PERSONAL FINANCE TRACKER MANAGEMENT

DBMS MINI PROJECT REPORT

Submitted by

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BONAFIDE CERTIFICATE

Certified that this project report "**PERSONAL FINANCE TRACKER MANAGEMENT"** is the Bonafide work of "**DHANU SHREE S(231501035) ARULOLI M S (231501020) DILSHAD M(231501041) DINESH KARTHIK K (231501042)** who carried out the project under my supervision.

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1. INTRODUCTION

The Personal Finance Tracker also includes a secure user authentication system, ensuring that personal financial data remains private and accessible only to authorized users. Upon logging in, users are greeted with an intuitive dashboard that simplifies the process of entering and categorizing transactions. The application supports both income and expense entries, allowing users to maintain a comprehensive record of all financial activities. This systematic tracking helps in identifying areas where users might be overspending and highlights opportunities for savings.

Additionally, the application's threshold setting feature is particularly useful for budgeting. Users can define monthly expense limits for various categories, such as groceries, entertainment, and utilities. The system then monitors these expenses in real-time, alerting users if they are approaching or exceeding their predefined thresholds. This proactive approach to budgeting not only helps in preventing overspending but also encourages better financial planning and discipline.

Furthermore, the integration of Pandas and Matplotlib enables sophisticated data analysis and visualization. By presenting financial data in an easily digestible format, users can quickly identify trends and make informed decisions. For example, bar charts provide a clear view of monthly expenditures, scatter plots reveal daily spending habits, and pie charts illustrate the distribution of expenses across different categories. These visual tools are invaluable for users looking to optimize their spending and achieve long-term financial stability. The Personal Finance Tracker, therefore, stands out as a comprehensive solution for personal financial management, combining robust functionality with ease of use.

1.1 OBJECTIVE

The objective of this project is to develop a Personal Finance Tracker application using Python and MySQL. The application allows users to log in securely, add their financial transactions including date, category, amount, and type (income or expense), and view analytics of their spending patterns. It aims to provide users with insights into their financial behavior by visualizing monthly expenditures, comparing them with set thresholds, and analyzing expenditure trends over time. Through a user-friendly graphical interface built with Tkinter, the application facilitates efficient data entry, analytics visualization, and secure login functionalities, empowering users to manage their finances effectively.

1.2 MODULES

- Viewing transactions
- Adding transactions
- Viewing analytics
- Adding threshold limit

CH 2. SURVEY OF TECHNOLOGIES

2.1 SOFTWARE DESCRIPTION

Visual studio code

Visual Studio Code is a lightweight yet powerful source code editor developed by Microsoft. It offers robust features such as IntelliSense, debugging support, and Git integration. With its extensive extension marketplace and cross-platform compatibility, VS Code provides a versatile and efficient environment for coding tasks across various programming languages**.**

2.2 LANGUAGES

2.2.1 Python

Python plays a pivotal role in the Personal Finance Tracker project, offering a versatile platform for application development. Leveraging Python's rich ecosystem, modules such as mysql.connector facilitate seamless interaction with MySQL databases, ensuring efficient storage and retrieval of transactional data. Tkinter empowers the creation of user-friendly graphical interfaces, enabling intuitive data entry and interaction. Additionally, Python's pandas library facilitates advanced data manipulation and analysis, allowing users to gain insights into their financial patterns. With its simplicity, readability, and extensive library support, Python serves as the cornerstone of the project, driving its functionality and enhancing user experience.

2.2.2 SQL

In the Personal Finance Tracker project, SQL (Structured Query Language) plays a crucial role in managing transactional data within the MySQL database. SQL queries are utilized to insert, retrieve, and analyze financial transactions, ensuring efficient storage and retrieval of user data. By executing SQL commands through modules like mysql.connector in Python, the application seamlessly interacts with the database, enabling users to securely log in, add transactions, and view analytics. SQL's standardized syntax and robust functionality empower the project to maintain data integrity, facilitate seamless data manipulation, and provide users with valuable insights into their financial behavior.

2.2.3 Integration of SQL and Python

The integration of SQL and Python in this Personal Finance Tracker application involves using Python's mysql.connector library to interact with a MySQL database. This library enables Python code to execute SQL queries, allowing for seamless communication between the application and the database.

In the backend, the application establishes a connection to the MySQL database by specifying the host, user, password, and database name. Using a cursor object, the application executes SQL queries. For instance, the cursor.execute("SELECT ...") statement fetches data, while the cursor.execute("INSERT ...") statement adds new records. The query results are then fetched using methods like fetchone() or fetchall(), and these results are processed within the Python application for further use or display.

The frontend of the application is built using Tkinter, which is Python's standard GUI library. Tkinter provides various widgets such as input fields, buttons, labels, and other UI components. The main window of the application includes input fields for transaction details, a treeview widget to display transactions, and buttons for adding transactions and viewing analytics. Users interact with the application through this graphical user interface, entering transaction data, logging in, and viewing analytics. Tkinter's event-driven programming model manages user actions, triggering appropriate backend functions.

On the backend, MySQL is used to store user credentials and transaction data. The database contains tables such as users for login information and transactions for financial records. SQL queries executed in the backend add, retrieve, update, and delete records in the database. Python functions manage these operations, ensuring data integrity and consistency. For data analysis, the application processes transaction data using Pandas for data manipulation and Matplotlib for visualization, providing users with insightful analytics.

The application has several key capabilities. It includes a user authentication system where users can log in with a username and password. The application validates credentials against the users table in the database, and the current user's ID is stored globally during the session for transaction tracking and data retrieval. Users can add new financial transactions by specifying the date, category, amount, and type (income or expense). A treeview widget displays a list of transactions, allowing users to review their financial history.

For data analysis and visualization, the application generates bar plots to display total monthly expenditures, helping users understand spending patterns over time. Scatter plots visualize daily expenses, highlighting spending trends. Histograms compare actual monthly expenses against a user-defined threshold, aiding in budget management. Pie charts show the distribution of expenditures by category, providing insights into spending habits.

The user interface is interactive and user-friendly, built with Tkinter. It features clear input fields, buttons, and visual feedback through message boxes. The application provides immediate feedback on user actions, such as successful transaction additions or login errors, ensuring a smooth user experience.

