CSCI 4380 Database Systems

Homework 2

Functional Dependencies and Data Normalization

This homework will focus on the concepts of Functional Dependencies and their use in normalizing a relational schema.

It is due on Thursday February 6 at 11:59PM and should be submitted electronically on the class Submitty site.

1. Assume the existence of a database schema being developed to track the operations of a Fitness Club (membership, different locations (branches), programs, trainers, etc.). Given the relation $Gym(id, nickname, branch, lockerNumber, program, trainer, fee)$, abbreviated $G(i, nb, l, p, t, f)$ and the functional dependencies $nbp \rightarrow tf$, $bl \rightarrow n$, $pt \rightarrow f$, $t \rightarrow b$, and $ib \rightarrow l$.

   (a) (2 points) What are the keys of the relation?

   (b) (1 point) Why is the FD $pt \rightarrow f$ a violation of BCNF?

   (c) (9 points) Decompose the relation into sub-relations that are in BCNF using the algorithm presented in class, using the violating FD above as the starting point for your first decomposition. Make sure you list any FDs that hold for your sub-relations.

(d) (2 points) Which of the original FDs isn't (aren't) preserved by your decomposition? How do you know?

(e) (6 points) Decompose the original relation into sub-relations in 3NF, using the synthesis algorithm described in class.