

<http://poloclub.gatech.edu/cse6242>

CSE6242 / CX4242: **Data** & **Visual** Analytics

Simple Data Storage; SQLite

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Partly based on materials by

Professors Guy Lebanon, Jeffrey Heer, John Stasko, Christos Faloutsos

How to store the data?
What's the easiest way?

Easiest Way to Store Data

As comma-separated files (CSV)

But may not be easy to parse. Why?

```
1997,Ford,E350
```

Easiest Way to Store Data

```
1997,Ford,E350
```

- Any field *may* be *quoted* (that is, enclosed within double-quote characters). Some fields *must* be quoted.

```
"1997","Ford","E350"
```

- Fields with embedded commas or double-quote characters must be quoted.

```
1997,Ford,E350,"Super, luxurious truck"
```

- Each of the embedded double-quote characters must be represented by a pair of double-quote characters.

```
1997,Ford,E350,"Super, ""luxurious"" truck"
```

- Fields with embedded line breaks must be quoted (however, many CSV implementations do not support this).



Most popular embedded database in the world

Well-known users: <http://www.sqlite.org/famous.html>
iPhone (iOS), Android, Chrome (browsers), Mac, etc.

Self-contained: one file contains data + schema

Serverless: database right on your computer

Zero-configuration: no need to set up!

SQL Refresher: create table

```
>sqlite3 database.db
```

```
sqlite> create table student(ssn integer, name text);
```

```
sqlite> .schema
```

```
CREATE TABLE student(ssn integer, name text);
```

ssn	name

SQL Refresher: insert rows

```
insert into student values(111, "Trump");  
insert into student values(222, "Johnson");  
insert into student values(333, "Obama");  
select * from student;
```

ssn	name
111	Trump
222	Johnson
333	Obama

SQL Refresher: create another table

```
create table takes  
(ssn integer, course_id integer, grade integer);
```

```
sqlite> .schema
```

```
CREATE TABLE student(ssn integer, name text);
```

```
CREATE TABLE takes (ssn integer, course_id integer,  
grade integer);
```

ssn	course_id	grade

SQL Refresher: joining 2 tables

More than one tables - **joins**

E.g., create roster for this course (6242)

ssn	name
111	Trump
222	Johnson
333	Obama

ssn	course_id	grade
111	6242	100
222	6242	90
222	4000	80

SQL Refresher: joining 2 tables + filtering

```
select name from student, takes
where
    student.ssn = takes.ssn and
    takes.course_id = 6242;
```

ssn	name
111	Trump
222	Johnson
333	Obama

ssn	course_id	grade
111	6242	100
222	6242	90
222	4000	80

Summarizing data:

Find ssn and GPA (a summary) for each student

```
select ssn, avg(grade)
from takes
group by ssn;
```

ssn	course_id	grade
111	6242	100
222	6242	90
222	4000	80

ssn	avg(grade)
111	100
222	85

Filtering Summarized Results

```
select ssn, avg(grade)
from takes
group by ssn
having avg(grade) > 90;
```

ssn	course_id	grade
111	6242	100
222	6242	90
222	4000	80

ssn	avg(grade)
111	100
222	85

SQL General Form

```
select a1, a2, ... an  
from t1, t2, ... tm  
where predicate  
[order by ...]  
[group by ...]  
[having ...]
```

A lot more to learn! Oracle, MySQL, PostgreSQL, etc.

Highly recommend taking

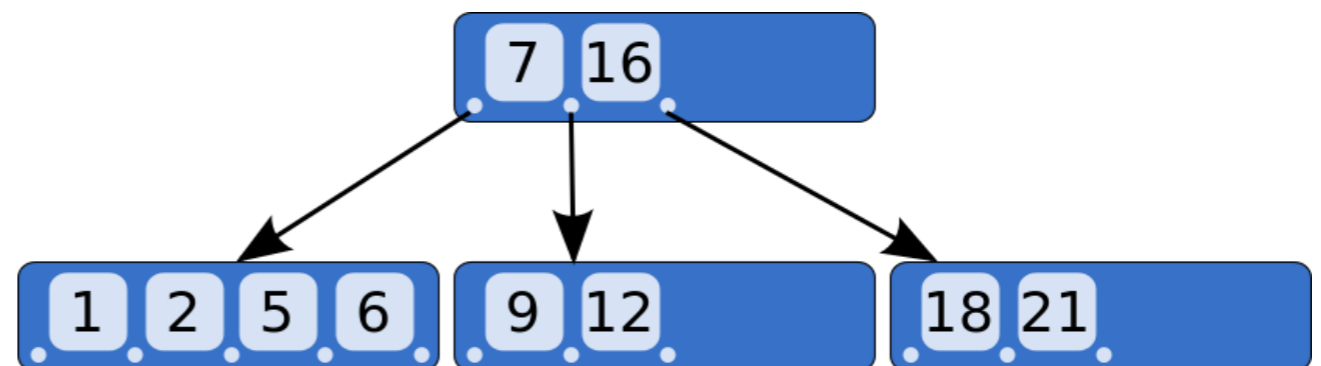
CS 4400 Introduction to Database Systems

