University of Toronto
CSC343, Winter 2017

Lecture Prep for Week 11

1. Suppose we have a relation on attributes A, B, C, D, E, and F, and these functional dependencies hold: $S = \{\ B \to DE, \quad BF \to C, \quad CF \to B, \quad DF \to AE\ \}$.

   (a) Compute B^+.

   (b) Compute CF^+.

   (c) Compute DF^+.

   (d) Compute BC^+.

   (e) Compute ABC^+.

   Write your closures in alphabetical order. For example, rather than $BDFA$, write $ABDF$.

2. Again, suppose we have a relation on attributes A, B, C, D, E, and F, and these functional dependencies hold: $S = \{\ B \to DE, \quad BF \to C, \quad CF \to B, \quad DF \to AE\ \}$.

   (a) Does it follow from S that $B \to A$?

   (b) Does it follow from S that $CF \to E$?

   (c) Does it follow from S that $DF \to B$?

   (d) Does it follow from S that $BD \to C$?

   (e) Does it follow from S that $BFC \to A$?

   Show your rough work.

3. Consider relation $R(A, B, C, D, E, F)$ with functional dependencies S.

$$S = \{CD \to A, \quad B \to EF, \quad A \to BC, \quad F \to D\}$$

   (a) Which functional dependencies indicate a violation of BCNF?

   (b) Create an instance of R that satisfies its FDs and has redundant data. Identify the redundancy. Thought exercise: what does it have to do with the FDs?

   (c) Apply the first step of the BCNF decomposition algorithm and indicate what two new relations will replace R. Show your rough work.

   (d) Project the FDs onto these two relations. You do not have to show your rough work for this part.

   (e) Is the new schema, with these two relations, in BCNF, or would we have to recurse and continue decomposing? Explain.

Submit your work in a pdf file called "prep10.pdf" on MarkUs.