Information Science and Technology Seminar Speaker Series

Dr. Alan Schaum
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"Continuum Fusion: A New Approach to Decision Theory"

Wednesday, July 18, 2012
3:00 - 4:00 PM
TA-3, Bldg. 1690, Room 102 (CNLS Conference Room)

Abstract: Autonomous detection algorithms usually rely on some physical/statistical models. These frequently depend on parameters with unknown but fixed values, making the optimal methods unknowable. For most of the 20th century, one procedure, the generalized likelihood ratio test (GLRT), has predominated as the algorithm generator for such incompletely specified models. The GLRT attempts to estimate the realized parameter values from each data sample, an unavoidably flawed undertaking, given that the true hypothesis–and hence the relevant parameter values–are unknown.

Now a new way of generating algorithms to address the same problem set has been found. "Continuum Fusion" (CF) methods do not attempt to estimate model parameters. Instead they fuse the optimal detectors for every allowed parameter value, according to simple rules of logic. Even when the parameter set is continuous, the fusion of the infinity of optimal algorithms can often be expressed in closed form.

CF methods come in many flavors, one of which is equivalent to the GLRT. Several others have been devised and applied to a variety of data types, including terrestrial hyperspectral and space-based multispectral imagery. We highlight these results and report new distinctions made possible by the CF approach. Promising future theoretical directions are also discussed.

Biography: Alan Schaum received a Ph.D. in Theoretical Physics in 1978 from The Johns Hopkins University, where his research focused on relativistic quantum field theo-ry, when particles were only points, but they gave you real predictions. He sub-sequently applied queuing and information theories to network design problems at Bell Laboratories, which he left in 1983, inadvertently prompting its dissolution along with that of the entire Bell System.

Since then he has developed signal and image processing methods at The Naval Research Laboratory, with a recent emphasis on the modeling of hyperspectral signatures and their dynamics. His detection algorithms are employed in a variety of operational systems. Most recently he has developed a new general theory of inference for addressing composite hypothesis testing problems, along with high dimensional visualization tools for understanding them.

He is first author of more than 100 journal and conference papers, and co-author of another 27. He is a member of $\phi\beta\kappa$ and is a Fellow of the SPIE.

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