Statistics Boot Camp
Course Syllabus

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Class Room: Online | Class Hours: Self-paced, asynchronous

Instructor contact

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Course Description

Success in the MSBA program, or advanced analytics courses more generally, depends on your grasp of basic statistical concepts. For some that grasp is currently pretty fragile; for others it is more secure. The aim of these tutorials is to improve every student's level of mastery and set the stage for what comes next.

First, we probably should say what these concepts are. In broadest terms, they are the ideas underlying probability and mathematical statistics. You had exposure to most of them in your introductory statistics courses, but that was probably a while ago and what you will need for the MSBA program is a little more sophisticated. Don't worry though – these tutorials will give you plenty of opportunity for repetition, so you can build your understanding incrementally.

One more thing before we start. While these tutorials have a computational component, they are are not primarily about computation, visualization or learning new R tricks. The emphasis here is on analytical concepts. Computation and code enter the discussion largely by way of illustration. You will do well to follow along with a notebook and pen.

Course Objectives

After completing this course, you should understand these 10 things:

1. what a random variable is and what random sampling means
2. the classical approach to probability
3. probability distributions and their "features"
4. laws of iterated expectations and total variance
5. the normal and related distributions
6. the law of large numbers and central limit theorem

7. estimator properties
8. asymptotically valid approaches to inference
9. the difference between economic and statistical significance
10. how to map these statistical concepts to simple linear regression.

Recommended Texts

Aronow, P. and B. Miller, *Foundations of Agnostic Statistics*, Cambridge University Press.

Wooldridge, J., *Introduction to Econometrics: A Modern Approach*, 7e, Cengage.

Angrist, J. and Pischke, S., *Mastering 'Metrics*, Princeton University Press.

Cunningham, S., *Causal Inference: The Mixtape*, Yale University Press.

Aronow and Miller provides a solid foundation for the topics covered in the boot camp, but you will probably find their treatment a bit more sophisticated than what you remember from your undergraduate statistics text. Where their discussion seems unfamiliar, you will need to "level up" for the road ahead. Wooldridge, which is my favorite undergraduate econometrics text, has a nice concise treatment of the basic concepts. The boot camp tutorials owe much to each.

Cunningham and Angrist & Pischke are key texts for the MSBA causal inference course (ECON 7710), and both deal directly with the most essential stat concepts. (Note there is a free bookdown version of The Mixtape, which is linked above.)

There are also many excellent purely online resources to get a statistics refresher with some R programming tossed in. At the beginner level, we recommend *Computational and Inferential Thinking: The Foundations of Data Science*, *R for Data Science* and *Learning Statistics with R*. You will find a more advanced treatment in *Foundations of Statistics with R*.

Software

The software of choice for this class is R, a free and open-source language for statistical computing and graphics. RStudio is a popular integrated development environment (IDE) for R that will greatly enhance your R experience. First, download and install R; then download and install RStudio. Follow these instructions.

Topical outline

1. Probability
    a. Random variables
    b. Probability distributions
    c. Features" of distributions
    d. Conditional expectation
    e. Normal and related distributions
2. Mathematical Statistics
    a. Estimation
        i. Random sampling
        ii. Sampling distributions
        iii. Unbiasedness and efficiency
        iv. Consistency and asymptotic normality
    b. Inference

   i. Confidence intervals
   ii. Hypothesis testing
   iii. Asymptotically valid test statistics
   iv. p-values and economic vs statistical significance
3. Simple linear regression

Accountability and content mastery

You will be guided through the boot camp material through as series of tutorials that follow the topical outline. You should approach each tutorial with notetaking in mind. Each tutorial includes a few quizzes to keep you focused. There are also a few places to play with some code that demonstrates a concept.

These tutorials are designed to be completed 4-5 weeks. At the end of the summer – during the final exam period for the "Short II" summer session – I will release a test of the boot camp material to gauge your progress. Faithfully completing the tutorials should ensure success on the test.

Mastering the boot camp material will be essential to success in the fall. To nudge accountability, test scores above 80 will add 2 points to your overall course average in ECON 7710 (which may be enough to push you into a higher grade category).

Other Course Policies and Statements

UGA student Honor Code

"I will be academically honest in all of my academic work and will not tolerate academic dishonesty of others." A Culture of Honesty, the University's policy and procedures for handling cases of suspected dishonesty, can be found at https://www.uga.edu/ovpi. Every course syllabus should include the instructor's expectations related to academic honesty.

Mental health and wellness resources

If you or someone you know needs assistance, you are encouraged to contact Student Care and Outreach in the Division of Student Affairs at 706-542-7774 or visit https://sco.uga.edu. They will help you navigate any difficult circumstances you may be facing by connecting you with the appropriate resources or services.

UGA has several resources for a student seeking mental health services (https://www.uhs.uga.edu/bewelluga/bewelluga) or crisis support (https://www.uhs.uga.edu/info/emergencies).

If you need help managing stress anxiety, relationships, etc., please visit BeWellUGA (https://www.uhs.uga.edu/bewelluga/bewelluga) for a list of FREE workshops, classes, mentoring, and health coaching led by licensed clinicians and health educators in the University Health Center.

Additional resources can be accessed through the UGA App.

Diversity, equity and inclusion

The Terry College is committed to promoting diversity, equity, inclusion, and belonging among its students, faculty, and staff. This class welcomes the open exchange of ideas and values freedom of thought and expression. This class provides a professional environment that recognizes the inherent worth of every person. It aims to foster dignity, understanding, and mutual respect among all individuals in the class.

Changes to the syllabus

The course syllabus is a general plan for the course; deviations announced to the class by the instructor may be necessary.