MDS Self-Study
Winter Term 2024/25
Prep 1

For the upcoming lesson on October 17, 2024, prepare the self-study material in advance and answer the questions under Q&A. Bring your answers to the next lesson.

Self Study Material

We refer to this video playlist "Introduction to Databases - Jennifer Widom - Stanford": `https://www.youtube.com/playlist?list=PLroEs25KGvwzmvIxYHRhoGTz9w8LeXek0`

- Brush up on the basics of relational databases systems (you should already know this), watch Jennifer Widom's videos 01-01 until 02-02.
- Recap relational algebra, watch Jennifer Widom's videos 05-01, 5-02, and 06-01.

Q&A

1. What does it mean if a query language is "compositional"? Why is this a desirable property?

2. SQL relies on multiset semantics, relational algebra on set semantics. What is an important consequence in query evaluation?

3. Let's consider an instance of relation *Student*:

Student			
sID	sName	GPA	sizeHS
123	Amy	3.9	1000
234	Bob	3.6	1500
345	Craig	3.5	50
677	Amy	4.0	1200

What is the result of evaluating the relational algebra query $\pi_{sID,sName}\big(\sigma_{GPA>3.7}(Student)\big)$?

4. What is the result of evaluating the relational algebra query $\pi_{sName}\big(\sigma_{GPA>3.7}(Student)\big)$?

5. Let's consider an instance of relation *Apply*:

Apply			
sID	cName	major	decision
123	Stanford	CS	Y
123	Stanford	EE	N
123	Berkeley	CS	Y
123	Cornell	EE	Y
234	Berkeley	biology	N
345	MIT	bioengineering	Y
345	Cornell	bioengineering	N
345	Cornell	CS	Y

How many tuples are in the result of evaluating $Student \times Apply$?

6. How many tuples are in the result of evaluating $Student \bowtie Apply$?

7. Is it true that $Student \bowtie (Apply \bowtie College) = (Student \bowtie Apply) \bowtie College$?

8. Is it true that $Apply \bowtie College = College \bowtie Apply$?

9. Is it true that $Apply \bowtie Student = \sigma_{Apply.sID=Student.sID}(Apply \times Student)$?

10. Is it true that $Apply \bowtie Student = Apply \bowtie_{Apply.sID=Student.sID}$ Student?

11. What does it mean when we say that the $\bowtie$ operator is not part of the core relational algebra?

12. What does it mean when we say that SQL is a declarative language?

13. How are basic SQL statements and relational algebra connected?