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*Higher Categorical Associahedra*

The associahedron is a well-known polytope with connections to many different areas of combinatorics, algebra, geometry, topology, and physics. The associahedron has Catalan number many vertices which can be equivalently described in terms of triangulations of a polygon, planar binary trees, maximal parenthesizations of a word, etc. From one perspective, the associahedron encodes the combinatorics of morphisms in the Fukaya category of a symplectic manifold. In 2017, Bottman introduced a family of posets called 2-associahedra which encode the combinatorics of functors between Fukaya categories, and he conjectured that they can be realized as the face posets of convex polytopes. We will begin by reviewing the basic theory of associahedra. We will then introduce categorical  $n$ -associahedra as a natural extension of associahedra and 2-associahedra, and we will produce a family of complete polyhedral fans called velocity fans whose face posets are the categorical  $n$ -associahedra. This is joint work with Nathaniel Bottman and Daria Poliakova.