1 Search

Total cost = Time to find a solution (off-line cost) + Cost of the solution path (on-line cost).
Strategy evaluation criteria:

- **Completeness**: does the strategy guarantees to find a solution if one exists?
- **Time complexity**: how long does it take to find a solution?
- **Space complexity**: how much memory is needed to carry out the search?
- **Optimality**: does the strategy find the best solution when there are more solutions?

2 Games

TODO

3 Constraint Programming

TODO

3.1 Propagation algorithms

- **Standard Backtracking**: Assign without checking future constraints, then check validity
- **Forward Checking**: After each assignment propagate the constraints from the assigned value to the free values
- **Partial Look Ahead**: After Forward Checking check constraints between free values in one direction
- **Full Look Ahead**: After Forward Checking check constraints between free values in both directions

4 Algorithms

b	branching factor
d	solution depth
m	maximum depth of the search tree
l	depth limit

Name	**Complete**	**Optimal**	**Time**	**Space**	**Notes**
Non-informed search strategies					
Breadth-First	Yes	Yes	b^d	b^d	Add the children nodes to the fringe, then iterate over them in FIFO order.
Uniform-Cost	Yes	Yes	b^d	b^d	Each node has a cost. Add the children to the fringe, then iterate over them in order of passed path cost.
Depth-First	No	No	b^m	bm	Expand the first child, then open it. Proceed until a leaf is found. If a node is not a success, backtrack and open it's brother.
Depth-First, limited depth	If $l \geq d$	No	b^l	bl	Like Depth-First, with a max depth.
Iterative Deepening	Yes	Yes	b^d	bd	Like Depth-First with limited depth, but at each failure increase the max depth and restart.
Informed search strategies					
Best-First	No	No	b^d	b^d	Breadth-first, estimating the cost of future steps as heuristic.
A*	Yes	Optimistic heuristic			Breadth-first, estimating the cost of passed and future steps as heuristic.
Local search					
TODO	TODO	TODO	TODO	TODO	
Swarm intelligence					
Ant Colony Optimization					Based on ants' behavior, positive feedback based on pheromone trails
Artificial Bee Colony					Individuals with different functions
Particle Swarm Optimization					Based on the observation of bird flocks or fish shoals. Stigmergy is used as communication.
Games					
Min-Max	Yes	Yes	b^m	bm	Min player minimizes, Max player maximizes. Graph search alternating moves and assuming the opponent plays at its best.
Min-Max, α/β pruning	Yes	Yes	$\leq b^m$, $\geq b^{\frac{m}{2}}$		Keep track of max and min value found, cut branches that would never be accessed.
Constraint programming					
Generate and Test					No propagation: generate full solution then check constraints.
Standard Backtracking					No propagation: after each assignment check constraints on the assigned value.
Forward Checking (FC)					Propagation: after each assignment propagate constraints from the assigned value to the free values.
Partial LookAhead					Propagation: like FC, plus check in one direction between free values.
Full LookAhead					Propagation: like FC, plus check in both directions between free values