Database Systems Final
Jeffrey Hudak
GitHub Repo Link: https://github.com/jshudak/CSC423

University DBMS Conceptual Design

3. Translate the logical data model for the Oracle Enterprise DBMS

ASSUMPTIONS:

- **Students can return to the same school to complete multiple majors over their lifetime, no reason to give a cap to the number of majors a student can declare.**
- **No two departments will have the same name**
- **No two majors will have the same name**
- **Students need a school-provided non-duplicative ID to be told apart in the system since students with the same major and name/initials can easily exist**
- **No two events with the same name can start on the same day**
- **The same professor cannot be a chair of more than 1 department**
- **"Today's date" is always considered '2021-12-05'**

a. Develop SQL code to create the database schema, reflecting all constraints.

```
#DEPARTMENT Table
query = """
CREATE TABLE Department(
depName VARCHAR(100) NOT NULL,
chairName VARCHAR(100),
numFaculty INT,
PRIMARY KEY(depName),
CONSTRAINT beginDep CHECK (depName LIKE 'Department%')
);
"""
cursor.execute(query)
```

```
# STUDENT Table
query = """
CREATE TABLE Student(
studentID VARCHAR(100) NOT NULL,
studName VARCHAR(100),
studInitials VARCHAR(3),
PRIMARY KEY(studentID),
CONSTRAINT oneInit CHECK (studInitials LIKE  '__%')
);
"""
cursor.execute(query)
```

```
# Event Table
query = """
CREATE TABLE Event(
eventName VARCHAR(100) NOT NULL,
startDate DATE NOT NULL,
endDate DATE,
PRIMARY KEY (eventName, startDate),
CONSTRAINT validStart CHECK (startDate > '2021-12-05'),
CONSTRAINT validEnd CHECK (startDate < endDate)
);
"""
cursor.execute(query)
```

```
# MAJOR Table
query = """
CREATE TABLE Major(
majorName VARCHAR(100) NOT NULL,
Code INT,
depName VARCHAR(100),
PRIMARY KEY(majorName),
CONSTRAINT codeLen CHECK (Code < 1000 AND Code > 99),
FOREIGN KEY (depName) REFERENCES Department (depName) ON DELETE CASCADE
ON UPDATE CASCADE
);
"""
cursor.execute(query)
```

```
# DECLAREDMAJOR Table
query = """
CREATE TABLE DeclaredMajor(
studentID VARCHAR(100) NOT NULL,
majorName VARCHAR(100) NOT NULL DEFAULT 'Undeclared',
PRIMARY KEY(studentID, majorName),
FOREIGN KEY (studentID) REFERENCES Student (studentID) ON DELETE CASCADE ON
UPDATE CASCADE,
FOREIGN KEY (majorName) REFERENCES Major (majorName) ON DELETE SET DEFAULT
ON UPDATE CASCADE
);
"""
cursor.execute(query)
```

```
# EVENTATTENDANCE Table
query = """
CREATE TABLE EventAttendance(
studentID VARCHAR(100) NOT NULL,
eventName VARCHAR(100) NOT NULL,
startDate DATE NOT NULL,
PRIMARY KEY(studentID, eventName, startDate),
FOREIGN KEY (studentID) REFERENCES Student (studentID) ON DELETE CASCADE ON
UPDATE CASCADE,
FOREIGN KEY (eventName) REFERENCES Event (eventName) ON DELETE CASCADE ON
UPDATE CASCADE,
FOREIGN KEY (startDate) REFERENCES Event (startDate) ON DELETE CASCADE ON
UPDATE CASCADE
);
"""
cursor.execute(query)
```

```
# UTILIZEDDEPARTMENT Table
query = """
CREATE TABLE UtilizedDepartment(
eventName VARCHAR(100) NOT NULL,
startDate DATE NOT NULL,
depName VARCHAR(100) NOT NULL,
PRIMARY KEY(eventName, startDate, depName),
FOREIGN KEY (eventName) REFERENCES Event (eventName) ON DELETE CASCADE ON
UPDATE CASCADE,
FOREIGN KEY (startDate) REFERENCES Event (startDate) ON DELETE CASCADE ON
UPDATE CASCADE,
FOREIGN KEY (depName) REFERENCES Department (depName) ON DELETE CASCADE
ON UPDATE CASCADE
);
"""
cursor.execute(query)
```