SQLite easily scales to multiple GBs. What if slow?

Important sanity check: Have you (or someone) created appropriate **indexes**?

SQLite's indices use **B-tree** data structure.
 $O(\log n)$ speed for adding/finding/deleting an item.

```
create index student_ssn_index on  
student(ssn);
```

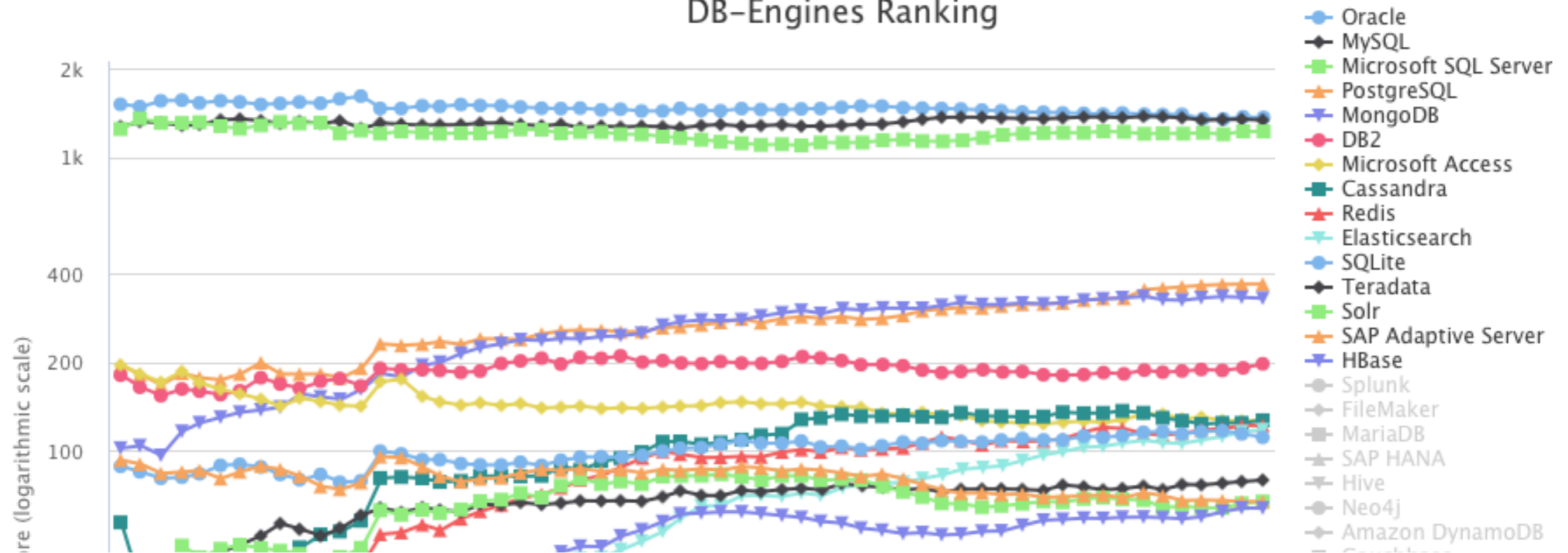


Comparison & Popularity Ranking

<https://db-engines.com/en/system/HBase%3BMySQL%3BOracle%3BPostgreSQL%3BSQLite>

Like for any rankings, observe the general trends, and be **cautious** about making important decisions based on absolute ranks.

DB-Engines Ranking



How ranking is computed: https://db-engines.com/en/ranking_definition

How to Store Petabytes++ ?

Likely need “No SQL” databases

HBase, Cassandra, MongoDB, many more

HBase covered in Hadoop/Spark modules later
this semester