

Coffee Shop Management System

Author: Esteban Lopez

Course: CS-GY 6083 Databases (Spring 2025) - NYU Tandon School of Engineering

App Access: https://github.com/Esteban-D-Lopez/coffee_shop_db **Presentation Video:** https://stream.nyu.edu/media/t/1_iv4ex9k9

Overview

This project implements a comprehensive management system for a coffee shop. It allows users to track sales, manage inventory, handle employee and store information, manage products and promotions, and administer a customer loyalty program. The system features a relational database backend using MySQL and an interactive web application frontend built with Python and Streamlit deployed locally.

Features

- **Store Management:** Add, view, edit, and delete store locations.
- **Employee Management:** Add, view, edit, and delete employee records, including assignment to stores.
- **Customer Management:** Add, view, edit, and delete customer information, including tracking loyalty points. Utilizes a stored procedure for adding customers.
- **Product Management:** Add, view, edit (price, stock), and delete products from the catalog.
- **Promotion Management:** Add, view, edit, and delete promotional offers (percentage/fixed discounts).
- **Order Processing:**
 - Create new orders for guests or registered customers.
 - Dynamically add/remove multiple items to an order.
 - Redeem customer loyalty points during checkout.
 - Manually apply active, non-point-based promotions to an order.
 - Uses a complex stored procedure (`sp_ProcessOrder`) for transactional processing, including stock validation and loyalty point calculations.
 - Utilizes a trigger (`trg_UpdateStockAfterOrder`) for automatic inventory updates.
- **Order Viewing:** View a list of past orders with key details and view items for a selected order.
- **Reporting:** View aggregated reports, including:
 - Top Selling Products (by revenue)
 - Monthly Sales Summary
 - Top Customers (by total spending)
 - Low Stock Item Alerts

Technology Stack

- **Backend Database:** MySQL (Version 8.x recommended)
- **Frontend Application:** Python 3.x with Streamlit
- **Database Connector:** PyMySQL
- **Data Handling:** Pandas
- **Development Environment:** VS Code, MySQL Workbench (for database setup/inspection)

Database Setup

1. **Install MySQL:** Ensure you have a local MySQL server instance installed and running (Version 8.x recommended).
2. **Connect:** Connect to your local MySQL server using a client like MySQL Workbench (use your root user or another user with privileges to create databases and users).
3. **Authentication (MySQL 8+):** If connecting with the `root` user (or another new user) fails with an 'Authentication plugin' error from the Python app later, run the following SQL commands in Workbench, replacing `'your_password'` with your actual MySQL user password:

```
-- Run this if you get 'caching_sha2_password' error from Python later
ALTER USER 'root'@'localhost' IDENTIFIED WITH mysql_native_password BY
'your_password';
FLUSH PRIVILEGES;
```

