Simonovits's Theorem in random graphs.

Ilay Hoshen

Let H be a graph with $\chi(H) = r + 1$. Simonovits's Theorem states that the unique largest H-free subgraph of K_n is its largest r-partite subgraph if and only if H is edge-critical. We show that the same holds with K_n replaced by $G_{n,p}$ whenever H is also strictly 2-balanced and

$$p \geq Cn^{-1/m_2(H)} \log(n)^{1/(e(H)-1)},$$

for some constant $C > 0$. This (partially) resolves a conjecture of DeMarco and Kahn, who proved the result in the case where H is a complete graph.

Joint work with Wojciech Samotij.