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WSU ID: 11536698
CptS 451
31 May 2020

HW 3

For each query, include the relational algebra expression, expression tree and output

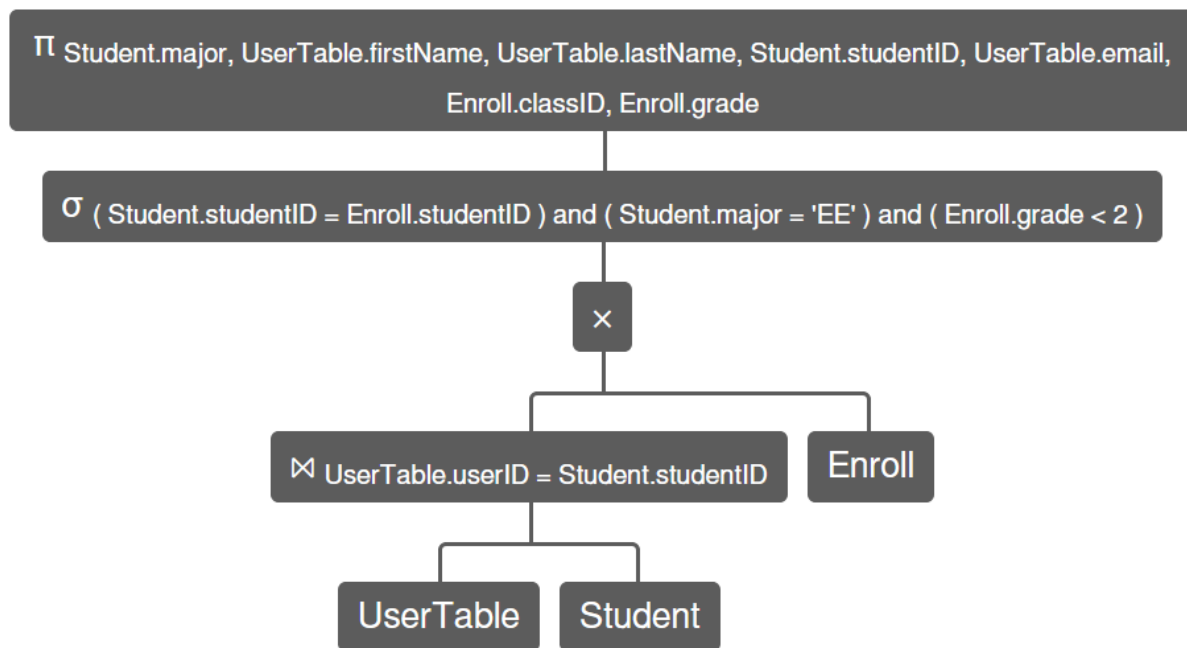
1. Find the students in 'EE' major who failed a class

a. Return the major, firstname, lastname, ID, email, ID of the failed class and the grade earned

Relational algebra expression:

π Student.major, UserTable.firstName, UserTable.lastName, Student.studentID, UserTable.email, Enroll.classID, Enroll.grade (σ (Student.studentID = Enroll.studentID) \wedge (Student.major = 'EE') \wedge (Enroll.grade < 2) ((UserTable \bowtie UserTable.userID = Student.studentID Student) \times Enroll))

Relational algebra tree:



Output:

π Student.major, UserTable.firstName, UserTable.lastName, Student.studentID, UserTable.email, Enroll.classID, Enroll.grade (σ (Student.studentID = Enroll.studentID) and (Student.major = 'EE') and (Enroll.grade < 2) ((UserTable \bowtie UserTable.userID = Student.studentID Student) \times Enroll))

