

COMP2411

Review (Week 13)

Exercise

- Given a relation $R(A, B, C)$ with a set of functional dependencies

$$F = \{A \rightarrow B, B \rightarrow C\}.$$

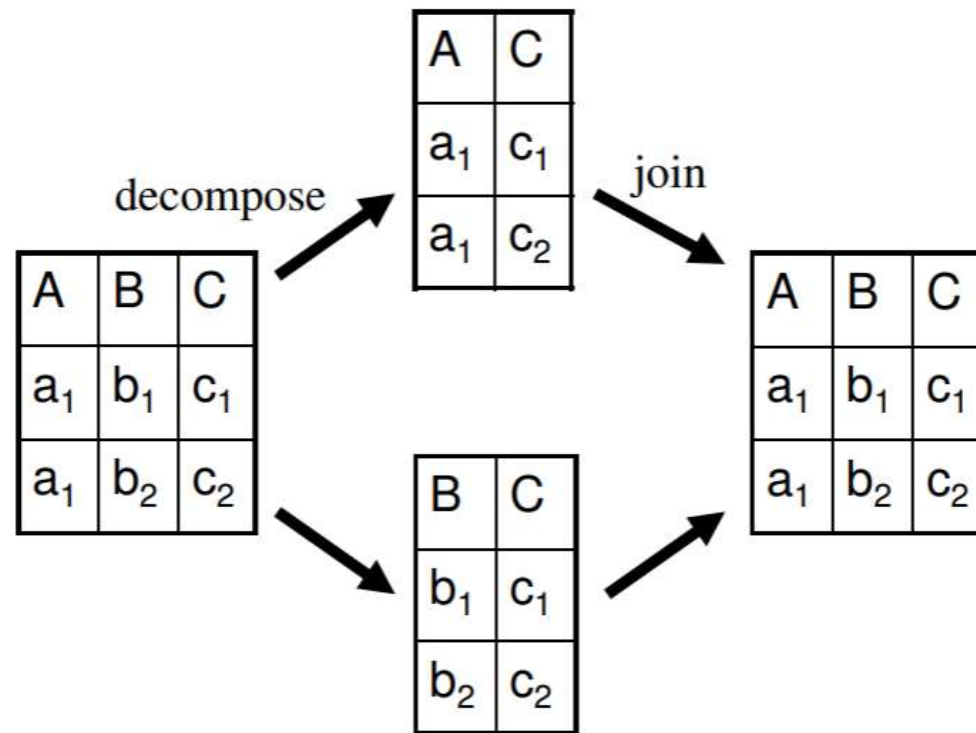
- Find closure of: $\{A\}^+$, $\{B\}^+$ & $\{C\}^+$
- Find candidate key(s)
- Is R in BCNF?
- If not, decompose the relation into a set of BCNF relations

- First Normal Form (1NF)
 - ◆ a relation R is in 1NF *if and only if* all underlying domains contain **atomic values** only
- Definition: A relation R is in 2NF *if and only if* it is in 1NF and every non-key attribute is **fully** dependent on any candidate key.
- Definition: A relation R is in 3NF *if and only if* it is in 2NF and every non-key attribute is **non-transitively** dependent on any candidate key.

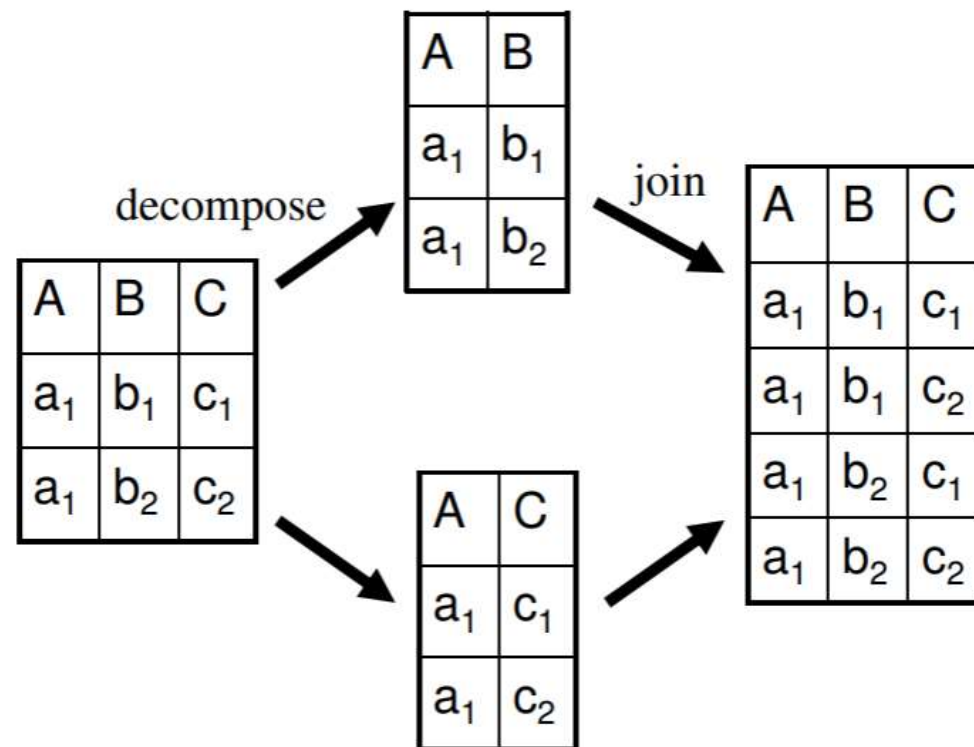
Inference Rules for FDs

- Given a set of FDs F , we can **infer** additional FDs that hold whenever the FDs in F hold
- Armstrong's inference rules:
 - ◆ IR1. (**Reflexive**) If Y is a *subset* of X , then $X \rightarrow Y$
 - ◆ IR2. (**Augmentation**) If $X \rightarrow Y$, then $XZ \rightarrow YZ$
 - ◆ (Notation: XZ stands for $X \cup Z$)
 - ◆ IR3. (**Transitive**) If $X \rightarrow Y$ and $Y \rightarrow Z$, then $X \rightarrow Z$
- IR1, IR2, IR3 form a **sound** and **complete** set of inference rules
 - ◆ Sound: These rules are true
 - ◆ Complete: All the other rules that are true can be deduced from these rules

Example (Lossless-Join)



Example (Lossy-Join)



Exercise

- $\{A\}^+ =$
- $\{B\}^+ =$
- $\{C\}^+ =$
- Candidate Key =
- BCNF?
- Decomposition: R1
R2