



CSAFE Course, Fall 2020 Statistics for Forensic Practitioners

Instructors:

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Course description:

Statistics for Forensic Practitioners is a continuing education statistics course designed for forensic practitioners. The syllabus complies with the course requirements specified by the Texas Forensic Science Commission. This course prepares practitioners for a career in the forensic sciences by addressing the core concepts related to probability, statistics and their application to today's forensics issues. Practitioners will learn how statistical principles apply to all aspects of the evaluation of evidence, including the assessment of the probative value of the evidence, and the range of conclusions that can be derived from the forensic analyses.

The emphasis of the course is not on *doing* statistical analysis but rather on understanding why statistical ideas must guide the collection, visualization, exploration, analyses, and interpretation of evidence. Instructors will also discuss in some deepness what can and cannot be concluded from various statistical analysis and how to present results that are supported by statistical findings.

Learning Objectives:

1. Understand the differences between populations and samples and methods to make inferences from the sample to the population, and the consequent need for well-designed experiments and surveys.
2. Be able to critically assess the designs used in published scientific papers and their impact on the findings presented by investigators. Students will be asked to evaluate designs and their strengths and weaknesses.
3. Be able to read the course textbook and similar texts to update their knowledge as their need for additional statistical knowledge evolves. Students should be able to identify situations where additional professional statistical help is called for.
4. Be able to calculate minimum sample sizes for basic experimental designs and surveys, and other basic statistics.

Accessing the Course

1. To enroll, please complete this form: <https://forms.gle/EchgkWUQwtvwQEz5>
2. Once registered, you will be given the link and login information to access the learning management system used for the course.



3. The course site will include several modules including the lecture materials, datasets, and supplemental lectures and worked examples.
4. You can watch the recorded lectures at your own pace. There will be a course Teaching Assistant who can answer questions about the lectures and help any issues. Please contact them at forensicstats@gmail.com
5. Each section will have a quiz and there will be a final exam once all sections are completed.
6. Quizzes and Excel labs are provided to supplement your learning and will not be graded.
7. You will be able to access the course online until you complete the final exam.

Software Information

Any demonstrations are done using Excel.

Syllabus

Section 1: Introduction

- a. What is the scientific method?
- b. What is statistics?
- c. Statistics, forensic practice, and the criminal justice system.
- d. Populations and samples, deduction and induction, examples in practice.

Section 2: The language of probability

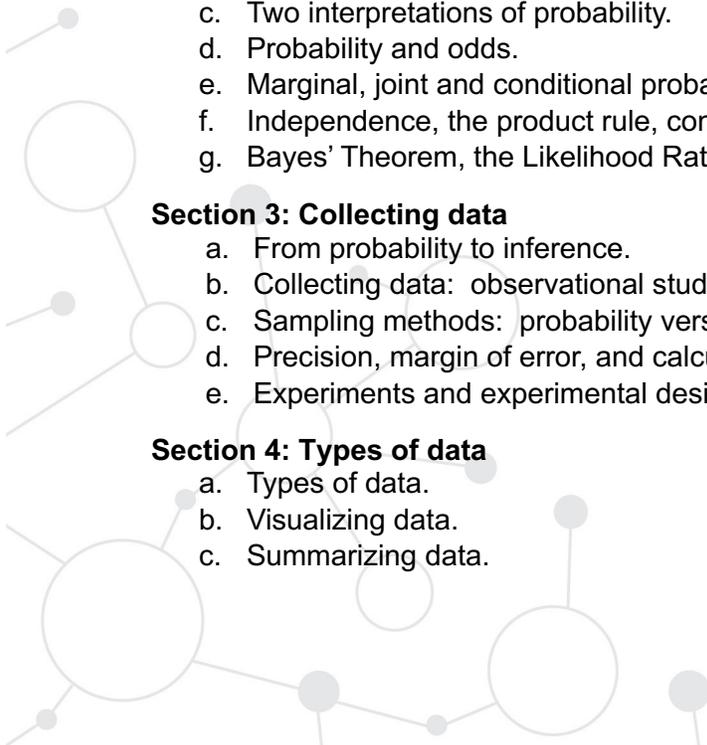
- a. Probability: People (CA) v. Collins (1968).
- b. What is probability? Some notation and properties.
- c. Two interpretations of probability.
- d. Probability and odds.
- e. Marginal, joint and conditional probability.
- f. Independence, the product rule, conditional independence, State (CT) v Skipper.
- g. Bayes' Theorem, the Likelihood Ratio, and prior information.

Section 3: Collecting data

- a. From probability to inference.
- b. Collecting data: observational studies, surveys, and experiments.
- c. Sampling methods: probability versus non-probability sampling.
- d. Precision, margin of error, and calculation of sample size.
- e. Experiments and experimental design.

Section 4: Types of data

- a. Types of data.
- b. Visualizing data.
- c. Summarizing data.





Section 5: Probability models and uncertainty

- a. Measurement, variability and uncertainty.
- b. Reliability, repeatability, and reproducibility, accuracy and precision.
- c. Probability distributions, parameters.
- d. Probability models for discrete variables.
- e. Probability models for continuous variables.
- f. Expectation, variance, covariance and correlation of variables.
- g. Propagation of error.

Section 6: Inference

- a. Definitions.
- b. Goals of inference.
- c. Point estimation, properties of estimators, standard errors, sampling distributions.
- d. Interval estimation.
- e. Hypothesis testing, types of errors, p-values.
- f. Difference between two means.
- g. Equivalence testing.
- h. Hypothesis testing for proportions.
- i. Non-parametric tests of hypothesis.
- j. Discussion of hypothesis testing in the context of forensic practice.

Section 7: Regression and analysis of variance

- a. Dependent and independent variables.
- b. Simple linear regression, least squares estimation and hypothesis testing for regression coefficients.
- c. Calibration, extrapolation.

Section 8: Assessing forensic evidence

- a. Types of evidence and types of forensic questions.
- b. Logic of forensic examination.
- c. Expert opinion.
- d. The two-stage approach.
- e. Likelihood ratio / Bayes factor.

Section 9: Reporting and testimony

