CBD SOT CONFERENCE TODAY'S INNOVATION, TOMORROW'S WARFIGHTER CAPABILITIES

Fusing Simple Wearables Sensors with GPS Data to Create Sensing Swarms for Environmental Threat Reconstruction.

Nicolas Hengartner, Los Alamos National Laboratory
Ethan Romero-Severson, Los Alamos National Laboratory
Leticia Cuellar, Los Alamos National Laboratory
Manore Carrie, Los Alamos National Laboratory

The ubiquity of GPS-enabled devices used in every day life and the development of wearable sensing technology allows for the possibility of rapidly deployed sensing swarms. Data from these swarms will be undirected trajectories though space coupled to a set of sensor measurements. These measurements could take the form of cumulative exposures or could themselves be complex random variables such as clinical outcomes. Understanding how to infer the physical distribution of the indirectly measured threat based on this data is a key component of integrating these technologies into decision-making and response practices.

This talk presents a mathematical framework and inference method for 1) reconstructing the underlaying distribution of an environmental threat based on the general case where the sensing outcome is a random variable and 2) methods for quantifying uncertainly in those estimates based on computing strict bounds. We also present a methods for integrating feedback from sensing swarms into an active sensing network by identifying what features are well resolved by the current data, and what features can be learned with additional data.

We thank DOE/LANL/LDRD 20170648ER for support.