4. **Create Database & Objects:** Execute the following complete SQL script in MySQL Workbench to create the `coffee_shop` database and all necessary tables, views, functions, procedures, and triggers.

```
-- ////////////////////////////////// Tables //////////////////////////////////
-- Table: Customers
CREATE TABLE Customers (
    CustomerID INT AUTO_INCREMENT PRIMARY KEY,
    FirstName VARCHAR(100) NOT NULL,
    LastName VARCHAR(100) NOT NULL,
    Email VARCHAR(255) NOT NULL UNIQUE,
    PhoneNumber VARCHAR(50) UNIQUE,
    JoinDate DATE NOT NULL,
    LoyaltyPoints INT DEFAULT 0
) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4;

-- Table: Stores
CREATE TABLE Stores (
    StoreID INT AUTO_INCREMENT PRIMARY KEY,
    StoreName VARCHAR(150) NOT NULL,
    Address VARCHAR(255),
    City VARCHAR(100),
    State VARCHAR(50),
    ZipCode VARCHAR(20)
) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4;

-- Table: Employees
CREATE TABLE Employees (
    EmployeeID INT AUTO_INCREMENT PRIMARY KEY,
    FirstName VARCHAR(100) NOT NULL,
    LastName VARCHAR(100) NOT NULL,
    Position VARCHAR(100),
    HireDate DATE,
```

```
HourlyRate DECIMAL(10, 2),
StoreID INT,
FOREIGN KEY (StoreID) REFERENCES Stores(StoreID)
ON DELETE SET NULL ON UPDATE CASCADE
) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4;

-- Table: Products
CREATE TABLE Products (
ProductID INT AUTO_INCREMENT PRIMARY KEY,
ProductName VARCHAR(150) NOT NULL,
Category VARCHAR(100),
Price DECIMAL(10, 2) NOT NULL CHECK (Price >= 0),
StockQuantity INT DEFAULT 0 CHECK (StockQuantity >= 0)
) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4;

-- Table: Orders
CREATE TABLE Orders (
OrderID INT AUTO_INCREMENT PRIMARY KEY,
CustomerID INT NULL,
EmployeeID INT NOT NULL,
StoreID INT NOT NULL,
OrderTimestamp DATETIME DEFAULT CURRENT_TIMESTAMP,
TotalAmount DECIMAL(10, 2) DEFAULT 0.00,
PointsEarned INT DEFAULT 0,
PointsRedeemed INT DEFAULT 0,
FOREIGN KEY (CustomerID) REFERENCES Customers(CustomerID) ON
DELETE SET NULL ON UPDATE CASCADE,
FOREIGN KEY (EmployeeID) REFERENCES Employees(EmployeeID) ON
DELETE RESTRICT ON UPDATE CASCADE,
FOREIGN KEY (StoreID) REFERENCES Stores(StoreID) ON DELETE
RESTRICT ON UPDATE CASCADE
) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4;

-- Table: OrderItems (Junction Table)
CREATE TABLE OrderItems (
OrderItemID INT AUTO_INCREMENT PRIMARY KEY,
OrderID INT NOT NULL,
ProductID INT NOT NULL,
Quantity INT NOT NULL CHECK (Quantity > 0),
PriceAtTimeOfOrder DECIMAL(10, 2) NOT NULL,
FOREIGN KEY (OrderID) REFERENCES Orders(OrderID) ON DELETE CASCADE
ON UPDATE CASCADE,
FOREIGN KEY (ProductID) REFERENCES Products(ProductID) ON DELETE
RESTRICT ON UPDATE CASCADE
) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4;

-- Table: Promotions
CREATE TABLE Promotions (
PromotionID INT AUTO_INCREMENT PRIMARY KEY,
PromotionName VARCHAR(150) NOT NULL,
Description TEXT,
DiscountType ENUM('PERCENT', 'FIXED') NOT NULL,
DiscountValue DECIMAL(10, 2) NOT NULL,
StartDate DATE,
```

```

        EndDate DATE,
        RequiredPoints INT NULL
    ) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4;

-- Table: AppliedPromotions (Junction Table)
CREATE TABLE AppliedPromotions (
    AppliedPromotionID INT AUTO_INCREMENT PRIMARY KEY,
    OrderID INT NOT NULL,
    PromotionID INT NOT NULL,
    DiscountAmountApplied DECIMAL(10, 2) NOT NULL,
    FOREIGN KEY (OrderID) REFERENCES Orders(OrderID) ON DELETE CASCADE
    ON UPDATE CASCADE,
    FOREIGN KEY (PromotionID) REFERENCES Promotions(PromotionID) ON
    DELETE RESTRICT ON UPDATE CASCADE
) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4;

-- ////////////////////////////////// Views //////////////////////////////////

-- View 1: Customer Order Summary
-- Shows basic customer info, total number of orders, and total amount
-- spent.
CREATE VIEW vw_CustomerOrderSummary AS
SELECT
    c.CustomerID,
    c.FirstName,
    c.LastName,
    c.Email,
    COUNT(o.OrderID) AS TotalOrders,
    -- Use COALESCE to show 0 if a customer has no orders, instead of
    NULL
    COALESCE(SUM(o.TotalAmount), 0) AS TotalSpent
FROM
    Customers c
    -- LEFT JOIN includes all customers, even those without orders
    LEFT JOIN Orders o ON c.CustomerID = o.CustomerID
GROUP BY
    c.CustomerID, c.FirstName, c.LastName, c.Email;

-- View 2: Product Sales Performance
-- Shows product details, total quantity sold, total revenue, and
-- average selling price.
CREATE VIEW vw_ProductSalesPerformance AS
SELECT
    p.ProductID,
    p.ProductName,
    p.Category,
    -- Use COALESCE to show 0 for products never sold
    COALESCE(SUM(oi.Quantity), 0) AS TotalQuantitySold,
    COALESCE(SUM(oi.Quantity * oi.PriceAtTimeOfOrder), 0) AS
    TotalRevenue,
    -- AVG will be NULL if the product was never sold, which is
    acceptable here
    AVG(oi.PriceAtTimeOfOrder) AS AverageSellingPrice
FROM

