STATS 300A Theory of Statistics
Stanford University, Fall 2015

A Note on Modern Relavance

Much of the material in this course is classical, as many of the foundations of theoretical statistics were laid decades ago. Much of modern (non-Bayesian) theory is asymptotic, because finite sample theory is more difficult to establish. Much of finite sample theory is established under strong parametric assumptions that may not hold in practice. Why then are these topics relevant in the modern day?

- **Modern ubiquity:** Some of the approaches and concepts in this course are actively employed in modern statistics. This is especially true of Bayes optimality.
- **Stepping stones:** Some of the concepts introduced have omnipresent asymptotic analogues. For example, asymptotic minimaxity is one of the most common modern quality measures for decision procedures. Understanding the finite sample version of this criterion is an important first step toward understanding the asymptotic version (which will be covered in 300B).
- **Nonparametric extensions:** We will highlight cases in which parametric assumptions can be weakened and broader nonparametric conclusions can be reached.
- **Backwards compatibility:** You will encounter all of these concepts and approaches in the literature and need to understand them. Unbiased estimation is an example of a topic with great prominence in the past that is less prevalent in modern statistics. However, we will highlight the modern domains in which optimal unbiased estimation does still play a role, like risk estimation. Moreover, the concepts introduced in the context of unbiased estimation, like completeness, are also used in hypothesis testing and in equivariant estimation to develop optimal procedures.