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How genealogies are affected by the speed of evolution

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In a series of recent works it has been shown that a class of simple models of evolving populations under selection leads to genealogical trees whose statistics are given by the Bolthausen-Sznitman coalescent rather than by the well known Kingman coalescent in the case of neutral evolution. Here we show that when conditioning the genealogies on the speed of evolution, one finds a one parameter family of tree statistics which interpolates between the Bolthausen-Sznitman and Kingman's coalescents. This interpolation can be calculated explicitly for one specific version of the model, the exponential model. Numerical simulations of another version of the model and a phenomenological theory indicate that this one-parameter family of tree statistics could be universal. We compare this tree structure with those appearing in other contexts, in particular in the mean field theory of spin glasses.

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