b. Create at least 5 tuples for each relation in your database

```
# Insert row into table
query = """
INSERT INTO Department
VALUES ("Department of Chemistry", "Mary", 7);
"""
cursor.execute(query)

# Insert row into table
query = """
INSERT INTO Department
VALUES ("Department of Biology", "Megan", 9);
"""
cursor.execute(query)

# Insert row into table
query = """
INSERT INTO Department
VALUES ("Department of Business", "Jacob", 23);
"""
cursor.execute(query)

# Insert row into table
query = """
INSERT INTO Department
VALUES ("Department of Computer Science", "Jeffrey", 7);
"""
cursor.execute(query)

# Insert row into table
query = """
INSERT INTO Department
VALUES ("Department of Mathematics", "Haley", 15);
"""
cursor.execute(query)
```

```
Department Table:
                          depName chairName  numFaculty
0         Department of Chemistry      Mary           7
1           Department of Biology     Megan           9
2          Department of Business     Jacob          23
3  Department of Computer Science   Jeffrey           7
4       Department of Mathematics     Haley          15
Index(['depName', 'chairName', 'numFaculty'], dtype='object')
```

```
# Insert row into table
query = """
INSERT INTO Student
VALUES ("S0001", "Dean Osborne", "DEO");
"""
cursor.execute(query)

# Insert row into table
query = """
INSERT INTO Student
VALUES ("S0002", "Caleb Heathershaw", "CAH");
"""
cursor.execute(query)

# Insert row into table
query = """
INSERT INTO Student
VALUES ("S0003", "Patrick Denny", "PDD");
"""
cursor.execute(query)

# Insert row into table
query = """
INSERT INTO Student
VALUES ("S0004", "Julia Eisner", "JAE");
"""
cursor.execute(query)

# Insert row into table
query = """
INSERT INTO Student
VALUES ("S0005", "Maya Nambiar", "MIN");
"""
cursor.execute(query)
```

```
Student Table:
  studentID           studName studInitials
0     S0001       Dean Osborne          DEO
1     S0002  Caleb Heathershaw          CAH
2     S0003      Patrick Denny          PDD
3     S0004       Julia Eisner          JAE
4     S0005       Maya Nambiar          MIN
Index(['studentID', 'studName', 'studInitials'], dtype='object')
```

```
# Insert row into table
query = """
INSERT INTO Event
VALUES ("Miami vs WSU", '2021-12-31', '2022-01-01');
"""
cursor.execute(query)


# Insert row into table
query = """
INSERT INTO Event
VALUES ("Move-In", '2022-01-12', '2022-01-16');
"""
cursor.execute(query)

# Insert row into table
query = """
INSERT INTO Event
VALUES ("Valentines Day", '2022-02-12', '2022-02-13');
"""
cursor.execute(query)

# Insert row into table
query = """
INSERT INTO Event
VALUES ("Jeffs Birthday", '2022-03-31', '2022-04-01');
"""
cursor.execute(query)

# Insert row into table
query = """
INSERT INTO Event
VALUES ("Spring Break", '2022-03-12', '2022-03-20');
"""
cursor.execute(query)
```

```
Event Table:
        eventName   startDate     endDate
0    Miami vs WSU  2021-12-31  2022-01-01
1         Move-In  2022-01-12  2022-01-16
2  Valentines Day  2022-02-12  2022-02-13
3  Jeffs Birthday  2022-03-31  2022-04-01
4    Spring Break  2022-03-12  2022-03-20
Index(['eventName', 'startDate', 'endDate'], dtype='object')
```

```
# Insert row into table
query = """
INSERT INTO EventAttendance
VALUES ("S0001", "Miami vs WSU", '2021-12-31');
"""
cursor.execute(query)


# Insert row into table
query = """
INSERT INTO EventAttendance
VALUES ("S0002", "Move-In", '2022-01-12');
"""
cursor.execute(query)

# Insert row into table
query = """
INSERT INTO EventAttendance
VALUES ("S0003", "Valentines Day", '2022-02-12');
"""
cursor.execute(query)

# Insert row into table
query = """
INSERT INTO EventAttendance
VALUES ("S0004", "Jeffs Birthday", '2022-03-31');
"""
cursor.execute(query)

# Insert row into table
query = """
INSERT INTO EventAttendance
VALUES ("S0005", "Spring Break", '2022-03-12');
