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Aaron Luttmann* (luttmaab@nv.doe.gov). *Mathematics and Nuclear Nonproliferation: Big Data, Hard Problems, and Real Impacts.*

The US Department of Energy's National Nuclear Security Administration has the science of nuclear nonproliferation as one of its core missions. This involves the development of technologies for detecting nuclear proliferation, detecting detonations, international nuclear safeguards, and treaty verification. Whereas this has traditionally focused on the invention and design of physical systems, like radiation detectors or seismic arrays, there has been a redirection towards big data analytics and mathematical and statistical approaches to extracting actionable information from diverse sources of data. The idea is to develop analysis methods to enhance our ability to see smaller and more subtle signatures indicative of illicit nuclear proliferation in the data we already have. Data from experiments being performed at the Nevada National Security Site for the design and development of mathematical and statistical approaches to detecting "patterns of life" associated with nuclear experimentation will be demonstrated. The sensor systems are compact and mobile, with multiple sensing modalities but very low-quality data, and we will present some of the computational methods designed to find signatures in this data, along with some projects for student internships or graduate theses. (Received July 11, 2018)