# Experiment 5: Java Standalone CRUD Application (JDBC with Oracle/MySQL)

This project develops a standalone Java application that demonstrates fundamental **CRUD (Create, Read, Update, Delete) operations** on a database table. The application connects to either an **Oracle or MySQL database** using **JDBC (Java Database Connectivity)**, illustrating the core principles of database interaction from a Java console application.

## Features

- **Database Connectivity**: Establishes a connection to a relational database (configured for either Oracle or MySQL).
- **CRUD Operations**:
  - **Create**: Inserts new records into a `STUDENTS` table.
  - **Read**: Retrieves and displays all records from the `STUDENTS` table, or specific records based on criteria.
  - **Update**: Modifies existing records in the `STUDENTS` table.
  - **Delete**: Removes records from the `STUDENTS` table.
- **Prepared Statements**: Utilizes `PreparedStatement` to prevent SQL injection vulnerabilities and improve performance for repetitive queries.
- **Resource Management**: Ensures proper closing of JDBC resources (`Connection`, `Statement`, `PreparedStatement`, `ResultSet`) using `try-with-resources` (or `finally` blocks for older Java versions) to prevent resource leaks.
- **Error Handling**: Includes robust error handling for `SQLException` and other potential issues during database operations.
- **Configurable Database**: Easy to switch between Oracle and MySQL by modifying connection details.

## Technologies Used

- Java SE
- JDBC API
- Oracle Database OR MySQL Database
- Oracle JDBC Driver (`ojdbcX.jar`) OR MySQL Connector/J (`mysql-connector-java-X.X.X.jar`)

## Prerequisites and Database Setup

Before running this project, ensure you have the following:

1. **Java Development Kit (JDK)**: Installed on your system.

2. **Database Instance**: A running Oracle Database instance OR MySQL Database instance.

3. **JDBC Driver**:

   - For **Oracle**: Download `ojdbcX.jar` (e.g., `ojdbc11.jar`) from Oracle's website.
   - For **MySQL**: Download `mysql-connector-java-X.X.X.jar` from MySQL's website.

- Place the chosen driver JAR file in a `lib/` folder within your project or add it directly to your project's build path.

4. **Database User and Table**:
   - You need a database user with appropriate privileges (`SELECT`, `INSERT`, `UPDATE`, `DELETE`, `CREATE TABLE`).
   - Create the `STUDENTS` table in your chosen database using the following SQL DDL:

```sql
-- For Oracle
CREATE TABLE STUDENTS (
    ID NUMBER(10) PRIMARY KEY,
    NAME VARCHAR2(100) NOT NULL,
    AGE NUMBER(3),
    MAJOR VARCHAR2(100)
);

-- For MySQL
CREATE TABLE STUDENTS (
    ID INT PRIMARY KEY,
    NAME VARCHAR(100) NOT NULL,
    AGE INT,
    MAJOR VARCHAR(100)
);
```

   - **Important**: Update the `DB_URL`, `DB_USER`, `DB_PASSWORD`, and `DB_DRIVER_CLASS` constants in `JdbcCrudDemo.java` to match your specific database type and connection details.

## Setup and Running

1. **Clone the Repository (or create manually):**

```
git clone [https://github.com/your-username/Experiment-05_Java-standalone_CRUD_App.git](https://github.com/your-username/Experiment-05_Java-standalone_CRUD_App.git)
cd Experiment-05_Java-standalone_CRUD_App
```

