corp, Koulouras explains that they're "allowed to put social objectives ahead of profit," with the aim of making highly affordable, accessible devices. But that comes with the challenge of raising money, which Koulouras says they hope to do through a combination of IP licensing, grants, and donations. Therefore, their focus now is funding the research that will power future devices and also provide Cato for free to the first 1,000 eligible people.

CONNECTING WITH CSAIL ALLIANCES: LEVERAGING EXISTING RESEARCH

When Auli.tech's head of partnerships Allen Cantwell ran into CSAIL Alliances Associate Director Glenn Wong at UIDP, an event centered around academic-corporate collaboration, Koulouras says, "it became obvious that the relationship made sense." The Auli.tech team had found in their engagement with other academic institutions that researchers and companies are generally eager to learn more about the need for assistive technology and jump on opportunities to collaborate in that space, and that such collaborations help get products and ideas to market faster. In that way, they were excited about how the innovative research happening at CSAIL could be applied to assistive technology. But it was "the application of CS and AI along with mechanical engineering and other disciplines that really make [CSAIL] shine" for Auli.tech.

For example, one research project that immediately caught the eye of the Auli.tech team was CSAIL's autonomous wheelchair, which was created in the lab of CSAIL Director Professor Daniela Rus to offer enhanced independence to the elderly, disabled, or injured. The wheelchair uses sensors to perceive its surroundings and a speech interface to interpret commands, allowing it to learn the layout of its environment, remember rooms by name, and follow vocal instructions like "take me to the kitchen." The wheelchair is also safety-enhanced with the capability to avoid collisions with objects and people. This kind of technology is particularly exciting to someone like Koulouras, who depends on a wheelchair but might soon lose the ability to control it with his hands. Elaborating on the goals of their relationship with CSAIL Alliances, Koulouras says, "number one is leveraging existing ideas the people, professors, and students are already working on, but coming at it from a different perspective." He hopes this will allow Auli.tech to bring these solutions quickly and efficiently to the market and the disabled individuals who need them.

With their objective to build upon established research, Auli.tech found the 2024 CSAIL Alliances Annual Meeting particularly helpful. They were able to send two representatives to learn about current CSAIL research, and Koulouras says they were particularly enthusiastic about the talks on autonomous driving and LLMs, both of which could be applied to assistive technology. In fact, after the meeting Koulouras hopes to engage with CSAIL researchers to harness the power of LLMs to help him communicate, applying the predictive text abilities of language models to finish his sentences and allow him to speak efficiently as forming words becomes more difficult. He says that the research they were exposed to at the Annual Meeting was "10 times what we needed to make [membership] worthwhile," adding, "when we saw the lineup of people and projects, we knew there will be things that help us keep our pipeline full forever."

LOOKING FORWARD: FUTURE TECHNOLOGY & PLANS WITH CSAIL ALLIANCES

The MIT community is a big draw for Auli.tech, and Koulouras is excited to spread awareness of what they're doing to the bright minds at CSAIL. "You're not going to find a smarter group of people or a better set of ideas anywhere in the world," he says, adding, "somewhere in the MIT population is a bright engineer who's motivated by the same goals." He hopes, by engaging with CSAIL through CSAIL Alliances, to find like-minded computer scientists willing to contribute their ideas, time, and talents toward helping provide better assistive technology.

With Cato being shipped out to those who need it, Auli.tech is now working on future products, like a better feeding arm or an AI-enhanced overhead pully system for repositioning and physical therapy exercises. The company isn't short on ideas, so the challenge going forward will be raising the funds necessary to finance the next round of prototypes. However, Koulouras is optimistic because, he says, "I've been doing this a long time, and I have never seen the level of interest from the big guys like we're seeing now. So what's next is proving our ability to execute and capitalizing on the doors that are open."

In the long term, Koulouras hopes Auli.tech will become a ubiquitous provider of technology for the disabled, offering an array of affordable products with a support network of technicians around them. For his part, Koulouras says that the work of bringing these solutions to market is fulfilling and motivating. "When you take everything you've learned, everything you've worked for, and put it into doing good," he says, "it's worth more than a paycheck."

Visit Auli.tech's website to learn more.