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anytime tree searches for operations research

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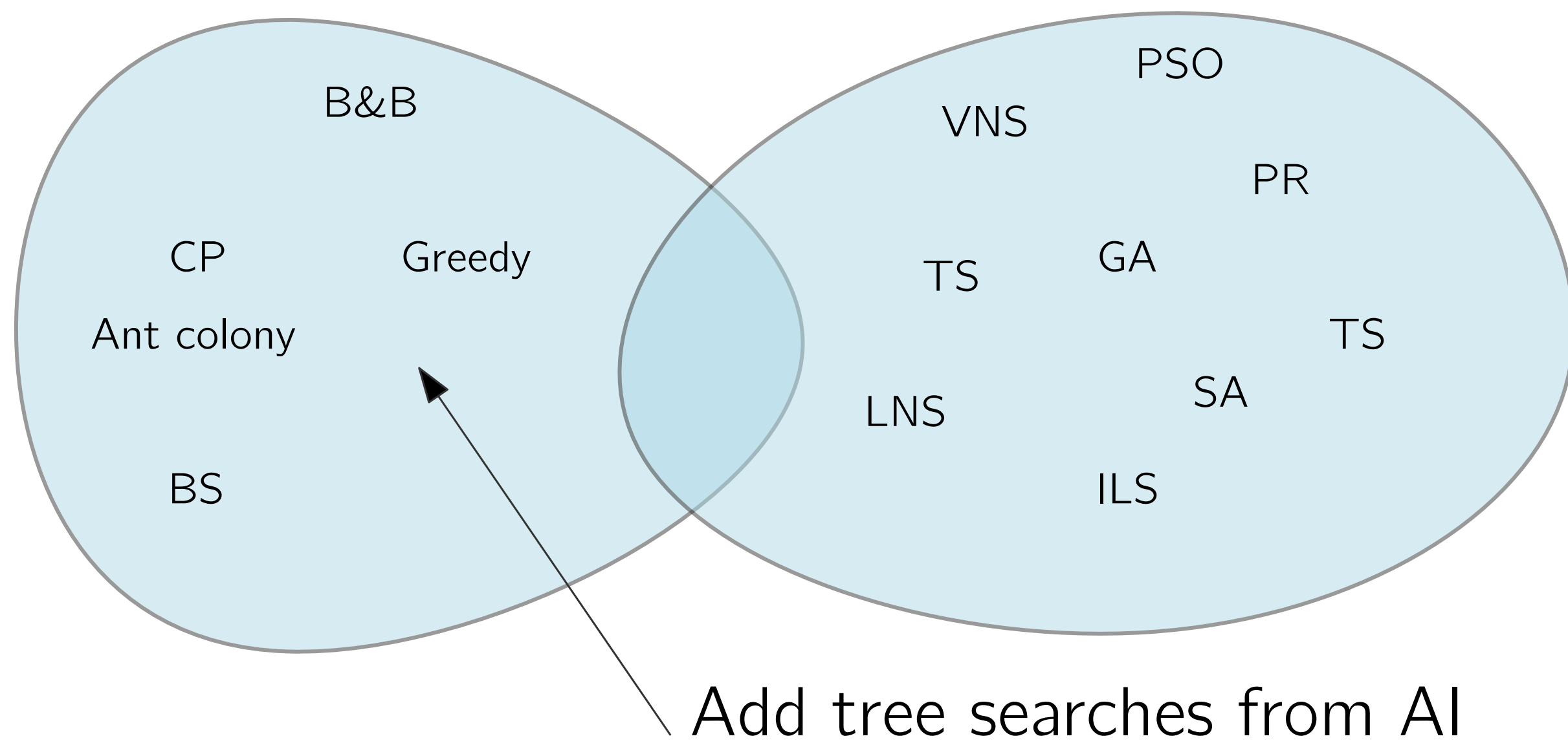
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How to solve hard problems ?

