

Seminar: 10/28/24

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Title: Forensic Source ID Problems with Complex Evidence Forms

Abstract: The forensic identification of source problem is a fundamental question of interest in forensic science and is concerned with whether or not a set of traces with an unknown origin arose from a specified source of traces. This question is usually restated in the context of two competing propositions, one associated with the prosecution model that a specified source is the source of the traces, and one associated with the defense model that a source in some alternative source population is the actual source of the traces. This restatement of the question reframes the forensic identification of source problem as a non-nested model selection problem. Unfortunately for complex evidence forms, the likelihood structure to approach this problem in the original feature space is difficult to state, if it exists at all. Recent developments in forensic statistics have allowed an indirect likelihood structure to be stated in terms of the joint distribution of pairwise comparisons (scores) that have marginally normal distributions. This likelihood structure can be used to address the non-nested model selection problem; however, when the marginal distribution of scores is highly non-normal, it is unclear how to proceed. In this presentation, we will focus on our current statistical methodological research related to developing statistically rigorous approaches addressing these issues for complex, high-dimensional evidence forms that we are encountering in the analysis of aluminum powders in improvised explosive devices.