

CSCI 5582 Artificial Intelligence

Fall 2006
Jim Martin

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Today 9/14

- Constraint Sat Problems
- Admin/Break
- Constraint Sat as Iterative Improvement

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Search Types

- Backtracking State-Space Search
- Optimization-Style Search
- Constraint Satisfaction Search

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Constraint Satisfaction

- In CSP problems, states are represented as sets of variables, each with values chosen from some domain
- A goal test consists of satisfying constraints on sets of variable/value combinations
- A goal state is one that has no constraint violations

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Examples

- Simple puzzles
- Graph coloring
- Scheduling problems
- Any constrained resource problem

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N-Queens

- Place N queens on a chess board such that no queen is under attack from any other queen.

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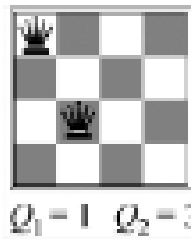
4-Queen Example

- Assume a 4x4 board
- Assume one queen per column
- 4 Variables (Q_1, Q_2, Q_3, Q_4)
- 4 possible values (1,2,3,4)
- Constraints...

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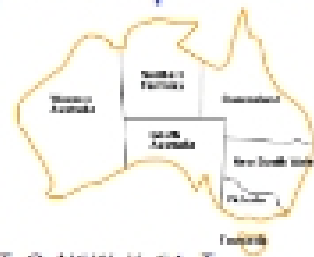
Constraints

- $V(Q_i) \neq V(Q_k)$
 - Can't be in the same row
- $|V(Q_i) - V(Q_k)| \neq |i - k|$
 - or the same diagonal



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Example: Map-Coloring



- Variables: WA, NT, Q, NSW, V, SA, T
- Domain: $D_i = \{\text{red, green, blue}\}$
- Constraints: adjacent regions must have different colors
- e.g., $WA \neq NT$, or $(WA, NT) \in \{(\text{red, green}), (\text{red, blue}), (\text{green, red}), (\text{green, blue}), (\text{blue, red}), (\text{blue, green})\}$

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