

# Department of Statistics & Data Science

## Colloquium Series

### Fall 2019

**Speaker:** Mike Sigman, Director – NCFE, Professor – Chemistry

**Title:** Strength of Evidence and Decision Theory Applied to Forensic Science: Fire Debris Analysis

**Date:** Friday, October 25, 2019

**Time:** 11:00 – 12:00

**Location:** Technology Commons I - Room 102C

#### **Abstract:**

The 2009 National Academies of Science report, "Strengthening Forensic Science in the United States: A Path Forward," provided a critical review of the status of U.S. forensic science practice and outlined research needs. Stronger scientific and statistical foundations were identified as important needs in many forensic disciplines, especially those involving pattern recognition (e.g., finger prints, toolmarks, ballistics, etc.) Forensic science research and practice in many other countries have focused on taking a "Bayesian" approach to expressing the strength of evidence and forensic scientists have been cautioned to limit their reports and testimony to addressing the likelihood ratio and not the prior or posterior probabilities. Prior and posterior probabilities, which deal with probabilities of a proposition, are generally considered to be the province of the court. Forensic practice in the U.S. often calls on the practitioner to go beyond the likelihood ratio and make evaluative decisions regarding the evidence. The forensic scientist's decisions are reflected in categorical statements made in reporting and testimony. Decisions are often made with bias and without an estimate of the likelihood ratio or the relationship between this strength of evidence measure and a decision threshold. This talk will discuss these aspects forensic science and put them into context of current practice in forensic fire debris analysis, which relies heavily on visual pattern recognition. Research at UCF has led to a combination of machine learning and decision theory which provides a more objective view of the strength of the evidence relative to a decision threshold.