The integration of SQL and Python with a Tkinter front end and a MySQL backend creates a robust and user-friendly Personal Finance Tracker. This system efficiently handles user authentication, transaction management, and data visualization, offering users a comprehensive tool to manage and analyze their personal finances. The seamless interaction between the frontend and backend enables the application to deliver a powerful yet accessible financial management solution.

CH 3. REQUIREMENT AND ANALYSIS

3.1 REQUIREMENTS SPECIFICATION

User requirement:

The system requirement in library management focuses on the possibility of search for books by title, author or subject by the member.

System requirement:

There should be a database backup of the library management system. Operating system should be WindowsXP or a higher version of windows.

3.2 HARDWARE AND SOFTWARE REQUIREMENTS

Software requirements:

- **Operating system (Windows)**
- **Front end: Python**
- **Back end: SQL**

Hardware requirements:

- Desktop PC or laptop
- Printer
- Operating system – Windows 11
- Keyboard and mouse
- AMD Ryzen™ 5 7600X Desktop Processor

3.3 FUNCTIONAL REQUIREMNETS:

User Authentication:

Login: The application must allow users to log in using a valid username and password.

Registration: Users should be able to create a new account by providing necessary information such as username and password.

Password Recovery: The system should support password recovery in case users forget their credentials.

Transaction Management:

Add Transaction: Users must be able to add new transactions, specifying the date, category, amount, and type (income or expense).

Edit Transaction: Users should be able to edit existing transactions to correct any errors.

Delete Transaction: The application must allow users to delete transactions that are no longer needed.

View Transactions: Users should be able to view a list of all their transactions in a tabular format, sortable by date, category, amount, and type.

Data Storage and Retrieval:

Database Integration: The application must integrate with a MySQL database to store and retrieve user data securely.

Data Persistence: All user data, including transactions and login credentials, should be persistently stored in the database.

Data Integrity: The system should ensure the integrity and consistency of data stored in the database.

Budget Management:

Set Monthly Threshold: Users must be able to set monthly expense thresholds for various categories.

Threshold Alerts: The system should alert users when their spending in a particular category is approaching or exceeding the set threshold.

Analytics and Reporting:

Monthly Expenditure Analysis: The application must provide bar charts showing total monthly expenditures.

Daily Expenditure Analysis: Users should be able to view scatter plots displaying daily spending habits.

Threshold Comparison: The system should generate histograms comparing actual monthly expenses against the set thresholds.

Category Breakdown: Users must be able to view pie charts illustrating the distribution of expenses across different categories.

Data Export: The application should allow users to export their transaction data and analytics reports in common formats like CSV or PDF.

User Interface:

Graphical User Interface: The application must provide a user-friendly GUI using Tkinter, enabling easy interaction with the system.

Dashboard: Upon logging in, users should be presented with a dashboard summarizing their financial status.

Input Validation: The system should validate user inputs to ensure correctness (e.g., valid dates, numeric amounts).

Interactive Widgets: The application must include various widgets like input fields, buttons, and tree views for an interactive experience.

Security:

Data Encryption: Sensitive user data, such as passwords, must be encrypted to prevent unauthorized access.

Secure Login: The login process should be secure to protect user credentials from being compromised.

Access Control: Ensure that only authenticated users can access their personal financial data.

Notifications and Alerts:

Budget Alerts: Notify users when they are close to exceeding their budget.

Transaction Confirmation: Provide confirmation messages upon successful addition, editing, or deletion of transactions.

Performance:

Efficiency: The application should efficiently handle data retrieval and processing to ensure quick response times.

Scalability: The system should be able to handle an increasing amount of data and users without performance degradation.

3.4 DATA FLOW DIAGRAM

Data Flow Diagrams (DFDs) are graphical representations that depict the flow of data within a system. They illustrate how data enters, moves through, and exits a system, highlighting the processes that transform data, the data stores where data is held, and the external entities that interact with the system. DFDs are used extensively in systems analysis and design to provide a clear and structured view of how information is processed and managed.

Key Components of DFDs

Processes:

Processes are the activities or functions that transform input data into output data. They are represented by circles or rounded rectangles. Each process in a DFD has a unique identifier and a descriptive name that indicates its function.

Data Stores:

Data stores represent places where data is stored within the system. These can be databases, files, or any other forms of storage. Data stores are depicted as open-ended rectangles. They show where data resides and can be accessed or updated by processes.

Data Flows:

Data flows are represented by arrows that indicate the direction of data movement between processes, data stores, and external entities. Each data flow is labeled to indicate the type of data being transferred. Data flows connect processes, data stores, and external entities to show the flow of information.

External Entities:

External entities are sources or destinations of data outside the system being described. They represent users, other systems, or organizations that interact with the system. External entities are depicted as rectangles and are connected to processes through data flows.

Levels of DFDs

DFDs are typically created at multiple levels of detail, each providing a deeper understanding of the system:

Context Diagram (Level 0 DFD):

The context diagram provides a high-level overview of the entire system. It shows the system as a single process and its interaction with external entities through data flows. This diagram is the most abstract and does not delve into internal processes.

Level 1 DFD:

A Level 1 DFD decomposes the single process of the context diagram into its main sub-processes. It shows more detail by breaking down the high-level process into several interconnected processes, data stores, and data flows.

Level 2 (and lower) DFDs:

These diagrams provide even more detail by further decomposing the processes from the Level 1 DFD. Each subsequent level breaks down processes into smaller sub-processes, offering a more granular view of the system's data flow and processing logic.

