$$\mathbb{A} = ([n], \ldots, R, \ldots, f, \ldots)$$

$\{1, \ldots, n\}$

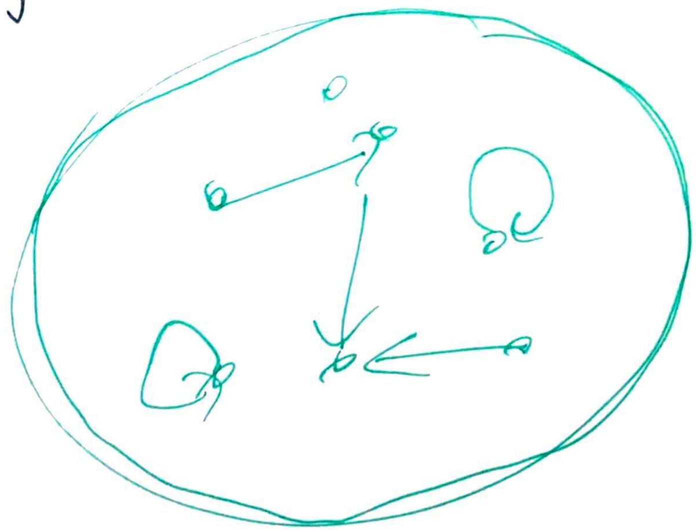
structure

$\uparrow\downarrow$

binary word $w_{\mathbb{A}} \in \{0,1\}^{n^{\text{const}}}$

lists tables of all $R, f, \ldots$

Ex.: $([n], R)$ binary



$W \in \{0,1\}^{n^2}$: for each pair of vertices says yes/no for a potential edge

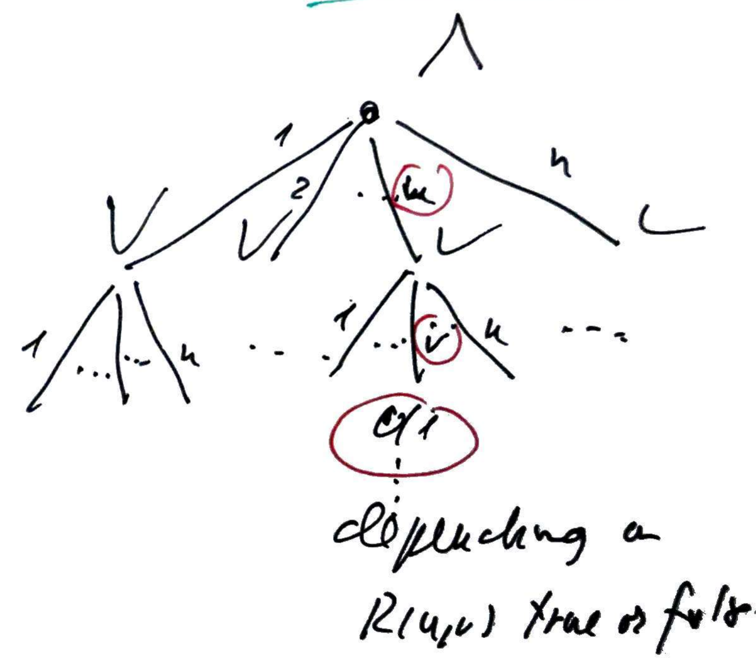
a link to computational complexity

Fix φ (a sentence). Task:

input: w/ $\mathbb{A}$

task: $\mathbb{A} \models^{?} \varphi$

evaluate tree:



Ex: $\forall x \exists y\, R(x,y)$

It is p-time.!

[In general: classes of sentences $\rightleftarrows$ computational compl. classes.]

Spectrum problem (Scholz '52, Asser '53)

For φ a sentence:

$$\boxed{\mathrm{Spec}(\varphi) := \text{the set of } n \geq 1 \text{ s.t. } \varphi \text{ has a model of cardinality } n}$$

Ex's: odd numbers, positive even numbers, composite numbers, primes, ... are all spectra.

(difficult to find some specific ex. which is not a spectrum)

Easy observation: U, V spectra $\Rightarrow U \cap V$, $U \cup V$ spectra.

PROBLEM: U spectrum $\Rightarrow \mathbb{N}^+ \setminus U$ spectrum?

- It is conjectured that NO.
- This implies that $P \neq NP$, the most famous conjecture in computational complexity.