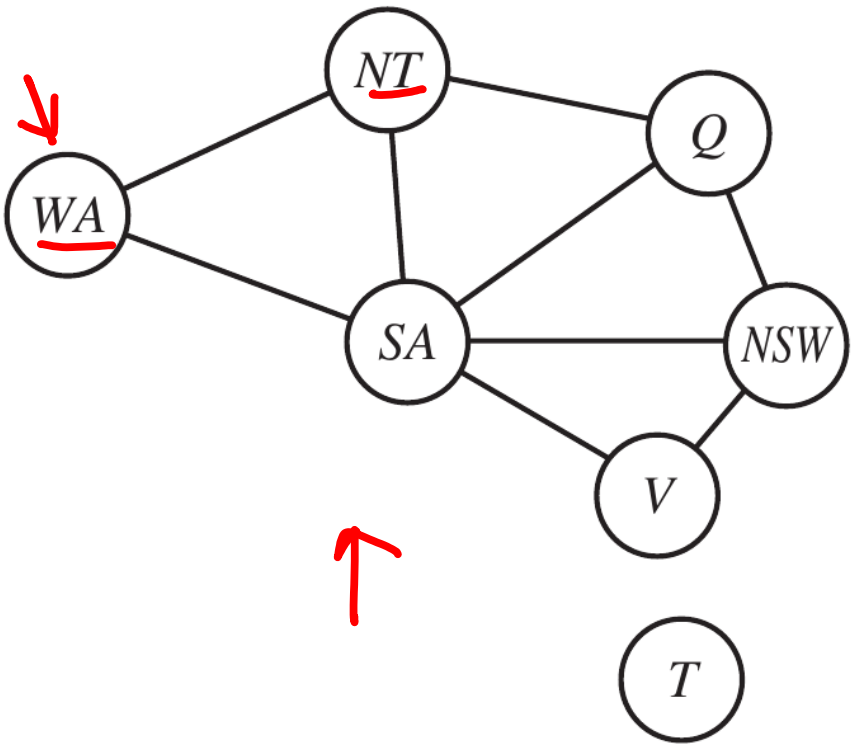
Artificial Intelligence [1]

BITS-Pilani Goa

[1] Material for the presentation taken from Stuart Russell and Peter Norvig, *Artificial Intelligence – A Modern Approach, Third Edition*;

Example: Map coloring problem

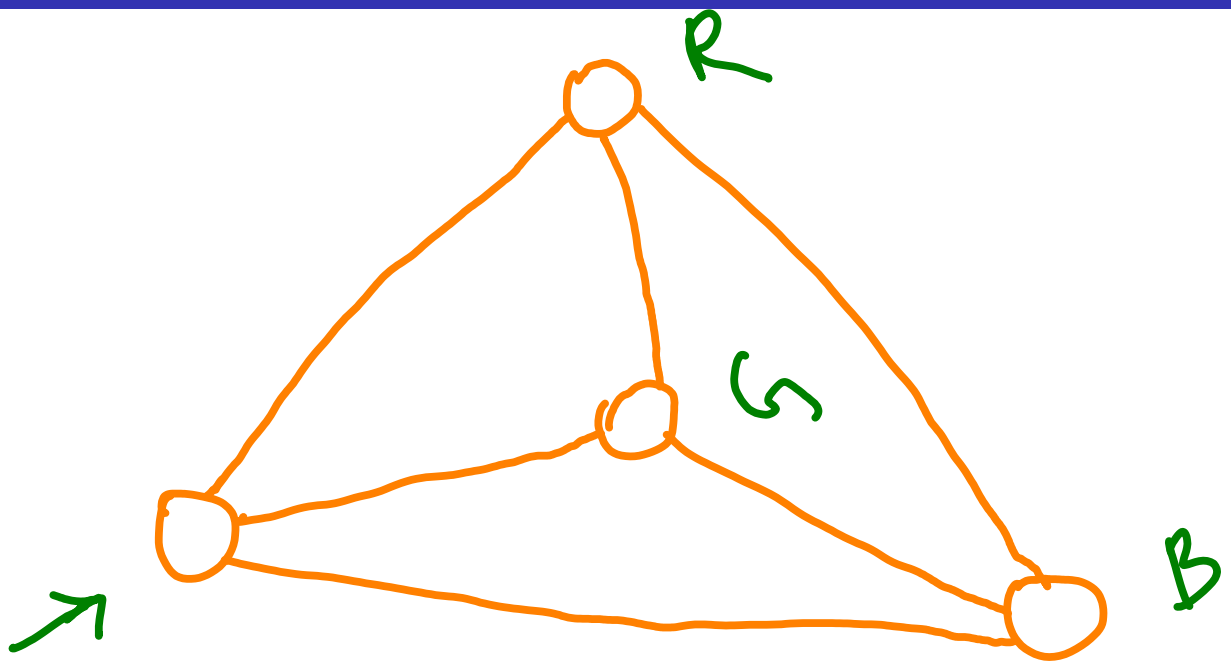
(a)



(b)

Figure 6.1 (a) The principal states and territories of Australia. Coloring this map can be viewed as a constraint satisfaction problem (CSP). The goal is to assign colors to each region so that no neighboring regions have the same color. (b) The map-coloring problem represented as a constraint graph.

Vertex-coloring problem



Is it 3-colorable ?

$(3)^n$

$3 \times 3 \times 3 \ldots \times 3 = 3^n$

$O(3^n)$

Vertex-coloring problem

- Best algorithm will still take exponential time (unless $P = NP$).
- Current best algorithm: $O(1.3289^n)$
- We are only interest in **general** tools and techniques for Constraint Satisfaction Problems.

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- We will define a problem.
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- The problem turns out to be NP-hard.
- What are the general techniques (**heuristics**) we can use so that the problem can be solved more easily in practice?