"""
cursor.execute(query)
```

```
EventAttendance Table:
  studentID       eventName   startDate
0     S0001    Miami vs WSU  2021-12-31
1     S0002         Move-In  2022-01-12
2     S0003  Valentines Day  2022-02-12
3     S0004  Jeffs Birthday  2022-03-31
4     S0005    Spring Break  2022-03-12
Index(['studentID', 'eventName', 'startDate'], dtype='object')
```

```
# Insert row into table
query = """
INSERT INTO UtilizedDepartment
VALUES ("Miami vs WSU", '2021-12-31', "Department of Chemistry");
"""
cursor.execute(query)


# Insert row into table
query = """
INSERT INTO UtilizedDepartment
VALUES ("Move-In", '2022-01-12', "Department of Biology");
"""
cursor.execute(query)

# Insert row into table
query = """
INSERT INTO UtilizedDepartment
VALUES ("Valentines Day", '2022-02-12', "Department of Computer Science");
"""
cursor.execute(query)

# Insert row into table
query = """
INSERT INTO UtilizedDepartment
VALUES ("Jeffs Birthday", '2022-03-31', "Department of Mathematics");
"""
cursor.execute(query)

# Insert row into table
query = """
INSERT INTO UtilizedDepartment
VALUES ("Spring Break", '2022-03-12', "Department of Business");
"""
cursor.execute(query)
```

```
UtilizedDepartment Table:
        eventName   startDate                          depName
0    Miami vs WSU  2021-12-31         Department of Chemistry
1         Move-In  2022-01-12           Department of Biology
2  Valentines Day  2022-02-12  Department of Computer Science
3  Jeffs Birthday  2022-03-31       Department of Mathematics
4    Spring Break  2022-03-12          Department of Business
Index(['eventName', 'startDate', 'depName'], dtype='object')
```

```
# Insert row into table
query = """
INSERT INTO Major
VALUES ("Investigative Chemistry", 101, "Department of Chemistry");
"""
cursor.execute(query)

# Insert row into table
query = """
INSERT INTO Major
VALUES ("Microbiology", 201, "Department of Biology");
"""
cursor.execute(query)

# Insert row into table
query = """
INSERT INTO Major
VALUES ("Marketing", 301, "Department of Business");
"""
cursor.execute(query)

# Insert row into table
query = """
INSERT INTO Major
VALUES ("Data Science", 401, "Department of Computer Science");
"""
cursor.execute(query)

# Insert row into table
query = """
INSERT INTO Major
VALUES ("Probability and Statistics", 501, "Department of Mathematics");
"""
cursor.execute(query)
```

```
Major Table:
                   majorName  Code                          depName
0     Investigative Chemistry   101         Department of Chemistry
1                Microbiology   201           Department of Biology
2                   Marketing   301          Department of Business
3                Data Science   401  Department of Computer Science
4  Probability and Statistics   501       Department of Mathematics
Index(['majorName', 'Code', 'depName'], dtype='object')
```

```
# Insert row into table
query = """
INSERT INTO DeclaredMajor
VALUES ("S0005", "Investigative Chemistry");
"""
cursor.execute(query)

# Insert row into table
query = """
INSERT INTO DeclaredMajor
VALUES ("S0002", "Microbiology");
"""
cursor.execute(query)

# Insert row into table
query = """
INSERT INTO DeclaredMajor
VALUES ("S0003", "Marketing");
"""
cursor.execute(query)

# Insert row into table
query = """
INSERT INTO DeclaredMajor
VALUES ("S0004", "Data Science");
"""
cursor.execute(query)

# Insert row into table
query = """
INSERT INTO DeclaredMajor
VALUES ("S0001", "Probability and Statistics");
"""
cursor.execute(query)
```

```
DeclaredMajor Table:
  studentID                   majorName
0     S0005     Investigative Chemistry
1     S0002                Microbiology
2     S0003                   Marketing
3     S0004                Data Science
4     S0001  Probability and Statistics
Index(['studentID', 'majorName'], dtype='object')
```

