

Institut für Diskrete Mathematik

Combinatorics Seminar

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Online meeting (Webex) & AE06, Steyrergasse 30

Local Central Limit Theorem for Clique Counts in $G(n, p)$

ILAY HOSHEN

(Tel Aviv University)

Let X_H denote the number of copies of a fixed graph H in $G(n, p)$. In 2016, Gilmer and Kopparty conjectured that X_H satisfies a local central limit theorem (LCLT) provided that H is connected, $p \gg n^{-1/m(H)}$, and $n^2(1-p) \gg 1$. While a standard CLT describes the convergence of the cumulative distribution function, an LCLT provides a much sharper estimate: it shows that the probability of X_H taking any specific integer value k is asymptotically equal to the density of the corresponding normalised Gaussian distribution at k .

Following the above, Sah and Sawhney (2020) confirmed the conjecture for constant p , leaving the regime where $p = o(1)$ open. In this regime, the only case addressed in the literature is when $H = K_3$. Indeed, in a recent paper, Araújo and Letícia (2023) confirmed the conjecture for $H = K_3$ and $p \in (4n^{-1/2}, 1/2)$, which, together with a general result of Röllin and Ross, settles the conjecture for triangles. In this talk, we present a generalisation of this result, and show that an LCLT holds for $H = K_r$ (for any fixed $r \geq 3$) in the regime $n^{-1/m(H)} \ll p \leq 0.5$. This settles the case of cliques as well.

This is joint work with Asaf Cohen Antonir and Maksim Zhukovskii.

Webex link:

<https://tugraz.webex.com/tugraz/j.php?MTID=mf05f6b3ceacd2516780fb034db51464d>

Fabian Burghart, Mihyun Kang