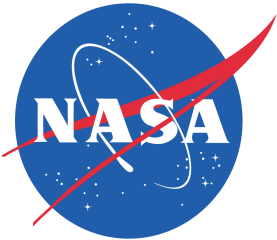


NASA Maximizes Flight Safety With Eureka®

Commercial airplane travel reigns as the king of safe long-distance travel, but the highly engineered and complex machinery has inherent risks that can be introduced by human error. In the complex world of an airplane cockpit, Nutonian's Eureka® is helping NASA improve pilot's split second judgement of unexpected flight conditions and reduce flight fatality risk by more than 50%.



- Reduce commercial flight fatality risk by 50% before 2025
- Handle hundreds of thousands of rows of data with complex, interrelated, and noisy inputs
- Automatically characterize user behavior and engagement across several mediums and physiological data types in real-time
- Design enhanced training methods and cockpit electronics to improve the performance and reliability of pilots under stress in various operating / environmental conditions

Guarantee Performance During Unexpected Conditions

After World War II, commercial aviation quickly became a popular means of transportation, growing to nearly 10 million total flights and 1 billion passengers across the US in 2013. Advances in aircraft design, engineering and navigation aids have dramatically improved safety and reduced accidents over the years, but the life of every passenger at 30,000 feet still rests solely in the pilot's hands. Historically, more than half of all plane crashes have been caused by pilot error; while experience and training reduce risks, even veteran pilots can be fallible under stress.

One common cause of pilot error is *channelized attention*. Similar to both tunnel vision and confirmation bias, pilots faced with sudden and unexpected flight conditions may fixate on certain activities or solutions regardless of the overall situation. Spurred by a 2010 Commercial Aviation Safety Team (CAST) report that analyzed patterns in aircraft accidents over the past decade, NASA has launched a three-year effort dedicated to tackling this deadly problem.

The researchers gathered data from volunteer pilots running high-fidelity flight simulators equipped with about 40 different data recording devices, including eye trackers, electrocardiograms, and motion sensors. But how to turn that data into meaningful action? These sensors record data at a minimum of 60Hz, capturing thousands of data points every 2 - 3 minutes. Multiplied by diverse pilots, flight tasks, hardware configurations, and flight conditions, the data complexity quickly increases beyond the comprehension of most human minds and analytical tools.

Enter Nutonian's Machine Intelligence

An easy task would be to run a linear regression analysis or analyze each of the sensors individually, but that only gives researchers a black and white view of pilot behavior. The real breakthroughs can only be found by combining all the sensor data to give a full-color, kaleidoscopic view of a pilot's ability to respond to unexpected flight conditions. Identifying the hidden signals within massive volumes of data while juggling multiple pieces of complex, interrelated and noisy inputs would be a herculean task for most statisticians and tools, so the researchers turned to Nutonian's automated data science platform, Eureka®, to augment their capabilities.

NASA researchers had used Eureka® in the past for other complex data analysis needs and knew not only could they trust Eureka® to independently search for key patterns and trends important to characterizing pilot engagement, but one of its strongest features allows users to specify computational efficiency. By avoiding the unnecessary complexity typical to machine

ORGANIZATION

The National Aeronautics and Space Administration (NASA)

INDUSTRY

Civilian space program, aeronautics, aerospace research

CHALLENGE

Given datasets with hundreds of thousands of rows and complex, interrelated and noisy inputs, isolate the signals defining pilot engagement.

RESULTS

Eureqa® delivered validated models that could be run in real-time to characterize pilot state data. Quantifying pilot response to unexpected in-flight occurrences enables research into improved training techniques and enhanced cockpit electronics to guarantee peak performance and maximize safety.

KEY FEATURES

- Autonomous search across several function sets
- Computationally efficient models that can be run in real-time alongside user behavior
- Scientifically verifiable models which can be crosschecked against new data and edge cases

learning algorithms, calculations can easily be run in real time, helping researchers quickly test hypotheses against pilot performance across a wide variety of experiments.

Additionally, Eureqa® has a unique advantage in providing direct and translatable access to the underlying mathematical expression, instead of just black box algorithms. These transparent results allow users to examine the assumptions behind each of the results and scientifically validate how their calculations would react when faced with new datasets or edge cases. This extra validation step allows users to avoid trusting human lives to unverified theories.

To Infinity... and Beyond

As the 2010 CAST report discovered, a pilot falling into channelized attention during unexpected in-flight situations can have fatal results. Thanks to Eureqa®, NASA researchers can now achieve real time feedback loops to explore methods that not only safely jog the pilot back into situational awareness, but also prevent channelized attention in the first place. These new methods will be incorporated into next generation pilot training regimens and plane cockpit technologies, leading to permanently safer skies.

NASA's research efforts are expected to extend over the next three years as they continue to test and refine the signals that characterize when pilots are engaged, situationally aware and under high or low workload stress across a wide variety of scenarios. With the power of Eureqa® at their fingertips, the researchers have the tools to guarantee peak performance from pilots and maximize safety for the pilot, crew and passengers.

Request an invitation to start at contact@nutonian.com



NASA researchers Kyle Ellis and Chad Stephens in the Research Flight Deck Simulator at NASA's Langley Research Center in Hampton, VA. Credit: NASA Langley/Sandie Gibbs

ABOUT NUTONIAN

Nutonian's Data Science as a Service offering, Eureqa®, enables industry-leading organizations to solve their most challenging business problems. Founded in 2011 by two of the world's leading data scientists, Nutonian's solutions simplify and automate data science making it a core competency for any organization. With more than 80,000 installations globally, Eureqa®'s vertically-focused application modules for financial services, life sciences, retail, telecommunications and utilities compute millions of potential solutions every second of every day. It's accuracy, time-to-understanding and scalability are unparalleled. Nutonian is Where Artificial Intelligence Meets Business Intelligence™.