Finalized Database after Data Input:

```
In [94]: runfile('C:/Users/jshud/OneDrive/Desktop/School Stuff/CSC424/connect_sqlite.py', wdir='C:/Users/jshud/
OneDrive/Desktop/School Stuff/CSC424')
Student Table:
  studentID          studName studInitials
0     S0001       Dean Osborne          DEO
1     S0002  Caleb Heathershaw          CAH
2     S0003      Patrick Denny          PDD
3     S0004       Julia Eisner          JAE
4     S0005       Maya Nambiar          MIN
Index(['studentID', 'studName', 'studInitials'], dtype='object')

In [95]: runfile('C:/Users/jshud/OneDrive/Desktop/School Stuff/CSC424/connect_sqlite.py', wdir='C:/Users/jshud/
OneDrive/Desktop/School Stuff/CSC424')
Major Table:
                   majorName  Code                        depName
0     Investigative Chemistry   101         Department of Chemistry
1               Microbiology   201           Department of Biology
2                  Marketing   301          Department of Business
3               Data Science   401  Department of Computer Science
4  Probability and Statistics   501       Department of Mathematics
Index(['majorName', 'Code', 'depName'], dtype='object')

In [96]: runfile('C:/Users/jshud/OneDrive/Desktop/School Stuff/CSC424/connect_sqlite.py', wdir='C:/Users/jshud/
OneDrive/Desktop/School Stuff/CSC424')
Department Table:
                         depName chairName  numFaculty
0         Department of Chemistry      Mary           7
1           Department of Biology     Megan           9
2          Department of Business     Jacob          23
3  Department of Computer Science   Jeffrey           7
4       Department of Mathematics     Haley          15
Index(['depName', 'chairName', 'numFaculty'], dtype='object')


In [97]: runfile('C:/Users/jshud/OneDrive/Desktop/School Stuff/CSC424/connect_sqlite.py', wdir='C:/Users/jshud/
OneDrive/Desktop/School Stuff/CSC424')
Event Table:
        eventName   startDate     endDate
0    Miami vs WSU  2021-12-31  2022-01-01
1         Move-In  2022-01-12  2022-01-16
2  Valentines Day  2022-02-12  2022-02-13
3  Jeffs Birthday  2022-03-31  2022-04-01
4    Spring Break  2022-03-12  2022-03-20
Index(['eventName', 'startDate', 'endDate'], dtype='object')

In [98]: runfile('C:/Users/jshud/OneDrive/Desktop/School Stuff/CSC424/connect_sqlite.py', wdir='C:/Users/jshud/
OneDrive/Desktop/School Stuff/CSC424')
DeclaredMajor Table:
  studentID                  majorName
0     S0005     Investigative Chemistry
1     S0002               Microbiology
2     S0003                  Marketing
3     S0004               Data Science
4     S0001  Probability and Statistics
Index(['studentID', 'majorName'], dtype='object')

In [99]: runfile('C:/Users/jshud/OneDrive/Desktop/School Stuff/CSC424/connect_sqlite.py', wdir='C:/Users/jshud/
OneDrive/Desktop/School Stuff/CSC424')
UtilizedDepartment Table:
        eventName   startDate                        depName
0    Miami vs WSU  2021-12-31         Department of Chemistry
1         Move-In  2022-01-12           Department of Biology
2  Valentines Day  2022-02-12  Department of Computer Science
3  Jeffs Birthday  2022-03-31       Department of Mathematics
4    Spring Break  2022-03-12          Department of Business
Index(['eventName', 'startDate', 'depName'], dtype='object')

In [100]: runfile('C:/Users/jshud/OneDrive/Desktop/School Stuff/CSC424/connect_sqlite.py', wdir='C:/Users/
jshud/OneDrive/Desktop/School Stuff/CSC424')
EventAttendance Table:
  studentID       eventName   startDate
0     S0001    Miami vs WSU  2021-12-31
1     S0002         Move-In  2022-01-12
2     S0003  Valentines Day  2022-02-12
3     S0004  Jeffs Birthday  2022-03-31
4     S0005    Spring Break  2022-03-12
Index(['studentID', 'eventName', 'startDate'], dtype='object')
```