```

```

    Products p
    -- LEFT JOIN includes all products, even those never sold
    LEFT JOIN OrderItems oi ON p.ProductID = oi.ProductID
GROUP BY
    p.ProductID, p.ProductName, p.Category;

-- ////////////////////////////////// Functions //////////////////////////////////

-- Temporarily change the delimiter so I can use ; inside the function
bodies
DELIMITER $$

-- Function 1: Get Customer Loyalty Points
-- Takes a CustomerID and returns their current points balance.
CREATE FUNCTION fn_GetCustomerLoyaltyPoints (p_CustomerID INT)
RETURNS INT
DETERMINISTIC -- Indicates the function gives the same result for the
same input
READS SQL DATA -- Indicates the function only reads data, doesn't
modify it
BEGIN
    DECLARE points INT;

    -- Select the points for the given customer.
    -- Use COALESCE to return 0 if the customer is not found or points
are NULL.
    SELECT COALESCE(LoyaltyPoints, 0) INTO points
    FROM Customers
    WHERE CustomerID = p_CustomerID;

    -- Return 0 if the customer wasn't found (points will be NULL from
the SELECT)
    RETURN COALESCE(points, 0);
END$$

-- Function 2: Calculate Points Earned
-- Takes an order total and calculates points based on shop rules.
CREATE FUNCTION fn_CalculatePointsEarned (p_OrderTotal DECIMAL(10,2))
RETURNS INT
DETERMINISTIC -- This calculation logic is deterministic
NO SQL -- Indicates the function doesn't need to access database
tables
BEGIN
    -- Business Rule Example: 1 point for every whole dollar spent.
    -- Ensure total is not negative before calculating.
    IF p_OrderTotal < 0 THEN
        RETURN 0;
    END IF;
    -- FLOOR rounds the result down to the nearest whole number.
    RETURN FLOOR(p_OrderTotal);
END$$

-- Change the delimiter back to the standard semicolon
DELIMITER ;

