University of British Columbia, Vancouver
Department of Computer Science

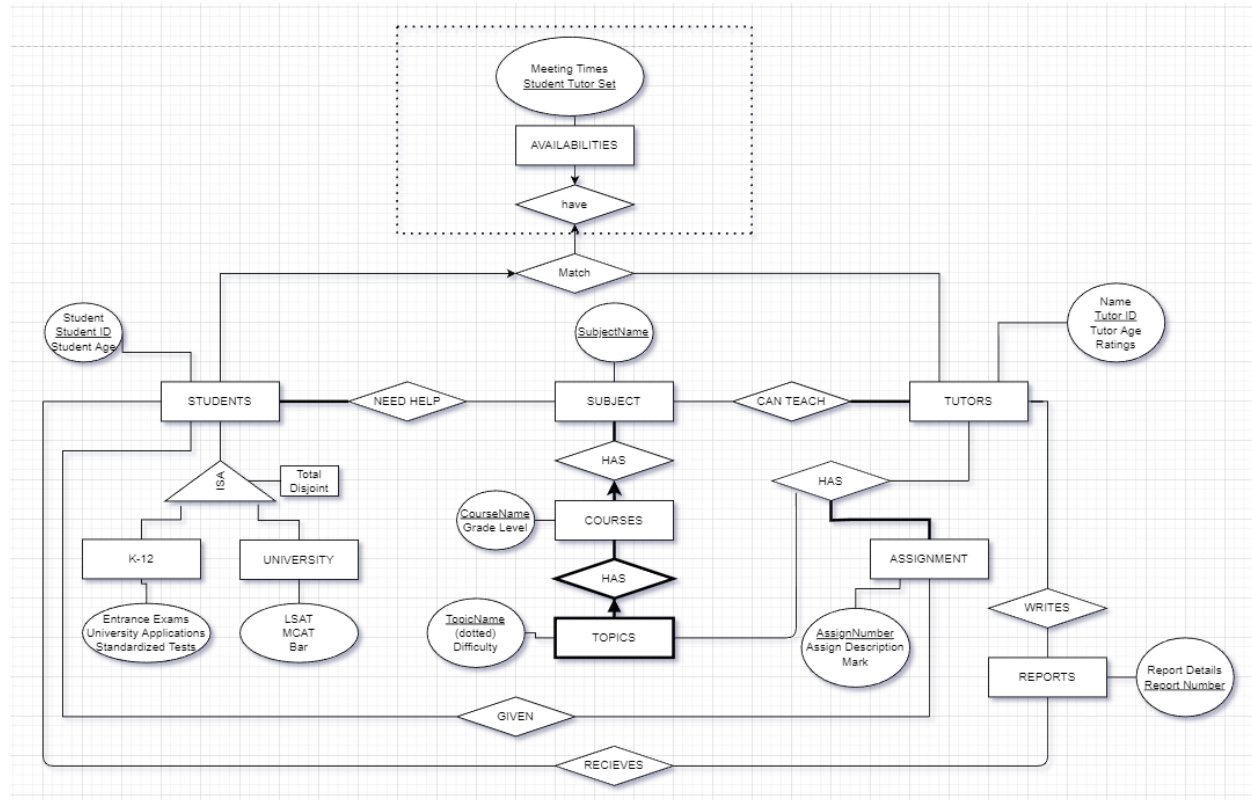# CPSC 304 Project Cover Page

Milestone #: 2

Date: 2022-07-26

Group Number: 21

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By typing our names and student numbers in the above table, we certify that the work in the attached assignment was performed solely by those whose names and student IDs are included above. (In the case of Project Milestone 0, the main purpose of this page is for you to let us know your e-mail address, and then let us assign you to a TA for your project supervisor.)

In addition, we indicate that we are fully aware of the rules and consequences of plagiarism, as set forth by the Department of Computer Science and the University of British Columbia

2. **ER-Diagram**

There are a few changes to note. We edited some of the naming to be more clear, e.g. Tutor Name and Student Name instead of just "name". We also decided to change to an aggregation relationship for students and tutors. Students and tutors can match, and through a matching pair one can also have a schedule of availability.