CONTEXT LEVEL DFD:

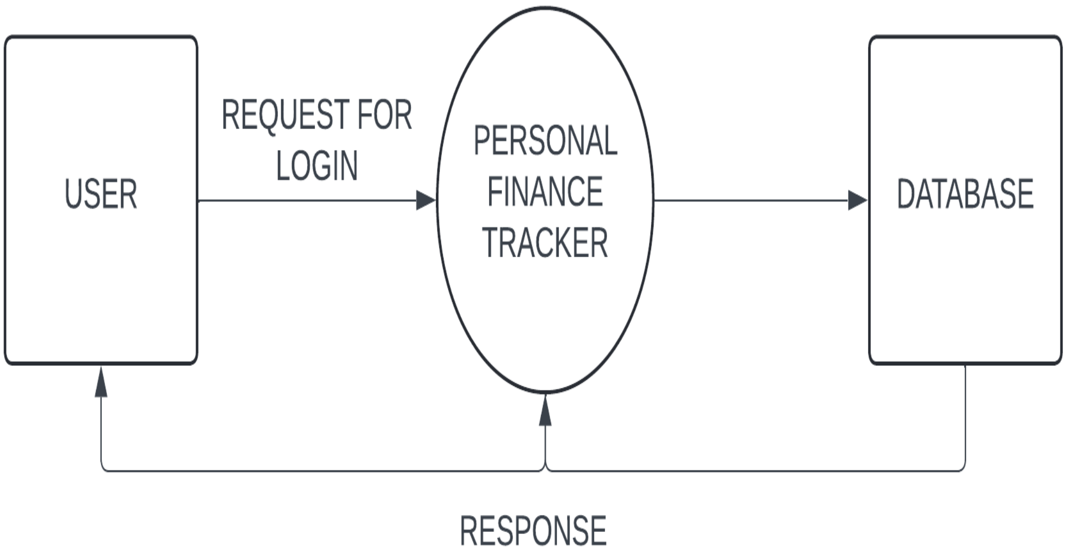


FIGURE 3.4.1: CONTEXT LEVEL DFD

Figure 3.4.1 illustrates the system architecture of a Personal Finance Tracker, detailing the interaction between the user, the personal finance tracker system, and the database during the login process.

User: The process begins with the user, who initiates a login request. This request is sent to the Personal Finance Tracker system.

Personal Finance Tracker: The core component of the system, represented by a central circle, receives the login request from the user. This system is responsible for handling user authentication and processing login information.

Database: Upon receiving the login request, the Personal Finance Tracker system communicates with the database. This rectangular block represents the storage system where user credentials and other relevant data are stored.

Response: After the database processes the request, it sends a response back to the Personal Finance Tracker system. This response could either confirm successful authentication or indicate a failure (e.g., incorrect credentials). The Personal Finance Tracker then relays this response back to the user.

In summary, the diagram shows the sequence of interactions required for user authentication in a personal finance tracking system, highlighting the roles of the user, the Personal Finance Tracker system, and the database.

LEVEL 1:

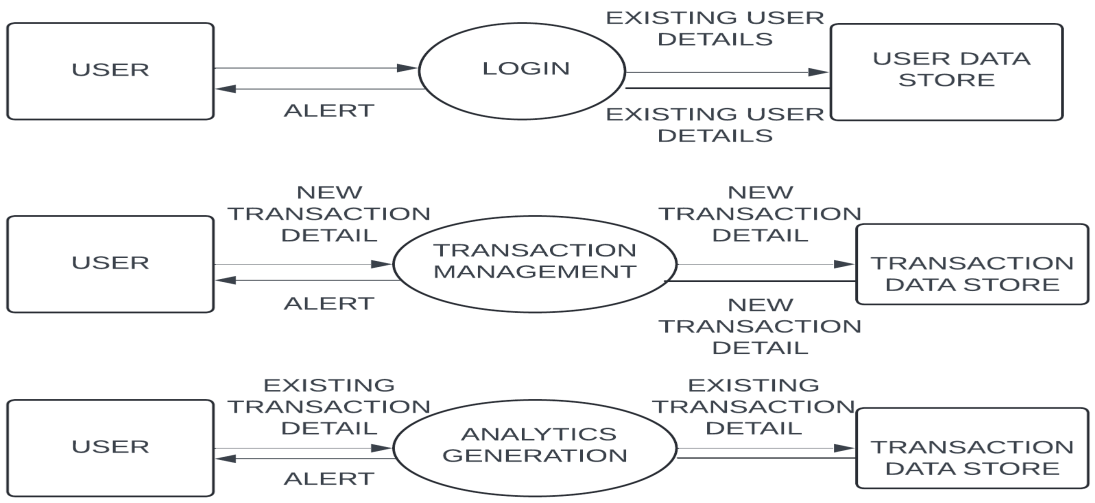


FIGURE 3.4.2: LEVEL 1 DFD

Figure 3.4.2 presents a detailed workflow of the Personal Finance Tracker system, outlining three key processes: Login, Transaction Management, and Analytics Generation. Each process involves interactions between the user, the system, and the relevant data stores.

Login Process:

User: Initiates a login request.
Login System: Receives the login request and verifies the credentials.
User Data Store: Contains existing user details. The Login System retrieves these details to authenticate the user.
Response Flow: If authentication is successful, the user is logged in; otherwise, an alert is sent back to the user.
Transaction Management:

User: Submits new transaction details.
Transaction Management System: Handles the new transaction data.
Transaction Data Store: Stores the new transaction details received from the Transaction Management System.
Response Flow: Confirms the successful storage of new transaction details and sends an alert back to the user.
Analytics Generation:

User: Requests analytics on existing transactions.
Analytics Generation System: Processes the request using existing transaction details.
Transaction Data Store: Supplies the necessary existing transaction details for analytics generation.
Response Flow: Generates analytics and sends the results back to the user, along with any relevant alerts.
In summary, this diagram illustrates the end-to-end interactions between the user, the core systems (Login, Transaction Management, Analytics Generation), and the respective data stores (User Data Store, Transaction Data Store) within the Personal Finance Tracker application.

