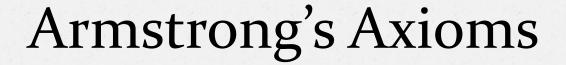
Database Management System

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- Armstrong's Axioms
- Problem solving on Armstrong's Axioms



- Armstrong's Axioms is a set of rules.
- It provides a simple technique for reasoning about functional dependencies.
- It was developed by William W. Armstrong in 1974.
- It is used to infer all the functional dependencies on a relational database.

Primary Rules

Rule 1	Reflexivity If A is a set of attributes and B is a subset of A, then A holds B. $\{A \rightarrow B\}$
	Augmentation If A hold B and C is a set of attributes, then AC holds BC. {AC → BC} It means that attribute in dependencies does not change the basic dependencies.
Rule 3	Transitivity If A holds B and B holds C, then A holds C. If $\{A \to B\}$ and $\{B \to C\}$, then $\{A \to C\}$ A holds B $\{A \to B\}$ means that A functionally determines B.

Secondary Rules

Rule 1	Union If A holds B and A holds C, then A holds BC. If{A \rightarrow B} and {A \rightarrow C}, then {A \rightarrow BC}
Rule 2	Decomposition If A holds BC and A holds B, then A holds C. If $\{A \rightarrow BC\}$ and $\{A \rightarrow B\}$, then $\{A \rightarrow C\}$
Rule 3	Pseudo Transitivity If A holds B and BC holds D, then AC holds D. If $\{A \rightarrow B\}$ and $\{BC \rightarrow D\}$, then $\{AC \rightarrow D\}$

Problem Solving using Armstrong's Axioms

1) Example:

Consider relation E = (P, Q, R, S, T, U) having set of Functional Dependencies (FD).

$$P \rightarrow Q$$
 $P \rightarrow R'$
 $QR \rightarrow S$ $Q \rightarrow T$
 $QR \rightarrow U$ $PR \rightarrow U$

Calculate some members of Axioms are as follows,

1.
$$P \rightarrow T$$

2. $PR \rightarrow S$
3. $QR \rightarrow SU$
4. $PR \rightarrow SU$

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1. P \rightarrow T
In the above FD set, P \rightarrow Q and Q \rightarrow T
So, Using Transitive Rule: If \{A \rightarrow B\} and \{B \rightarrow C\}, then \{A \rightarrow C\}
\therefore If P \rightarrow Q and Q \rightarrow T, then P \rightarrow T.
P \rightarrow T
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2. PR \rightarrow S
In the above FD set, P \rightarrow Q
As, QR \rightarrow S
So, Using Pseudo Transitivity Rule: If{A \rightarrow B}
and {BC \rightarrow D}, then {AC \rightarrow D}
\therefore If P \rightarrow Q and QR \rightarrow S, then PR \rightarrow S.
PR \rightarrow S
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3. QR \rightarrow SU
In above FD set, QR \rightarrow S and QR \rightarrow U
So, Using Union Rule: If{A \rightarrow B} and {A \rightarrow C},
then {A \rightarrow BC}
\therefore If QR \rightarrow S and QR \rightarrow U, then QR \rightarrow SU.
QR \rightarrow SU
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4. PR \rightarrow SU
So, Using Pseudo Transitivity Rule: If{A \rightarrow B} and {BC \rightarrow D}, then {AC \rightarrow D}
... If PR \rightarrow S and PR \rightarrow U, then PR \rightarrow SU.
PR \rightarrow SU
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End of Lecture