Matthew J. Graham (Caltech)

SQL: the basics

JPL Jet Propulsion Laboratory
Keck Institute for Space Studies
Sponsored by the Jet Propulsion Laboratory and by the Keck Institute for Space Studies, California Institute of Technology
Caltech

structured query language

- Appeared in 1974 from IBM
- First standard published in 1986; most recent in 2008
- SQL92 is taken to be default standard
- Different flavours:

Microsoft/Sybase	Transact-SQL
MySQL	MySQL
Oracle	PL/SQL
PostgreSQL	PL/pgSQL

select

SELECT *selectionList* FROM *tableList* WHERE *condition*
ORDER BY *criteria*

```
SELECT name, constellation FROM star WHERE dec > 0
    ORDER by vmag

SELECT * FROM star WHERE ra BETWEEN 0 AND 90

SELECT DISTINCT constellation FROM star

SELECT name FROM star LIMIT 5
    ORDER BY vmag
```

joins

Inner join: combining related rows

```
SELECT * FROM star s INNER JOIN stellarTypes t ON s.stellarType = t.id
```

```
SELECT * FROM star s, stellarTypes t WHERE s.stellarType = t.id
```

Outer join: each row does not need a matching row

```
SELECT * from star s LEFT OUTER JOIN stellarTypes t ON s.stellarType = t.id
```

```
SELECT * from star s RIGHT OUTER JOIN stellarTypes t ON s.stellarType = t.id
```

```
SELECT * from star s FULL OUTER JOIN stellarTypes t ON s.stellarType = t.id
```

aggregate functions

COUNT, AVG, MIN, MAX, SUM

```
SELECT COUNT(*) FROM star

SELECT AVG(vmag) FROM star

SELECT stellarType, MIN(vmag), MAX(vmag) FROM star
    GROUP BY stellarType

SELECT stellarType, AVG(vmag), COUNT(id) FROM star
    GROUP BY stellarType
    HAVING vmag > 14
```

create

CREATE DATABASE *databaseName*
CREATE TABLE *tableName* (name1 type1, name2 type2, ...)

```
CREATE TABLE star (name varchar(20), ra float, dec float, vmag float)
```

Data types:

- boolean, bit, tinyint, smallint, int, bigint;
- real/float, double, decimal;
- char, varchar, text, binary, blob, longblob;
- date, time, datetime, timestamp

```
CREATE TABLE star (name varchar(20) not null, ra float default 0, ...)
```

keys

```
CREATE TABLE star (name varchar(20), ra float, dec float, vmag float,
    CONSTRAINT PRIMARY KEY (name))
```

- A primary key is a unique identifier for a row and is automatically not null

```
CREATE TABLE star (name varchar(20), ..., stellarType varchar(8),
    CONSTRAINT stellarType_fk FOREIGN KEY (stellarType)
    REFERENCES stellarTypes(id))
```

- A foreign key is a referential constraint between two tables identifying a column in one table that refers to a column in another table.

show and describe

SHOW ...

```
SHOW TABLES
```

```
SHOW INDEXES IN star
```

```
SHOW WARNINGS
```

DESCRIBE

```
DESCRIBE star
```

INSERT INTO *tableName* VALUES(val1, val2, . . .)

```
INSERT INTO star VALUES('Sirius', 101.287, -16.716, -1.47)

INSERT INTO star(name, vmag) VALUES('Canopus', -0.72)

INSERT INTO star
    SELECT ...
```

load data

LOAD DATA INFILE *"path/to/file"* INTO TABLE *tableName*
FIELDS TERMINATED BY *"delimiter"*

```
LOAD DATA INFILE "data.csv" INTO TABLE star FIELDS TERMINATED BY ","

SELECT * INTO OUTFILE "/tmp/star" FIELDS TERMINATED BY "," FROM star
  WHERE vmag > 16
```

delete

DELETE FROM *tableName* WHERE *condition*
TRUNCATE TABLE *tableName*
DROP TABLE *tableName*

```
DELETE FROM star WHERE name = 'Canopus'

DELETE FROM star WHERE name LIKE 'C_n%'

DELETE FROM star WHERE vmag > 0 OR dec < 0

DELETE FROM star WHERE vmag BETWEEN 0 and 5
```

update

UPDATE *tableName* SET *columnName* = val1 WHERE *condition*

```
UPDATE star SET vmag = vmag + 0.5

UPDATE star SET vmag = -1.47 WHERE name LIKE 'Sirius'

UPDATE star INNER JOIN temp on star.id = temp.id SET star.vmag = temp.mag
```