LEVEL 2:

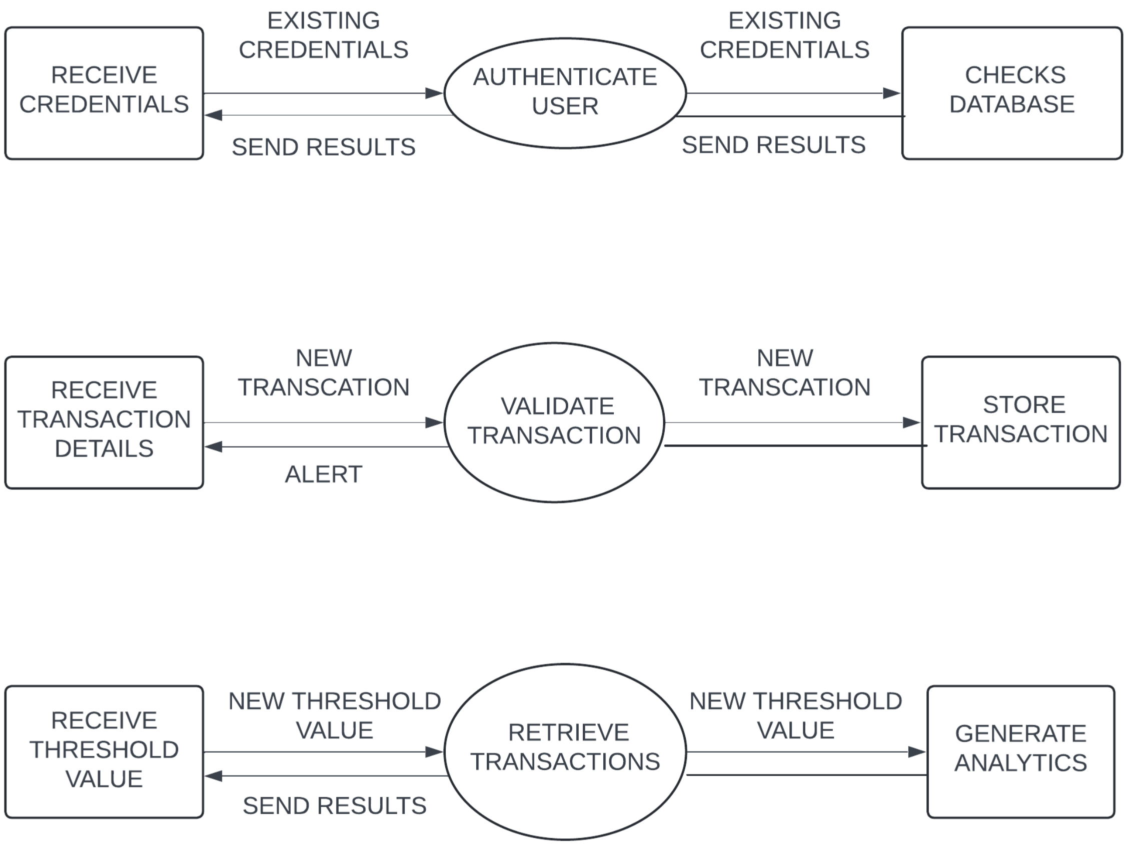


FIGURE 3.4.3: LEVEL 2 DFD

Figure 3.4.3 provides a breakdown of three critical processes within the Personal Finance Tracker system: User Authentication, Transaction Validation, and Analytics Generation. Each sub-process highlights the interactions between the various components involved.

User Authentication:

Receive Credentials: The process starts with the system receiving the user's credentials.

Authenticate User: The credentials are passed to the authentication module.

Checks Database: The authentication module checks the received credentials against existing credentials stored in the database.

Response Flow: Based on the results from the database, the authentication module sends the results back, indicating whether the authentication was successful or not.

Transaction Validation:

Receive Transaction Details: The system receives new transaction details from the user.

Validate Transaction: These details are then sent to the transaction validation module.

Store Transaction: Upon successful validation, the transaction is stored in the transaction database.

Alert: The system sends an alert back to the user confirming the successful validation and storage of the transaction, or an error if validation fails.

Analytics Generation:

Receive Threshold Value: The system receives a threshold value or criteria from the user.

Retrieve Transactions: The retrieval module uses this threshold to fetch relevant transactions from the transaction database.

Generate Analytics: Based on the retrieved transactions, the system generates analytics.

Send Results: The results of the analytics are then sent back to the user.

3.5 ER DIAGRAM

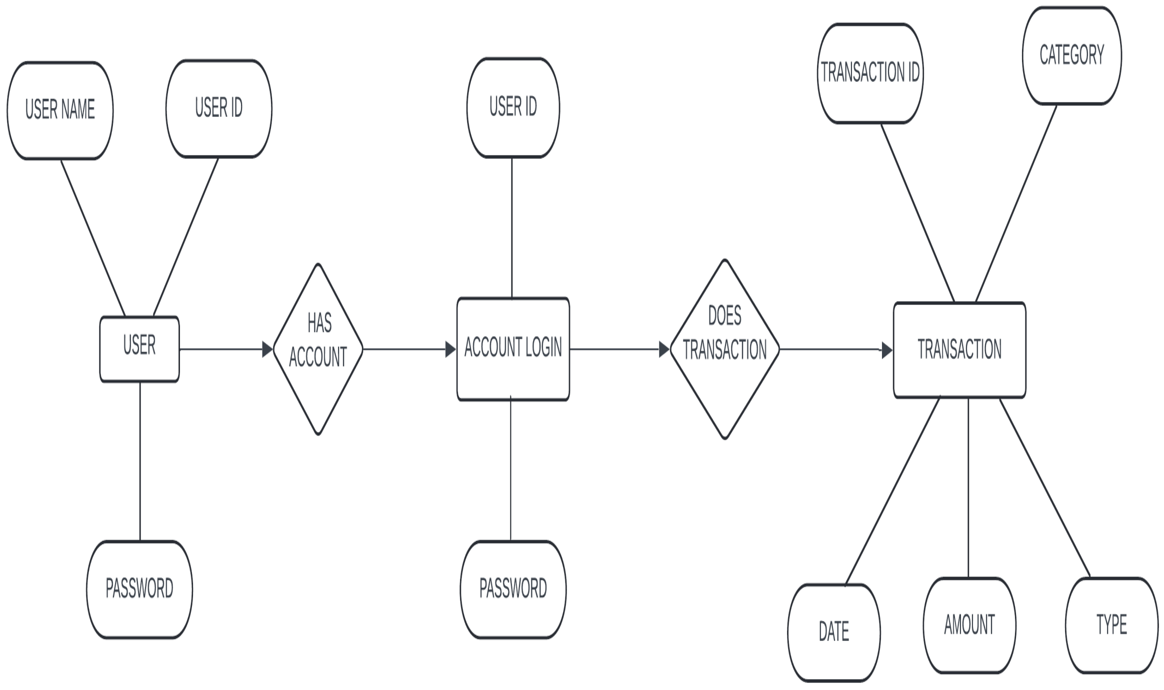


FIGURE 3.5.1: ENTITY RELATIONSHIP DIAGRAM

Figure 3.5.1: Entity-Relationship Diagram for User Account and Transaction Management System

This diagram illustrates the relationships and entities involved in managing user accounts and transactions within a system.

