SQL: Structured Query Language

1 sheet on half wall

INFO/CS 2300:
Intermediate Web Design and Programming

P2, HW 1

Due this Tuesday 5pm.

Note that you must upload to CMS for each assignment by the deadline as your signal to us that your work is complete and ready for grading.

jQuery example: sticky menu

```
$(document).scroll(function() {
    var y = $(document).scrollTop(), //get page y value
    nav = $("#primary_nav"),
    headerHeight = $('#cu-identity').outerHeight(),
    adminBarHeight = $('#wpadminbar').outerHeight();
    aboveHeight =  headerHeight + adminBarHeight;

    if((y >= aboveHeight) && screen.width > 939) {
        nav.css({position: "fixed", "top" : adminBarHeight + "px"});
    } else {
        nav.css({position: "relative", "top" : "0"});
    }
});
```

http://music.cornell.edu/people/faculty/

http://www.smashingmagazine.com/2012/09/11/sticky-menus-are-quicker-to-navigate/

http://jsfiddle.net/mariusc23/s6mLJ/31/

jQuery example: slideToggle

```
//Open or close the filter div
$( 'h3.overlay-link' ).on( 'click', function(){
        //Class to change appearance of + marker
        $( this ).toggleClass( 'open' );

        //Show or hide the filters
        $( '.filter' ).slideToggle( 400, 'swing' );
});
```

http://earthpattern.com/piece/

jQuery example: CSS transition

```
$("article.piece").on( 'mouseenter', function () {
    $(this).addClass('hover');
});
$("article.piece").on( 'mouseleave', function () {
    $(this).removeClass('hover');
});

.hover .overlay {
    height: 100%;
    opacity: .8;
}
.overlay {
    opacity: 0;
    height: 0;
    transition: all 0.25s;
}
```

Even better: no JavaScript

```
parent:hover .overlay {
    height: 100%;
    opacity: .8;
}
.overlay {
    opacity: 0;
    height: 0;
    transition: all 0.25s;
}
```

http://earthpattern.com/piece/

JS constraint case study

- Inches vs cm
- Finishing
- Shipping
- PayPal
  - Add to Cart button is initially disabled
  - Like HW1, not touching PHP cart code – tweak with JS

http://earthpattern.com/piece/albert-rift/#view-purchase

Choosing primary keys

Students(NetID, FirstName, LastName)

Courses(Dept, Number, Time, Semester)

Registrations(NetID, Dept, Number, Semester)

Natural Keys

Alternatively

Students(NetID, FirstName, LastName)

