

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

- (a) Compute B^+ .

$$B^+ = BDE$$

- (b) Compute CF^+ .

$$CF^+ = ABCDEF$$

- (c) Compute DF^+ .

$$DF^+ = ADEF$$

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

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

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

No, because B^+ does not include A from Q1 part (a).

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

Yes, because CF^+ includes E from Q1 part (b).

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

No, because DF^+ does not include B from Q1 part (c).

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

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 $BFC \rightarrow A$?

The closure of BFC can be derived from the functional dependencies given, which is

$$BFC^+ = ABCDEF.$$

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

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

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

$$A^+ = ACDE$$

$$B^+ = ABCDE$$

$$D^+ = ACDE$$

Therefore, the aimed dependencies are computed,

$$A \rightarrow D$$

$$B \rightarrow AD$$

$$D \rightarrow A$$

Since B determines all behaviors of A, B and D by B^+ , there is no need to consider any superset with B . Also,

$$AD^+ = ACDE,$$

which does not contribute any new functional dependencies on attributes A, B , and D . Finally, the projection is solved as,

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

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

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

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
3	5	2	4	1	6