1. **User Entity**:
   - Attributes: User Name, User ID, Password
   - Relationship: Each user has one or more accounts, represented by the "HAS ACCOUNT" relationship.

2. **Account Login Entity**:
    - Attributes: User ID, Password
    - Relationship: Each account is associated with one or more transactions, represented by the "DOES TRANSACTION" relationship.
3. **Transaction Entity**:
    - Attributes: Transaction ID, Date, Amount, Type, Category
    - Relationship: Transactions are performed by users through their account logins.

The diagram is divided into three main sections:

- The left section focuses on user details and their authentication through account login.
- The middle section bridges the user and transaction entities through account login and the relationships.
- The right section details the transaction attributes and their association with account logins.

This structured representation helps in understanding how users interact with the system to perform transactions and how their information is stored and linked.

3.6 ARCHITECTURE DIAGRAM

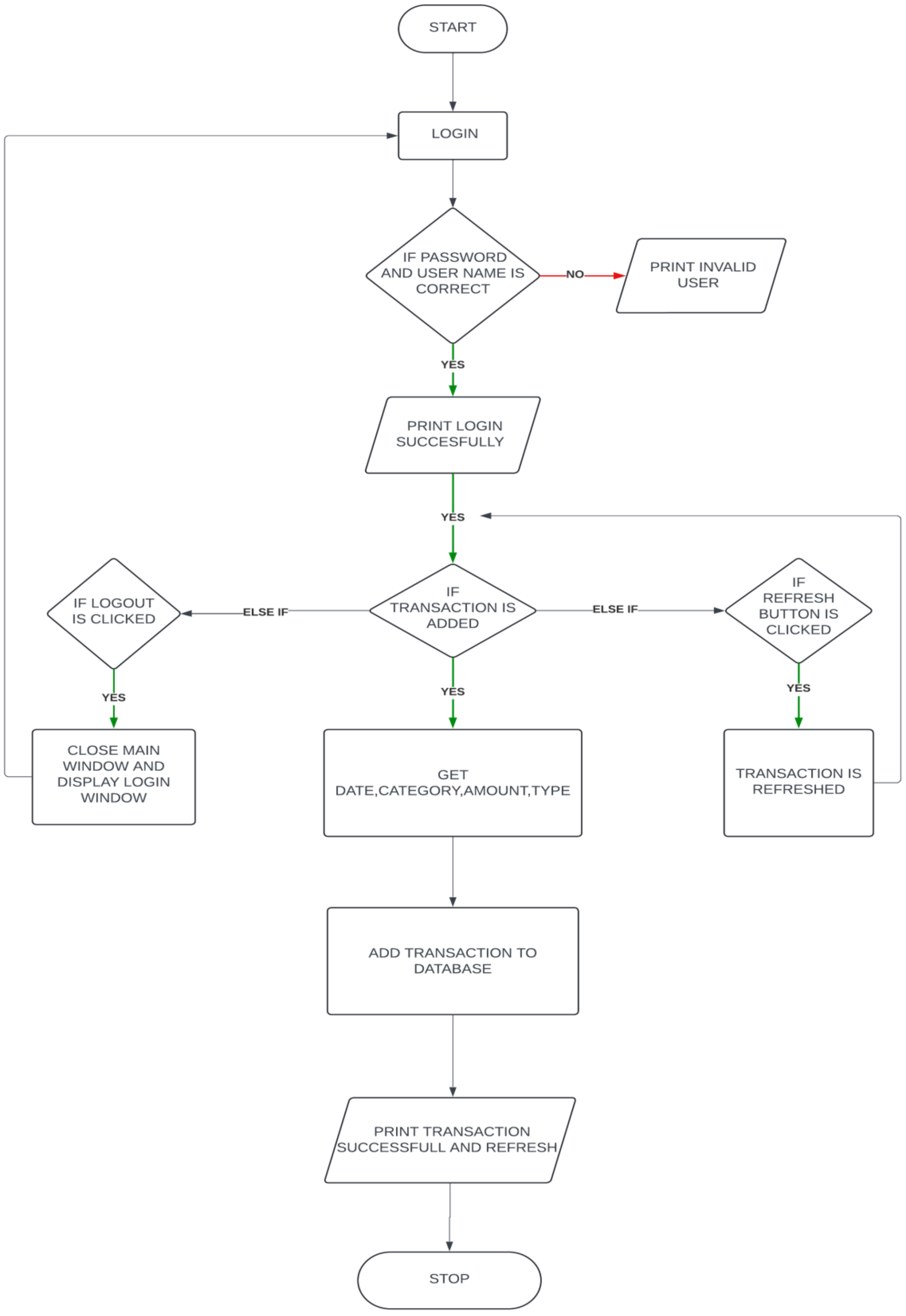

START
LOGIN
IF PASSWORD AND USER NAME IS CORRECT
NO
PRINT INVALID USER
YES
PRINT LOGIN SUCCESFULLY
YES
IF TRANSACTION IS ADDED
ELSE IF
IF LOGOUT IS CLICKED
ELSE IF
IF REFRESH BUTTON IS CLICKED
YES
CLOSE MAIN WINDOW AND DISPLAY LOGIN WINDOW
YES
GET DATE,CATEGORY,AMOUNT,TYPE
YES
TRANSACTION IS REFRESHED
ADD TRANSACTION TO DATABASE
PRINT TRANSACTION SUCCESSFULL AND REFRESH
STOP

FIGURE 3.6.1: Architecture Diagram

Figure 3.6.1: Flowchart for User Login and Transaction Management Process

This flowchart outlines the step-by-step process for user login and transaction management within a system.

