# Advanced Constraint Techniques

**Kumar, “Algorithms for constraint satisfaction problems: A survey”**

**Barták, “Constraint programming: In pursuit of the holy grail”**

# Review

- Represent a problem as a set of variables and constraint among those variables
  - For binary constraints, result is a constraint graph G = (**V**, **C**) with N variables and M constraints
- Use search and/or constraint propagation to solve the constraint network
- Improve efficiency of solving by
  - Interleaving search and constraint propagation
  - Variable ordering
  - Value ordering
  - Intelligent backtracking

# Ordered constraint graphs

- Select a variable ordering, $V_1$, …, $V_n$
- **Width of a node** in this OCG is the number of arcs leading to earlier variables:
  - $w(V_i)$ = Count ( $(V_i, V_k) \mid k < i$)
- **Width of the OCG** is the maximum width of any node:
  - $w(G)$ = Max ($w(V_i)$), $1 <= i <= N$
- **Width of an unordered CG** is the minimum width of all orderings of that graph (“best you can do”)