

Setting the stage for quantum leaps

College students from across the US showcase quantum computing research at ASU-Amazon expo

By Joe Kullman, ASU News
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Quantum computing is opening new possibilities for solving complex problems that are difficult for traditional computers to process.

Through [Amazon Braket](#), a cloud-based quantum computing service from Amazon Web Services, or AWS, researchers and students in the [Sensor, Signal and Information Processing Center](#), or SenSIP, are gaining access to tools that support quantum computing research and education.

Part of the [Ira A. Fulton Schools of Engineering](#) at Arizona State University, SenSIP recently hosted an Amazon Braket training and exposition event at the [Artificial Intelligence Cloud Innovation Center](#) at [SkySong, the ASU Scottsdale Innovation Center](#).

Amazon has donated nearly \$78,000 in AWS credits to SenSIP to expand access to quantum computing and simulation tools.

“The collaboration with Amazon is very important for us,” says [Andreas Spanias](#), SenSIP director and a professor in the [School of Electrical, Computer and Energy Engineering](#), part of the Fulton Schools at ASU. “Having Amazon involved with our center helps strengthen our research efforts and attract additional research support and industry consortium memberships.”

The event brought together doctoral students, undergraduate researchers and faculty members to present projects that use quantum computing tools to address engineering and scientific challenges.

“We have doctoral students who have been working in this area for a couple of years now, as well as students from across the country who are participating in the [National Science Foundation Research Experience for Undergraduates](#),” Spanias says.

The undergraduate research program gives students from universities across the country opportunities to conduct hands-on research, explore new pathways in STEM fields and build skills that support their future academic and professional goals.

One example is work by Nandika Goyal, a Fulton Schools computer engineering doctoral student and researcher in SenSIP. Goyal used AWS credits to develop novel algorithms designed to aid cancer detection and classification.

“She developed a quantum machine learning algorithm for cancer detection and classification, which was something she had only simulated before last fall,” Spanias says. “She is now able to run it on a quantum computer, assess quantum noise and apply noise mitigation algorithms — all things that she had not been able to do before.”

Helping educators connect students to quantum computing

The event also gave educators a closer look at how emerging fields such as AI, machine learning and quantum computing can be introduced in classrooms.

Max Colfer, a teacher at [ASU Preparatory Academy Polytechnic STEM High School](#), has participated in SenSIP’s Research Experience for Teachers for the past five years. This summer, he says he enjoyed learning more about Amazon Braket, seeing all the students present their quantum machine learning projects, and participating in the higher-level talks.

“(Research Experience for Teachers) is an all-around great program for people looking to get into the field and to network with like-minded individuals,” Colfer says. “For me as a teacher, it expanded my perspective on AI and quantum research and gave me concepts I can emphasize in my high school classroom for students interested in pursuing these fields.”

[Bechir Amdouni](#), a math faculty member at South Mountain Community College who is also involved in the program, describes it as “an incredible experience on so many levels.”

Amdouni says the program deepened his understanding of Python, machine learning and deep learning, and allowed him to explore ways to introduce those topics to his students and encourage them to engage with AI and pursue STEM fields.

“Being in this program has really opened my eyes to what’s possible. We had the chance to participate in the SenSIP Industry Consortium,” he says. “That experience highlighted how far ahead ASU is in collaborating with top industry partners, and the AI-focused presentations, especially the ones on Amazon Braket and related topics, were especially informative and insightful.”

Moving quantum research from simulation to practice

Niraj Anil Babar, a computer engineering doctoral student working with Spanias on quantum machine learning for image processing, says the Amazon Braket event helped clarify how he could use the platform in his research.

“It helped me understand more about exactly what SenSIP provides and gave me more confidence in transitioning to Amazon Braket-enabled quantum hardware access,” Babar says. “The examples were helpful, and I got clarification about how my research can be deployed in their system.”

Electrical engineering doctoral student Tanay Patel is also working to transition his credit card fraud detection simulations to Amazon Braket.

Spanias says the experiences of Goyal, Babar and Patel show how access to Amazon Braket is supporting research, education and workforce preparation across different levels of learning.

Sanjita Patwardhan, a Fulton Schools computer science student minoring in data science, participated to learn more about quantum computing, a field he sees as increasingly important to the engineering profession. He aspires to continue studying quantum computing in graduate school.

Patwardhan says the event offered ideas for expanding future research and opportunities to make industry connections.

Spanias credits AWS representatives Michael Brett, Lorena Costanza and Tyler Takeshita with helping coordinate the AWS credit donation and bringing AWS personnel from Seattle to help train students.

“The partnership was established because SenSIP is one of the few university programs in the U.S. that is actively putting students on real quantum hardware as part of their research, not just teaching theory,” says Brett, who holds the title of worldwide go-to-market strategy lead for Quantum Technologies at AWS. “From our side, the engagement gives students and researchers direct access to multiple quantum hardware architectures through Braket.

“The June 23 event was a natural extension of that partnership. Takeshita from our specialist team delivered the Braket training session, and it was designed to take participants from their first circuit through to real QPU execution in a single day.”

Christopher Qiu, a sophomore at Harvard University, participated because the consortium aligned with his quantum computing research. He says one highlight was hearing from Brett about the potential for quantum computing to tackle major scientific challenges.

“The fact that SenSIP’s consortium includes companies like Qualcomm, Raytheon, NXP and Alphacore means the research and the students are already oriented toward industry-relevant problems, which is why the partnership works for both sides,” Brett says. “Professor Spanias and the SenSIP team have built something that connects academic quantum research directly to workforce outcomes and industry demand. That is why AWS is engaged with ASU.”

This story originally appeared on [ASU News](#).

Main image



Faculty members, alumni, industry professionals and students from colleges and universities across the U.S. joined Andreas Spanias (sixth from left), director of the Sensor, Signal and Information Processing Center, or SenSIP, and a professor in the Ira A. Fulton Schools of Engineering at Arizona State University, for an Amazon Braket training and exposition event at ASU. The event gave students the opportunity to present research using quantum computing tools. Photo by Erika Gronek/ASU

Text image(s)



Sophia Knutson, an undergraduate student majoring in computational science at Carnegie Mellon University, gave a presentation on using Amazon Braket to augment imbalanced cancer images during the training and exposition event. Photo by Erika Gronek/ASU



Harvard University student Christopher Qiu gave a presentation on using quantum computing methods to help identify brain tumor classification using Amazon Braket technology. Such information could help guide treatment for patients. Photo by Erika Gronek/ASU



Nandika Goyal, a doctoral student in the Fulton Schools computer engineering program, gave a presentation on her work developing and implementing quantum hardware to develop AI algorithms that would help to advance cancer detection. Photo by Erika Gronek/ASU