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Web Duality

Two classically studied rings are the homogenous coordinate ring of the Grassmannian of k -planes in n -space and the ring of SL_r tensor invariants. Each of these spaces can be understood through certain planar diagrams called webs. In particular, the rings of SL_3 and SL_4 tensor invariants have rotation-invariant web bases due to Kuperberg and Gaetz–Pechenik–Pfannerer–Striker–Swanson respectively. Fraser, Lam, and Le showed a relationship between these spaces via their immanant map. In some small cases, these three authors observe a phenomenon they call “web duality” in which web immanants, i.e. the output of the immanant map from basis webs, are also web invariants. Moreover, this duality can be realized by taking the transpose of standard young tableaux, which index basis webs. We show that this duality continues to hold for a large set of SL_3 and SL_4 webs. Applications of this duality to cluster variables in the coordinate ring of the Grassmannian will be presented by Kayla Wright in the following talk. This is based on joint work with Catania, Gaetz, Moore, Musiker, and Wright.