CSC343 Prep 9

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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^+.

   $$ABC^+ = ABCDE$$

2. Again, suppose we have a relation on attributes A, B, C, D, E, and F,and these functional dependencies hold: $S = \{B \to DE, BF \to C, CF \to B, DF \to AE\}$.
   Write "yes" or "no" for each, and show your rough work.

   (a) Does it follow from S that $B \to A$?
   No, because B^+ does not include A from $Q1$ part (a).

   (b) Does it follow from S that $CF \to E$?
   Yes, because CF^+ includes E from $Q1$ part (b).

   (c) Does it follow from S that $DF \to B$?
   No, because $DF+$ does not include B from $Q1$ part (c).

   (d) Does it follow from S that $BD \to C$?
   The closure of BD can be derived from the functional dependencies given, which is

   $$BD^+ = BDE.$$

   No, C can not be derived from BD^+ since BD^+ does not include C.

   (e) Does it follow from S that $BFC \to A$?
   The closure of BFC can be derived from the functional dependencies given, which is

   $$BFC^+ = BDEFCA.$$

   Yes, A can be derived from BFC^+ since BFC^+ includes A.

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

By the algorithm introduced in the lecture, compute A^+, B^+, D^+ at first, which is,

$$A^+ = ADCE$$
$$B^+ = BADCE$$
$$D^+ = DCEA$$

Therefore, the aimed dependencies are computed,

$$A \to D$$
$$B \to AD$$
$$D \to A$$

Finally, the projection is solved as,

$$\{A \to D, B \to AD, D \to A\}.$$

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?

A	B	C	D	E	F
1	2	3	4	5	6
1	2	3	4	5	6