Backtracking

Search

and

Constraint
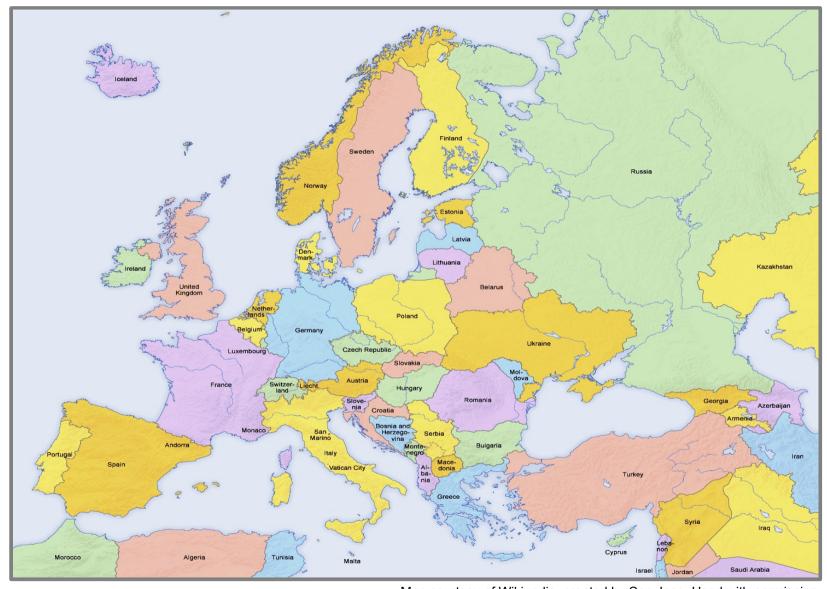
Satisfaction

Map courtesy of Wikipedia, created by San Jose. Used with permission.

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<-- That is Europe

Pretty...

Notice the map uses 6 colours

but

we can do better!

- We can colour the map using only four colours in such a way that no adjacent
  countries have the same colour

- To do so, we formulate the map colouring problem as graph, with nodes
  representing countries, and edges that represent adjacency

Q1 – Draw one such graph for the following countries:
   Portugal, Spain, Andorra, France, Luxembourg, Belgium, Netherlands,
   Germany, Switzerland, Italy, Czech Republic, Austria, and San Marino

   Be careful that your graph does not contain crossing edges!

- We can find a suitable colouring using backtracking search. Assuming that you can use the four colours **red, green, blue, yellow**. Answer the following:

Q2 – What are the variables in this problem? What do they represent?

Q3 – What is the domain of each variable?

Q4 – Which variable(s) intervene in the largest number of constraints? (and how many?)

Q5 – Which variable(s) intervene in the least number of constraints? (and how many?)

-Recall there are rules to help you decide which variables to choose earlier during the search.

Q6 – In this graph, which variable should be chosen first?

Q7 – Which variable should be chosen next?

Q8 – Show the first 3 levels of the search tree with the values assigned to the variables chosen at each level (note we're not actually searching, since the search would go all the way down before backtracking).

- Sudoku is a great example of a constraint satisfaction problem.

Q7 – Draw edges on the diagram below showing which nodes are constrained by the '7' on the top-middle red quadrant.

Q8 – How many variables are there?

Q9 - What is the upper bound on the size of the search tree for this particular Sudoku?

Q10 – What square should be expanded first (and why)?

The 1-minute paper

One minute before the end of tutorial, your TA will ask you to bring out a clean sheet of paper to hand in. In this sheet you will write:

Name (last, first)

Student number

And briefly answer the following question:

Is the current combination of lecture time, programming assignments, and problem-solving tutorials helping you gain a good understanding of the AI topics covered so far?

(yes, no, and why. Also, if your answer is no, what is missing from the course in your opinion?)

Hand this sheet to your TA. We will use these 1-minute papers (there will be one after each tutorial), along with our observations on your *preparedness, participation, and hard work* during tutorials to assess the 5% of your final mark corresponding to tutorial participation.