

# 36-755: Advanced Statistical Theory

## Fall 2017

### Instructor:

Alessandro Rinaldo

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### TA:

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### Lectures:

Monday and Wednesday, 9:00am - 10:20am, PH 226C.

### Class Website:

<http://www.stat.cmu.edu/~arinaldo/36755/F17/>

Please check the website on a regular basis.

### Prerequisites:

- 36-705: Intermediate Statistics

### Topics:

This is a core Ph.D. course in theoretical statistics. We will cover a selection of modern topics in mathematical statistics, with a focus on high-dimensional statistical models and non-parametric statistical models. One of the main goals of this course is to provide you with some theoretical background and mathematical tools to read and understand the current statistical literature on high-dimensional models.

### Class material:

Much of the course material come from a draft of the book “High-dimensional statistics: A non-asymptotic viewpoint”, by M. Wainwright. Chapters and relevant parts will be posted and **are not to be distributed**. Further reading material and notes will be posted on [the website](#).

Recommended textbooks are:

1. *Statistics for High-Dimensional Data: Methods, Theory and Applications*, by P. Bühlman and S. van de Geer, Springer, 2011.
2. *Statistical Learning with Sparsity: The Lasso and Generalizations*, by T. Hastie, R. Tibshirani and M. Wainwright, Chapman & Hall, 2015.

3. *Introduction to High-Dimensional Statistics*, by C. Giraud, Chapman & Hall, 2015.
4. *Testing Statistical Hypotheses*, by Lehmann and Romano, 2005, Springer, 3<sup>rd</sup> Edition.
5. *Asymptotic Statistics*, by A. van der Vaart, Springer, 2000.

### **Course Grading:**

Your assessment and grades will be determined as follows:

- Homework assignments (70%).
- Scribe duties (10%).
- Attendance and class participation (5%).
- Final Exam (15%).

Any failure to turn in any assignment, to fulfill the scribe duties and to miss a significant number of lectures without informing me of your absence or without a reasonable excuse will result in a lower grade.

### **Scribe duties:**

Each student will take turn in transcribing the notes of every lecture in electronic format using the latex template available at <http://www.stat.cmu.edu/~arinaldo/36755/F17/schedule.html>. The scribe has to attend class, take good and accurate notes, check for mistakes and inconsistencies, write them up in latex, add references and expand the material if appropriate and after consulting with me. The resulting pdf and latex files have to be submitted for my approval within one week. The pdf files containing the lecture notes will be posted on the class website.

### **Homework:**

Homework problems will be assigned every 10-15 days. The problems will be mostly of theoretical nature and will essentially be proofs.

There is a great value in discussing problems and sharing knowledge with your classmate, so you are encouraged to engage in group work. However, you should attempt to solve homework problems by yourself and only afterwards meet and compare with others.

### **Attendance and Involvement:**

It is important that you attend class, as the selection and organization of the topics will be on occasion different from the notes and textbooks. If you know you will be absent for few consecutive lectures, please let me know.

Come and see me any time you are confused or stuck and don't be shy in class: the more questions you ask and the more feedback I receive from you, the better I will be able to tailor the lectures to your specific needs.

### **Final Exam:**

The final exam will be on Dec 6.