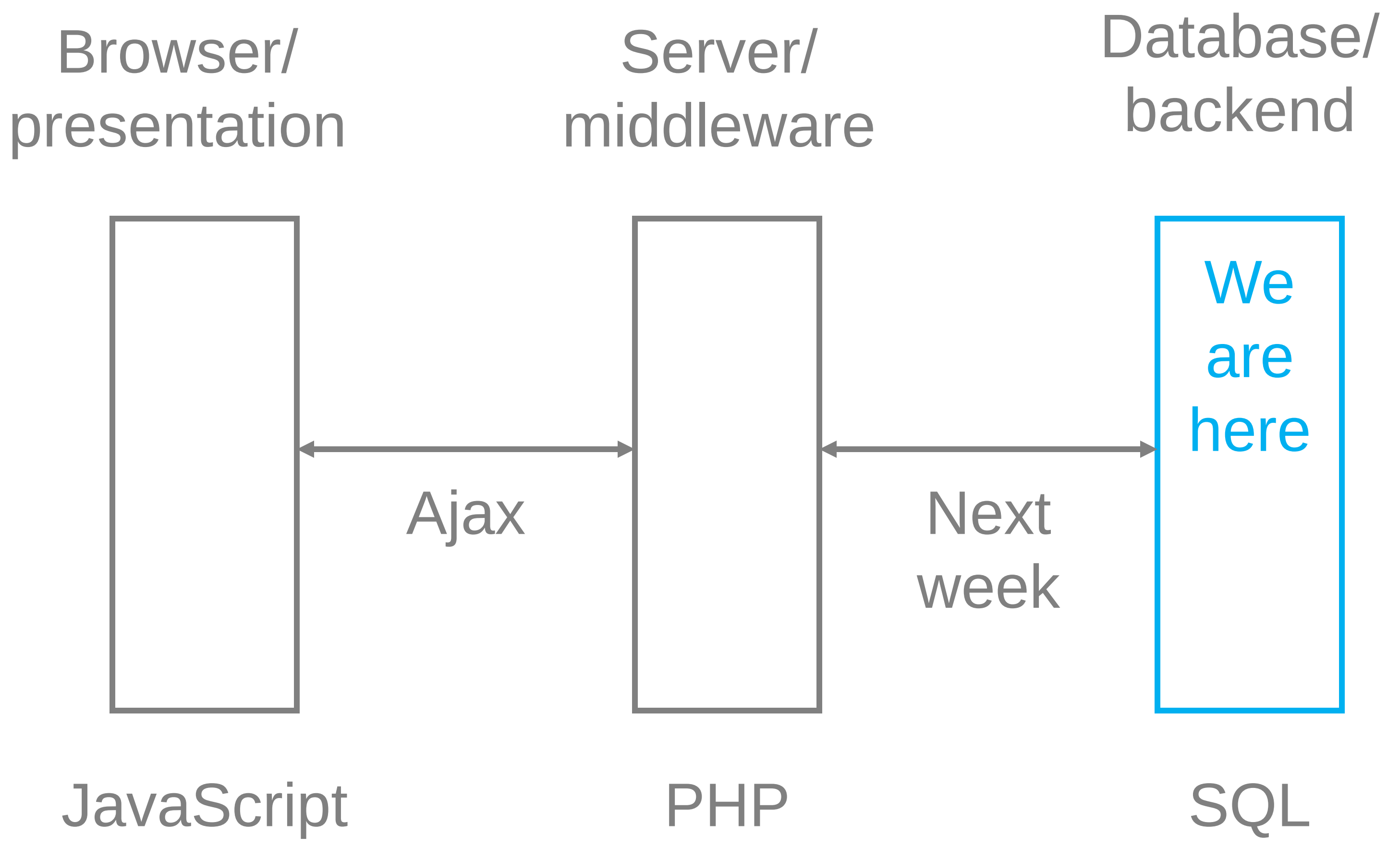
Courses(CourseID, Dept, Number, Time, Semester)

Surrogate Key

Registrations(NetID, CourseID)

Foreign Keys

Course Overview



SQL basics: selection and projection

Movies

Title	Year	Length
Sleepless in Seattle	1993	105
Holiday	1938	95
The Philadelphia Story	1940	112
Sabrina	1954	113

Show me movies that are shorter than 100 minutes

```
SELECT *
  FROM MOVIES
  WHERE Length < 100
```

Title	Year	Length
Holiday	1938	95 mins.

The basic SQL statement

```
SELECT Fields
  FROM Table
  WHERE Condition

SELECT *
  FROM MOVIES
  WHERE Length < 100
```

The * means all fields

Conditions

We can use the following conditions in the “`WHERE`” clause:

= (equals)

not == like in PHP

< (less than)

> (greater than)

<= (less than or equal)

>= (greater than or equal)

<> (not equal)

not != like in PHP

Conditions can use ( ) as well as “`AND`”, “`OR`”, and “`NOT`”.

Selection

Title	Year	Length
Gladiator	2000	155
A Beautiful Mind	2001	135
Chicago	2002	113
The Return of the King	2003	201
Million Dollar Baby	2004	132

E.g.
```
SELECT *
 FROM MOVIES
 WHERE Length > 150
```

Title	Year	Length
Gladiator	2000	155
The Return of the King	2003	201

Title	Year	Length
Gladiator	2000	155
A Beautiful Mind	2001	135
Chicago	2002	113
The Return of the King	2003	201
Million Dollar Baby	2004	132

Show me movies that are longer than 150 minutes
and were made before 2002

```
SELECT *
FROM MOVIES
WHERE (Length > 150)
    AND (Year < 2002)
```

Title	Year	Length
Gladiator	2000	155

Title	Year	Length
The Lion King	1994	89
A Beautiful Mind	2001	135
Chicago	2002	113
The Return of the King	2003	201
Million Dollar Baby	2004	132

Show me movies that have “King” in the title

```
SELECT *
FROM MOVIES
WHERE (Title LIKE '%King%' )
```

Title	Year	Length
The Lion King	1994	89
The Return of the King	2003	201

Simple wildcards

`LIKE` uses special characters

- `%` - percent matches 0 or more characters
- `_` - underscore matches any single character

```
SELECT *
FROM Movies
WHERE Title LIKE ‘%King%’
```