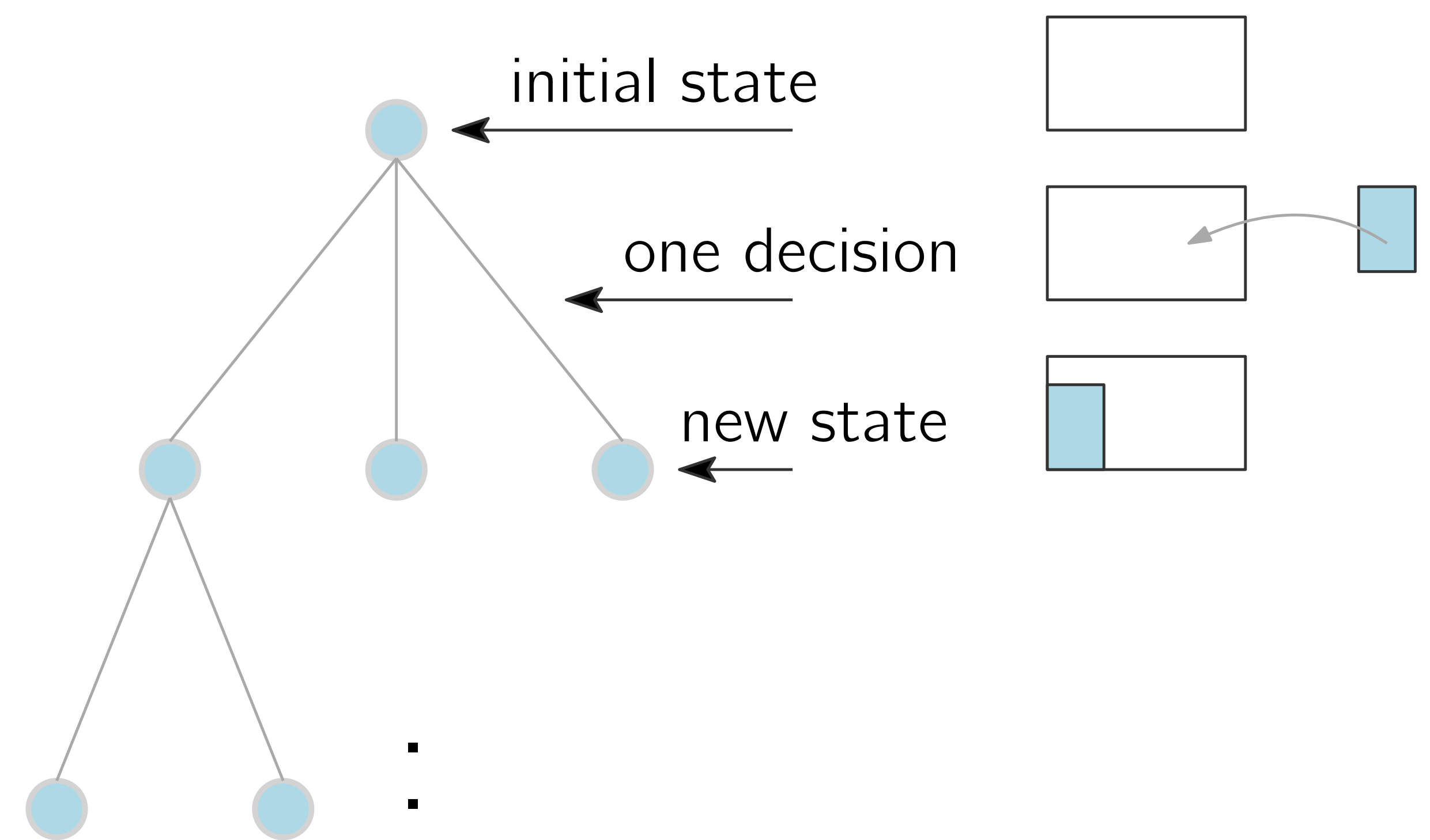
Constructive

local improvement



We believe that tree search from AI is suited for operations research

