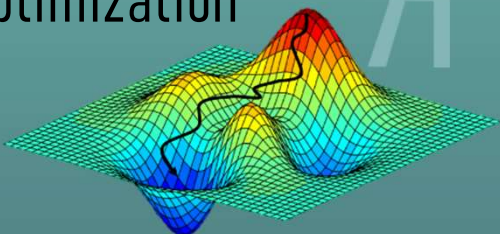


# Machine Learning

## Combinatorial optimization

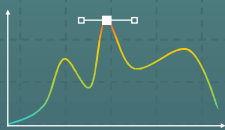
"Use of an algorithm to find the best configuration"



## Key elements

### Optimization

Maximizing or minimizing an objective function



### Machine Learning



Algorithm learning to improve performance



Configuration of a large discrete domain

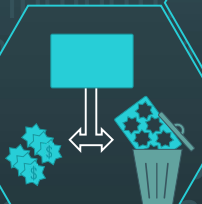
### Combination

## Applications

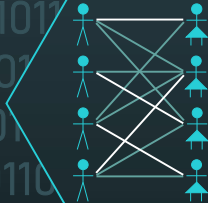
### Travelling salesman problem



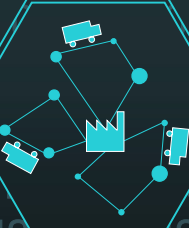
### Cutting stock problem



### Packing problem



### Matching problem



### Capacitated Vehicle Routing Problem



### Timetabling problem

## Algorithms

### Combinatorial optimization

#### Reinforcement Learning

Experience driven

#### Value function

Reward prediction

DQN

Deep Q Network

#### Policy function

State-action mapping

PPO

Proximal Policy Optimization

#### Metaheuristics

Random based

#### Population based

Candidate selection

GA

Genetic Algorithm

PSO

Particle Swarm Optimization

#### Single candidate

Mutation intensity adaptation

VNS

Variable Neighborhood Search

SA

Simulated Annealing