Syllabus – STOR 890
Reading Classics:
Topics in Foundations of Statistics

Spring 2018 (January 10 – April 30)
Section 001, TuTh 9:30-10:45am
Hanes 107

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Office Hours: M 11:00 – 12:00noon and by appointment

Course home page on http://www.unc.edu/~hannig/STOR890RC

Target Audience: Ph.D. students in the Department of Statistics and Operations Research. It is assumed that students have taken enough advanced statistics courses to be able to read research articles.

Required Text:

- The list of papers we will read in this class can be found below.

Optional Text:

- Kotz, S., & Johnson, N. L. (Eds.). (2012). Breakthroughs in Statistics: Foundations and basic theory. Springer Science & Business Media.

Course Objective: In this class we will discuss statistical papers that had a big influence on the field.

Assessment: Your grade will be based on class presentation, scribing, and participation.

Readings and Annotation. Each student is responsible for all reading material assigned. By midnight on Sundays prior to each class, everyone will post regarding this week's reading material online on forums on sakai with at least one question, a response to a question, or a comment. The task is to identify and point out a concept or an argument that you don't understand and ask a question about it, explaining what about it you don't understand. Alternatively, you can answer somebody else's question. We will incorporate these questions into the discussion during class.

Leading a Class Discussion. Each week, a team of two students will prepare a presentation aimed for generating an interactive class discussion. Presenters assume that everyone read the material, and are prepared to critically analyze it and add insight to the reading. The presentation should highlight key results/definitions/concepts from the reading and briefly summarize it (no more than 10 min). Presenting students will also incorporate questions posted on the forums on sakai offer their answers and/or direct them to the class. We encourage presenters to include their own questions and/or general

thoughts about the assigned material, think of examples that illustrate main results, trace further development of highlighted ideas in the literature, and offer further readings for those who are interested. The presentation should be planned as one would plan a discussion section, not a lecture.

Scribing. A team of students will be assigned for each meeting to write down all the questions and answers, thoughts, claims and ideas that come up during the class. The presenting team will provide their materials to the scribing team so that they can incorporate all the notes that they took and tie everything together. The scribing team has one week to draft the notes and e-mail them to the presenting team for further revision and comments. At the end, the document should summarize the ideas presented in the class, based on the assigned reading, as well as recount the discussion that followed. Note that the discussion should not be transcribed completely word-for word, but rather in the form of a summary of the main points, although citations are permitted if necessary. The final version of the scribing is due to Jan two weeks after the presentation.

Course Outline:

Week 0

Introduction

Week 1

Student. (1908). The probable error of a mean. *Biometrika*, 1-25.

M'Kendrick, A. G. (1926). Applications of mathematics to medical problems. *Proceedings of the Edinburgh Mathematical Society*, *44*, 98-130.

Week 2

Fisher, R. A. (1922) On the Mathematical Foundations of Theoretical Statistics. *Philosophical Transactions of the Royal Society of London Series A.*

Savage, L. J. (1976). On rereading R.A. Fisher. *The Annals of Statistics*, 441-500.

Week 3

Neyman, J., & Pearson, E. S. (1933) On the problem of the most efficient tests of statistical hypotheses. *Philosophical Transactions of the Royal Society of London. Series A*, *231*, 289-337.

Bartlett, M. S. (1965). RA Fisher and the last fifty years of statistical methodology. *Journal of the American Statistical Association*, *60*(310), 395-409.

Week 4

Robins, James, and Larry Wasserman (2000) Conditioning, likelihood, and coherence: a review of some foundational concepts. *Journal of the American Statistical Association* 95(452) 1340-1346.

Berger, J. O. (2003). Could Fisher, Jeffreys and Neyman have agreed on testing? *Statistical Science. a Review Journal of the Institute of Mathematical Statistics*, *18*(1), 1–32.

Week 5

Brown, L. (1967). The conditional level of Student's t-test. *Ann. Math. Statist.*, *38*, 1068–1071.