1. **Start**: The process begins.
2. **Login**: The user is prompted to log in.
3. **Verify Credentials**:
    - Decision Point: Check if the user name and password are correct.
        - **Yes**: Proceed to print a successful login message.
        - **No**: Print an "Invalid User" message and halt further actions.
4. **Print Login Successfully**: Upon successful verification, a message is printed indicating successful login.
5. **User Actions**: The system waits for the user to perform one of the following actions:
    - **Logout**:
        - **If Logout is Clicked**: Close the main window and display the login window, looping back to the initial login step.
    - **Add Transaction**:
        - **If Transaction is Added**: Collect transaction details such as date, category, amount, and type.
        - Add the transaction to the database.
        - Print a message indicating the transaction was successful and refresh the display.
    - **Refresh**:
        - **If Refresh Button is Clicked**: Refresh the transaction display.
6. **Stop**: The process terminates after a successful transaction is added and the display is refreshed.

CH 4. PROGRAM CODE

4.1 PYTHON:

```
import mysql.connector  # type: ignore
import tkinter as tk
from tkinter import messagebox
from tkinter import ttk
from PIL import Image, ImageTk  # type: ignore
import matplotlib.pyplot as plt
from matplotlib.backends.backend_tkagg import
FigureCanvasTkAgg
import pandas as pd

# Ensure pyarrow is installed
# Run the following command in your terminal or command
prompt:
# pip install pyarrow

# Database connection
def connect_db():
    try:
        conn = mysql.connector.connect(
            host='localhost',
            user='root',
            password='harry',
            database='finance_tracker'
        )
        return conn
    except mysql.connector.Error as e:
        print(f"Error connecting to database: {e}")
        return None
```

```
conn = connect_db()
if conn is None:
    raise Exception("Could not connect to the database")
cursor = conn.cursor()
root = tk.Tk()
root.title("Personal Finance Tracker")
root.geometry("600x400")

# Global variable to store user_id and monthly threshold
current_user_id = None
monthly_threshold = 0

# Login function
def login():
    global current_user_id
    username = username_entry.get()
    password = password_entry.get()

    cursor.execute("SELECT user_id FROM users WHERE
username = %s AND password = %s", (username, password))
    result = cursor.fetchone()

    if result:
        current_user_id = result[0]
        messagebox.showinfo("Success", "Login successful!")
        login_window.destroy()
        main_app()
    else:
        messagebox.showerror("Error", "Invalid username or
password")
```

```
# Function to display the main app after login
def main_app():
    # Functions
    def add_transaction():
        date = date_entry.get()
        category = category_entry.get()
        amount = float(amount_entry.get())
        type_ = type_combobox.get()

        cursor.execute("INSERT INTO transactions (user_id, date,
category, amount, type) VALUES (%s, %s, %s, %s, %s)",
                       (current_user_id, date, category, amount, type_))
        conn.commit()
        messagebox.showinfo("Success", "Transaction added
successfully!")
        load_transactions()

    def load_transactions():
        for i in transactions_tree.get_children():
            transactions_tree.delete(i)

        cursor.execute("SELECT date, category, amount, type
FROM transactions WHERE user_id = %s", (current_user_id,))
        rows = cursor.fetchall()
        for row in rows:
            transactions_tree.insert("", tk.END, values=row)

    def view_analytics():
        global monthly_threshold
        try:
            monthly_threshold = float(threshold_entry.get())
        except ValueError:
            messagebox.showerror("Error", "Invalid threshold value.
Please enter a numeric value.")
            return

        cursor.execute("SELECT date, amount, category FROM
transactions WHERE user_id = %s AND type = 'expense'",
(current_user_id,))
        data = cursor.fetchall()

        if not data:
            messagebox.showinfo("Info", "No transaction data
available for analysis.")
            return

        df = pd.DataFrame(data, columns=["date", "amount",
"category"])
        df['date'] = pd.to_datetime(df['date'])
        df['amount'] = pd.to_numeric(df['amount'], errors='coerce')

        df['month'] = df['date'].dt.to_period('M')

        monthly_data = df.groupby('month')['amount'].sum()
        category_data = df.groupby('category')['amount'].sum()

        fig, ((ax1, ax2), (ax3, ax4)) = plt.subplots(2, 2,
figsize=(15,15))

        # Bar plot for monthly data
        monthly_data.plot(kind='bar', ax=ax1)
        ax1.set_title('Monthly Expenditure')
        ax1.set_xlabel('Month')
        ax1.set_ylabel('Amount Spent')
        df.plot(kind='scatter', x='date', y='amount', ax=ax2)
        ax2.set_title('Daily Expenditure (Scatter Plot)')
        ax2.set_xlabel('Date')
        ax2.set_ylabel('Amount Spent')
        # Histogram for threshold vs. actual expenses
        threshold_data = pd.Series([monthly_threshold] *
len(monthly_data), index=monthly_data.index)
        threshold_df = pd.DataFrame({'actual': monthly_data,
'threshold': threshold_data})
        threshold_df.plot(kind='bar', ax=ax3)
        ax3.set_title('Monthly Threshold vs Actual Expenses')
        ax3.set_xlabel('Month')
        ax3.set_ylabel('Amount')

        # Pie chart for category data
        category_data.plot(kind='pie', ax=ax4, autopct='%1.1f%%')
        ax4.set_title('Expenditure by Category')
        ax4.set_ylabel('')
        plt.tight_layout()
        analytics_window = tk.Toplevel(root)
        analytics_window.title("Analytics")
        analytics_window.geometry("1000x1000")

        canvas = FigureCanvasTkAgg(fig,
master=analytics_window)
        canvas.draw()
        canvas.get_tk_widget().pack(side=tk.TOP, fill=tk.BOTH,
expand=1)
    # Widgets
    date_label = tk.Label(root, text="Date (YYYY-MM-DD)")
    date_label.grid(row=0, column=0, padx=10, pady=10)
    date_entry = tk.Entry(root)
    date_entry.grid(row=0, column=1, padx=10, pady=10)

    category_label = tk.Label(root, text="Category")
    category_label.grid(row=1, column=0, padx=10, pady=10)
    category_entry = tk.Entry(root)
    category_entry.grid(row=1, column=1, padx=10, pady=10)

    amount_label = tk.Label(root, text="Amount")
    amount_label.grid(row=2, column=0, padx=10, pady=10)
    amount_entry = tk.Entry(root)
    amount_entry.grid(row=2, column=1, padx=10, pady=10)

    type_label = tk.Label(root, text="Type")
    type_label.grid(row=3, column=0, padx=10, pady=10)
    type_combobox = ttk.Combobox(root, values=["income",
"expense"])
    type_combobox.grid(row=3, column=1, padx=10, pady=10)
    type_combobox.set("income")

    threshold_label = tk.Label(root, text="Monthly Expense
Threshold")
    threshold_label.grid(row=4, column=0, padx=10, pady=10)
    threshold_entry = tk.Entry(root)
    threshold_entry.grid(row=4, column=1, padx=10, pady=10)
    add_button = tk.Button(root, text="Add Transaction",
command=add_transaction)

    add_button.grid(row=5, column=0, columnspan=2, pady=10)
    view_analytics_button = tk.Button(root, text="View
Analytics", command=view_analytics)
```

```
view_analytics_button.grid(row=5, column=2, columnspan=2,
pady=10)
    # Transactions Treeview
    columns = ("date", "category", "amount", "type")
    transactions_tree = ttk.Treeview(root, columns=columns,
show="headings")
    for col in columns:
        transactions_tree.heading(col, text=col.capitalize())
        transactions_tree.grid(row=6, column=0, columnspan=2,
padx=10, pady=10)

    # Load transactions
    load_transactions()
# Login window setup
login_window = tk.Toplevel(root)
login_window.title("Login")
login_window.geometry("300x250")

# Create a frame as the background with a specific background
color
background_frame = tk.Frame(login_window, bg="#000000")
background_frame.pack(expand=True, fill="both")

# Login widgets
username_label = tk.Label(background_frame, text="Email or
username", bg="#000000", fg="#FFFFFF")
username_label.pack(pady=5)
username_entry = tk.Entry(background_frame, bg="#333333",
fg="#FFFFFF", insertbackground="#FFFFFF")
username_entry.pack(pady=5, ipady=5, ipadx=5, fill=tk.X,
padx=10)
```

```
password_label = tk.Label(background_frame, text="Password",
bg="#000000", fg="#FFFFFF")
password_label.pack(pady=5)
password_entry = tk.Entry(background_frame, show="*",
bg="#333333", fg="#FFFFFF", insertbackground="#FFFFFF")
password_entry.pack(pady=5, ipady=5, ipadx=5, fill=tk.X,
padx=10)

remember_me_var = tk.BooleanVar()
remember_me_check = tk.Checkbutton(background_frame,
text="Remember me", variable=remember_me_var,
bg="#000000", fg="#FFFFFF", selectcolor="#000000",
activebackground="#000000")
remember_me_check.pack(pady=5)

login_button = tk.Button(background_frame, text="Log In",
command=login, bg="#1DB954", fg="#FFFFFF",
font=("Helvetica", 10, "bold"))
login_button.pack(pady=20, ipady=5, ipadx=5, fill=tk.X,
padx=10)

forgot_password_label = tk.Label(background_frame,
text="Forgot your password?", bg="#000000", fg="#FFFFFF",
cursor="hand2")
forgot_password_label.pack(pady=5)
forgot_password_label.bind("<Button-1>", lambda e:
messagebox.showinfo("Info", "Password recovery not
implemented."))

root.mainloop()
# Close the database connection when the application is closed
conn.close()
```