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3. **Schema**

       K-12(<u>SID</u>, Name, Age, Exams, Uni-Application, SAT, **STS, TutorID**)
       University(<u>SID</u>,Name, Age, LSAT, MCAT, BAR, **STS, TutorID**)
       Availabilities(<u>STS</u>, Meet-Times, **SID, TID**)
       Tutors(<u>TutorID,</u> Name, t-Age, Ratings)
       NeedsHelp(**<u>SID</u>**, **<u>SubjectName</u>**)
       CanTeach(**<u>SubjectName, TutorID</u>**)
       Reports(<u>ReportNumber,</u> ReportDesc)
       WriteReport(**<u>ReportNumber, TutorID</u>**)
       ReceiveReport(**<u>SID, ReportNumber</u>**)
       Subjects(<u>SubjectName</u>)
       Courses(<u>CourseName</u>, Grade-level, **SubjectName**)
       Topics(**<u>Topic-Name</u>**<u>, CourseName</u>, Difficulty)
       Assignment(<u>AssignNumber,</u> assign-Description, Mark)
       Give(**<u>AssignNumber, SID</u>**)
       Has(**<u>Topic-Name, CourseName, TutorID, AssignNumber</u>**)

4. **Functional Dependencies**

       K-12(<u>SID</u>, Name, Age, Exams, Uni-Application, SAT, **STS, TutorID**)

           SID -> Name, Age, Exams, Uni-Application, SAT, **STS, TutorID**
           Age -> Uni-Application, SAT
           SAT -> Uni-Application

       University(<u>SID</u>, Name, Age, LSAT, MCAT, BAR, **STS, TutorID**)

           SID -> Name, Age, LSAT, MCAT, BAR, **STS, TutorID**
           LSAT -> BAR

       Availabilities(<u>STS</u>, Meet-Times, **SID, TID**)

           STS -> Meet-Times, **SID, TID**

       Tutors(<u>TutorID,</u> Name, t-Age, Ratings)

           TutorID -> Name, t-Age, Ratings

       Reports(<u>ReportNumber,</u> ReportDesc)

           ReportNumber -> Desc

Courses(<u>CourseName</u>, Grade-level, **SubjectName**)

CourseName -> Grade-level, **SubjectName**

Topics(**<u>Topic-Name</u>**, <u>CourseName</u>, Difficulty)

Topic-Name, CourseName -> DIfficulty

Assignment(<u>AssignNumber</u>, assign-Description, Mark)

AssignNumber -> assign-Description, Mark

5. **Normalization**

K-12(<u>SID</u>, Name, Age, Exams, Uni-Application, SAT, **STS, TutorID**)

SID -> Name, Age, Exams, Uni-Application, SAT, **STS, TutorID**
Age -> Uni-Application, SAT (violates BCNF)
SAT -> Uni-Application (violates BCNF)

K-12 (SID, Name, Age, Exams, Uni-Applications, SAT, STS, TutorID)

Age -> Uni-Application

SID, Name, Age, Exams, SAT, STS, TutorID   Age, Uni - Application

After reduction we get :
R1(SID, Name, Age, Exams, SAT, STS, TutorID)
R2(Age, Uni-Application)

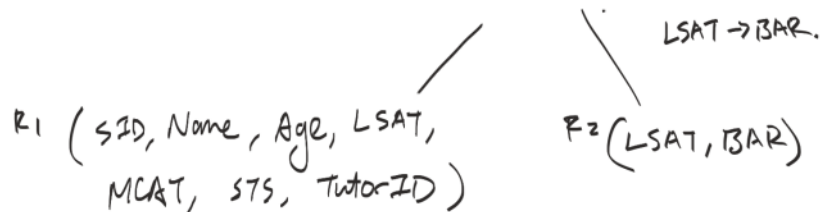University(<u>SID</u>, Name, Age, LSAT, MCAT, BAR, **STS, TutorID**)

SID -> Name, Age, LSAT, MCAT, BAR, **STS, TutorID**
LSAT -> BAR

$SID \rightarrow$ Name, Age, LSAT, MCAT, BAR, STS, TutorID
$LSAT \rightarrow BAR$. 💥 violates BCNF

University (SID, Name, Age, LSAT, MCAT, BAR, STS, TutorID)

$LSAT \rightarrow BAR$.

