CSC343, Fall 2017

# Lecture Prep for Week 9

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

   (a) Compute $B^+$. $B^+ = BDE$

   (b) Compute $CF^+$. $CF^+ = CFBDEA$

   (c) Compute $DF^+$. $DF^+ = DFAE$

   (d) Compute $BC^+$. $BC^+ = BCDE$

   (e) Compute $ABC^+$. $ABC^+ = ABCDE$

   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: $S = \{\ B \to DE,\ \ BF \to C,\ \ CF \to B,\ \ DF \to AE\ \}$.

   (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 $BD \to C$? $BD^+ = BDE$ ✗

   (e) Does it follow from $S$ that $BFC \to A$? $BFC^+ = BFCDEA$ ✓

   Write "yes" or "no" for each, and show your rough work.

3. Suppose we have a relation with attributes $ABCDE$ and these functional dependencies: $S = \{\ A \to D,$ Keep
   $B \to A,\ C \to A,\ D \to CE.\ \}$ Project the functional dependencies onto the attribute set $ABD$.

   Project(S, ABD)

   $A^+ \to ADCE$ $A \to D$

   $B^+ \to BADCE$ $B \to AD$

   $D^+ \to DEAD$ $D \to A$

   ~~$AB \to ABCDE$~~ ~~$AB \to D$~~

   $AD^+ \to ADCE$

   $BD^+ \to ABCDE$ ~~$BD \to A$~~

   Show all your steps, and clearly label your final anwer.

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

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

   Create an instance of $R$ that satisfies its FDs and has redundant data. Identify redundancy by circling a single value in the table that could be erased and yet we would know what its value *must* be. Thought exercise: what does it have to do with the FDs?

Submit your work in a pdf file called "prep9.pdf" on MarkUs.

$CD \to A$ D

$A^+ = ABCEF$

~~$AB \to D$~~

$AF = BCD$

R

| A | B | C | D | E | F |
|---|---|---|---|---|---|
| ~~1~~ | ~~2~~ | ~~1~~ | ~~0~~ | ~~3~~ | ~~4~~ |
| ~~2~~ | ~~3~~ | ~~2~~ | ~~1~~ | ~~4~~ | ~~5~~ |
| 1 | 2 | 1 | 1 | 2 | 1 |
| 2 | 3 | 2 | 2 | 3 | 2 |
| 3 | 4 | 3 | 3 | 4 | 3 |