

BIO 480/680 – Final Exam Topics

Stochastic models

- Meanings: stochastic, deterministic, random, chaotic
- Generating random numbers with computers
 - Uniform deviates
 - Use of random function in Python language, seeding
 - Scaling generated random numbers
 - Uniformity and sequential correlations
 - Other problems – sequences repeat, limited resolution

Random processes and population models

- Random births and deaths, assumptions
- Modeling process: generate random number, compare to P_+ , P_-
- Model results
 - Individual runs versus average run
 - Effects of birth and death rates
 - Similarities to deterministic population models?
 - Strengths and weaknesses

Chaotic systems

- History
- Definition – deterministic but unpredictable
- May's model
 - Equation
 - Meaning and effect of changing "a"
 - Effect of changing initial population size
 - Similarity to logistic function model except for special conditions applied in May's model (What were these?)
 - Logistic function solution behavior with Euler's method and large time step size
- Bifurcation diagrams, chaotic vs stochastic and predictability

Bioinformatics

- Definitions (along with genomics, proteomics)
- Why do we care about sequences?
- Alignment methods
 - Dynamic programming methods
 - alignment process, traceback
 - amino acid substitution matrix, gap/mismatch penalties

Genetic programming & Artificial Life simulations

- Definitions of terms
- Evolutionary computation
- Avida program (concepts, process, results)
 - (See Discover article)

General Programming (See the 3 programming guides: ComputerProblems1.pdf...)

- Variable types
- for loops, range function
- if statements
- Defining functions with "def"

General review – major course themes