Regular expressions

Some variants of SQL (such as MySQL) allow regular expression matching.

```
SELECT *
FROM Movies
WHERE Title REGEXP ‘[aeou]t’;
```

Title	**Year**	**Length**
Gladiator	2000	155
A Beautiful Mind	2001	135
Chicago	2002	113
The Return of the King	2003	201
Million Dollar Baby	2004	132

Projection

Student(NetID, firstName, lastName, year, address, dateOfBirth, gpa, …)

Give me just the NetID and last name of students named “Steve”

```
SELECT NetID, lastName
FROM Student
WHERE firstName = ‘Steve’
```

When the query specifies only some of the fields it is called a projection.

Distinct

Name	Title	Year
Russell Crowe	Gladiator	2000
Russell Crowe	A Beautiful Mind	2001
Viggo Mortensen	Return of the King	2003
Hillary Swank	Million Dollar Baby	2004

What actors are in my table?

```
SELECT Name
FROM StarsIn
```

Name
Russell Crowe
Russell Crowe
Viggo Mortensen
Hillary Swank

```
SELECT DISTINCT Name
FROM StarsIn
```

Name
Russell Crowe
Viggo Mortensen
Hillary Swank

Click In!

Click In!

Which of the following is not a valid SQL statement?

A. `SELECT * FROM movies WHERE year = 2002`

B. `SELECT title WHERE year > 2002`

C. `SELECT * FROM movies`

D. `SELECT year, length FROM movies WHERE length <> 145`

E. `SELECT title FROM movies WHERE title LIKE 'The_'`

Click In!

Which of the following is not a valid SQL statement?

A. `SELECT * FROM movies WHERE year = 2002`

B. `SELECT title WHERE year > 2002`

C. `SELECT * FROM movies`

D. `SELECT year, length FROM movies WHERE length <> 145`

E. `SELECT title FROM movies WHERE title LIKE 'The_'`

Click In!

id	first_name	last_name	age	subject
100	Rahul	Sharma	10	Science
101	Anjali	Bhagwat	12	Math
102	Stephen	Fleming	9	Science
103	Shekar	Gowda	18	Math
104	Priya	Chandra	15	Economics

What is the last name and subject of students 10 and older

```
SELECT ____ FROM students _______________
```

A	last_name, subject	WHERE age >= 10
B	*	if age >= 10
C	last_name, subject	WHERE age > 10
D	*	age >=10
E	last_name, subject	if age >= 10

Click In!

id	first_name	last_name	age	subject
100	Rahul	Sharma	10	Science
101	Anjali	Bhagwat	12	Math
102	Stephen	Fleming	9	Science
103	Shekar	Gowda	18	Math
104	Priya	Chandra	15	Economics

What is the last name and subject of students 10 and older

```
SELECT ____ FROM students _______________
```

A	last_name, subject	WHERE age >= 10
B	*	if age >= 10
C	last_name, subject	WHERE age > 10
D	*	age >=10
E	last_name, subject	if age >= 10

More than one table

Movies

Title	Year
Gladiator	2000
A Beautiful Mind	2001

StarsIn

Name	Title
Russell Crowe	Gladiator
Viggo Mortensen	Return of the King
Hillary Swank	Million-Dollar Baby

```
SELECT *
   FROM MOVIES, StarsIn
```

This "JOIN" is usually useless

Movies.Title	Year	Name	StarsIn.Title
Gladiator	2000	Russell Crowe	Gladiator
A Beautiful Mind	2001	Russell Crowe	Gladiator
Gladiator	2000	Viggo Mortensen	Return of the King
A Beautiful Mind	2001	Viggo Mortensen	Return of the King
Gladiator	2000	Hillary Swank	Million-Dollar Baby
A Beautiful Mind	2001	Hillary Swank	Million-Dollar Baby

INNER JOIN

Students(<u>NetID</u>, FirstName, LastName)

Courses(<u>CourseID</u>, Dept, Number, Time, Semester)

Registrations(<u>NetID</u>, <u>CourseID</u>)

How do we connect Students and Registrations so that only related data is in the result set?

INNER JOIN

Students(NetID, FirstName, LastName)

Courses(CourseID, Dept, Number, Time, Semester)

Registrations(NetID, CourseID)

```
SELECT
  Students.NetID,
  Students.FirstName
FROM
  Students INNER JOIN Registrations
    ON Students.NetID = Registrations.NetID
WHERE CourseID = 12345;
```

What question is this query answering?