```

```
-- ////////////////////////////////// Stored Procedures //////////////////////////////////

-- Create Procedures --

-- Temporarily change the delimiter
DELIMITER $$

-- Procedure 1: Add New Customer
CREATE PROCEDURE sp_AddCustomer (
    IN p_FirstName VARCHAR(100),
    IN p_LastName VARCHAR(100),
    IN p_Email VARCHAR(255),
    IN p_PhoneNumber VARCHAR(50),
    OUT p_NewCustomerID INT
)
BEGIN
    -- Basic Input Validation
    IF p_FirstName IS NULL OR p_FirstName = '' OR p_LastName IS NULL
    OR p_LastName = '' THEN
        SIGNAL SQLSTATE '45000' SET MESSAGE_TEXT = 'First name and
last name cannot be empty.';
    END IF;

    IF p_Email IS NULL OR p_Email = '' OR p_Email NOT LIKE '%@%.%'
    THEN
        SIGNAL SQLSTATE '45000' SET MESSAGE_TEXT = 'A valid email
address is required.';
    END IF;

    -- Check if email already exists
    IF EXISTS (SELECT 1 FROM Customers WHERE Email = p_Email) THEN
        SIGNAL SQLSTATE '45000' SET MESSAGE_TEXT = 'Email address
already exists.';
    END IF;

    -- Insert the new customer
    INSERT INTO Customers (FirstName, LastName, Email, PhoneNumber,
JoinDate, LoyaltyPoints)
    VALUES (p_FirstName, p_LastName, p_Email, p_PhoneNumber,
CURDATE(), 0);

    -- Get the automatically generated CustomerID for the new customer
    SET p_NewCustomerID = LAST_INSERT_ID();

END$$

-- Procedure 2: Process Order
CREATE PROCEDURE sp_ProcessOrder (
    IN p_CustomerID INT,
    IN p_EmployeeID INT,
    IN p_StoreID INT,
    IN p_ProductIDsAndQuantities TEXT,
```

```

    IN p_PointsToRedeem INT,
    OUT p_NewOrderID INT
)
BEGIN
    -- 1. Declare ALL variables first
    DECLARE v_OrderID INT;
    DECLARE v_SubTotal DECIMAL(10, 2) DEFAULT 0.00;
    DECLARE v_FinalTotal DECIMAL(10, 2) DEFAULT 0.00;
    DECLARE v_RedeemedValue DECIMAL(10, 2) DEFAULT 0.00;
    DECLARE v_PointsEarned INT DEFAULT 0;
    DECLARE v_CustomerPointsAvailable INT DEFAULT 0;
    DECLARE v_ItemString TEXT DEFAULT p_ProductIDsAndQuantities;
    DECLARE v_Delimiter CHAR(1) DEFAULT ',';
    DECLARE v_ItemPair VARCHAR(50);
    DECLARE v_ProductID INT;
    DECLARE v_Quantity INT;
    DECLARE v_ProductPrice DECIMAL(10, 2);
    DECLARE v_Stock INT;
    DECLARE v_Pos INT;
    DECLARE v_ErrorMessage VARCHAR(255); -- <<<< Added variable for
error message

    -- 2. Declare Handlers AFTER variables but BEFORE other logic
    DECLARE EXIT HANDLER FOR SQLEXCEPTION
    BEGIN
        ROLLBACK;
        RESIGNAL;
    END; -- Added semicolon is correct

    -- Now proceed with the rest of the logic...
    -- Basic validation for required IDs
    IF p_EmployeeID IS NULL OR NOT EXISTS (SELECT 1 FROM Employees
WHERE EmployeeID = p_EmployeeID) THEN
        SIGNAL SQLSTATE '45000' SET MESSAGE_TEXT = 'Invalid or missing
EmployeeID.';
    END IF;
    IF p_StoreID IS NULL OR NOT EXISTS (SELECT 1 FROM Stores WHERE
StoreID = p_StoreID) THEN
        SIGNAL SQLSTATE '45000' SET MESSAGE_TEXT = 'Invalid or missing
StoreID.';
    END IF;
    IF p_CustomerID IS NOT NULL AND NOT EXISTS (SELECT 1 FROM
Customers WHERE CustomerID = p_CustomerID) THEN
        SIGNAL SQLSTATE '45000' SET MESSAGE_TEXT = 'Invalid CustomerID
provided.';
    END IF;
    IF p_ProductIDsAndQuantities IS NULL OR p_ProductIDsAndQuantities
= '' THEN
        SIGNAL SQLSTATE '45000' SET MESSAGE_TEXT = 'Order must contain
at least one item.';
    END IF;

    -- Start Transaction
    START TRANSACTION;

