

# L05 Constraint Satisfaction

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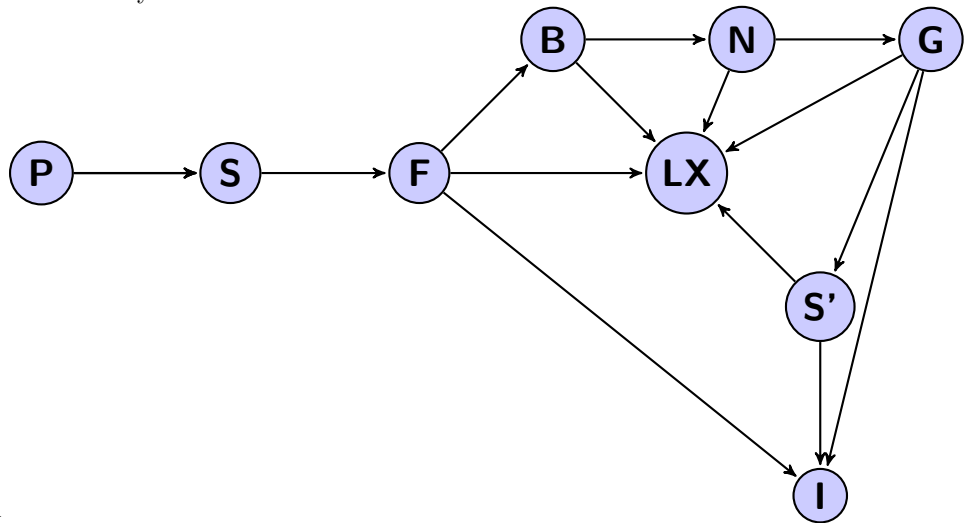
Restrictions on variables, Set of variables that represent your problem.  
ex. Quantities in chemical reaction. Time/Schedule for operation.

1. Set of variables  $X_i$
2. each variable has a domain  $d_i$
3. Goal test  $\rightarrow$  checks for a solution.

Assign colours such that no two adjacent countries share a colour

## 1 Constraint Graph

**Variables** Colour at each country



**Domain**  $\{R, G, C, Y\}$

### 1.1 Using Search??

1. Types of **CSPs** - which are we solving here?

2. CSPs with continuous (Real valued variables)
3. Discrete variables, finite -i graph colouring infinite -i scheduling

Don't use BFS. rather use DFS or in constraint graphs **"Backtracking Search"**

Choose variables from a root in some order.

Choose another variable.

If we come to a solution then we're done. But if there aren't any more possible nodes (Because of our constraints). Then go back up.

## 1.2 Sudoku

**Variables**  $9 \times 9 = 81$  variables

**Constraint** sudoku.

Search has **A LOT of constraints!**

Allow search to break a few constraints and then pay a penalty:  $\sum_{BrokenConstraints} W_i > Total$

Backtrack if the penalty surpasses some limit