Inner join 2 fields

Title	Year	Length
Gladiator	2000	155
A Beautiful Mind	2001	135
Chicago	2002	113
The Return of the King	2003	201
Million Dollar Baby	2004	132

Name	Title	Year
Russell Crowe	Gladiator	2000
Russell Crowe	A Beautiful Mind	2001
Viggo Mortensen	Return of the King	2003
Hillary Swank	Million Dollar Baby	2004

```
SELECT *
FROM
  Movies INNER JOIN StarsIn
     ON Movies.Title = StarsIn.Title
       AND Movies.Year = StarsIn.Year
WHERE
  Length > 150;
```

Inner join results

Title	**Year**	**Length**
Gladiator	2000	155
A Beautiful Mind	2001	135
Chicago	2002	113
The Return of the King	2003	201

Name	**Title**	**Year**
Russell Crowe	Gladiator	2000
Russell Crowe	A Beautiful Mind	2001
Viggo Mortensen	Return of the King	2003

Movies.Title	Movies.Year	Length	Name	StarsIn.Title	StarsIn.Year
Gladiator	2000	155	Russell Crowe	Gladiator	2000
A Beautiful Mind	2001	135	Russell Crowe	A Beautiful Mind	2001
The Return of the King	2003	201	Viggo Mortensen	Return of the King	2003

INNER JOIN 3 tables

students(<u>NetID</u>, FirstName, LastName)

courses(<u>CourseID</u>, Dept, Number, Time, Semester)

registrations(<u>NetID</u>, <u>CourseID</u>)

```
SELECT
  students.NetID,
  students.FirstName,
  courses.Dept
FROM registrations
  INNER JOIN students
    ON registrations.NetID = students.NetID
  INNER JOIN courses
    ON registrations.CourseID = courses.CourseID
WHERE courses.Dept = "Information Science"
```

Alias

```
SELECT
   s.NetID,
   s.FirstName
FROM registrations r
   INNER JOIN students s
      ON r.NetID = s.NetID
WHERE r.CourseID = 12345
```

The “s” is an alias for Students and “r” for Registrations

Steve’s opinion: usually makes the SQL harder to read; we have to translate in our minds

Aggregation

We can aggregate results of a given field across all records of a table.

SUM – sums a field with numerical value

AVG – averages a field with numerical values

MIN, MAX – produces minimum, maximum of a field (either for numbers or strings)

COUNT – counts the number of records

Title	Year	Length
Gladiator	2000	155
A Beautiful Mind	2001	135
Chicago	2002	113
The Return of the King	2003	201
Million Dollar Baby	2004	132

```
SELECT MAX(Length)
  FROM Movies;
```

MAX(Length)
201

Alias for field

```
SELECT AVG(Length) as Average
  FROM Movies;
```

Average
147.2

```
SELECT COUNT(*)
  FROM Movies
  WHERE Year >= 2002;
```

Count(*)
3

Distinct

Name	Title	Year
Russell Crowe	Gladiator	2000
Russell Crowe	A Beautiful Mind	2001
Viggo Mortensen	Return of the King	2003
Hillary Swank	Million Dollar Baby	2004

Remember this?

```
SELECT DISTINCT Name
  FROM StarsIn
```

Name
Russell Crowe
Viggo Mortensen
Hillary Swank

```
SELECT COUNT(DISTINCT Name)
  FROM StarsIn
```

Count(DISTINCT Name)
3

Now you try…

List all hotel names

Hotel (hotelNo, hotelName, city)

Room (roomNo, hotelNo, type, price)

Booking (hotelNo, guestNo, dateFrom, dateTo, roomNo)

Guest (guestNo, guestName, guestAddress)

List all hotel names

Hotel (hotelNo, hotelName, city)

Room (roomNo, hotelNo, type, price)

Booking (hotelNo, guestNo, dateFrom, dateTo, roomNo)

Guest (guestNo, guestName, guestAddress)

```
SELECT hotelName
  FROM Hotel;
```

List the names of all hotels that have single rooms with a price below $100

Hotel (hotelNo, hotelName, city)

Room (roomNo, hotelNo, type, price)

Booking (hotelNo, guestNo, dateFrom, dateTo, roomNo)

Guest (guestNo, guestName, guestAddress)