R1 (SID, Name, Age, LSAT, MCAT, STS, TutorID)

R2 (LSAT, BAR)

After reduction we get :

   R1(SID, Name, Age, LSAT, MCAT, STS, TutorID)
   R2(LSAT, BAR)

5. DDL

  K-12(<u>SID</u>, Name, Age, Exams, UniApplication, SAT, **STS, TutorID**)
  CREATE TABLE k-12 (
    SID int PRIMARY KEY,
    Age int NOT NULL
    Name char(50),
    Exams char(30),
    UniApplication bit,
    SAT bit,
    STS int NOT NULL,
    TutorID NOT NULL,
    FOREIGN KEY (STS) REFERENCES Availabilities,
    FOREIGN KEY(TutorID) REFERENCES Tutors
)

  University(<u>SID</u>,Name, Age, LSAT, MCAT, BAR, **STS, TutorID**)
  CREATE TABLE University(
    SID int PRIMARY KEY,
    Name char(50),
    Age int,
    LSAT bit,
    MCAT bit,

```
        BAR bit,
        STS int,
        TutorID int,
        FOREIGN KEY (STS) REFERENCES Availabilities,
        FOREIGN KEY(TutorID) REFERENCES Tutors
)
```

Availabilities(<u>STS</u>, MeetTimes, **SID, TID**)
```
CREATE TABLE Availabilities (
        STS int PRIMARY KEY,
        MeetTimes char(100),
        SID int NOT NULL,
        TID int NOT NULL,
        FOREIGN KEY (SID) REFERENCES K-12,
        FOREIGN KEY (SID) REFERENCES University,
        FOREIGN KEY(TID) REFERENCES Tutors
)
```

Tutors(<u>TutorID,</u> Name, tAge, Ratings, **STS, SubjectName**)
```
CREATE TABLE Tutors (
        TutorID int PRIMARY KEY,
        Name char(50),
        tAge int,
        Ratings int,
        SubjectName char(50) NOT NULL,
        FOREIGN KEY(STS) REFERENCES Availabilities,
        FOREIGN KEY(SubjectName) REFERENCES Subject
)
```

NeedsHelp(**<u>SID</u>**, **<u>SubjectName</u>**)
```
CREATE TABLE NeedHelp (
        SID integer,
        SubjectName Char(50)
        PRIMARY KEY (SID, SubjectName),
        FOREIGN KEY(SID) REFERENCES K-12,
        FOREIGN KEY(SID) REFERENCES University
)
```

CanTeach(**<u>SubjectName, TutorID</u>**)
```
CREATE TABLE CanTeach(
        Name char(50),
        TutorID int,
```

```
        PRIMARY KEY (SubjectName, TutorID),
        FOREIGN KEY(SubjectName) REFERENCES Subject,
        FOREIGN KEY(TutorID) REFERENCES Tutor
)
```
Reports(<u>ReportNumber,</u> ReportDesc)
```
CREATE TABLE Reports(
        ReportNumber int PRIMARY KEY,
        ReportDesc char(1000)
)
```
WriteReport(**<u>ReportNumber, TutorID</u>**)
```
CREATE TABLE WriteReport(
        ReportNumber int,
        TutorID int,
        PRIMARY KEY(ReportNumber, TutorID),
        FOREIGN KEY(ReportNumber) REFERENCES Reports,
        FOREIGN KEY(TutorID) REFERENCES Tutors
)
```
ReceiveReport(**<u>SID, ReportNumber</u>**)
```
CREATE TABLE ReceiveReport (
        ReportNumber int,
        SID int,
        PRIMARY KEY(ReportNumber, SID),
        FOREIGN KEY(ReportNumber) REFERENCES Reports,
        FOREIGN KEY(SID) REFERENCES Student
)
```
Subjects(<u>SubjectName</u>)
```
CREATE TABLE Subjects(
        SubjectName char(20) PRIMARY KEY
)
```
Courses(<u>CourseName</u>, GradeLevel, **SubjectName**)
```
CREATE TABLE Courses(
        CourseName char(50) PRIMARY KEY,
        GradeLevel int,
        SubjectName char(80) NOT NULL,
        FOREIGN KEY(SubjectName) REFERENCES Subjects
)
```
Topics(**<u>TopicName, CourseName</u>**, Difficulty)
```
CREATE TABLE Topics(
        TopicName char(20),
        CourseName char(20),
        Difficult int,
        PRIMARY KEY(TopicName, CourseName)
        FOREIGN KEY(TopicName) REFERENCES Topics
```

```
)
Assignment(AssignNumber, AssignDescription, Mark)
CREATE TABLE Assignment(
        AssignNumber int PRIMARY KEY,
        AssignDescription char(1000),
        Mark int
)
Give(AssignNumber, SID)
CREATE TABLE Give(
        AssignNumber int,
        SID int,
        PRIMARY KEY(AssignNumber, SID),
        FOREIGN KEY(AssignNumber) REFERENCE Assignment,
        FOREIGN KEY(SID) REFERENCES K-12
        FOREIGN KEY(SID) REFERENCES University
)
Has(TopicName, CourseName, TutorID, AssignNumber)
CREATE TABLE (
        TopicName char(20),
        TutorID integer,
        AssignNumber integer,
        PRIMARY KEY(TopicName, TutorID, AssignNumber)
        FOREIGN KEY(TopicName, CourseName) REFERENCES Topic
        FOREIGN KEY(TutorID) REFERENCES Tutor
        FOREIGN KEY(AssignNumber) REFERENCES Assignment




)
```

