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Fatgraphs for string topology and polytopes for V-infinity algebras

Spaces of fatgraphs have long been used to study a variety of topics in math and physics. In this talk, we introduce two spaces of fatgraphs arising in string topology—one which parameterizes operations on chains of the free loop space of a manifold and one which parametrizes operations on Hochschild cochains of a "V-infinity" algebra. We present a conjecture relating these two spaces to one another and to the moduli space of Riemann surfaces. We also introduce polyhedra called "assocoipahedra" which generalize Stasheff's associahedra to algebras with a compatible co-inner product. Assocoipahedra are used to prove that the dioperad governing V-infinity algebras is Koszul. This is joint work with Gabriel C. Drummond-Cole, Nathaniel Rounds, and Thomas Tradler.