

# Problema de la coloración mínima

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**Abstract**—Graph coloring is a fundamental problem in graph theory and combinatorial optimization, where the goal is to assign colors to the vertices of a graph such that no two adjacent vertices share the same color. This problem has many applications in real-world problems such as scheduling, register allocation, and frequency assignment. Despite its simplicity in definition, the problem is NP-hard, making it computationally challenging for large and complex graphs.

**Keywords**—Particle Swarm Optimization (PSO), NP-hard Problems, Graph Theory, Algorithms, Minimum Graph Coloring

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