



GROUPS, LOGIC, AND COMPUTATION. GAGTA-2025

Sergei Gukov

Caltech

AI and AC.

June 6–13, 2025

Abstract:

Using a long-standing conjecture from combinatorial group theory, we explore, from multiple perspectives, the challenges of finding rare instances carrying disproportionately high rewards. Based on lessons learned in the context defined by the Andrews-Curtis conjecture, we propose algorithmic enhancements and a topological hardness measure with implications for a broad class of search problems. As part of our study, we demonstrate the length reducibility of all but two presentations in the Akbulut-Kirby series (1981) and resolve various potential counterexamples in the Miller-Schupp series (1991), including three infinite subfamilies.

Based on recent work with A.Shehper, A.Medina-Mardones, L.Fagan, B.Lewandowski, A.Gruen, Y.Qiu, P.Kucharski, and Z.Wang.