

Main "official" focus of the lecture: Deductive DB

additional topics:

- understand (some) mechanisms of human reasoning & deduction
 - use of formal systems
 - relational algebra: is also a formal system *bottom-up evaluation* *declarative*
 - FOL: used/preferred for a mechanism for querying *basis for operational queries in DB* *declarative, non-procedural*
 - used in Query-Based approaches ... to anything
 - Querying a DB
 - managing a computer
- SQL
↓
DB
↓
internal algebra

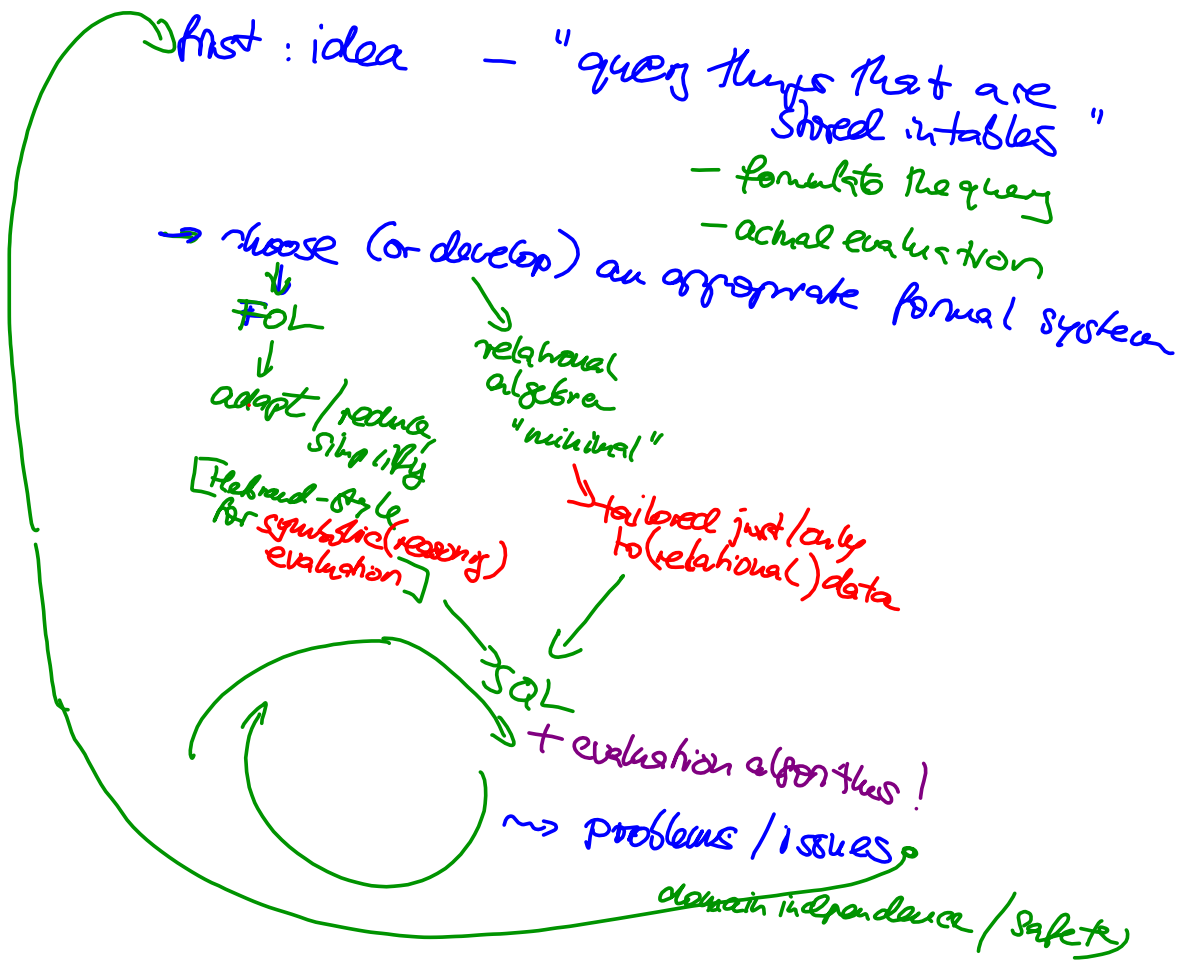
Example

```

select country.name, city.name, city.population, country.area
from country,city
where city.country=country.code
and (city.population > 1000000
    or country.area > 1000000)
    
```

$$\begin{aligned}
 & F(x_N, y_N, y_P, x_A) \\
 & = \exists c, x_P, y_P, y_A : \text{country}(x_N, c, x_P, x_A, y_P, y_A) \wedge \\
 & \quad \text{city}(y_N, y_P, c, y_P, y_A, y_A) \wedge \\
 & \quad (y_P > 1000000 \vee x_A > 1000000)
 \end{aligned}$$

usage of Formal systems in CS :



⇒ back to SmedBoard example from 28. Apr?.....

Translating - restrictiveness / SRNF

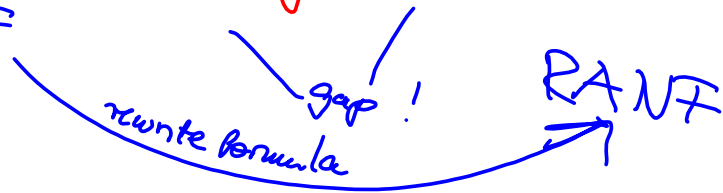
• defined bottom-up

SQL: not completely bottom-up

+ always information passing

$\hat{=}$ SRNF

relational algebra:
also defined bottom-up
only, strictly



Continue example from ~~25.4~~ 25.4 : (Σx 8.10 (2))

idea

$$F(x,y) = \underline{p(x,y)} \wedge (q(y) \vee r(x))$$

SQL and SPJNF
basically it's safe,
evaluable,
but not (yet) purely
bottom-up

idea: gives an overestimate (upper bound of possible results)
safe

distinction like this (\wedge Union) not (yet) allowed

\Rightarrow Rewrite!

$\Rightarrow F'(x,y) = p(x,y) \wedge (p(x,y) \wedge q(y) \vee p(x,y) \wedge r(x))$

$\pi(p)?$

allowed as "U"

$\{x,y\}$ $\{y\}$ $\{x,y\}$ $\{x\}$ $\{x,y\}$

\rightarrow rel. Alg:



algebraic optimizer $\rightarrow (p \bowtie q) \cup (p \bowtie r)$

summary from that example
 (based on the formal systems):

