

# Map Coloring

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## 1. Introduction

The map coloring problem is a well-known problem in computer science and graph theory. It involves assigning colors to different regions on a map, such as countries or territories.

This problem has practical applications in various fields, and it is known to be a challenging computational problem. Various algorithms and techniques have been developed to solve it, aiming to find valid and efficient coloring schemes that satisfy the given constraints.

In this project, our group will explore different search algorithms to solve the map coloring problem.

## 2. Variables and Domain

Let M represent regions,

Let N represent colors

variables: regions  $M_i$ ,  $i=1$  to  $i=x$   $\{M_1, M_2, M_3, \dots, M_x\}$

Domain : colores  $\{N_1, N_2, N_3, \dots, N_y\}$

## 3. Constrains

For M regions and N colors, no two adjacent regions have the same color.

Example: if  $M_1$  and  $M_2$  are adjacent regions the color  $N_1$  associated with  $M_1$  must not be the same as the color  $N_2$  associated with  $M_2$ , so  $N_1 \neq N_2$ .

## 4. Objective Function

In the Map Coloring Problem, we typically want to minimize the number of colors used. However, as a CSP, we don't usually define an objective function. The goal is to find a solution that satisfies all constraints. If we were to define an objective function, it could be to minimize the sum of the colors used, represented as:

$$\text{Min } \sum_{i=1}^n X_i$$