

Transparent Performance Characterization of Measurement Systems in Forensics and Biology

(U.S. Citizenship Preferred)

Overview

Developing and applying statistical methods to characterize the performance of forensic comparison methods in ways that are transparent and usable by non-statisticians. A central motivation is supporting the responsible adoption of algorithmic methods for comparing forensic evidence, such as cartridge case comparison. The goal is to provide information to help recipients assess what weight to give a particular comparison result, such as how method performance depends on conditions. Because forensic results ultimately inform the decisions of examiners, attorneys, judges, and jurors, the work emphasizes making the data and reasoning behind a performance claim visible and manipulable, so that recipients can form their own judgments rather than rely on an opaque summary or someone else's sentiment.

Across these projects you will quantify uncertainty in measures of discrimination and strength of evidence, design studies to assess potential sources of performance variability, evaluate metrics intended to capture evidence quality, and develop analyses, visualizations, and software tools that let non-specialists interrogate what drives method performance.

A secondary thrust applies related ideas to measurement quality in other domains, such as the statistical analysis of live-cell monitoring data and creating analyses and tools supporting standards development for assessing the quality of cell-viability measurement systems. The balance between thrusts will depend on project needs and the candidate's strengths.

Duties include but are not limited to:

- Developing statistical methods for quantifying uncertainty in the performance of measurement and comparison methods, accounting for potentially correlated data.
- Developing exploratory analyses, visualizations, and software tools that enable non-statisticians to interrogate the factors that drive method and measurement-system performance.
- Designing studies and conducting analyses that characterize and apportion sources of variability in measured or reported performance
- Developing and evaluating metrics and standards for assessing quality, such as the quality of forensic comparisons or of cell-viability measurement systems
- Presenting results at internal meetings, and occasional meetings with external stakeholders.
- Ensuring that results, protocols, software, and documentation have been archived or otherwise transmitted to the larger organization.

Required Skills, Expertise and Qualifications

- Ph.D. in Statistics or related field
- Expertise in distribution-free / nonparametric statistical methods and simulation-based uncertainty quantification; statistical decision theory (Bayesian loss analysis, cost modeling); time series analysis, multivariate statistics, and hierarchical mixed-effects modeling; statistical discrimination and classification assessment (ROC/AUC and related metrics).
- Expertise in exploratory data analysis and statistical graphics.

- Expertise in statistical experimental design and analysis of variance.
- Proficiency in Python and/or R. The team operates in a Python environment; development in R is acceptable provided the resulting tools can be executed within or called from Python workflows.
- Familiarity with the probabilistic programming language Stan for MCMC and reproducible research and version-control practices (e.g., Git).
- Hands-on experience with interactive application or dashboard development (preferred).

Employment Terms: This opportunity is to be an associate researcher in the NIST Statistical Engineering Division for a term of 1 year, with options to renew and/or pursue longer-term federal employment. Associate researchers are NOT Federal Employees, but they work aside NIST researchers. Relocation expenses will not be provided.

Salary: \$100,000-\$100,000

How to express interest: Interested candidates, U.S. Citizens preferred, who meet all of the required qualifications are invited to express their interest in the position by sending an updated CV to Julia Sharp at julia.sharp@nist.gov or apply at <https://engineering.gwu.edu/post-doctoral-fellow-transparent-performance-characterization-measurement-systems-forensics-and>.