

SMART SENSING: APPLICATIONS, METHODS, AND TOOLS

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SUMMARY

Smart sensing systems automatically convert cluttered sensor data to clear information. This course will show how smart sensing is being applied to solve important anomaly detection problems and to make clear, correct decisions from real time data. Highlighted applications will include maritime surveillance, equipment condition monitoring, human health monitoring, and whale detection.

The course will begin with hands-on analyses of surveillance and monitoring data, showing how clutter and false alarms can be removed and important events can be clarified. In the process, attendees will use a variety of related methods and software tools. Attendees will be given these tools to evaluate datasets on their own, during and after the course. Attendees will also be introduced to basic concepts for making decisions under uncertainty, including random errors, tradeoffs between hit rates and false alarm rates, and related precision metrics. They will also learn to evaluate tradeoffs between smart sensing costs and smart sensing value.

OBJECTIVES

By the end of this course, attendees will:

- Be able to use simple but powerful smart sensing methods.
- Have hands-on experience in identifying anomalies from historical data.
- Be able to evaluate the use of such methods for automatically making decisions and reducing clutter from real time data.
- Understand how smart sensing can improve decision making precision and reduce costs.
- Evaluate smart sensing value, relative to cost.

WHO SHOULD ATTEND

This course will be valuable to:

- Operators who make monitoring or surveillance decisions from sensor data.
- Analysts who develop monitoring and surveillance systems.
- Operators' and Analysts' supervisors and managers.
- Managers of programs for developing monitoring and surveillance solutions.

Monitoring and surveillance newcomers will leave the course with a basic, hands-on understanding of how smart sensing works. Signal processing experts will leave the course with an understanding of newer, more powerful methods than they have seen before. All attendees will leave the course with a renewed understanding of monitoring concepts, as well as computing tools that will allow them to use smart sensing methods on their own.

COURSE OUTLINE



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Hands-on data analysis:

- Submarine detection with passive sonar data.
- Maritime surveillance clutter reduction with camera data.
- Undersea threat detection with magnetometer data.
- Undersea mine detection with active sonar data.

Basic sensing and signal processing concepts:

- Sensor data sources.
- Sensor data plots and statistics.
- Random error.
- Hit, false alarm, and missed target rates and tradeoffs.
- Precision improvement metrics and analyses.

Smart sensing methods:

- Generation and analysis of simulated data.
- automated analysis.
- adaptive analysis.
- Real-time clutter reduction.
- Real-time telemetry reduction.

Risk Analysis:

- False alarm costs.
- Missed target costs.
- Operational costs.
- Smart sensor development costs.

COURSE MATERIALS

A Microsoft laptop PC is required. The laptop must run on a Windows 98 or more recent operating system, with at least 250 megabytes of free memory, and with Microsoft Office 2003 or 2007 installed. During registration, attendees will be given an option to purchase a laptop as part of their course materials. Purchased laptops, which will be delivered at the beginning of the course, will have all other required course materials and software pre-installed. Special purpose, smart sensing software and manuals will be provided at the beginning of the course.

INSTRUCTORS

Robert J. (Bob) Jannarone is Founder of Brainlike Surveillance, Inc., a company with offices in Atlanta and San Diego that evaluates and delivers monitoring value for defense and homeland security. Before entering industry, Bob was an engineering, statistics, and psychology professor at the University of South Carolina. Before then, Bob served in the U.S. Navy as a submarine nuclear engineer. He has authored many patents, articles, and a book, entitled *Concurrent Learning and Information Processing*. Bob has degrees in computer science, statistics, and psychometrics, including a Ph.D. from the University of California at Berkeley.



David Cohen works as a Senior Analyst at Brainlike Surveillance, Inc., and has a strong data analysis background. David also has extensive prior experience teaching mathematics and statistics to a wide variety of student populations at high school, community college, and university levels. Along with graduate level certifications in secondary education, David's degrees from the University of Michigan include a Bachelor of Science in Natural Resources and Master of Science in Biometrics.



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