

A QUEST FOR A TUTTE POLYNOMIAL OF EMBEDDED GRAPHS

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(This talk is based on joint work with Iain Moffatt.)

The Tutte polynomial is a *universal invariant*, whose specialisations include the chromatic polynomial, the Jones polynomial of an alternating knot, the partition function of the Potts model, the weight enumerator of linear codes, among others. One of its key characteristics is that it can be defined in *three equivalent ways*: a sum over edge states, recursively via edge deletion–contraction and a sum over spanning trees.

For the past several decades, there has been much interest in finding a topological analogue of the Tutte polynomial for graphs embedded in surfaces (Figure 1). In this talk, I will give a brief overview of the resulting family of *topological Tutte polynomials* and how their approaches diverged. In joint work with Iain Moffatt, we unified this divergence to obtain a new Tutte polynomial for embedded graphs that specialises to all its predecessors while retaining their properties. I will explain how our resulting polynomial recovers key characteristics of the classical Tutte polynomial: it is a universal topological graph invariant with three analogous definitions via state-sum, deletion–contraction and summing over spanning quasi-trees.

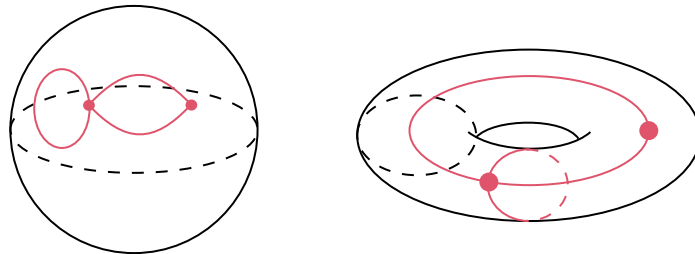


Figure 1: Two nonequivalent cellular embeddings of the same graph.