4.2 SQL:

```
-- create_finance_tracker_db.sql
CREATE DATABASE IF NOT EXISTS finance_tracker;
USE finance_tracker;
CREATE TABLE IF NOT EXISTS users (
   user_id INT AUTO_INCREMENT PRIMARY KEY,
   username VARCHAR(50) NOT NULL,
   password VARCHAR(50) NOT NULL
);
CREATE TABLE IF NOT EXISTS transactions (
   transaction_id INT AUTO_INCREMENT PRIMARY KEY,
   user_id INT,
   date DATE NOT NULL,
   category VARCHAR(50) NOT NULL,
   amount DECIMAL(10, 2) NOT NULL,
   type ENUM('income', 'expense') NOT NULL,
   FOREIGN KEY (user_id) REFERENCES users(user_id)
);
```

4.3 Source code description:

The provided code consists of a Python script and a SQL script. The Python script creates a graphical user interface (GUI) for a personal finance tracker application using the tkinter library, while the SQL script sets up the necessary database and tables for the application.

PYTHON SCRIPT:

Libraries and Modules:

mysql.connector: Connects to the MySQL database.

tkinter: Used to create the GUI.

messagebox, ttk from tkinter: Used for pop-up messages and themed widgets.

PIL.Image, ImageTk: Used for image handling (though not actively used in the script).

matplotlib.pyplot: For creating plots and graphs.

matplotlib.backends.backend_tkagg.FigureCanvasTkAgg: To embed matplotlib figures in tkinter.

pandas: Used for data manipulation and analysis.

Database Connection:

The connect_db function establishes a connection to a MySQL database named finance_tracker.

If the connection is successful, the global variable conn holds the connection object and cursor is initialized.

GUI Setup:

The main application window (root) is created with a title "Personal Finance Tracker".

A separate login window (login_window) is created for user authentication.

Login Function:

The login function checks the user's credentials against the database.

If successful, the main application interface is displayed; otherwise, an error message is shown.

Main Application Interface:

The main_app function sets up the main interface after a successful login.

It includes fields for date, category, amount, and type of transaction, and buttons to add transactions and view analytics.

Functions for Transaction Management:

add_transaction: Adds a new transaction to the database based on user input.

load_transactions: Loads and displays the user's transactions in a treeview.

view_analytics: Generates various plots (bar, scatter, histogram, and pie charts) to visualize the user's financial data using matplotlib and pandas.

Login Window Setup:

The login window includes fields for username and password, a "Remember me" checkbox, a "Log In" button, and a "Forgot your password?" label.

Closing the Database Connection:

The database connection is closed when the application is terminated.

SQL SCRIPT:

Database and Table Creation:

users table: Stores user credentials with fields for user_id, username, and password.

transactions table: Stores transaction details with fields for transaction_id, user_id, date, category, amount, and type.

