Applied Statistics Course
Course Overview and Goals

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Course Goals and Learning Outcomes

Primary Goals

This 6-lesson course provides a comprehensive introduction to applied statistics:

- **Statistical modeling** and data-generating processes
- **Parameter estimation** and uncertainty quantification
- **Hypothesis testing** with proper interpretation
- **Reproducible research** using Python

Learning Outcomes

Students will be able to:

- Build statistical models from data
- Estimate parameters while quantifying estimation errors
- Conduct and interpret hypothesis tests

Course Structure

Six Comprehensive Lessons

1. **Statistical Modeling** Random variables, distributions, LLN/CLT
2. **Parameter Estimation** MLE, Method of Moments, Fisher Information
3. **Estimator Properties** Bias, variance, MSE, confidence intervals
4. **Hypothesis Testing I** Foundations, one-sample tests
5. **Hypothesis Testing II** Two-sample, categorical, multiple testing
6. **Final Coding Project** Applied statistical analysis

Practical Focus

- Each lesson includes hands-on exercises, some with real datasets
- Python programming with numpy, pandas, scipy, matplotlib
- Emphasis on reproducible analysis and visualization

Assessment and Tools

Assessment Structure

- **Practicals (50%)** Short labs across lessons 15 and written tests
- **Final Project (50%)** Complete statistical analysis with report, slides, and code

Tools and Technology

- **Python 3.9+** with scientific computing stack
- **Real datasets** for practical applications
- **Jupyter notebooks** for interactive analysis

Prerequisites

Introductory probability, calculus, and some programming experience (Python preferred).

Why Applied Statistics Matters

Real-World Applications

Statistics is essential across diverse fields:

- **Data Science** Making sense of big data
- **Scientific Research** Testing hypotheses and validating theories
- **Business Analytics** Informed decision-making
- **Public Policy** Evidence-based governance

Course Philosophy

Bridge theory and practice Emphasize interpretation over computation
Build intuition through visualization

Get Ready!

This course will equip you with fundamental statistical thinking and
practical skills for data analysis.

A Final Note on Learning

"A great LLM comes with great responsibility."

Learning with AI Tools

- LLMs are powerful tools that can enhance your productivity
- Use them to **accelerate learning**, not replace understanding
- Always **verify results** and understand the underlying concepts
- The goal is to become a **better statistician**, not just faster

Remember

Deep understanding comes from practice, reflection, and making mistakes not just from prompting!