```

```
-- Handle Point Redemption
SET p_PointsToRedeem = COALESCE(p_PointsToRedeem, 0);
IF p_CustomerID IS NOT NULL AND p_PointsToRedeem > 0 THEN
    SET v_CustomerPointsAvailable =
fn_GetCustomerLoyaltyPoints(p_CustomerID);
    IF v_CustomerPointsAvailable < p_PointsToRedeem THEN
        SIGNAL SQLSTATE '45000' SET MESSAGE_TEXT = 'Insufficient
loyalty points.';
    END IF;
    SET v_RedeemedValue = p_PointsToRedeem / 100.0;
END IF;

-- Create Initial Order record
INSERT INTO Orders (CustomerID, EmployeeID, StoreID,
OrderTimestamp, TotalAmount, PointsEarned, PointsRedeemed)
VALUES (p_CustomerID, p_EmployeeID, p_StoreID, NOW(), 0.00, 0,
p_PointsToRedeem);
SET v_OrderID = LAST_INSERT_ID();

-- Process Order Items Loop
SET v_ItemString = CONCAT(v_ItemString, v_Delimiter);
WHILE LOCATE(v_Delimiter, v_ItemString) > 0 DO
    SET v_Pos = LOCATE(v_Delimiter, v_ItemString);
    SET v_ItemPair = TRIM(SUBSTRING(v_ItemString, 1, v_Pos - 1));
    SET v_ItemString = SUBSTRING(v_ItemString, v_Pos + 1);
    SET v_ProductID = CONVERT(SUBSTRING_INDEX(v_ItemPair, ':', 1),
UNSIGNED INTEGER);
    SET v_Quantity = CONVERT(SUBSTRING_INDEX(v_ItemPair, ':', -1),
UNSIGNED INTEGER);

    IF v_ProductID <= 0 OR v_Quantity <= 0 THEN
        SIGNAL SQLSTATE '45000' SET MESSAGE_TEXT = 'Invalid
ProductID or Quantity format in item list.';
    END IF;

    SELECT Price, StockQuantity INTO v_ProductPrice, v_Stock FROM
Products WHERE ProductID = v_ProductID;

    IF v_ProductPrice IS NULL THEN
        SIGNAL SQLSTATE '45000' SET MESSAGE_TEXT = 'Invalid
ProductID found in order items.';
    END IF;

    -- ***** REFACTORED STOCK CHECK *****
    IF v_Stock < v_Quantity THEN
        -- 1. Set the error message variable
        SET v_ErrorMessage = CONCAT('Insufficient stock for
ProductID: ', v_ProductID);
        -- 2. Use the variable in the SIGNAL statement
        SIGNAL SQLSTATE '45000' SET MESSAGE_TEXT = v_ErrorMessage;
    END IF;
    -- ***** END OF REFACTOR *****
```



```

        INSERT INTO OrderItems (OrderID, ProductID, Quantity,
PriceAtTimeOfOrder)
        VALUES (v_OrderID, v_ProductID, v_Quantity, v_ProductPrice);
        SET v_SubTotal = v_SubTotal + (v_Quantity * v_ProductPrice);
    END WHILE;

    -- Calculate Final Total
    SET v_FinalTotal = v_SubTotal - v_RedeemedValue;
    IF v_FinalTotal < 0 THEN SET v_FinalTotal = 0.00; END IF;

    -- Calculate Points Earned
    IF p_CustomerID IS NOT NULL THEN SET v_PointsEarned =
fn_CalculatePointsEarned(v_FinalTotal);
    ELSE SET v_PointsEarned = 0; END IF;

    -- Update Order with totals
    UPDATE Orders SET TotalAmount = v_FinalTotal, PointsEarned =
v_PointsEarned WHERE OrderID = v_OrderID;

    -- Update Customer Loyalty Points
    IF p_CustomerID IS NOT NULL THEN
        UPDATE Customers SET LoyaltyPoints = LoyaltyPoints +
v_PointsEarned - p_PointsToRedeem WHERE CustomerID = p_CustomerID;
    END IF;

    -- Commit
    COMMIT;

    -- Set output parameter
    SET p_NewOrderID = v_OrderID;

END$$

-- Change the delimiter back to the standard semicolon
DELIMITER ;

-- End of Script

-- ////////////////////////////////// Trigger //////////////////////////////////

-- Temporarily change the delimiter
DELIMITER $$

-- Trigger 1: Update Stock Quantity After Order Item Insert
-- Fires automatically AFTER a row is inserted into the OrderItems
table.
CREATE TRIGGER trg_UpdateStockAfterOrder
AFTER INSERT ON OrderItems -- Specifies the event and table
FOR EACH ROW -- Executes the trigger body for each row inserted
BEGIN
    -- Decrease the StockQuantity in the Products table
    -- NEW refers to the row that was just inserted into OrderItems
    UPDATE Products
    SET StockQuantity = StockQuantity - NEW.Quantity -- Subtract the

