

Week 8 Notes

Note | w.r.t = with respect to

Data redundancy

- Data redundancies can cause **update anomalies**
 - Insertion anomaly
 - Deletion anomaly
 - Modification anomaly | May have to modify something in multiple places if the data is redundant

Normal Forms

- To minimize redundancy we need tables that are in a *normal form*
- Some normal forms are defined using functional dependencies
 - 1st normal form | 1NF
 - 2nd normal form | 2NF
 - 3rd normal form | 3NF
 - Boyce-Codd normal form | BCNF

Functional Dependencies

- A FD is a formula of the form $A \rightarrow B$ (Where A and B are sets).
 - If two records have the same value for A then they also have the same value for B
 - For each value of A there is a unique value of B
 - We say that A functionally determines B or B is functionally dependant on A
- $A \rightarrow B$ can also be written as $A_1, A_2, \dots, A_k \rightarrow B_1, B_2, \dots, B_n$

Trivial Functional Dependency

- If B is a subset of A, then $A \rightarrow B$ and this is a trivial dependency
- Trivial dependencies are not considered in normalization

Some observations

- All attributes in a table are FD on the PK

FD Inference

If we know $A \rightarrow B$, $B \rightarrow C$, then we can infer that $A \rightarrow C$ If $A \rightarrow B$, $A, C \rightarrow B, C$

Inference Rules

Reflexivity

- If B is a subset of A, then $A \rightarrow B$ Augmentation
- If $A \rightarrow B$, then $A, C \rightarrow B, C$ Transitivity

- If $A \rightarrow B$ and $B \rightarrow C$, then $A \rightarrow C$

Closure set of a set of attributes

- Let F be a set of FDs, A be a set of attributes
 - The closure set of A w.r.t F , denoted A^+ is the set of all attributes that are functionally dependant on A

Finding Candidate Keys using Functional Dependencies

- Any super key must contain all the attributes that do not appear on the right hand side of the arrow
- So start with the set of keys that have not appeared on the right
- If A^+ contains all attributes then it is the *only* candidate key
- Otherwise keep adding attributes into A
- To make sure A is a CK you need to make sure any subset of A is not a super key