A Coboundary Polynomial for Subspace Configurations

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(joint work with Dominic Welsh)

An edge of a vertex–coloured graph is *bad* if both of its incident vertices have the same colour. The so–called coboundary polynomial of graph enables one to enumerate, for given λ and k, the number of λ–colourings with exactly k bad edges. The talk will consider a generalisation of this polynomial to subspace configurations.

Via this single polynomial we are able to obtain analogues of the coboundary polynomial for a number of seemingly diverse problems. For example, given a collection S of subspaces of a finite vector space V, then, for any r and k we can enumerate the number of r–dimensional subspaces that contain exactly k members of S. We also obtain a bad–colouring polynomial for hypergraphs, and a k–defect version of a stable–set polynomial for graphs and hypergraphs.