```

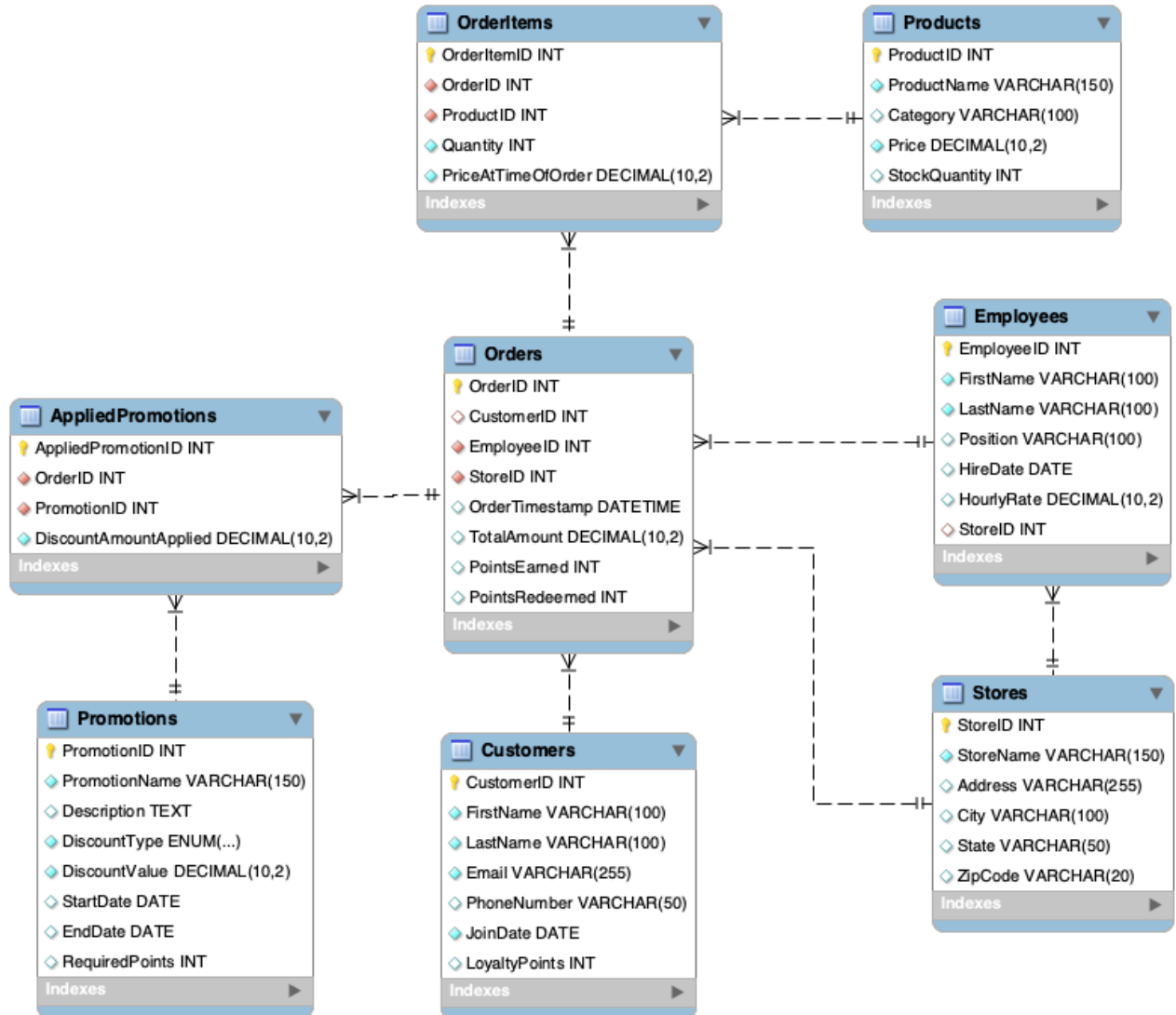
```

quantity ordered
    WHERE ProductID = NEW.ProductID; -- For the specific product that
was ordered
END$$

-- Change the delimiter back to the standard semicolon
DELIMITER ;

