# STAT 534 Statistical Computing

## A many-threaded roadmap through the course

### python

- python data structures -numpy, list, string, dict -simple variables and references
- file input/output
- functions and modules -range/scope of variables
- random number generation
- parallel programming in python

### Elements of computer systems

- the RAM (Random Access Memory)
  - garbage collection and memory management

  - pointers/memory addresses
- computer architecture in a nutshell
- processes, threads, programs
  - interpreted vs compiled programming languages
  - stacks, heaps, queues

### Data structures (and algorithms)

- the basics -dynamic sets (i.e. sets of varying size): stack, heap, queue, list CRLS 10.1, 10.2, 10.3 -static sets (i.e. pre-allocated): arrays
- storing and retrieving data from trees (and maybe tries) CRLS 12.1, 12.2, 12.3
- dynamic programming CRLS 15
- hashing and hash-tables CRLS 11.1, 11.2, [11.3]
- a data structure for disjoint sets (one of the 10 most elegant algorithms on a list by Robert E. Tarjan
- graph algorithms *this is already a lot! will we get to do it all?*

### Markov Chains and MCMC

- Markov chains
- MCMC
  - Gibbs sampling
  - Metropolis-Hastings sampling
  - Swendsen-Wang *if time*