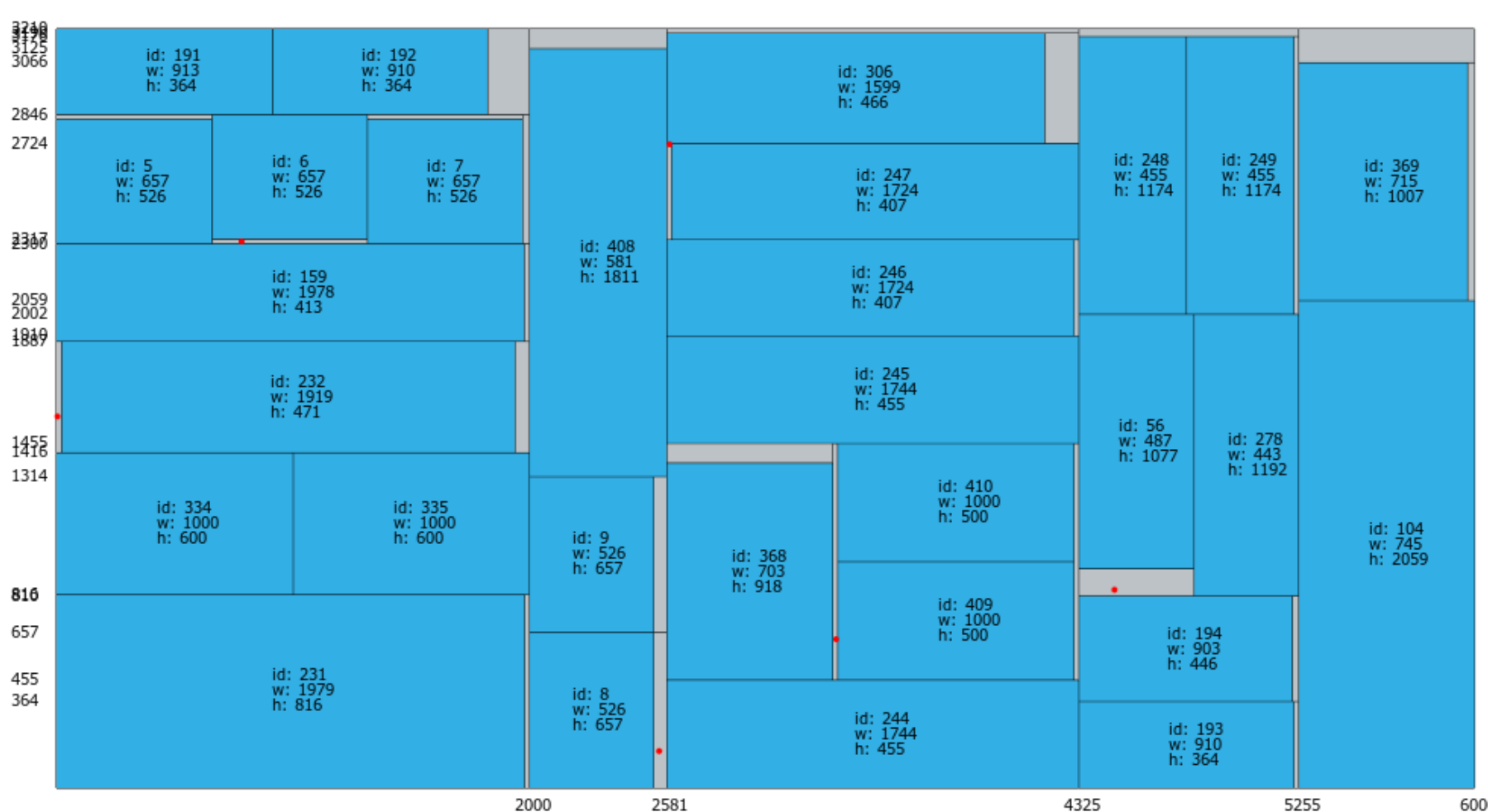
Tree search principles



Each problem can be represented by a search tree.
We design generic algorithms that explore this tree.

