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Stony Brook and MIT Team Awarded $1M to Improve Air Traffic Control Safety

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A team led by Stony Brook University's Department of Computer Science has secured a $1 million National Science Foundation grant to develop techniques to reduce human error in


Scott Smolka

Addressing an Urgent Safety Crisis

With over 45,000 commercial flights operating daily across the United States, aviation safety incidents continue to occur at alarming rates. In January this year, an American Airlines aircraft collided with a U.S. Army helicopter near Ronald Reagan Washington National Airport, killing all 67 aboard both aircraft and making it the deadliest US air disaster since 2001. Beyond fatal incidents, a typical month sees dozens of close calls in near-airport operations across the US. The proposed approach strives to improve safety by leveraging modern AI-driven and formal methods approaches to enable semantic understanding of air traffic controller voice communication, and detecting potentially dangerous miscommunication and misunderstanding.


Stanley Bak

"Complex systems often require computer optimization combined with human coordination," said Bak, a previous recipient of the Air Force Office of Scientific Research Young Investigator Award and National Science Foundation CAREER Award. "Global situational awareness that takes into account human communication and intent is essential for efficient operation that avoids catastrophic incidents."

Multi-Layered Approach

The research team will deploy a multi-layered framework combining artificial intelligence with formal methods to improve air traffic management. At the airport level, they will develop predictive monitoring systems using advanced mathematical models to detect safety violations before they happen. This requires creating robust and real-time capable machine learning models to interpret air traffic controller voice communications, in order to detect critical miscommunication issues that contribute to many near-miss incidents.

adverse weather.

“While our immediate focus is air traffic control, the methods we’re developing apply to any cyber-physical system involving human coordination with intelligent automation,” explained Smolka, a distinguished expert in formal verification methods.

Safety for Human Coordination
Beyond aviation safety, the proposed framework holds promise to enhance firefighting operations, improve power grid resilience, and strengthen national security in military operations where preventing human error is paramount.

Department Chair Samir Das emphasized the project’s significance: “This NSF award exemplifies our department’s commitment to high-impact research that delivers practical solutions to save lives and protect millions of travelers.”

With air traffic projected to grow substantially, human-focused analysis systems will be essential for 21st-century aviation safety and efficiency.

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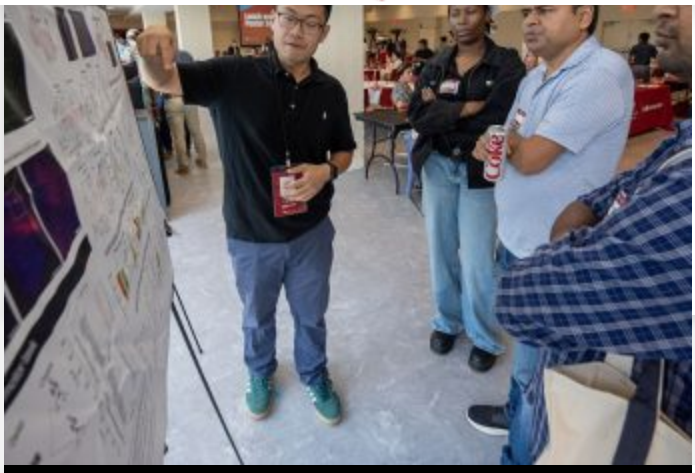
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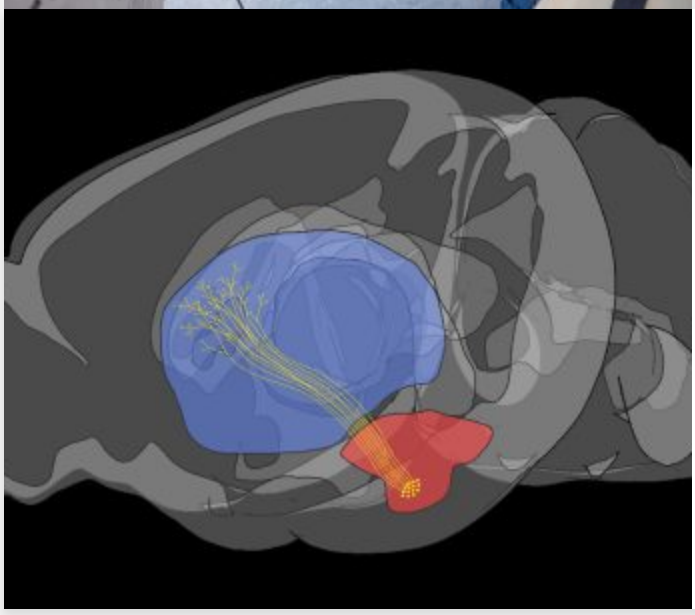
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