Data management for data science

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Exercise on SQL

We want to build a relational database about the domain of students and exams. In particular, we want to store information about students (name, birthdate, ID (matricola), enrollment year, city, address), course editions (name, number of CFUs, year, semester, professor), exams (student, course name, year, grade), exam reservations (student, course name, year).

1. Write SQL statements that define the schema of the above described database;
2. Write SQL statements that insert some tuples in each of the tables defined at the previous point;
3. Write SQL statements that express the following queries:
   (a) return the names of all the students living in Rome;
   (b) return the names of the professors of the exams passed by John Doe;
   (c) return the names of the professors of the exams passed by John Doe in 2018;
   (d) return the ID and the birthdate of all the students that have passed at least an exam in 2018;
   (e) return name and number of CFUs of all the courses that were passed by the students enrolled in 2017;
   (f) return the names of the professors that have registered exams that were not reserved by students;
   (g) for every student, return the name and the number of exams passed by the student;
   (h) for every student, return the name and the average grade of the of exams passed by the student;
   (i) for every student, return the name and the number of exams that were reserved but not passed by the student;
   (j) return the ID and the birthdate of every student such that the total amount of CFUs of the exams passed by the student in 2018 is less than 20;
   (k) return the professor(s) who registered the maximum number of exams with the maximum grade (either 30 or 30 cum laude).

Solution of point (f):

Schema:

```
STUDENT(name,birthdate,ID,enrollmentYear,city,address)
EXAM(student,courseName,year,grade)
EXAM_RESERVATION(student,courseName,year)
COURSE-EDITION(name,CFU,year,semester,prof)
```

SQL query 1:

```
SELECT prof
FROM COURSE-EDITION ce
WHERE EXISTS (
  SELECT *
  FROM EXAM e
  WHERE e.courseName=ce.courseName
  AND e.year=ce.year
  AND NOT EXISTS (
    SELECT *
    FROM EXAM-RESERVATION er
    WHERE er.student=e.student
    AND er.courseName=e.couseName
    AND er.year=e.year))
```

SQL query 2:

```
SELECT prof
FROM COURSE-EDITION ce, EXAM e
WHERE e.courseName=ce.courseName
AND e.year=ce.year
AND NOT EXISTS (
  SELECT *
  FROM EXAM-RESERVATION er
  WHERE er.student=e.student
  AND er.courseName=e.couseName
  AND er.year=e.year))
```

SQL query 3:

```
SELECT prof
FROM COURSE-EDITION ce, EXAM e
WHERE e.courseName=ce.courseName
AND e.year=ce.year
AND (e.student, e.courseName, e.year) NOT IN (
  SELECT *
  FROM EXAM-RESERVATION er)
```