UNIVERSITY OF EDINBURGH
SCHOOL OF INFORMATICS
INFR11199 - ADVANCED DATABASE SYSTEMS (SPRING 2024)

Tutorial Sheet 1

1. (Single-Table SQL) Consider a database of published scientific papers with the following schema, where each primary key is underlined:

> Conference(<u>conference_id</u>, conference_name, organiser)
>
> Paper(<u>paper_id</u>, title, field, citations, year_published, conference_id)
>
> Ownership(<u>paper_id</u>, <u>researcher_id</u>)
>
> Researcher(<u>researcher_id</u>, researcher_name, affiliation, email)

Write a SQL query for each task below.

(a) Find the 10 papers with the highest numbers of citations, ordered from most to least. Break ties by paper title in alphabetical order.

(b) Find the name and email for every researcher whose affiliation starts with the string 'University of'.

(c) Find the total number of published papers per research field.

(d) Find the total number of published papers per research field. Do not report fields with less than 10 papers.

(e) Find the research field with the highest number of papers published after the year 2020. Assume there are no ties.

2. (Multi-Table SQL) Consider the same database schema from the previous question.

Write a SQL query for each task below.

(a) Find the name of all conferences that featured database papers in 2024.

(b) Find the name of the conference that featured the paper with the highest number of citations. Assume there is only one such paper.

(c) For each researcher, find the researcher name and the highest citation count of one of their paper. Include researchers that have not published a paper.

3. (CQ Minimization) Consider the CQ

$$Q(x, y) \coloneqq R(y, x, z), R(w, v, z), T(x, z), T(x, a), R(y, x, a)$$

where x, y, z, v, w are variables and a is a constant value. Compute the minimal CQ of Q.

4. (Acyclicity) Consider the CQ

$$Q(x, y) \coloneqq T(x, y, z), R(y, z), P(y, v, w), R(z, u).$$

Prove that Q is acyclic. In particular, apply the GYO-reduction to the hypergraph $H(Q)$ of Q and show that this leads to the empty graph. Give also the obtained join tree of $H(Q)$.