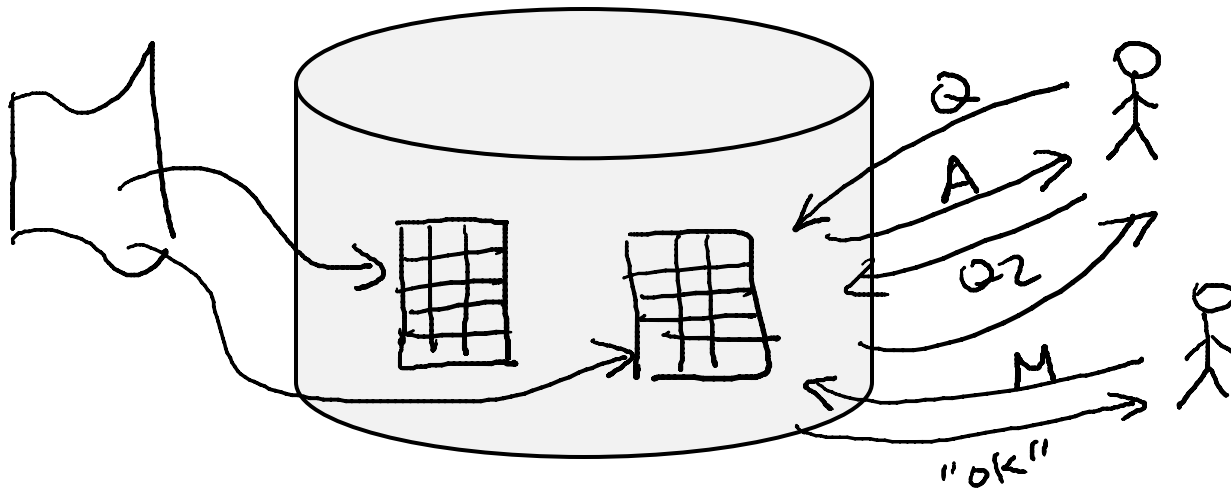# Relational Databases

## Querying Relational Databases

Jennifer Widom

# Steps in creating and using a (relational) database

1. Design schema; create using DDL
2. "Bulk load" initial data
3. Repeat: execute queries and modifications

**Ad-hoc queries in high-level language**

- – All students with GPA > 3.7 applying to Stanford and MIT only
- – All engineering departments in CA with < 500 applicants
- – College with highest average accept rate over last 5 years
- Some easy to pose; some a bit harder    ) Not correlated
- Some easy for DBMS to execute efficiently; some harder
- "Query language" also used to modify data

DML

**Queries return relations** ("compositional", "closed")



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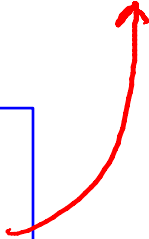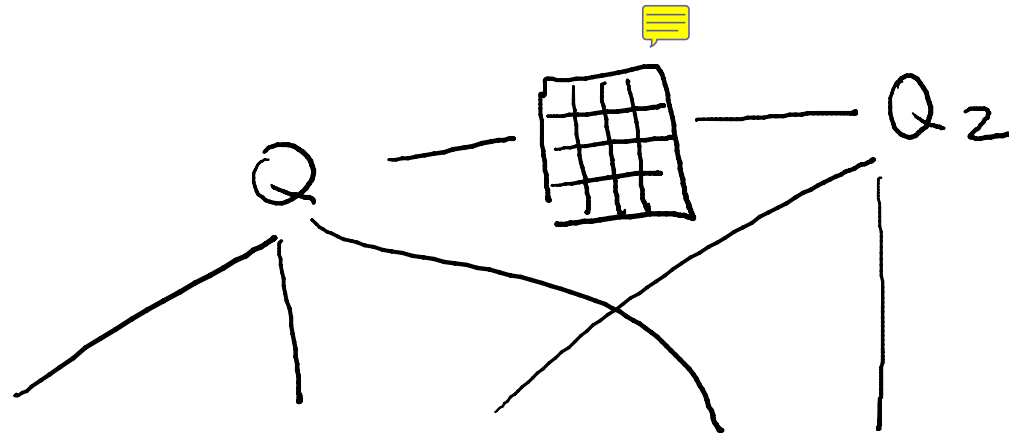
# Query Languages

- Relational Algebra — formal

$$\Pi_{ID} \sigma_{GPA > 3.7 \wedge cName = \text{`Stanford''}} (\text{Student} \bowtie \text{Apply})$$

- SQL — actual / implemented

```
Select Student.ID
From Student, Apply
Where Student.ID=Apply.ID
And GPA>3.7 and college='Stanford'
```

*IDs of students with GPA > 3.7 applying to Stanford*

Jennifer Widom