14.380 Statistical Methods
Time and place: Tuesdays and Thursdays 9-10.30am, E51-145
Recitations: F 4-5.30, E51-145
Fall 2019, first half of the semester

Instructor: Anna Mikusheva (amikushe@mit.edu, E52-526, OH: Wed 3-4pm)
TA: David Hughes (dwhughes@mit.edu, OH: Mon 2.30-4pm, E52-548)

***Course Description*:** The course provides an introduction to statistical theory. A brief review of probability will be given mainly as background material, however, it is assumed to be known. The course provides an introduction to regression analysis, including interpretation, finite sample results, and large sample properties.

Final Exam. The final exam is on October 22, Tuesday, during the regular lecture time.

Waiver Exam. The waiver exam is on Friday, August 30, 1-2.30 (E52-324) is intended for the incoming PhD students who want to show their qualification to proceed without taking this course.

Study Groups. The students are encouraged to collaborate on discussing and solving problem sets, but they have to write up their own solutions.

Text. The text, which will be followed closely, is Casella, G. and R. Berger, Statistical Inference, 2nd Edition, Duxbury. This book covers all of the material of the course and, in addition, provides many problems for practice as well as excellent references.

Outline. Numbers after each section refer to sections of the text.

1. Samples and their Characteristics: Sample vs Population, Histogram, Sample Moments, Order Statistics (5.1-5.4)

2. Types of Convergence and Limit Theorems: LLN, CLT, Slutsky Theorem, Chebyshev's Inequality (5.5)

3. Summarizing Data: Sufficient Satistics, Minimal Sufficient Statistic, Ancillary Statistics (6.1-6.4)

4. Point Estimates and their Comparison: Unbiasness, MSE, Rao-Cramer Bound, Information Matrix; Asymptotic behavior: Consistency, Asymptotic Normality, Asymptotic Efficiency (7.3)

5. Method of Moments (7.2.1)

6. Maximum Likelihood (7.2.2)

7. Testing: Size and Power, UMP Test and Neyman-Pearson Lemma, Wald Test (8.1-8.3)

8. Confidence Sets Construction (9.1-9.3)

Grading. There will be the final exam on October 22 (worth 70%). There will be 6 problem sets. A solution to one problem (marked) from each problem set should be handed in to the TA at the beginning of the lecture or sent to the TA via e-mail before the lecture. This will constitute 30% of the grade. The solution to **this** problem will be posted after the due date. No late assignments will be accepted. All other problems are for your own study; the solutions to them won't be posted, but will be discussed during the recitations. One problem from the problem sets will appear on the final exam.