

# **Normalization Project Report**

## **1. Importing Libraries:**

required libraries and modules, including 'csv', 'pandas', 'numpy', and 'copy'.

## **2. Global Variables:**

'global\_map': A global dictionary to map attributes to the key they belong to.

## **3. Reading CSV File:**

'read\_csv\_file(file\_name)': Reads a CSV file and converts it into a list of dictionaries, where each dictionary represents a row in the table.

## **4. Parsing Functional Dependencies:**

'parse\_functional\_dependencies()': Takes user input to input functional dependencies and returns a list of these dependencies.

## **5. Decompose to 1NF:**

'decompose\_to\_1NF(fds, data, multi\_value\_attributes)': Decomposes the table into the first normal form (1NF), specifically handling multivalued attributes.

## **6. Find Normal Form:**

'find\_normal\_form(data, fds, key, target\_nf\_choice, mvds)': Determines the normal form of the table and performs normalization steps accordingly. It checks for 1NF, 2NF, 3NF, BCNF, and 4NF based on the user's choice and functional dependencies.

## **7. Check for 1NF:**

'is\_in\_1NF(data)': Checks if the table is in the first normal form by identifying multivalued attributes.

## **8. Check for 2NF:**

'is\_in\_2NF(fds, key)': Checks if the table is in the second normal form by identifying violated functional dependencies.

## **9. Decompose to 2NF:**

'decompose\_to\_2NF(data, primary\_key, violated\_fds, correct\_fds, fds)': Decomposes the table into the second normal form, particularly handling violated functional dependencies.

## **10. Populate Global Map:**

'populateGlobalMap(fds, primary\_key\_set, data, violated\_fds, correct\_fds)': Populates the global map to map attributes to their respective primary keys.

## **11. Convert Data to DataFrame:**

'convertDataToDataFrame(data)': Converts the data to a Pandas DataFrame for easier manipulation.

## **12. Check for 3NF:**

'is\_in\_3NF(table\_fds, tables\_of\_2nf\_dfs, key)': Checks if the table is in the third normal form by verifying transitive dependencies.

### **13. Decompose to 3NF:**

'decompose\_to\_3NF(transitive\_dependencies, temp\_table\_fds, tables\_of\_2nf\_dfs, faulty\_dependency\_indexes)': Decomposes the table into the third normal form, addressing transitive dependencies.

### **14. Check for BCNF:**

'is\_in\_BCNF(table\_fds, tables\_of\_2nf\_dfs, candidate\_key)': Checks if the table is in BoyceCodd Normal Form (BCNF).

### **15. Decompose to BCNF:**

'decompose\_to\_BCNF(problematic\_fds, table\_fds, tables\_of\_2nf\_dfs, key)': Decomposes the table into BCNF, handling problematic functional dependencies.

### **16. Check for 4NF:**

'is\_in\_4NF(table\_fds, tables\_of\_2nf\_dfs, mvds, key)': Checks if the table is in the fourth normal form (4NF) and deals with multivalued dependencies (MVDs).

### **17. Decompose to 4NF:**

'decompose\_4nf(data, fds, mvds)': Implements a basic 4NF decomposition using given MVDs.

### **18. Decompose to 5NF:**

'decompose\_to\_5NF(data, fds)': Identifies join dependencies and relevant attributes, then performs a losslessjoin decomposition based on the identified join dependencies.

### **19. Identify Join Dependencies:**

'identify\_join\_dependencies(fds)': Identifies join dependencies and relevant attributes to assist in the losslessjoin decomposition.

### **20. Lossless Join Decomposition:**

'lossless\_join\_decomposition(data, join\_dependencies, relevant\_attributes)': Performs a losslessjoin decomposition based on identified join dependencies.

### **21. Choose Attributes:**

'choose\_attributes(uncovered\_attributes, relevant\_attributes)': Helps select attributes for creating new decomposed tables in the losslessjoin decomposition.

### **22. Find MultiValued Dependencies:**

'find\_multivalued\_dependencies()': Takes user input to input multivalued dependencies (MVDs) and returns a list of these dependencies.

### **23. Main Function:**

'main()': This is the main function that orchestrates the normalization process. It reads data, parses functional dependencies, determines the user's choice for the highest normal form, and normalizes the table accordingly.