CECS 535: Introduction to Database - Homework 1

Prof. Badia

January 27, 2020

DUE DATE: one week from today

Write the following questions as queries in Relational Algebra. Use only the operators discussed in class (select, project, Cartesian product, join, union, intersection, set difference and renaming). Type your answers. If you can't find Greek letters in your word processor, you can simply write out the operator, all uppercase (i.e. 'SELECT'). Please use renaming consistently!

The following database schema is given:

`RESEARCHER(rid,name,institution,city,country)`
`PAPER(title,journal,volume,number,year)`
`AUTHOR(resid,title)`

where `rid` is the identifier (primary key) of `RESEARCHER`, `name` is the researcher's name, `institution` is where the researcher works, and `city` and `country` the city and country where the institution is located; `title` is the paper identifier (primary key) of `PAPER`, `journal` is the journal where it was published (in volume `volume` and number `number`), and `year` is the year it appeared. Finally, in `AUTHOR` `resid` is a foreign key for `RESEARCHER` and `title` is a foreign key for `PAPER`. A researcher may write several papers, and papers may be jointly written by several researchers; this means that the key of `Author` is (`resid,title`).

1. List the names of authors of any paper published in journal "Databases" in 2019 in volume 12.

2. List the titles of any paper where at least one of the authors is from an institution in Boston, USA.

3. List the names of authors who have published a paper in either "Nature" or "Science" (journals).

4. List the names of authors who have published a paper in both "Nature" and in "Science" (journals).

5. List the names of authors who have never published a paper in "Nature" (journal).

6. List the names of authors who have published two or more papers in "Nature" (journal).

7. List the names of authors who have published a paper in "Nature" but never in "Science" (journals).

8. List the names of authors who have published a paper in "Nature" (journal) alone (i.e. without co-authors).

9. List the title of papers where all authors are from MIT (institution). Note: this includes sole authors too.

10. List the pairs of authors who have co-authored a paper. Note: if a paper has 3 authors (say, Larry, Curly and Moe), then (Larry,Curly), (Curly,Moe) and (Larry,Moe) are co-authors. It's ok to list both (Larry,Curly) and (Curly,Larry) in the answer.