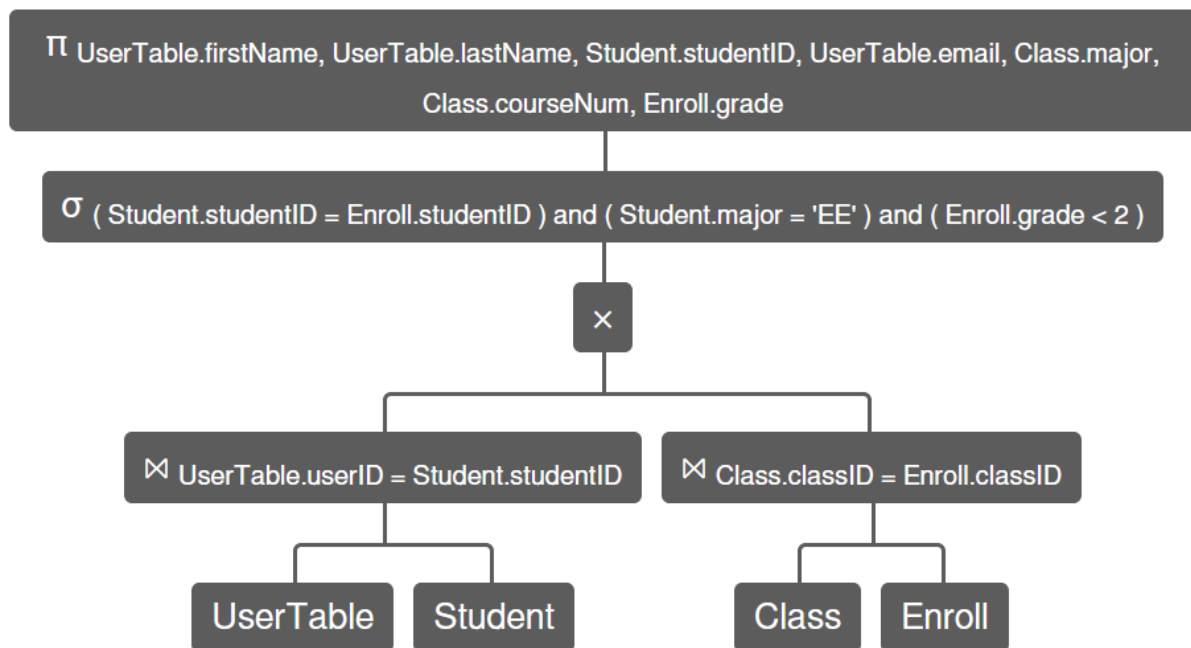
Student.major	UserTable.firstName	UserTable.lastName	Student.studentID	UserTable.email	Enroll.classID	Enroll.grade
EE	Kelly	Easton	18	kelly@wsu.edu	2019S01CptS437	1
EE	Amy	Fan	19	amy@wsu.edu	2019S01CptS437	1

b. Return the firstname, lastname, ID, email of the student, major and courseNum of the class failed and the grade earned

Relational algebra expression:

π UserTable.firstName, UserTable.lastName, Student.studentID, UserTable.email, Class.major, Class.courseNum, Enroll.grade (σ (Student.studentID = Enroll.studentID) \wedge (Student.major = 'EE') \wedge (Enroll.grade < 2) ((UserTable \bowtie UserTable.userID = Student.studentID Student) \times (Class \bowtie Class.classID = Enroll.classID Enroll)))

Relational algebra tree:



Output:

π UserTable.firstName, UserTable.lastName, Student.studentID, UserTable.email, Class.major, Class.courseNum, Enroll.grade (σ (Student.studentID = Enroll.studentID) and (Student.major = 'EE') and (Enroll.grade < 2) ((UserTable \bowtie UserTable.userID = Student.studentID Student) \times (Class \bowtie Class.classID = Enroll.classID Enroll)))

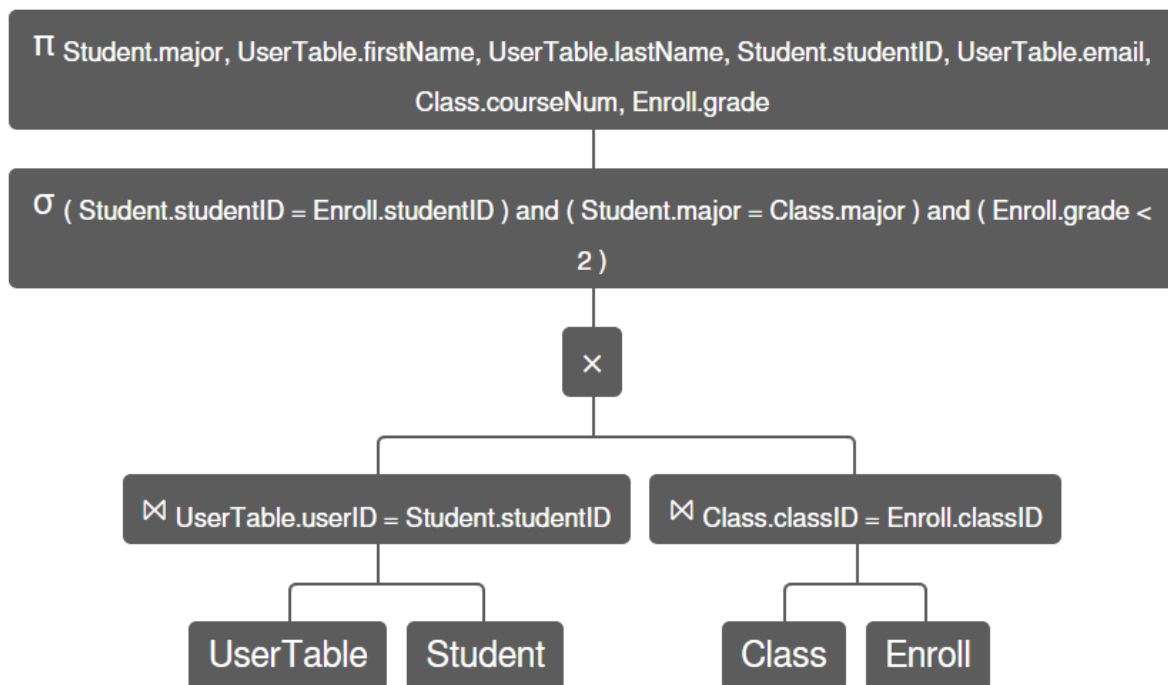
UserTable.firstName	UserTable.lastName	Student.studentID	UserTable.email	Class.major	Class.courseNum	Enroll.grade
Kelly	Easton	18	kelly@wsu.edu	CptS	437	1
Amy	Fan	19	amy@wsu.edu	CptS	437	1

c. Find all students who failed a class offered by their own majors. Return major, firstname, lastname, ID, email, courseNum, and grade earned