James, W., & Stein, C. (1961). Estimation with quadratic loss. In *Proceedings of the fourth Berkeley symposium on mathematical statistics and probability*, 361-379.

Morris, Carl N (1982). Natural exponential families with quadratic variance functions, *The Annals of Statistics* 65-80.

Week 6

Good, I. J. (1952). Rational decisions. *Journal of the Royal Statistical Society. Series B*, 107-114.

Tukey, J. W. (1962). The future of data analysis. *The annals of mathematical statistics*, *33*(1), 1-67.

Week 7

Birnbaum, A. (1962). On the foundations of statistical inference. *Journal of the American Statistical Association*, *57*, 269–326.

Edwards, W., Lindman, H., & Savage, L. J. (1963). Bayesian statistical inference for psychological research. *Psychological review*, *70*(3), 193

Week 8

Fraser, D. A. S. (1966). Structural probability and a generalization. *Biometrika*, *53*(1-2), 1-9.

Hannig, J., Iyer, H., Lai, R. C., & Lee, T. C. (2016). Generalized fiducial inference: A review and new results. *Journal of the American Statistical Association*, *111*(515), 1346-1361.

Week 9

Dawid, A. P., Stone, M., & Zidek, J. V. (1973). Marginalization paradoxes in Bayesian and structural inference. *Journal of the Royal Statistical Society. Series B*, 189-233.

Godambe, V. P. (1982). Ancillarity principle and a statistical paradox. *Journal of the American Statistical Association* 77, 931-933.

Huber, P. J. (1964). Robust estimation of a location parameter. *The Annals of Mathematical Statistics*, *35*(1), 73-101.

Week 10

Efron, B. (1979). Bootstrap Methods: Another Look at the Jackknife. *The Annals of Statistics*, *7*(1), 1-26.

Dempster, A. P., Laird, N. M., & Rubin, D. B. (1977). Maximum likelihood from incomplete data via the EM algorithm. *Journal of the royal statistical society. Series B (methodological)*, 1-38.

Week 11

Barndorff-Nielsen, O. (1983). On a formula for the distribution of the maximum likelihood estimator. *Biometrika*, *70*(2), 343-365.

Hall, P. (1988). Theoretical comparison of bootstrap confidence intervals. *The Annals of Statistics*, 927-953.

Week 12

Metropolis, N., Rosenbluth, A. W., Rosenbluth, M. N., Teller, A. H., & Teller, E. (1953). Equation of state calculations by fast computing machines. *The journal of chemical physics*, *21*(6), 1087-1092.

Gelfand, A. E., & Smith, A. F. (1990). Sampling-based approaches to calculating marginal densities. *Journal of the American statistical association*, *85*(410), 398-409.

Week 13

Valiant, L. G. (1984). A theory of the learnable. *Communications of the ACM*, *27*(11), 1134-1142.

Donoho, D. L., & Johnstone, I. M. (1995). Adapting to unknown smoothness via wavelet shrinkage. *Journal of the american statistical association*, *90*(432), 1200-1224.

Hartigan, J. A., & Wong, M. A. (1979). Algorithm AS 136: A k-means clustering algorithm. *Journal of the Royal Statistical Society. Series C (Applied Statistics)*, *28*(1), 100-108.

Week 14

Aizerman, A., Braverman, E. M., & Rozoner, L. I. (1964) Theoretical foundations of the potential function method in pattern recognition learning. *Automation and remote control*, *25*, 821-837

Cortes, C., & Vapnik, V. (1995). Support-vector networks. *Machine learning*, *20*(3), 273-297.

Week 15

Breiman, Leo. (2001). Statistical modeling: The two cultures (with comments and a rejoinder by the author) Statistical science 16: 199-231.

Holmes, S (2018), Statistical proof? The problem of irreproducibility, *Bulletin of the AMS*. 55, 31-56

Reminder of the class

Guest lectures, students suggested papers

Note: The instructor reserves the right to make any changes he considers academically advisable. It is your responsibility to attend classes and keep track of the proceedings.