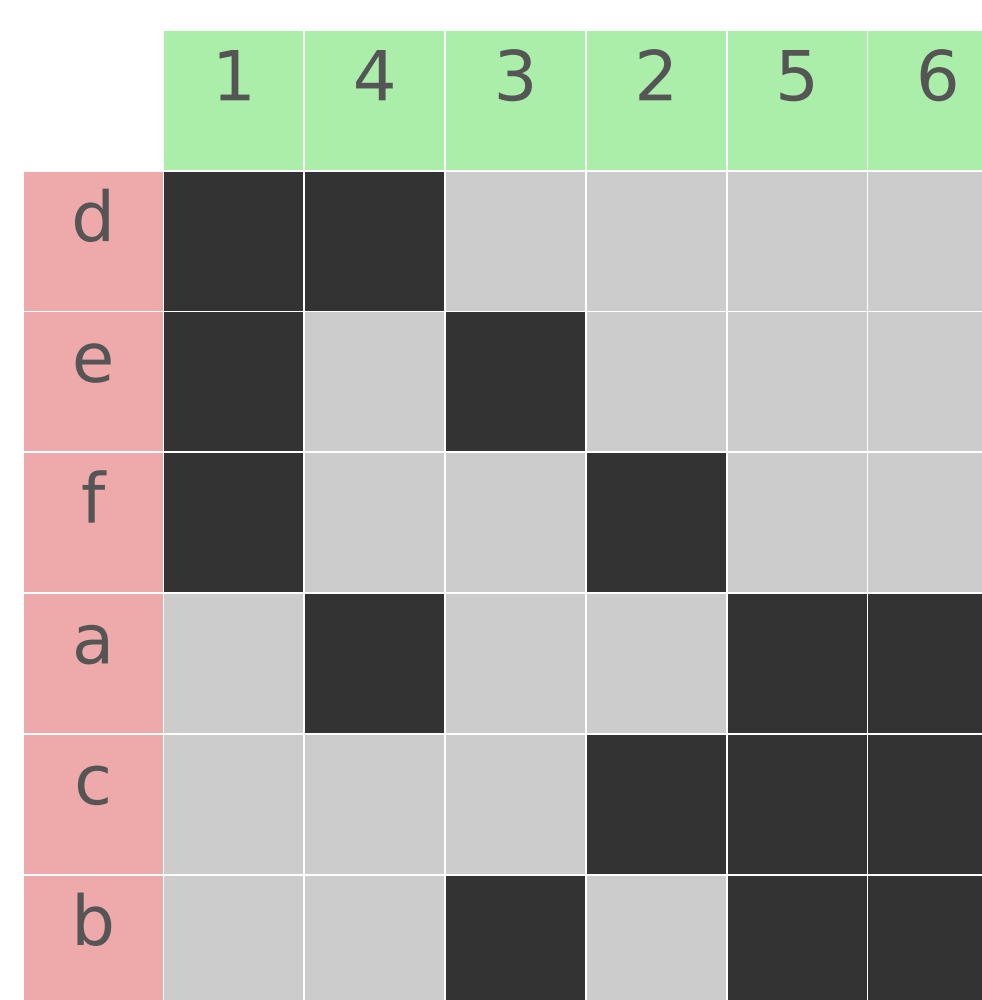
Applications

Saint-Gobain's Glass cutting challenge



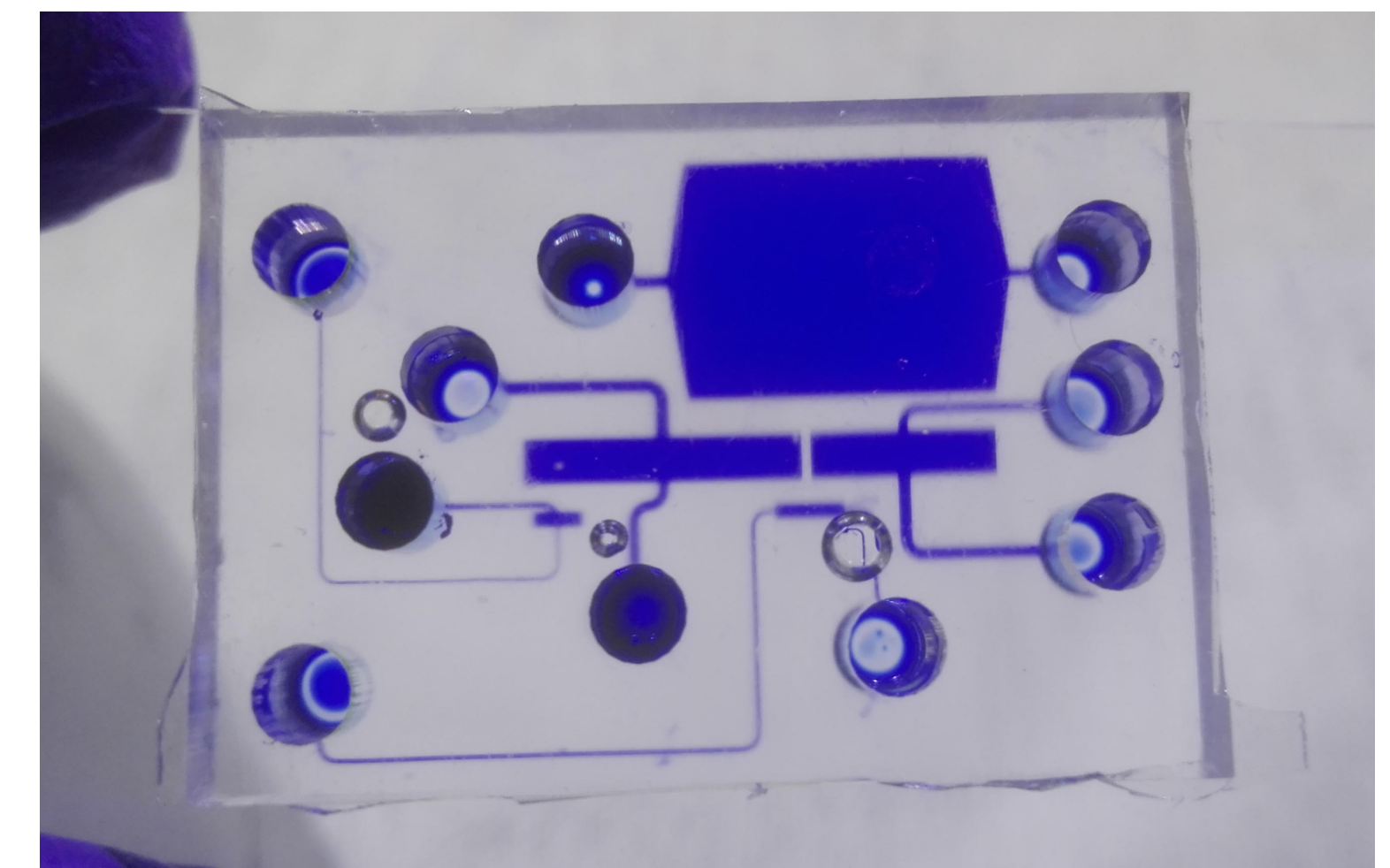
pack glass items (in blue), minimize the waste (gray)
avoid defects (red dots) and many other constraints
We obtained the best final results during the competition

Triangle Width



from embedded vision systems
maximize "white triangle"
tree search algorithms obtain the best results

Brains on chips



partnership with Netri
aims to design devices that mimic brains
GOAL: better studies on Alzheimer's disease
we work on using tree search to generate chips

Research Themes

Integration of AI techniques

Many algorithms exist in AI
They are not well known in OR
We develop a framework in C++ to use them in OR

Offline & Online Learning

use machine learning to obtain better guides
use machine learning to perform heuristic cuts
Use bandit inspired algorithms

Combination with other OR techniques

integrate dynamic programming (history cuts)
integrate pheromones mechanisms from Ant Colony Optimization
combine with local search techniques (local search, path relinking etc.)

Use it on other industrial problems

anytime tree search algorithms seem to be suited to solve complex problems
we obtained excellent results on such problems compared to other approaches