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Canonical colourings in random graphs

Rödl and Ruciński established Ramsey's theorem for random graphs. In particular, for fixed integers r, $\ell \geq 2$ they showed that $n^{-\frac{2}{\ell+1}}$ is a threshold for the Ramsey property that every r-colouring of the edges of the binomial random graph $G(n,p)$ yields a monochromatic copy of K_ℓ.

We investigate how this result extends to arbitrary colourings of $G(n,p)$ with an unbounded number of colours. In this situation Erdős and Rado showed that *canonically coloured* copies of K_ℓ can be ensured in the deterministic setting. We transfer the Erdős–Rado theorem to the random environment and show that for $\ell \geq 4$ both thresholds coincide. As a consequence the proof yields $K_{\ell+1}$-free graphs G for which every edge colouring yields a canonically coloured K_ℓ.

This is joint work with Nina Kamčev.