Quasi-equilibria and click times for a variant of Muller's ratchet

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Nov 17, 10am

Consider a population of N individuals, each of them carrying a type in $\mathbb{N}_0$. The population evolves according to a Moran dynamics with selection and mutation, where an individual of type k has the same selective advantage over all individuals with type $k' > k$, and type k mutates to type $k + 1$ at a constant rate. This model is thus a variation of the classical Muller's ratchet: there the selective advantage is proportional to $k' - k$. For a regime of selection strength and mutation rates which is between the regimes of weak and strong selection/mutation, we obtain the asymptotic rate of the click times of the ratchet (i.e. the times at which the hitherto minimal (best) type in the population is lost), and reveal the quasi-stationary type frequency profile between clicks. The large population limit of this profile is characterized as the normalized attractor of a dual hierarchical multitype logistic system.

Joint work with Adrian Gonzalez Casanova and Anton Wakolbinger.