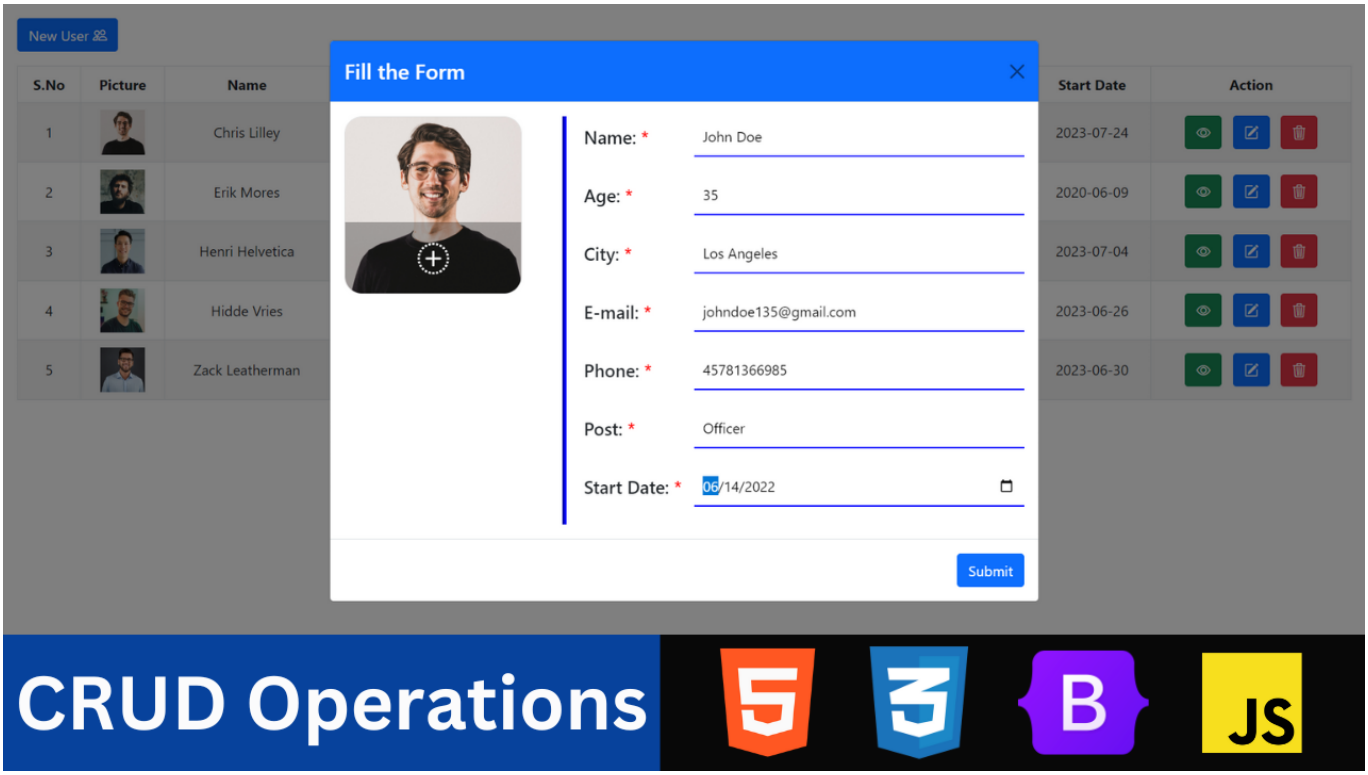
2. **Add JDBC Driver to Project:**
   - Create a `lib/` directory in your project root if it doesn't exist.
   - Place the chosen `ojdbcX.jar` (for Oracle) or `mysql-connector-java-X.X.X.jar` (for MySQL) into the `lib/` folder.
   - **In your IDE (IntelliJ IDEA/Eclipse):** Add this JAR file to your project's build path (or classpath).
     - **IntelliJ IDEA:** Right-click on `ojdbcX.jar` / `mysql-connector-java-X.X.X.jar` -> `Add as Library...`.
     - **Eclipse:** Right-click on Project -> `Properties` -> `Java Build Path` -> `Libraries` tab -> `Add JARs...` (or `Add External JARs...`).

3. **Update Database Configuration:**
    - Open `src/main/java/com/example/jdbc/JdbcCrudDemo.java`.
    - **Uncomment and update** the appropriate `DB_URL`, `DB_USER`, `DB_PASSWORD`, and `DB_DRIVER_CLASS` variables for your chosen database (Oracle or MySQL). Make sure the other database's configuration is commented out.
4. **Run the Application:**
    - Open your IDE.
    - Navigate to `src/main/java/com/example/jdbc/JdbcCrudDemo.java`.
    - Right-click on `JdbcCrudDemo.java` and select `Run 'JdbcCrudDemo.main()'`.

```
Caused by: java.lang.NoClassDefFoundError: crud/InsertData (wrong name: InsertData)
PS C:\Users\SRITHAN\OneDrive\Desktop\SDC files\Srithan sdc\Srithan SDC Files\Experiment-05_Java-standalone_CRUD_MySQL\src> javac -cp "C:\Users\SRITHAN\Downloads\mysql-connector-j
-9.2.0\mysql-connector-j-9.2.0.jar" InsertData.java
PS C:\Users\SRITHAN\OneDrive\Desktop\SDC files\Srithan sdc\Srithan SDC Files\Experiment-05_Java-standalone_CRUD_MySQL\src> java -cp ".;C:\Users\SRITHAN\Downloads\mysql-connector-
j-9.2.0\mysql-connector-j-9.2.0.jar" InsertData
Inserting Data into student table:

Enter student id: 21026
Enter student name: srithan
Enter student address: mabd
Data inserted successfully into student table
PS C:\Users\SRITHAN\OneDrive\Desktop\SDC files\Srithan sdc\Srithan SDC Files\Experiment-05_Java-standalone_CRUD_MySQL\src>
```

## Expected Output




The program will print messages to the console indicating:

- JDBC driver registration.
- Connection success or failure.
- Results of each INSERT, SELECT, UPDATE, and DELETE operation (e.g., "X rows inserted/updated/deleted", "Students Table: ...").
- Any SQL errors encountered.

## Verification

After running the Java program, you can connect to your database using a client tool (e.g., SQL Developer for Oracle, MySQL Workbench/CLI for MySQL) and run:

```
SELECT * FROM STUDENTS;
Experiment-05_Java-standalone_CRUD_MySQL/image-4.png
![alt text](image-5.png)
```