Lecture 34: Aggregation and Grouping

Announcements.

- Glookup grades are up.
- Use form (see Piazza) to report apparent errors, request regrades.

Aggregation, Again

- We briefly saw examples of *aggregation* in a previous lecture:

```
> select max(score) from grades;
20

> select avg(score) from grades;
12.0769230769231

> select avg(score) from grades
...     where assign="hw1";
2.0
```

grades

name	assign	score
John Brown	hw1	2
Walt Green	hw1	3
Valerie Blue	hw1	1
Simon Red	hw2	3
John Brown	test1	20
Walt Green	test1	14
John Brown	test2	19
Valerie Blue	test1	14
Simon Red	test1	17
Walt Green	test2	12
Valerie Blue	test2	15
Sarah Tan	test2	19
Sarah Tan	test1	18

Aggregation

- Sometimes, we'd like a query that groups the data into subsets and aggregates each.
- A clumsy approach:

```
>   select assign, avg(score) from grades where assign="hw1" union
... select assign, avg(score) from grades where assign="hw2" union
... select assign, avg(score) from grades where assign="test1" union
... select assign, avg(score) from grades where assign="test2";
```

- But it is generally cleaner to let SQL do the grouping for you:

```
> select assign, avg(score) from grades group by assign;
hw1|2.0
hw2|3.0
test1|16.6
test2|16.25
```

- First, groups rows with the same `assign` column value. Then runs the query on each group separately, unioning the results.

Selecting Groups

- Just as we often want to filter *rows*, may also need to filter *groups*.
- Example: I want a summary of assignments that have *at least two submissions*.
- The `where` clause isn't quite right, because it happens *before* grouping.
- So for groups, we use a new clause: `having`:

```
> select assign, avg(score)
      from grades
...   group by assign
        having count(*) >= 2;
hw1|3|2.0
test1|5|16.6
test2|4|16.25
```

grades

name	assign	score
John Brown	hw1	2
Walt Green	hw1	3
Valerie Blue	hw1	1
Simon Red	hw2	3
John Brown	test1	20
Walt Green	test1	14
John Brown	test2	19
Valerie Blue	test1	14
Simon Red	test1	17
Walt Green	test2	12
Valerie Blue	test2	15
Sarah Tan	test2	19
Sarah Tan	test1	18

A Bit Fancier

- I'd like average scores for each *category* of assignment:

categories

assign	type
hw1	hw
hw2	hw
test1	test
test2	test

A Bit Fancier, Continued

- I'd like average scores for each *category* of assignment:

categories

assign	type
hw1	hw
hw2	hw
test1	test
test2	test

```
> select type, avg(score) from grades, categories
...  where grades.assign = categories.assign
...  group by type;
hw|2.25
test|16.4444444444444
```

Some Bells and Whistles

- We can sort the rows presented, and can filter out duplicates:

```
> select name from grades
...     order by name;
John Brown
John Brown
John Brown
Sarah Tan
Sarah Tan
Simon Red
Simon Red
Valerie Blue
Valerie Blue
Valerie Blue
Walt Green
Walt Green
Walt Green
```

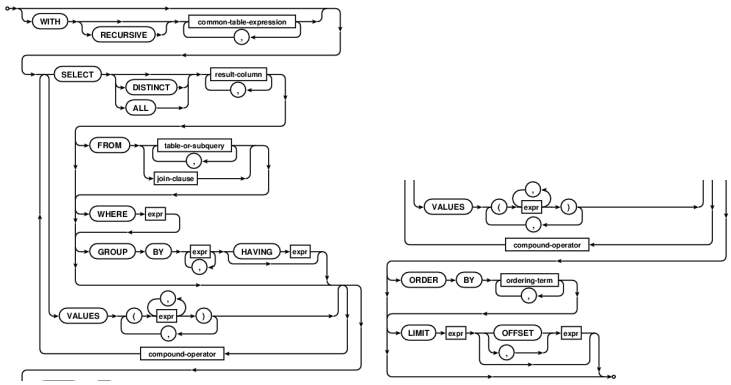
```
> select distinct name from grades
...  order by name;
John Brown
Sarah Tan
Simon Red
Valerie Blue
Walt Green
```


One More Bell

- Finally, can limit the number of responses:

```
> select name from grades order by name limit 8;
John Brown
John Brown
John Brown
Sarah Tan
Sarah Tan
Simon Red
Simon Red
Valerie Blue
```


Syntax of Select



Extracted from `https://www.sqlite.org/lang.html`