Relational algebra expression:

π Student.major, UserTable.firstName, UserTable.lastName, Student.studentID, UserTable.email, Class.courseNum, Enroll.grade (σ (Student.studentID = Enroll.studentID) \wedge (Student.major = Class.major) \wedge (Enroll.grade < 2) ((UserTable \bowtie UserTable.userID = Student.studentID Student) \times (Class \bowtie Class.classID = Enroll.classID Enroll)))

Relational algebra tree:



Output:

π Student.major, UserTable.firstName, UserTable.lastName, Student.studentID, UserTable.email, Class.courseNum, Enroll.grade (σ (Student.studentID = Enroll.studentID) and (Student.major = Class.major) and (Enroll.grade < 2) ((UserTable \bowtie UserTable.userID = Student.studentID Student) \times (Class \bowtie Class.classID = Enroll.classID Enroll)))

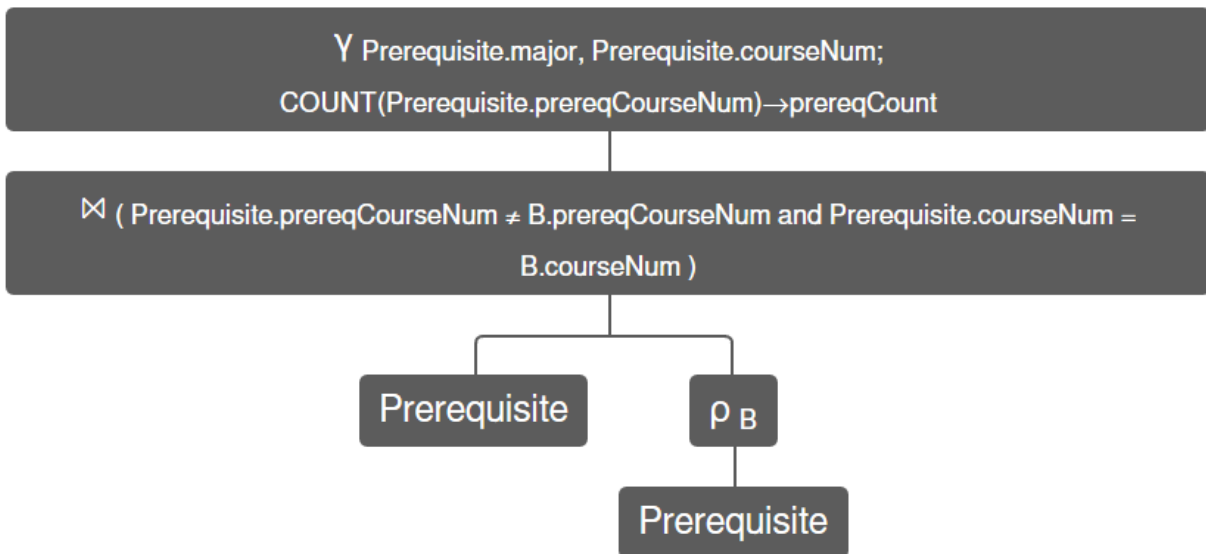
Student.major	UserTable.firstName	UserTable.lastName	Student.studentID	UserTable.email	Class.courseNum	Enroll.grade
CptS	Tazin	Rahman	4	rahman@wsu.edu	451	1
CptS	Rea	Marks	12	rea@wsu.edu	451	1

2. Find the courses that have two or more prerequisite courses

Relational algebra expression:

γ Prerequisite.major, Prerequisite.courseNum; count(Prerequisite.prereqCourseNum) -> prereqCount (Prerequisite \bowtie (Prerequisite.prereqCourseNum \neq B.prereqCourseNum \wedge Prerequisite.courseNum = B.courseNum) (ρ B (Prerequisite)))

Relational algebra tree:



Output:

γ Prerequisite.major, Prerequisite.courseNum; COUNT(Prerequisite.prereqCourseNum)→prereqCount (Prerequisite \bowtie (Prerequisite.prereqCourseNum \neq B.prereqCourseNum and Prerequisite.courseNum = B.courseNum) (ρ_B (Prerequisite)))

Prerequisite.major	Prerequisite.courseNum	prereqCount
CptS	421	2