

Directionality and community-level selection

Guy Bunin

The dynamics of some systems are directional, meaning that the state of a system can be characterized by a function that increases in time. This includes, for example, the growth of entropy in physical systems, or the growth of fitness in certain formulations of Darwinian evolution. Yet even when directionality holds, it might be sensitive to perturbations, such as interactions in evolutionary dynamics. I'll describe a model of ecological community dynamics which features a phase-transition, from a regime where directionality is sensitive to a regime where it is robust. This has far reaching consequences: In the latter phase, the system admits many alternative community states, that are able to expand in space, forming (exact or approximate) copies of themselves. This leads to community-level selection, in analogy with Darwinian selection, with the increasing function acting as a fitness.