STAT 8931
Fall 2013
12:20–1:10 MWF

Aster Models, Life History Analysis, Exponential Families, Random Effects, Estimates at Infinity

Instructor: Charles Geyer

This course is designed for two audiences: graduate students in biology and graduate students in statistics.

Biology students will learn about using aster models in research. Areas of life history analysis covered include comparison of fitness between groups, estimation of fitness landscapes and response to selection, and estimation of population growth rates. Topics include graphical models, exponential families, parameterizations of aster models (six of them), sufficiency, maximum entropy, parametric bootstrap (for when asymptotics are in doubt), multivariate monotonicity and interpretation of aster models, and the (just released) aster models with random effects. All of these will be discussed with emphasis on their practical effects on aster analysis.

Statistics students will learn about algorithms for generalized linear models and aster models with random effects and about exponential family theory relevant to aster models, including conditions for existence (in the conventional sense) of maximum likelihood estimates in exponential families and how to do valid hypothesis tests and confidence intervals when they do not exist (in the conventional sense).

We hope mixing graduate students in biology and statistics will lead to each group learning from the other. Biology students may not understand all the theory but should learn enough to gain important insights about issues that arise in practice (for example, what to do when maximum likelihood estimates do not exist and the `summary` function in the `aster` package complains about "directions of recession"). Statistics students may not understand all the biology but should learn about important issues that arise in application of statistics in real science (which are very different from toy examples in textbooks and statistics journals).