parker-notes

Parker Simulation Chapter

Introduction to simulations:

Simulations will allow: - Statistical inference to complex models - Estimate quantities that can't be carried out analytically - Make predictions from certain scenarios (such as the outcome of an event)

Covered in **Parker Simulation Chapter**
- Simulating a sample from common probability distributions (creating data that will occur in a certain way from different types of distribution) - Simulation experiments for sampling distributions (using statistical methods to make predictions) - Simulation experiments for type I error rates and power calculations (can test the performance of a statistical test)

Simulating from non-standard distributions (Accept-Reject and MCMC): these do not have straightforward mathematical formulas for generating random values.

Accept-Reject method: - Will generate random samples from a difficult to sample distribution (instead uses a simpler distribution) - This simpler distribution will surround the target distribution - Random samples are drawn from the simpler distribution, samples are accepted or rejected based on a certain criteria - Accepted samples used as samples from the target distribution

Markov Chain Monte Carlo (MCMC) - Broad class of techniques: includes several algorithms used to generate samples from complex distributions - Constructs a Markov chain (a sequence of states) – distribution of states converges to the desired target distribution - Powerful method for simulating from distributions that are challenging to the sample directly

Simulation experiment from a SIR epidemic model - This part of the chapter will show one how to use simulations to study and analyse the dynamics of an infectious disease - This is done using an SIR model (susceptible infectious recovered) epidemic model - The SIR model is a basic compartmental model in epidemiology – describes the the spread of infectious diseases within a population