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The phylogenetic operad

Phylogenetics is concerned with the study of evolutionary relationships among species or genes. These relationships are usually represented by metric trees called phylogenetic trees. In 2001 Billera, Holmes and Vogtmann introduced a space that parametrizes the set of all phylogenetic trees with a fixed set of leaf labels, and since then a lot of research has been done to understand the combinatorics and geometry of this space to develop suitable statistical methods. In this talk I will present joint work with John Baez that relates the space of phylogenetic trees to a certain operad, which we call the phylogenetic operad. I will first introduce the space of phylogenetic trees, and talk about some of its combinatorial and geometric properties. Then I will give a gentle introduction to operads and describe two results: the space of phylogenetic trees with n leaves is homeomorphic to the space of n-ary operations of the phylogenetic operad, and Markov processes used in phylogenetics give coalgebras over this operad.