Relational Databases
Querying Relational Databases
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
  - Some easy for DBMS to execute efficiently; some harder
- “Query language” also used to modify data
  - DML
Queries return relations ("compositional", "closed")
Query Languages

- **Relational Algebra** — formal
  \[ \Pi_{\text{ID}} (\text{GPA} > 3.7 \land \text{cName} = \text{`Stanford'}) (\text{Student} \bowtie \text{Apply}) \]

- **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