CS 327E Class 8

March 30, 2020

Announcements

- Midterm is **next class** from 6pm - 7:30pm
- Midterm location: Zoom
- Review session: Friday from 6:30pm - 7:30pm on Zoom
- Milestone 8 due this Sunday

1) Does `Q1` contain a subquery?

```
Q1: SELECT * FROM Lineup
    WHERE band = (SELECT id FROM Band
                    WHERE name = 'Asleep at the Wheel')
```

A. Yes
B. No

2) There can be at most one subquery per SQL statement.

A. True
B. False

3) What is the output from this query?

```
SELECT COUNT(*) FROM Lineup WHERE band IN
(SELECT id FROM Band WHERE genre != 'Swing')
```

Lineup

id	date	time	length	venue	band
1	2020-06-05	00:15	30	vegas	1
2	2020-06-04	00:45	60	pclub	2
3	2020-06-11	00:00	40	coopers	3
4	2020-06-09	23:50	15	barra	4
5	2020-06-05	00:00	40	cclub	3
6	2020-06-04	12:45	45	honda	5

Band

id	name	genre
1	Borzoi	Punk
2	Black Pumas	Soul
3	Western Youth	Rock
4	Deezie Brown	Hip-Hop
5	Asleep at the Wheel	Swing

A. 6   B. 5   C. 4

4) What is the output from this query?

```
SELECT COUNT(*) FROM Lineup WHERE length >
(SELECT MIN(length) FROM Lineup)
```

Lineup

id	date	time	length	venue	band
1	2020-06-05	00:15	30	vegas	1
2	2020-06-04	00:45	60	pclub	2
3	2020-06-11	00:00	40	coopers	3
4	2020-06-09	23:50	15	barra	4
5	2020-06-05	00:00	40	cclub	3
6	2020-06-04	12:45	45	honda	5

Band

id	name	genre
1	Borzoi	Punk
2	Black Pumas	Soul
3	Western Youth	Rock
4	Deezie Brown	Hip-Hop
5	Asleep at the Wheel	Swing

A. 6	B. 5	C. 4

5) A subquery can appear only in the `WHERE` clause of a SQL statement.

A. True
B. False

Filtering Subqueries: `WHERE` clause

```
SELECT a, b, c
FROM T1
WHERE a =
        (SELECT x FROM T2 ...)
```

Comparison Operators: =, !=, >, <, <=, >=

Practice Question 1

Who are the oldest students?

Student_Beam(sid, fname, lname, dob, status)

Class(cid, cno, cname, credits)

Teacher_Beam(tid, fname, lname, dept)

Takes_Beam(sid, cid, grade)

Teaches(tid, cid)

Filtering Subqueries: `WHERE` clause

```
SELECT a, b, c
FROM T1
WHERE d IN
      (SELECT x FROM T2 ...)
```

List Membership Operators:
`IN`
`NOT IN`

Practice Question 2

*Who does **not** take CS327E?*

Student_Beam(<u>sid</u>, fname, lname, dob, status)

Class(<u>cid</u>, cno, cname, credits)

Teacher_Beam(<u>tid</u>, fname, lname, dept)

Takes_Beam(<u>sid</u>, <u>cid</u>, grade)

Teaches(<u>tid</u>, <u>cid</u>)

Is this a correct implementation?

```
SELECT sid
FROM Takes
WHERE cno != 'CS327E'
```

Filtering Subqueries: `HAVING` clause

```
SELECT a, b, c <aggregate functions>
FROM T1
[WHERE <boolean condition>]
GROUP BY a, b, c
HAVING <aggregate function> = (SELECT x
                                 FROM T2 ...)
```

Comparison Operators: = != > < <= >=

Practice Question 3

Which classes have a higher enrollment than the overall average enrollment per class?

Student_Beam(sid, fname, lname, dob, status)

Class(cid, cno, cname, credits)

Teacher_Beam(tid, fname, lname, dept)

Takes_Beam(sid, cid, grade)

Teaches(tid, cid)

iClicker Question

Which classes have a higher enrollment than the overall average enrollment per class?

Student_Beam(sid, fname, lname, dob, status)

Class(cid, cno, cname, credits)

Teacher_Beam(tid, fname, lname, dept)

Takes_Beam(sid, cid, grade)

Teaches(tid, cid)

How many **subqueries** does the answer require?

A. 0   B. 1   C. 2   D. 3

Correlated Subqueries

```
SELECT a, b, c
FROM T1
WHERE d > (SELECT x FROM T2 WHERE T2.y = T1.a)
```

Comparison Operators: =, !=, >, <, <=, >=

List Membership Operators: IN, NOT IN

Correlated Subqueries: `EXISTS`

```
SELECT a, b, c
FROM T1
WHERE EXISTS
      (SELECT * FROM T2 WHERE T2.x = T1.a)
```

Existential Quantifiers:
```
EXISTS
NOT EXISTS
```

Practice Question 4

*Who does **not** take CS327E?*

Using `EXISTS` this time.

Student_Beam(<u>sid</u>, fname, lname, dob, status)

Class(<u>cid</u>, cno, cname, credits)

Teacher_Beam(<u>tid</u>, fname, lname, dept)

Takes_Beam(<u>sid</u>, <u>cid</u>, grade)

Teaches(<u>tid</u>, <u>cid</u>)

iClicker Question

*Who does **not** take CS327E?*

Using `EXISTS` this time.

Student_Beam(<u>sid</u>, fname, lname, dob, status)

Class(<u>cid</u>, cno, cname, credits)

Teacher_Beam(<u>tid</u>, fname, lname, dept)

Takes_Beam(<u>sid</u>, <u>cid</u>, grade)

Teaches(<u>tid</u>, <u>cid</u>)

Which field is used to correlate the outer query with the subquery?

A. `sid`   B. `cid`   C. `cno`

Virtual Table Subqueries: FROM and JOIN clauses

```
SELECT a, b, c
FROM (SELECT a, b, c FROM ...)
[WHERE]
[ORDER BY]


SELECT a, b, c
FROM T1 JOIN (SELECT a, b, c FROM T2)
[WHERE]
[ORDER BY]
```

Practice Question 5

*Out of the students who **don't** take CS327E, which ones are Seniors?*

Student_Beam(<u>sid</u>, fname, lname, dob, status)

Class(<u>cid</u>, cno, cname, credits)

Teacher_Beam(<u>tid</u>, fname, lname, dept)

Takes_Beam(<u>sid</u>, <u>cid</u>, grade)

Teaches(<u>tid</u>, <u>cid</u>)

Practice Question 6

Which teachers earn a higher salary than the average salary of their department?

Student_Beam(<u>sid</u>, fname, lname, dob, status)

Class(<u>cid</u>, cno, cname, credits)

Teacher_Sal(<u>tid</u>, fname, lname, dept, sal)

Takes_Beam(<u>sid</u>, <u>cid</u>, grade)

Teaches(<u>tid</u>, <u>cid</u>)

iClicker Question

Which teachers earn a higher salary than the average salary of their department?

Student_Beam(sid, fname, lname, dob, status)

Class(cid, cno, cname, credits)

Teacher_Sal(tid, fname, lname, dept, sal)

Takes_Beam(sid, cid, grade)

Teaches(tid, cid)

Does the answer contain a correlated subquery?

A.   Yes   B.   No

Milestone 8

http://www.cs.utexas.edu/~scohen/milestones/Milestone8.pdf