c. Develop 5 SQL queries using embedded SQL.

```
# If the user wants to see all students that attended the football game, they can search
# for all studentIDs in the EventAttendance table at that event use those IDs to find
# names in the Student table.

query = """
SELECT e.eventName, e.studentID, s.studName
FROM EventAttendance e, Student s
WHERE e.studentID == s.studentID AND e.eventName LIKE "Miami VS WSU"
"""
cursor.execute(query)
```

```
      eventName studentID      studName
0  Miami vs WSU     S0001  Dean Osborne
Index(['eventName', 'studentID', 'studName'], dtype='object')
```

```
# If the user wants to count how many students are in each major they can figure that
# out just counting how many times a major shows up in the DeclaredMajor table.

query = """
SELECT majorName, COUNT(majorName)
FROM DeclaredMajor
GROUP BY majorName
"""
cursor.execute(query)
```

```
                   majorName  COUNT(majorName)
0               Data Science                 1
1     Investigative Chemistry                 1
2                  Marketing                 1
3               Microbiology                 1
4  Probability and Statistics                 1
Index(['majorName', 'COUNT(majorName)'], dtype='object')
```

If the user wants to find each event the chemistry department helped plan they can
find all events in the **UtilizedDepartment** table that matches that a depName of
“%Chemistry”.

```
query = """
SELECT eventName, depName
FROM UtilizedDepartment u
WHERE depName LIKE "%Chemistry"
"""
cursor.execute(query)
```

```
      eventName                    depName
0  Miami vs WSU  Department of Chemistry
Index(['eventName', 'depName'], dtype='object')
```

If the user wants to find which events data science majors attended, and how many
people in that major attended each event, they can match student IDs from
EventAttendance and **DeclaredMajor** and find where majorName is “Data Science”
major, and count the number of student IDs.

```
query = """
SELECT eventName, d.majorName, COUNT(e.studentID)
FROM DeclaredMajor d, EventAttendance e
WHERE (d.studentID == e.studentID) AND (d.majorName LIKE "Data Science")
GROUP BY d.majorName, eventName
"""
cursor.execute(query)
```

```
        eventName     majorName  COUNT(e.studentID)
0  Jeffs Birthday  Data Science                   1
Index(['eventName', 'majorName', 'COUNT(e.studentID)'], dtype='object')
```

If the user wants to find all events that are after Feb. 1st they can just look in the
Event table and find all events where the startDate is greater than ‘2022-02-01’.

```
query = """
SELECT eventName, startDate
FROM Event
WHERE startDate > "2022-02-01"
"""
cursor.execute(query)
```

```
        eventName   startDate
0  Valentines Day  2022-02-12
1  Jeffs Birthday  2022-03-31
2    Spring Break  2022-03-12
Index(['eventName', 'startDate'], dtype='object')
```