Many T copies in H-free subgraphs of random graphs

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For two fixed graphs T and H let $\mathrm{ex}(G(n,p),T,H)$ be the random variable counting the maximum number of copies of T in an H-free subgraph of the random graph $G(n,p)$. In this talk we will discuss the behaviour of this variable, focusing mostly on the case where $T = K_m$ and H has a chromatic number at least $m+1$.

Let $m_2(H) = \max\left(e(H')-1\right)/(v(H')-2)$ for $H' \subset H$, $|H'| > 2$. We will show that there are two main behaviours of $\mathrm{ex}(G(n,p),T,H)$ depending on p. The phase transition between these behaviours depends on the value of $m_2(H)$ and whether it is greater or smaller then $m_2(T)$ (where both cases are possible when $T = K_m$ and $\chi(H) = m+1$).

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