

Steps of the BCNF Algorithm

Step 1: Check for BCNF Violations

- A relation R violates BCNF if there exists a functional dependency $X \rightarrow Y$ such that:
 1. X is not a superkey (i.e., X does not uniquely identify all attributes in R).
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Step 2: Decompose the Relation

- For each violating FD $X \rightarrow Y$:
 1. Create a new relation $R_1(X \cup Y)$ containing:
 - The attributes of X (determinant) and Y (dependent attributes).
 - X is the primary key.
 2. Replace the original relation R with a new relation
 3. $R_2(R - Y)$:
 - Remove Y from R , but keep X to preserve the dependency.
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Step 3: Repeat

- Apply the BCNF check recursively on all new relations until all relations satisfy BCNF.
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Key Properties of the Algorithm

1. Lossless Join:
 - The decomposition ensures that the original relation R can be reconstructed from the decomposed relations without any loss of information.
2. Dependency Preservation:
 - BCNF does not guarantee that all FDs in F are preserved in the decomposed relations. Some dependencies may be lost.