

Gallai's Conjecture in Complete Graphs and "Nearly" Complete Graphs

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This work explores Gallai's conjecture by way of removing edges from complete graphs. We first provide a construction for a path decomposition of complete graphs that satisfies Gallai's Conjecture. We then use that construction to prove that we can remove configurations from the complete graphs including stars and cycles with hanging edges, such that the resulting graph still satisfies Gallai's Conjecture. Additionally, we prove through casework and relabeling edges that we can remove a small number of edges from sufficiently large complete graphs and still have a graph satisfying Gallai's conjecture.

Keywords: Gallai's conjecture, complete graph, edge removal, path decomposition