More on SQL: Joins and Set operators

Chapter 7 p. 260 -265 in Kroenke textbook

Today

- Inner join
- Natural join
- Outer join
- Set Operators: Union, Intersect, Except
JOIN ON Syntax

List the students and the courses they are enrolled in

<table>
<thead>
<tr>
<th>Students</th>
<th>Enrolled</th>
</tr>
</thead>
<tbody>
<tr>
<td>SNb</td>
<td>SName</td>
</tr>
<tr>
<td>190</td>
<td>Smith</td>
</tr>
<tr>
<td>673</td>
<td>Doe</td>
</tr>
<tr>
<td>312</td>
<td>Doe</td>
</tr>
</tbody>
</table>

SELECT S.SNb, SName, E.Cid
FROM Students S, Enrolled E
WHERE S.Snb = E.Snb

JOIN ON Syntax

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JOIN .. USING Syntax

List the students and the courses they are enrolled in

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<td>312</td>
<td>Doe</td>
</tr>
</tbody>
</table>

SELECT S.SNb, SName, E.Cid
FROM Students S, Enrolled E
WHERE S.Snb = E.Snb

JOIN USING (Snb)

JOIN Courses AS C
ON E.Cid = C.Cid

SELECT S.SNb, SName, E.Cid, C.Cname
FROM Students AS S
JOIN Enrolled AS E
USING (Snb)
JOIN Courses AS C
USING (Cid)

Only enrolled students listed
Outer Joins

List all students and the courses they are enrolled in

SELECT S.SNb, SName, E.Cid
FROM Students S LEFT JOIN Enrolled E
ON S.Snb=E.Snb

Students

<table>
<thead>
<tr>
<th>SNb</th>
<th>SName</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>190</td>
<td>Smith</td>
<td><a href="mailto:jsmith@usna.edu">jsmith@usna.edu</a></td>
</tr>
<tr>
<td>673</td>
<td>Doe</td>
<td><a href="mailto:jdoe@usna.edu">jdoe@usna.edu</a></td>
</tr>
<tr>
<td>312</td>
<td>Doe</td>
<td><a href="mailto:jdoe2@usna.edu">jdoe2@usna.edu</a></td>
</tr>
</tbody>
</table>

Enrolled

<table>
<thead>
<tr>
<th>SNb</th>
<th>Cid</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>190</td>
<td>IT340</td>
<td>Spring2006</td>
</tr>
<tr>
<td>312</td>
<td>IT360</td>
<td>Fall2008</td>
</tr>
<tr>
<td>312</td>
<td>IT430</td>
<td>Fall2008</td>
</tr>
</tbody>
</table>

Join Summary

- Inner join
  - … JOIN … ON cond
  - … JOIN … USING(cols)

- Natural join
  - …NATURAL JOIN … -- uses the columns with the same name

- Left | Right | Full Outer join
  - … LEFT JOIN .. ON cond
Set Operators

- UNION
- UNION ALL
- INTERSECT (not in MySQL)
- EXCEPT (not in MySQL)

UNION

- Enrolled(Alpha, Cid, Semester, Grade)
- List all Alpha of students enrolled in IT360 or IC322

```
SELECT Alpha
FROM enrolled
WHERE Cid = 'IT360'
UNION
SELECT Alpha
FROM enrolled
WHERE Cid = 'IC322'
```

- Same number of columns and data types in the 2 select
- Duplicates in results are eliminated by default (use UNION ALL if want to keep duplicates)
**INTERSECT**

- Enrolled(Alpha, Cid, Semester, Grade)
- List all Alpha of students enrolled in IT360 and IC322

```sql
SELECT Alpha
FROM enrolled
WHERE Cid = 'IT360'
INTERSECT
SELECT Alpha
FROM enrolled
WHERE Cid = 'IC322'
```

• Same number of columns and data types in the 2 select
• NOT SUPPORTED in MYSQL

**EXCEPT**

- Enrolled(Alpha, Cid, Semester, Grade)
- List all Alpha of students enrolled in IT360 but not in IC322

```sql
SELECT Alpha
FROM enrolled
WHERE Cid = 'IT360'
EXCEPT
SELECT Alpha
FROM enrolled
WHERE Cid = 'IC322'
```

• Same number of columns and data types in the 2 select
• NOT SUPPORTED in MYSQL