

Statistics in Psychology and Education

Course Syllabus

Instructor: Hau-Hung Yang

Course Information

Course Level: Undergraduate
Credits: 3 credits (one semester)
Prerequisites: None
Software: R (with RStudio)

Course Description

This course provides psychology and education students with a comprehensive introduction to applied statistical methods commonly used in psychological and educational research. The course emphasizes intuition, correct interpretation, and hands-on data analysis with R. Students will learn to formulate research questions in statistical terms, choose appropriate analytic strategies, conduct analyses, and critically evaluate statistical results reported in published research. By the end of the course, students will possess the practical skills to analyze data independently and the conceptual understanding to be informed consumers of quantitative research.

Course Objectives

Upon completion of this course, students will be able to:

1. Understand the logic of statistical inference, including estimation and hypothesis testing.
2. Select appropriate statistical methods for common research designs in psychology and education.
3. Conduct statistical analyses using R and interpret output correctly.
4. Critically evaluate the use of statistics in published research articles.
5. Communicate statistical results clearly in written reports.

Textbook and References

- Howell, D. C. (2013). *Statistical Methods for Psychology* (8th ed.). Cengage Learning. **[Primary textbook]**
- Field, A., Miles, J., & Field, Z. (2012). *Discovering Statistics Using R*. SAGE Publications. [Supplementary reference]

Assessment

Homework assignments (weekly R exercises)	30%
Midterm examination	25%
Final examination	25%
In-class quizzes and participation	10%
Data analysis project	10%

Weekly Schedule

Week	Topic
1	Introduction to statistics: Why do we need statistics? Populations, samples, and the logic of inference
2	Descriptive statistics: Measures of central tendency and variability
3	Data visualization: Histograms, boxplots, scatterplots; introduction to R and RStudio
4	Probability foundations: Basic probability rules, conditional probability, Bayes' theorem
5	Random variables and probability distributions: Discrete and continuous distributions; the normal distribution
6	Sampling distributions and the Central Limit Theorem
7	Point estimation and interval estimation: Confidence intervals for means
8	Introduction to hypothesis testing: Null and alternative hypotheses, Type I and Type II errors, p -values
9	<i>Midterm Examination</i>
10	One-sample and two-sample t -tests
11	Paired-samples t -test; statistical power and effect size
12	One-way analysis of variance (ANOVA): Between-subjects designs
13	Multiple comparisons and post-hoc tests
14	Correlation: Pearson and Spearman correlation coefficients
15	Simple linear regression: Model, estimation, and interpretation
16	Introduction to nonparametric tests: Chi-square test for independence and goodness of fit
17	Review and integration: Choosing the right test; common misuses of statistics
18	<i>Final Examination</i>

Course Policies

- All homework must be submitted as reproducible R scripts or R Markdown documents.
- Late submissions will incur a 10% penalty per day, up to a maximum of three days.
- Academic integrity is expected; all individual work must be the student's own.
- Students are encouraged to use AI tools (e.g., ChatGPT) for learning, but must demonstrate understanding of the output and clearly cite any AI-assisted work.