Case Study

STMicroelectronics

Written by Audrey Woods

Semiconductors, often referred to as the "brains" of modern electronics, play a pivotal role in the contemporary economy. These tiny but powerful components serve as the building blocks of virtually all electronic devices, from smartphones and laptops to cars and industrial machinery. As society becomes increasingly reliant on technology for communication, commerce, and innovation, semiconductors have become the foundation of the digital age. With the transformative promise—and computing demands—of AI and other pivotal technologies being developed, the evolution of semiconductors will dictate what's possible in the years to come.

For that reason, global semiconductor provider STMicroelectronics is using their relationship with MIT CSAIL to ensure they stay at the forefront of cutting edge technology.

ABOUT STMICROELECTRONICS

A global semiconductor leader serving customers across the spectrum of electronics applications, ST is an integrated device manufacturer working with more than 200,000 customers and thousands of partners to design and build products, solutions, and ecosystems that address their challenges and opportunities, and the need to support a more sustainable world. Formed in 1987 through a merger between SGS Microelettronica (Italy) and Thomson Semiconducteurs (France), the company has since diversified its product portfolio to include a wide array of semiconductor solutions, ranging from microcontrollers to sensors and power management devices. Committed to sustainability and social responsibility, ST has earned a reputation as a prominent provider of cutting-edge semiconductor products, shaping the digital landscape and powering the evolution of smart, connected devices worldwide.

One of the challenges ST is currently working to address is that of AI computing on devices at the edge. With the expanding potential of AI, there is increasing interest to apply it in a variety of situations, including robotics, wearables, and sensors. However, sending data back and forth from the device to the cloud is expensive, slow, inefficient, and opens the user to security risks. Empowering edge devices with intelligence independent of the cloud would be a massive step in the field, but current technology can't support large AI models on small devices like watches, smart glasses, and headphones. There's opportunity in this area for creative tradeoffs, like designing smaller, more specific AI models and/or adapting the microchips to be maximally efficient for a given scenario. As a result, Strategic Marketing Manager at ST Marco de Fazio says that there's been "a big push in ST to explore use cases for AI on small devices." He continues, "How this architecture will evolve over time is something our customers really don't know. And [among other things] it's the answer we are looking for with our affiliation with CSAIL."

CONNECTING WITH CSAIL: RESEARCH GIFTS, EVENTS & TECH TALKS

The relationship between ST and CSAIL Alliances began in 2019 when de Fazio was a visiting research scientist at MIT. At the time, he was focused on graphene and power electronics, but AI was rapidly turning into the cultural and economic juggernaut it has become today. De Fazio says, since ST is heavily invested in the hardware and tools for AI, they "joined CSAIL to explore new directions and applications" for AI at the edge.

Soon after joining, de Fazio met with CSAIL Director Professor Daniela Rus, whose robotics research had interested him from the beginning. Their initial meetings were "really fantastic" and soon he'd helped organize a research gift to Professor Rus's lab to support her group's work on smart clothing. Specifically, the gift supported research that led to a glove that could recognize American Sign Language without being hooked up to a larger computer. This project was mutually beneficial, as it demonstrated artificial intelligence on edge devices for ST and also brought industry challenges, expertise, and technology into the lab for the graduate students to use and gain experience with.

Another CSAIL Alliances benefit that ST has taken advantage of is hosting Tech Talks on campus to engage in a dialogue with students and researchers on a specific technical topic. So far, ST has hosted four Tech Talks with the most recent one taking place April 25th, 2024. This latest talk, titled "AI Core: The Unified Technology across Sensors and Microcontrollers," showcased their Unified AI Core Technology designed to enable Tiny Machine Learning—or AI on edge devices—with a more seamless, end-to-end workflow across ST products. De Fazio explains that ST uses their Tech Talks to explore highly technical subjects because the student and researcher body at CSAIL is "very knowledgeable [and] already familiar with our technology." This means that the audience brings specific questions and feedback which are useful for the company. De Fazio says, "every time we've had a Tech Talk, we spent more than an hour after the talk just to answer questions." One sub-goal from these events is to inspire experimentation with ST tools, to which De Fazio adds, "if students want to test the very cutting edge technology from ST, I can get the parts to students and support to use them."

Beyond Tech Talks, de Fazio also enjoys attending events such as the 2024 CSAIL Alliances Annual Meeting, which showcased the latest in faculty research projects, research initiative updates, and highlights of the work happening in the Stata Center. De Fazio emphasizes that he gets the most value out of CSAIL events when he joins in-person because, "when you do this remotely, you have several screens in your office. You have the conference in background. You lack all that immersion." One thing he particularly enjoyed about the most recent Annual Meeting was interacting with faculty at the Small Group Discussion lunches, where members sat with a CSAIL researcher for an informal dialogue about industry problems, research challenges, and promising ideas.

Overall, de Fazio enjoys that CSAIL is an "easygoing environment" where world-renowned researchers are approachable and eager to tackle interesting technical problems. "**There are a lot of interesting conversations at CSAIL that you can follow through the CAP member website**," he says. Furthermore, being aligned with CSAIL is good branding for ST, since "the idea is to be recognized as one of the companies who is investing the most in AI at the edge." Collaborating on projects that lead to papers, articles, and publications provides the company with some "really amazing" outreach. Thanks to these benefits and the excitement of what's to come, de Fazio says ST plans to "keep our affiliation for a long time."

GOING FORWARD

When asked what makes him excited to be working in this space, de Fazio answers, "I believe that AI is the biggest innovation after the year 2000 by far." Over the course of his own career, he's seen AI gone from an obscure research curiosity to one of the biggest economic and cultural topics of the day. "AI is here to stay," de Fazio says, adding that his relationship with CSAIL gives him glimpses of the upcoming changes before they happen. "I feel like I'm in the front seat of a very, very interesting new movie," he jokes.

His excitement for the potential and promise of AI technology is something he shares with CSAIL, which he describes as "the top research group on AI there is." Working with the passionate researchers and students at CSAIL, de Fazio hopes that promising solutions to current AI problems aren't far away. **"I feel younger when I come home after a day at CSAIL,"** he concludes. **"When you feel the enthusiasm, the electricity there, it's refreshing."**