

Assignment 4: How fluctuations vary with population size

Repeat Assignment 1 (mutation without selection) in a slightly different way. Divide population of size N equally between two types of individuals A and B represented by the numbers 0 & 1. Define mutation rates u_1 and u_2 . Use $u_1=0.003$ and $u_2=0.001$

1. Repeat each simulation for different population sizes $N=50, 100, 200, 300, 400, 600, 800, 1000, 5000$ for $N_T=100$ trials
2. For each value of N , choose a time-step at which the system has equilibrated (use your results from Assignment 1 to make this choice). For that time step, calculate the mean frequency and variance of the frequency by averaging over $N_T=100$ trials. Use the type with the large equilibrated frequency.

$$\langle f \rangle_{trials} = \frac{1}{N_T} \sum_{i=1}^{N_T} f \quad : \text{Mean}$$

$$\langle (\delta f)^2 \rangle_{trials} = \langle f^2 \rangle_{trials} - (\langle f \rangle_{trials})^2 \quad : \text{Variance}$$

Plot a graph of Variance vs $(1/N)$ and show that it is a straight line. This simulation is meant to show that fluctuations arising due to finite size of the population (quantified by variance) is *inversely proportional to population size (N)*.

Submission Deadline: Feb. 7, 2018