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Colourings, Simple Colourings, and a Connection to Bootstrap Percolation

Define a k -colouring of a mixed graph to be a homomorphism to a k -vertex (complete) mixed graph. A simple colouring of a mixed graph is a homomorphism to a reflexive mixed graph. Intuitively one would expect the simple chromatic number of a family of mixed graphs to be less than the chromatic number – surely allowing adjacent vertices to have the same colour will allow us to use fewer colours. In this talk we explore cases where our intuition fails us using via a connection between simple colouring and a directed bootstrap percolation process.