Week 2 - Combinatorial optimization in AI, combinatorial explosion and computational complexity

Knowledge

▼ Set

A set is ***nothing more than an unordered collection of elements with absolutely no duplicates***

A = [2, 21, 42, 856]

▼ Relation

co-domain

▼ Function - Math

One input maps one output

▼ content

Polynomial

$$x^n$$

Exponential

$$2^x$$

Quadratic Equation

$$ax^2 + bx + c$$

▼ Symbolic AI (GOFAI) → Optimization

Neighborhood → give a range for x of $F(x)$, depending on constraints like computation power to find a local minimum.

In general: **polynomial** and better are considered "practical",
whereas
exponential and worse are considered "impractical",
when taking into account realistic computational resources

▼ Approximate method

Doesn’t guarantee a globally optimal solution, but finds a decent solution (convergence) within a neighborhood.

- **Important summations**

$$1 + 2 + 3 + \cdots + n = \frac{1}{2} n(n+1)$$

$$1 + b + b^2 + \cdots + b^n = \frac{b^{n+1} - 1}{b - 1}$$

- Time complexity:
  - Worst case: upper bond ← what Big O Notation normally stands for
  - Best case: lower bond
  - Average case: expected cost