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**Nicolle Gonzalez\*** (nicolle@math.ucla.edu) and **Matt Hogancamp**. *A skein theoretic Carlsson-Mellit algebra.*

The shuffle theorem gives a combinatorial formula for the Frobenius character of the space of diagonal harmonics in terms of certain symmetric functions indexed by Dyck paths. In their proof, Carlsson and Mellit introduce a new interesting algebra denoted  $A_{q,t}$ . This algebra arises as an extension of the affine Hecke algebra by certain raising and lowering operators and acts on the space of symmetric functions via certain complicated plethystic operators. Afterwards Carlsson, Mellit, and Gorsky showed this algebra and its representation could be realized using parabolic flag Hilbert schemes and in addition to containing the generators of the elliptic Hall algebra. Despite the various formulations of this algebra, computations within it are extremely complicated and non-intuitive.

In this talk I will discuss joint work with Matt Hogancamp where we construct a new topological formulation of  $A_{q,t}$  and its polynomial representation as certain braid diagrams on an annulus. This framework allows many difficult computations to become simple diagrammatic manipulations. Moreover, this new topological construction yields a categorification of its representation as certain functors over the derived trace of the Soergel category. (Received August 31, 2021)