Outline

• Grading, Office Hours, Quizzes (see handout)
• Course Schedule
• Example Database
• SQL
• SQLite
Course Schedule

• Relational Database Systems (8-10 weeks)
  – SQL
    • SQL in Programs
  – ER Modeling
  – Normal Forms
  – Query Processing
  – Transactions

• NoSQL Databases (4-6 weeks)
  – MongoDB
  – Neo4J
  – Others as time permits
## Movie Table

<table>
<thead>
<tr>
<th>MID</th>
<th>TITLE</th>
<th>DIRECTOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>0001</td>
<td>It Happened One Night</td>
<td>Frank Capra</td>
</tr>
<tr>
<td>0002</td>
<td>Double Indemnity</td>
<td>Billy Wilder</td>
</tr>
<tr>
<td>0003</td>
<td>Mrs. Miniver</td>
<td>William Wyler</td>
</tr>
<tr>
<td>0004</td>
<td>The Best Years of Our Lives</td>
<td>William Wyler</td>
</tr>
<tr>
<td>0005</td>
<td>The Treasure of Sierra Madre</td>
<td>John Huston</td>
</tr>
<tr>
<td>0006</td>
<td>The Quiet Man</td>
<td>John Ford</td>
</tr>
<tr>
<td>0007</td>
<td>Some Like it Hot</td>
<td>Billy Wilder</td>
</tr>
<tr>
<td>0008</td>
<td>The Asphalt Jungle</td>
<td>John Huston</td>
</tr>
<tr>
<td>0009</td>
<td>Lawrence of Arabia</td>
<td>David Lean</td>
</tr>
<tr>
<td>0010</td>
<td>The Godfather Part II</td>
<td>Francis Ford Coppola</td>
</tr>
<tr>
<td>0011</td>
<td>One Flew Over the Cuckoo's Nest</td>
<td>Milos Forman</td>
</tr>
</tbody>
</table>
## DVD Tables

<table>
<thead>
<tr>
<th>DNUM</th>
<th>MID</th>
<th>InStock</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1</td>
<td>0002</td>
<td>Borrowed</td>
</tr>
<tr>
<td>D2</td>
<td>0001</td>
<td>Available</td>
</tr>
<tr>
<td>D3</td>
<td>0007</td>
<td>Borrowed</td>
</tr>
<tr>
<td>D4</td>
<td>0003</td>
<td>Borrowed</td>
</tr>
<tr>
<td>D5</td>
<td>0007</td>
<td>Available</td>
</tr>
<tr>
<td>D6</td>
<td>0005</td>
<td>Available</td>
</tr>
<tr>
<td>D7</td>
<td>0011</td>
<td>Borrowed</td>
</tr>
<tr>
<td>D8</td>
<td>0009</td>
<td>Available</td>
</tr>
<tr>
<td>D9</td>
<td>0006</td>
<td>Borrowed</td>
</tr>
<tr>
<td>D10</td>
<td>0009</td>
<td>Available</td>
</tr>
<tr>
<td>D11</td>
<td>0002</td>
<td>Available</td>
</tr>
<tr>
<td>D12</td>
<td>0008</td>
<td>Borrowed</td>
</tr>
<tr>
<td>D13</td>
<td>0011</td>
<td>Borrowed</td>
</tr>
</tbody>
</table>
Relational Data Model

- Use ideas from mathematical logic and the theory of relations to represent and query data
- A database is a set of relations
- A relation is a set of tuples
- A tuple is a set of attributes
- Attributes represent the data values (e.g. mid or title) stored in the database
- Each attribute is associated with a data type
Relational Data Model

• Synonyms for relational database terms
  – Relation Table
  – Tuple Row or Record
  – Attribute Column or Field
Relational Data Model

- A Relational Database Management System (RDBMS) is the software which implements the relational data model
  - SQLite
    - [http://www.sqlite.org/download.html](http://www.sqlite.org/download.html)
    - Command line shell
  - mySQL
  - Postgres
  - Oracle
  - SQLServer
Create Table Statements

• CREATE TABLE Movie(mid varchar(6) primary key, title varchar(50), director varchar(40))
• CREATE TABLE DVD(dnum varchar(8) primary key, mid varchar(6) references Movie(mid), inStock varchar(20))
Terminology

• Primary key
  – A subset of the attributes of a table that uniquely identifies each row in the table
  – We will refine this definition when we talk about functional dependencies later in the course

• Entity Integrity
  – Attributes of the primary key cannot be Null
Terminology

• Foreign key
  – A subset of the attributes of a table that reference the primary key of a related table

• Referential Integrity
  – A foreign key value is either Null or its value appears in the referenced table
  – Some people use this constraint for any attributes (not just foreign key attributes) that refer to attributes in another table
Example Queries

• Find the titles of movies directed by John Ford
  – Select title from Movie where director = ‘John Ford’

• Find the titles of movies that have Available DVDs
  – Select title from Movie M, DVD D where M.mid = D.mid and inStock = ‘Available’
  – Join Operation
SQLite

• Self-contained serverless transactional SQL database engine
• Widely used to include database functionality with applications (see https://www.sqlite.org/famous.html)
• The contents of a SQLite database is stored in a single file
SQLite

• Freely available
• Ships with Mac OS X
• Download for Windows at www.sqlite.org/download.html

  – For this course you only need the command-line shell program (See Precompiled Binaries for Windows on the download page)
**SQLite Example** *(User input in **BOLD**)*

Toms-MacBook-Air:sqliteExamples gendreau$ sql3 movies.db
SQLite version 3.7.13 2012-07-17 17:46:21
Enter ".help" for instructions
Enter SQL statements terminated with a ";"
sqlite> **create table Movie(mid text primary key, title text, director text);**
sqlite> **.import movie.txt Movie**
sqlite> **select title from Movie where director = 'John Ford';**
The Grapes of Wrath
The Quiet Man
sqlite> **.quit**
SQLite Example Windows

- `.open filename` (open an existing database)
- `.save filename` (save the contents of the database a file)
Other SQLite Commands
(Windows and Mac)

- .read
- .output
Assignment 0 (zero points)

• Implement the Movie database in SQLite
• Follow the example I showed on the previous slide
  – Windows users must open a command shell and run sqlite3.exe
  – Windows users will have to download the command line shell
  – Mac users must run the Terminal app and run sqlite3