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*Mathematical methods in evolutionary dynamics*

Evolutionary dynamics permeates life and life-like systems. Mathematical methods can be used to study evolutionary processes, such as selection, mutation, and drift, and to make sense of many phenomena in life sciences. I will present two very general types of evolutionary patterns, loss-of-function and gain-of-function mutations, and discuss scenarios of population dynamics – including stochastic tunneling and calculating the rate of evolution. I will also talk about evolution in random environments. The presence of temporal or spatial randomness significantly affects the competition dynamics in populations and gives rise to some counterintuitive observations. Applications to biomedical problems (such as the role of aspirin in delaying cancer) will be discussed.