6.

K-12

SID	Name	Age	Exams	UniApplication	SAT	STS	TutorID
35694356	Tim	18	1	0	0	112312	1
24357532	Jimmy	16	0	1	1	2	1
13294586	Bob	14	0	0	0	184935	4
19283844	Jones	12	0	0	0	192383	5
10293948	Johnny	18	1	1	1	123944	6

University

SID	Name	Age	LSAT	MCAT	BAR	STS	TutorID
23423672	Sean	20	1	0	0	129488	2
85566722	Isaac	21	0	1	0	417475	3
18553137	Hargreeves	22	0	0	1	183929	7
32904858	Bobby	21	0	0	0	123948	8
1239485	Billy	26	0	0	1	128384	7

Availabilities

STS	MeetTimes	SID	TID
112312	T/TH	35694356	1
2	M/W/F	24357532	1
184935	T/TH	13294586	4
192383	M/T/W	19283844	5
123944	M/TH/F	10293948	6
129488	M/TH/SAT	23423672	2
417475	M/W/F	85566722	3
183929	M/W/F	18553137	7
123948	M/TH/F	32904858	8
128384	M/TH/SAT	1239485	7

Tutors

TutorID	Name	tAge	Ratings
1	Leena	43	4
2	Aaliyah	23	3
3	Mike	28	4
4	Tony	26	4
5	Josh	30	5
6	Sophia	24	3
7	Marnie	28	4
8	Lewis	17	1

NeedsHelp	
SID	SubjectName
35694356	Mathematics
24357532	Physics
13294586	Physics
19283844	English
10293948	English
23423672	Mathematics
85566722	Computer Science
18553137	Biology
32904858	Biology
1239485	Mathematics

CanTeach	
SubjectName	TutorID
Mathematics	1
Physics	2
English	3
Computer Science	4
Biology	5

Reports	
ReportNumber	ReportDesc
324234	Good
123123	Bad
123213	R u even human
956765	Stupid
456456	Genius

WriteReport

ReportNumber	TutorID
324234	1
123123	2
123213	3
956765	4
456456	5

ReceiveReport

SID	ReportNumber
23423672	324234
24357532	123123
85566722	123213
18553137	956765
32904858	456456

Subjects

SubjectName
Mathematics
Physics
English
Computer Science
Biology

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Courses

CourseName	GradeLevel	SubjectName
Pre-Calc 11	11	Math
Biology 12	12	Science
MATH 220	14	Math
Language Arts 9	9	English
BIOL 111	13	Science

Topics

TopicName	CourseName	Difficulty
Trigonometry	Pre-Calc 11	7
Cells	Biology 12	3
Sequence Proofs	MATH 220	10
Hamlet	Language Arts 9	1
Natural Disasters	BIOL 111	3

Assignment

AssignNumber	AssignDescription	Mark
2	Trigonometry Identity practice	90
12	Worksheet on cellular composition	78
5	Worksheet on causes of natural disasters	82
3	Essay on Hamlet's character	95
6	Sequential proof problem set	60

Give

AssignNumber	SID
2	23423672
12	24357532
5	85566722
3	18553137
6	32904858

Has

TopicName	CourseName	TutorID	AssignNumber
Trigonometry Identity practice	Pre-Calc 11	23423672	2
Worksheet on cellular composition	Biology 12	24357532	12
Worksheet on causes of natural disasters	BIOL 111	85566722	5
Essay on Hamlet's character	Language Arts 9	18553137	3
Sequential proof problem set	MATH 220	32904858	6