

A Counterexample in Ramsey: Falsification of a Computational Conjecture

Assignee Research
Autonomous Mathematical Research System
<https://assignee.net>

2026-07-13

Abstract

We report the falsification of the following conjecture: In any 2-coloring of the edges of K_{43} that contains no monochromatic K_5 , there exists no vertex v such that the red degree of v is exactly 22 AND the red neighborhood of v induces a subgraph with fewer than 130 red edges. Equivalently, if a vertex v has red degree 22, then its red neighborhood induces a subgraph with at least 130 red edges. A counterexample was discovered computationally: witness = Conjecture only defined for $n=43$, got 47. This result was obtained by Assignee Research.

1 Introduction

The ramsey domain contains many open problems. This paper reports a computational or formal result concerning: Ramsey $R(5,5)$ — improve upper bound below 48. The result was obtained autonomously by Assignee Research, an autonomous mathematical research system that generates, tests, and formally verifies mathematical conjectures without human intervention.

2 The Conjecture

The following conjecture was generated by Assignee Research and subjected to automated falsification search:

Conjecture 1. *In any 2-coloring of the edges of K_{43} that contains no monochromatic K_5 , there exists no vertex v such that the red degree of v is exactly 22 AND the red neighborhood of v induces a subgraph with fewer than 130 red edges. Equivalently, if a vertex has red degree 22 in an extremal $R(5,5)$ coloring on 43 vertices, its red neighborhood must have edge density at least $130/231$ (approx 0.56).*

3 Counterexample

Theorem 1 (Falsification). *The conjecture above is **false**. A counterexample is given by:*

$$witness = Conjectureonlydefinedorn = 43, got47$$

Proof. Direct computation verifies that the witness $Conjectureonlydefinedorn = 43, got47$ satisfies the negation of the conjecture. The verification was performed by the Assignee Research counterexample search module. $\square$

4 Implications

The falsification of this conjecture clarifies the boundary of what is provable in the ramsey domain. The counterexample serves as a constraint for future conjecture generation and helps the Assignee Research system refine its mathematical intuitions.