List the names of all hotels that have single rooms with a price below $100

Hotel (hotelNo, hotelName, city)

Room (roomNo, hotelNo, type, price)

Booking (hotelNo, guestNo, dateFrom, dateTo, roomNo)

Guest (guestNo, guestName, guestAddress)

```
SELECT
  hotelName
FROM



WHERE
  type = 'single'
  AND price < 100;
```

List the names of all hotels that have single rooms with a price below $100

Hotel (hotelNo, hotelName, city)

Room (roomNo, hotelNo, type, price)

Booking (hotelNo, guestNo, dateFrom, dateTo, roomNo)

Guest (guestNo, guestName, guestAddress)

```
SELECT
  hotelName
FROM
  Hotel INNER JOIN Room
    ON Hotel.hotelNo = Room.hotelNo
WHERE
  type = 'single'
  AND price < 100;
```

But there is still a problem: duplicate entries

List the names of all hotels that have single rooms with a price below $100

Hotel (<u>hotelNo</u>, hotelName, city)

Room (<u>roomNo</u>, <u>hotelNo</u>, type, price)

Booking (<u>hotelNo</u>, <u>guestNo</u>, <u>dateFrom</u>, dateTo, roomNo)

Guest (<u>guestNo</u>, guestName, guestAddress)

```
SELECT DISTINCT
   hotelName
FROM
   Hotel INNER JOIN Room
      ON Hotel.hotelNo = Room.hotelNo
WHERE
   type = 'single'
   AND price < 100;
```

Eliminate duplicate entries

What is the average price of a room?

Hotel (<u>hotelNo</u>, hotelName, city)

Room (<u>roomNo</u>, <u>hotelNo</u>, type, price)

Booking (<u>hotelNo</u>, <u>guestNo</u>, <u>dateFrom</u>, dateTo, roomNo)

Guest (<u>guestNo,</u> guestName, guestAddress)

What is the average price of a room?

```
SELECT
  AVG( price )
FROM
  Room;
```

Hotel (hotelNo, hotelName, city)

Room (roomNo, hotelNo, type, price)

Booking (hotelNo, guestNo, dateFrom, dateTo, roomNo)

Guest (guestNo, guestName, guestAddress)

List the room number, price and type of all rooms at the Statler

Hotel (hotelNo, hotelName, city)

Room (roomNo, hotelNo, type, price)

Booking (hotelNo, guestNo, dateFrom, dateTo, roomNo)

Guest (guestNo, guestName, guestAddress)

List the room number, price and type of all rooms at the Statler

Hotel (hotelNo, hotelName, city)
Room (roomNo, hotelNo, type, price)
Booking (hotelNo, guestNo, dateFrom, dateTo, roomNo)
Guest (guestNo, guestName, guestAddress)

```
SELECT
  Room.roomNo,
  Room.price,
  Room.type
FROM
  Hotel INNER JOIN Room
    ON Hotel.hotelNo = Room.hotelNo
WHERE
  Hotel.hotelName = ‘Statler’
```

Order doesn't matter for INNER JOIN

List all guests currently staying at the Statler

Hotel (hotelNo, hotelName, city)

Room (roomNo, hotelNo, type, price)

Booking (hotelNo, guestNo, dateFrom, dateTo, roomNo)

Guest (guestNo, guestName, guestAddress)

List all guests currently staying at the Statler

Hotel (hotelNo, hotelName, city)
Room (roomNo, hotelNo, type, price)
Booking (hotelNo, guestNo, dateFrom, dateTo, roomNo)
Guest (guestNo, guestName, guestAddress)

```
SELECT
  Guest.guestName
FROM
  Booking
    INNER JOIN Hotel
      ON Booking.hotelNo = Hotel.hotelNo
    INNER JOIN Guest
      ON Booking.guestNo = Guest.guestNo
WHERE
  Hotel.hotelName = ‘Statler’
    AND Booking.dateFrom <= CURDATE()
    AND Booking.dateTo >= CURDATE()
```

List the number of rooms in each hotel

```
SELECT
  Hotel.hotelName,
  COUNT(Room.roomNo)
FROM
  Room
    INNER JOIN Hotel
      ON Room.hotelNo = Hotel.hotelNo
GROUP BY
  Hotel.hotelNo;
```

Review

- SQL is the standard language for asking queries in a relational DBMS.

HW1 Due Tuesday 5 pm – Remember CMS