```

Once script is ran, the database architecture should look like the following ERD:



5. **Insert Sample Data (Optional but Recommended):** You can use the sample data script in this repo under [SQL/DummyData.sql](#) after creating the structure to have data for testing immediately.

Application Setup

1. **Prerequisites:**
 - Python 3 (version 3.8 or higher recommended).
 - Access to a terminal or command prompt.
2. **Download Code:** Download or clone the project files to your local machine.
3. **Navigate to Folder:** Open your terminal and navigate into the project's root directory (e.g., `cd /path/to/CoffeeShopStreamlit`).
4. **Create Virtual Environment:** It's highly recommended to use a virtual environment:

```
python3 -m venv venv
```

5. Activate Virtual Environment:

- macOS/Linux: `source venv/bin/activate`
- Windows: `.\venv\Scripts\activate`

6. Install Dependencies: Install the required Python libraries:

```
pip install streamlit pymysql pandas
```

7. Configure Database Connection:

- Open the `database.py` file in a text editor or VS Code.
- Locate the `DB_CONFIG` dictionary near the top.
- **IMPORTANT:** Replace the placeholder value for `'password'` with your actual local MySQL password for the specified `'user'` (likely `root`). Ensure host, port, user, and database name are correct for your local setup.
- Save the `database.py` file.

Running the Application

1. Make sure your local MySQL server is running.
2. Ensure your virtual environment is activated (you should see `(venv)` in your terminal prompt).
3. From the project's root directory (`coffee_shop_db`), navigate to the `app/` directory, and then run the following command in your terminal:

```
streamlit run app.py
```

4. Streamlit will start the web server, and the application should automatically open in your default web browser. The URL will likely be `http://localhost:8501`.
5. Use the sidebar navigation to explore different management sections.

Project Structure

```
coffee_shop_db/  
|-- Admin/ # Project instructions/samples  
|-- App/  
    |-- pages/ # Streamlit page scripts  
    |   |-- 01_🏪_Stores.py  
    |   |-- 02_👤_Employees.py  
    |   |-- 03_👤_Customers.py  
    |   |-- 04_☕_Products.py  
    |   |-- 05_🎉_Promotions.py  
    |   |-- 06_📄_Orders.py  
    |   |-- 07_📊_Reports.py
```

```
|-- app.py # Main Streamlit app file (Home page)
|-- database.py # Database connection & helper functions
|-- requirements.txt # Python package dependencies
|-- ERD/ # EER diagram
|-- Presentation/ # Final Presentation
|-- README.md # This file
|-- SQL/ # SQL scripts to create, populate, and test db
```

Rubric Items Checklist

- **Database Objects:** 8 Tables, 2 Views (1 complex), 2 Functions (1 complex), 2 Procedures (1 complex), 1 Trigger implemented. ER Diagram available.
- **CRUD Operations:** Full Create, Read, Update, Delete functionality implemented via the Streamlit UI for Stores, Employees, Customers, Products, and Promotions. Order creation via dedicated form/procedure. Order viewing implemented.
- **Reporting:** Reports page includes multiple reports with aggregation (using views and SQL aggregates), such as Top Products, Monthly Sales, Top Customers, and Low Stock.
- **Database Concepts:** Normalization (3NF/BCNF), Integrity Enforcement (PK, FK, UNIQUE, NOT NULL, CHECK, Procedure Validation), and Isolation Level (MySQL Default REPEATABLE READ with Transaction Control) addressed and implemented appropriately.