

# Agent-based model of evolution in asexually reproducing populations

Short model description

# Nichol et al. paper

- “Steering Evolution with Sequential Therapy to Prevent the Emergence of Bacterial Antibiotic Resistance”, Nichol et al. 2015, Plos CB
- Evolutionary dynamics of an asexually reproducing population with unspecified, but variable, population size in which individuals are subject to point mutation at reproduction.
- Considers adaptation as a biased random walk on a fitness landscape.

# This ABM model

- The model keeps track of allele types over generations
- Division rates differ depending on allele type
  - Fitness landscape (average growth rates) information is taken from the available data.
- There is constant mutation rate for all cells.
  - If mutation happens the direction is decided by the transition matrix
  - Can incorporate any transition matrix
  - Right, now I am using a transition matrix for random mutation directions up to Hamming distance.
- Fixed death probability for all cells

# Each generation for each cell

1. Generate a random number
  - Kill the cell if the number is less than the overall death rate.
2. Otherwise, generate a random number
  - Divide the cell if the number is less than division rate of it's allele type
1. For generated daughter cells, generate a random number
  - Change the allele type if the number is less than the overall mutation rate
  - New allele type is chosen randomly from the transition matrix probabilities

# Each generation for each cell

