

Title: The Fox conjecture, log-concavity and deep-learning

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Abstract:

In the 1960s, Ralph Fox conjectured that the coefficient sequence of the Alexander polynomial of an alternating knot is unimodal. Stronger versions of this conjecture have been formulated since; in particular one may ask whether the Alexander polynomial is log-concave. While Fox's conjecture remains open, modern machinery developed by June Huh and others on log-concave polynomials offer a glimpse of hope.

I will discuss the background from knot theory, Fox's conjecture and its friends, log-concavity and recent work on log-concave sequences, and outline a novel connection between rational tangles and combinatorics on words. This gives a proof of log-concavity of the Alexander polynomial for two-bridge knots, a well-known class of alternating links. If time permits, I will explain why this problem is ideally suited to be studied by applying modern sequence models from deep-learning (i.e. Transformers).