



# Students merge computer-generated images with the real world to win award

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Benjamin Katko and Brian Bleck won a best poster award in the engineering category at the August 9 Los Alamos National Laboratory Student Symposium. Titled “Augmented Reality Tools for the Development of Smart Nuclear Facilities,” the poster used QR codes to cue the appearance of holograms.

“Augmented reality is fundamentally different than virtual reality and different than everyday reality because it is multi-modal,” explains Bleck, a junior computer science major at UNM. “With virtual reality, you are completely immersed in a computer-generated world; in everyday reality, you are completely in the real world; augmented reality blends computer-generated images into the real world.”

Using a computer model of a generic nuclear facility, Katko and Bleck’s project examined how augmented reality might be useful for nuclear criticality safety. “A nuclear facility is like a nesting doll—it is a series of containers,” Bleck explains. “For each boundary between containers there exist rules and procedures that can be added into the model. For example, if a canister of fissile material needed to be moved from glovebox A to glovebox X, then the model could be used to assess whether such a material movement was allowed under the rules and also what the optimal series of movements would be.”

“One of the main capabilities of augmented reality is the ability to display holograms in the real world. The team showed how holograms could give glovebox operators feedback about the environment,” Mascarenas explains. “In nuclear applications, a user could bring up a hologram of the documentation associated with the contents of a canister. This is much easier than going to a computer or filing cabinet and manually bringing up the documentation.”

At the experiential level, the duo focused on the glovebox operator. Can an augmented reality headset be used to make an operator’s job safer and more efficient? “That question is probably too large to answer in one summer,” Bleck says, “though I believe we proved some important concepts that demonstrate the great potential of augmented reality.”

To bring their project to life at the Student Symposium, the pair built a demo where the user could look at a particular canister via an augmented reality headset, open its menu, and instantly gain access to safety and regulatory documents, detailed information about that canister and its contents, a video of the canister being packed, and connect

into the systemic-level by requesting approval to move the canister into a different glovebox.

“All of this is done hands-free (augmented reality user interfaces can be navigated entirely using a combination of your gaze and your words) and without the need for glovebox operators to take their arms out of the glovebox,” Bleck explains. “The forms operators access can be filled out using speech-to-text. We used QR codes to anchor all of these functionalities to particular objects or locations.”

“Most likely their poster is the world’s first augmented [reality] poster,” says Bleck’s mentor, David Mascarenas of the Laboratory’s National Security Education Center (NSEC). “So not only are we breaking ground in augmented reality but poster presentations as well.”

“It was humbling win best poster,” Bleck says. “It is also an honor that should be shared by the whole team at NSEC and especially my mentor, David Mascarenas. I have been very happy to be in an environment that fosters learning and pushes the envelope of what is possible. I feel our summer’s work is a reflection of the team that maintains that exciting environment.”

The poster was part of the Lab’s annual Student Symposium—a gathering of more than 200 students who showcased their work at the University of New Mexico-Los Alamos on August 9. A complete list of winners is as follows:

Jacquelyn Mettler was a winner in the biosciences division.

## **Biosciences**

Emily Cloyd: The Expansion of Analytics for Investigation of Disease Outbreaks (AIDO)

Jacquelyn Mettler: Agrobacterium-mediated Transformation of Prairie Cordgrass for Guar Production

## **Chemistry**

Julie Haagenstad: Development of an Internal Quality Assurance Program for the LANL NWAL Program

Roy Madrid: Evaluating Thermal Response of “Giant” Quantum Dots

## **Computing**

Nils Carlson and Jacob Carroll: Investigating Phase Transitions in Sparsely Coded Convolutional Neural Networks

Siddhartha Bishnu and Shane Fogerty: Thoughtful Precision In Mini-apps

## **Earth and space science**

Emily Hopkins: Sooting Potential of Biomass in Wildfire

Charles Abolt: Topographic Control on the Subsurface Heat Budget of Ice Wedge Polygons

## **Engineering**

Benjamin Katko and Brian Bleck: Augmented Reality as a Next-generation Tool for Nuclear Facility Criticality Safety

Matthew Wilkin: Data Mining The General Purpose Heat Source Program

## **Health and safety**

Ian McNabb: The Overlooked Radiation Dose to Downwinders from the trinity Blast

Melissa Moreno: Uncertainty Budgets Associated with Calibration

## **Information technology**

Kayleen Hovey: Improving Information Security with Encryption

## **Materials science**

Shigehiro Takajo: Microstructure Analysis of Gas Gun Deformed 304L Stainless Steel

Tashiema Wilson: Experimental Analysis of Selected Uranium Silicide and Uranium-Silicide-Nitrate

## **Mathematics**

Jeanette Varela: Predicting Bunker Temperature

## **Non-technical**

Madeline Whitacre: Digital Narrative: Exploring the History of Science at LANL using Web-Based Media

## **Other**

LJ Horan, Ryan LaMonica, Jason Pedraza, Mariah Richardson, and Genna Waldvogel: Smart Lab Renovation in TA35-0085

## **Physics**

Kiersten Haffey: Non-pneumatic Actuation of Stretchable Membranes for Organ on a Chip Applications

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