# Transcript

Integrated Data Analysis Methods for Explosives Detection

# TRANSCRIPT

**(Image of Kristin Jarman, Text: Kristin Jarman, Ph.D., Pacific Northwest National Laboratory, Integrated Data Analysis Methods for Explosives Detection)**
**Kristin Jarman, Ph.D.:** I'm Dr. Kristen Jarman, and I'm a researcher in statistics at Pacific Northwest National Laboratory. I'm working on developing integrated data analysis methods for explosives detection.

**(Image of layered mathematical codes)**
**Jarman:** We're developing a mathematical method using a Bayes Net that scores the likelihood that some item of interest is an explosives threat. The Bayes Net is constructed from nodes, which contain different types of relevant information.

**(Color-coded "nodes" representing explosives, physical and chemical characteristics, and sensor measurements; nodes merged together in Bayes net)**
**Jarman:** The first type of node represents the explosives we might be interested in finding. The second type of node represents physical and chemical characteristics of these explosives. The last type of node represents sensor measurements for those characteristics. So given an item of interest, we take the sensor measurements and input them into this Bayes Net. Those measurements then indicate the physical and chemical characteristics we're looking for—which in turn get mathematically combined to score the likelihood of a threat.

**(Images of law enforcement vehicle, badges, and public transportation and social facilities)**
**Jarman:** One of the things many government clients are interested in for security applications would be combining systems in airports, train stations, at the border or for monitoring large events with a lot of people.

**(Image of public transportation facility, airport animation with metal detector, chemical sensor, and infrared sensor)**
**Jarman:** So if we think of an example where we're looking for explosives in an airport, we may have a metal detector, and then we might also have some sort of a chemical sensor. The metal detector in and of itself wouldn't necessarily tell you if the explosives were present. It would just tell you if metal was present. Chemical sensors, in and of themselves, are designed to detect explosives—but certain items such as medicines or fertilizers could also set off these sensors.

**(Image of hallway with commuters, cutaway of silhouette with explosives and handgun, three sensors flashing and merging for "Threat Yes")**
**Jarman:** And on top of the metal and chemical sensors, we could integrate an infrared camera that would detect heat or the shielding of heat that you might see from a gun or metal that is next to the body. And so you can take all of these three different pieces of information and you may get answers for each individual sensor that are maybe close to a threshold or mildly indicative of a threat, but then when you combine them together, they will give you a very definite indicator of a threat.

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**(Animation of airport with three sensors simultaneously scanning, overhead image of Pacific Northwest National Laboratory, images of researchers and engineers)**

**Jarman:** Our method will be more robust and easier to calibrate to specific scenarios because we're actually incorporating the physics and chemistry instead of just taking the data and crunching it through a black box kind of algorithm. This kind of integration is possible at characteristic of the work we do at PNNL, where we have teams of scientists, mathematicians, and engineers to make this work possible.

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