

CS122 Using Relational Databases and SQL Joins

Chengyu Sun
California State University, Los Angeles

Join

- ◆ When information is spread over multiple tables
 - Find the projects which John is working on

Employees

eid	ename
'01'	'John'
'02'	'Susan'

Projects

eid	pid
'01'	'T4'
'01'	'X3'
'02'	'S2'

Combine Two Tables

e.eid	ename	p.eid	pid

- ◆ Or what do we get when we do
`SELECT * FROM Employees, Projects;`

Combine Two Tables

e.eid	ename	p.eid	pid
'01'	'John'	'01'	'T4'
'01'	'John'	'01'	'X3'
'01'	'John'	'02'	'S2'
'02'	'Susan'	'01'	'T4'
'02'	'Susan'	'01'	'X3'
'02'	'Susan'	'02'	'S2'

- ◆ Or what do we get when we do
`SELECT * FROM Employees, Projects;`

Cartesian Product

$$A = \{ a_1, a_2, a_3, a_4, \dots, a_n \}$$

$$B = \{ b_1, b_2, b_3, b_4, \dots, b_m \}$$

$$A \times B = \{ \text{all possible pairs of } \langle a_i, b_j \rangle \}$$

For example:

$$A = \{ a_1, a_2, a_3 \}, B = \{ b_1, b_2 \}, C = \{ c_1, c_2 \}$$

$$A \times B = ??$$

$$B \times C = ??$$

$$A \times B \times C = ??$$

All Kinds of Joins

- ◆ Theta join: =, >, >=, <, <=, <>
 - Equi-join: =
 - Nonequi-join: >, >=, <, <=, <>
- ◆ Self join
- ◆ Inner join
 - Natural join
- ◆ Outer join
 - Left join
 - Right join
 - Full outer join

Self Join

Ages

Name	Age
'John'	48
'Susan'	45
'Amy'	32
'Bob'	45

- ◆ Find the names of the people who are older than Susan
 - older than or of the same age

INNER Join

- ◆ Eliminate rows that do not make sense
- ◆ Avoid unintentional Cartesian products

```
SELECT * FROM Employees e INNER JOIN Projects p  
ON e.eid = p.eid;
```



```
SELECT * FROM Employees e, Projects p  
WHERE e.eid = p.eid;
```

Natural Join

- ◆ An inner join on all columns with matching names

```
SELECT * FROM Employees e INNER JOIN Projects p  
ON e.eid = p.eid;
```



```
SELECT * FROM Employees e NATURAL JOIN Projects p;
```

* Not supported in MS Access

Outer Join

- ◆ Left join (left outer join)
 - All rows of an inner join, and the remaining rows from the first table
 - *E.g. Find the employees who are not working on a project*
- ◆ Right join (right outer join)
 - All rows of an inner join, and the remaining rows from the second table
- ◆ Full outer join

Join Multiple Tables

```
SELECT fields FROM Table1, Table2, Table3  
WHERE Table1.field1 = Table2.field2  
AND Table2.field2 = Table3.field3;
```

Or

```
SELECT fields FROM Table1 INNER JOIN  
( Table2 INNER JOIN Table3 ON Table2.field2 = Table3.field3 )  
ON Table1.field1 = Table2.field2;
```