10-705/36-705: Intermediate Statistics, Fall 2016

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Office hours	Mondays, 1:30-2:30
Class Time	Mon-Wed-Fri 12:30 - 1:20
Class Location	Baker Hall A51
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Objective

This course covers the fundamentals of theoretical statistics. Topics include: VC theory, convergence, point and interval estimation, maximum likelihood, hypothesis testing, data reduction, Bayesian inference, nonparametric statistics and bootstrap resampling. We will cover Chapters 1 – 12 from the text plus some supplementary material. This course is excellent preparation for advanced work in Statistics and Machine Learning.

Textbook: Wasserman, L. (2004). *All of Statistics: A concise course in statistical inference.*

Background

I assume that you are familiar with basic probability and mathematical statistics. You should already know the following concepts: probability, distribution functions, density functions, moments, transformation of variables, and moments generating functions.

Is This The Right Course For You? 36-705 versus 36-700

We have another course, 36-700, that covers similar material but assumes less background. In 705 I assume you are already familiar with basic probability. **This course moves very fast.** If you want a course that requires less background, you should take 36-700 instead.

Other Recommended Texts

Casella, G. and Berger, R. L. (2002). *Statistical Inference, 2nd ed.*
Bickel, P. J. and Doksum, K. A. (1977). *Mathematical Statistics.*
Rice, J. A. (1977). *Mathematical Statistics and Data Analysis, Second Edition.*
van der Vaart, A. (2000). *Asymptotic Statistics*

Grading
20% : Test I (Friday Sept. 9) on the material of Chapters 1–4
20% : Test II (Friday October 14)
20% : Test III (Friday November 11)
20% : Final Exam (Date set by the University)
20% : Homework

Exams
All exams are closed book. **Do NOT buy a plane ticket until the final exam has been scheduled.**

Homework
Homework assigments will be posted on the web. Hand in homework to the homework deposit box Baker Hall 132 by **3 pm Thursday**. Make sure to **write the course number in large, clear letters. No late homework. If you need an extension due to illness, email me BEFORE the homework deadline.**

Reading and Class Notes
Class notes will be posted on the web regularly. **Bring a copy to class.** The notes are not meant to be a substitute for the book and hence are generally quite terse. Read both the notes and the text before lecture. Sometimes I will cover topics from other sources.

Group Work
You are encouraged to work with others on the homework. But write-up your final solutions on your own.

Course Outline

1. Quick Review of basic probability.
2. Inequalities
3. Vapnik-Chervonenkis Theory
4. Convergence
5. Sufficiency
6. Likelihood
7. Point Estimation
8. Minimax Theory
9. Asymptotics
10. Robustness
11. Hypothesis Testing
12. Confidence Intervals
13. Nonparametric Inference
14. Prediction and Classification
15. The Bootstrap
16. Bayesian Inference
17. Model Selection

18. Causation

A Message From the Provost:

Take care of yourself. Do your best to maintain a healthy lifestyle this semester by eating well, exercising, avoiding drugs and alcohol, getting enough sleep and taking some time to relax. This will help you achieve your goals and cope with stress.

All of us benefit from support during times of struggle. You are not alone. There are many helpful resources available on campus and an important part of the college experience is learning how to ask for help. Asking for support sooner rather than later is often helpful.

If you or anyone you know experiences any academic stress, difficult life events, or feelings like anxiety or depression, we strongly encourage you to seek support. Counseling and Psychological Services (CaPS) is here to help: call 412-268-2922 and visit their website at `http://www.cmu.edu/counseling/`. Consider reaching out to a friend, faculty or family member you trust for help getting connected to the support that can help.