CH 5. RESULTS AND DISCUSSIONS

5.1 USER DOCUMENTATION:

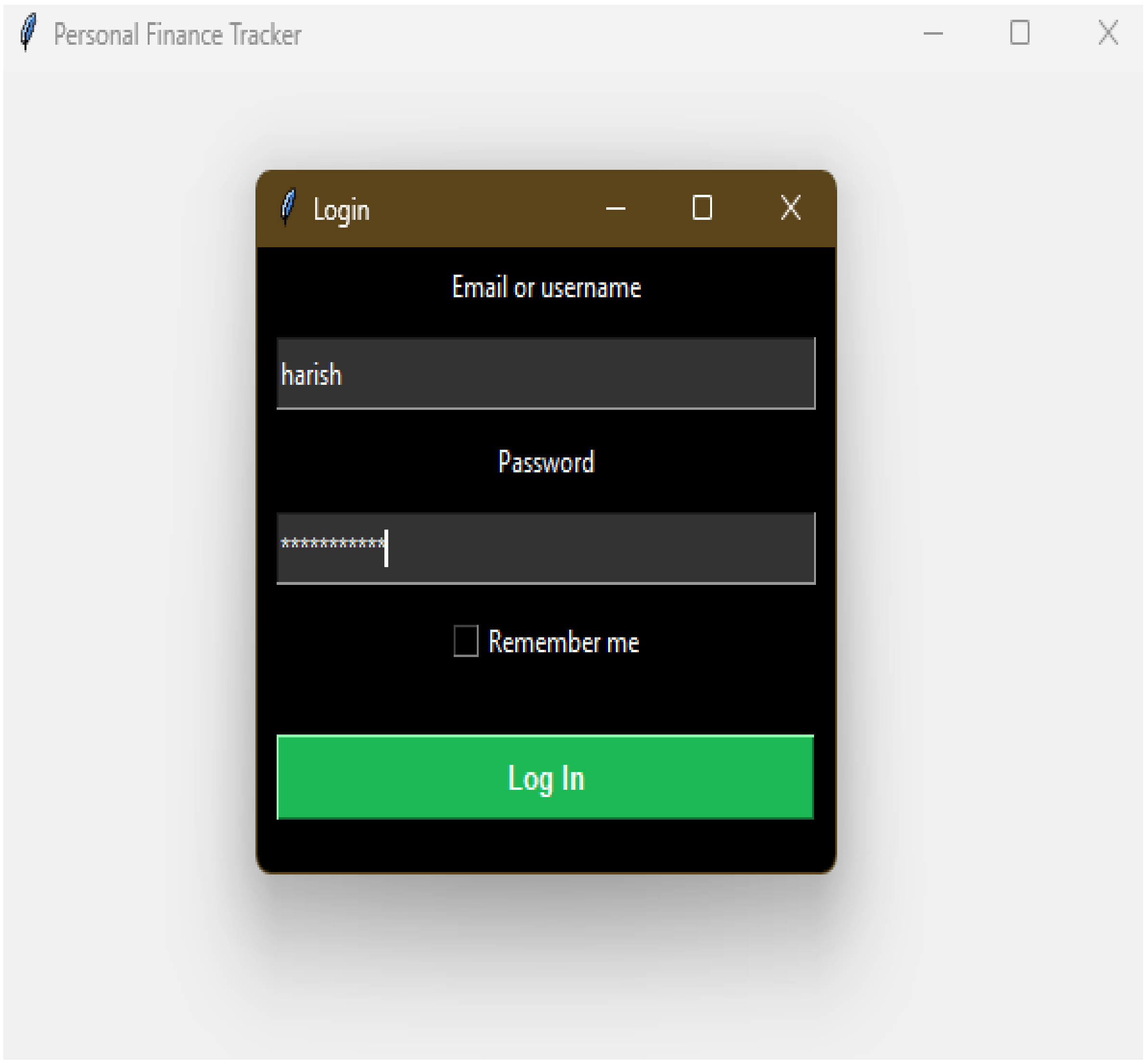


FIGURE 5.1.1: Login page.

Figure 5.1.1: User Login Interface for Personal Finance Tracker

This figure depicts the login interface for the Personal Finance Tracker application. The login window features a sleek, modern design with a dark background and contrasting text and elements.

- **Title Bar**: The window is titled "Login" and displays a feather icon.
- **Labels and Entry Fields**:
  - **Email or Username**: A label prompting the user to enter their email or username is positioned above the entry field. In this example, the username "harish" is entered.
  - **Password**: Below the password label, there is a password entry field displaying masked characters for security.
- **Remember Me Checkbox**: Positioned below the password entry, there is a checkbox labeled "Remember me".
- **Log In Button**: A prominent green "Log In" button is centered at the bottom of the window, inviting users to submit their credentials.
- **Overall Design**: The interface uses a black and green color scheme, with white text for labels and entries. The button stands out with a bold, green background, and the window has rounded corners, contributing to a visually appealing and user-friendly design.

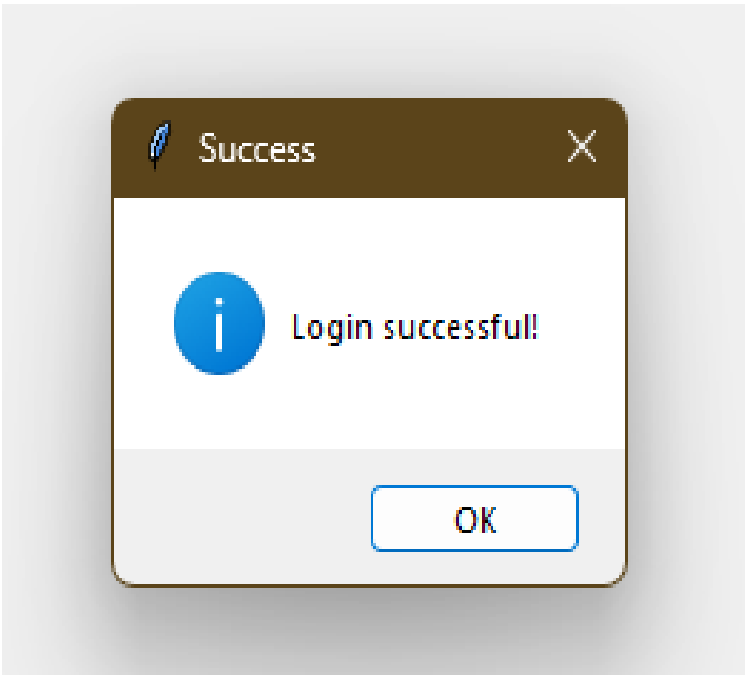
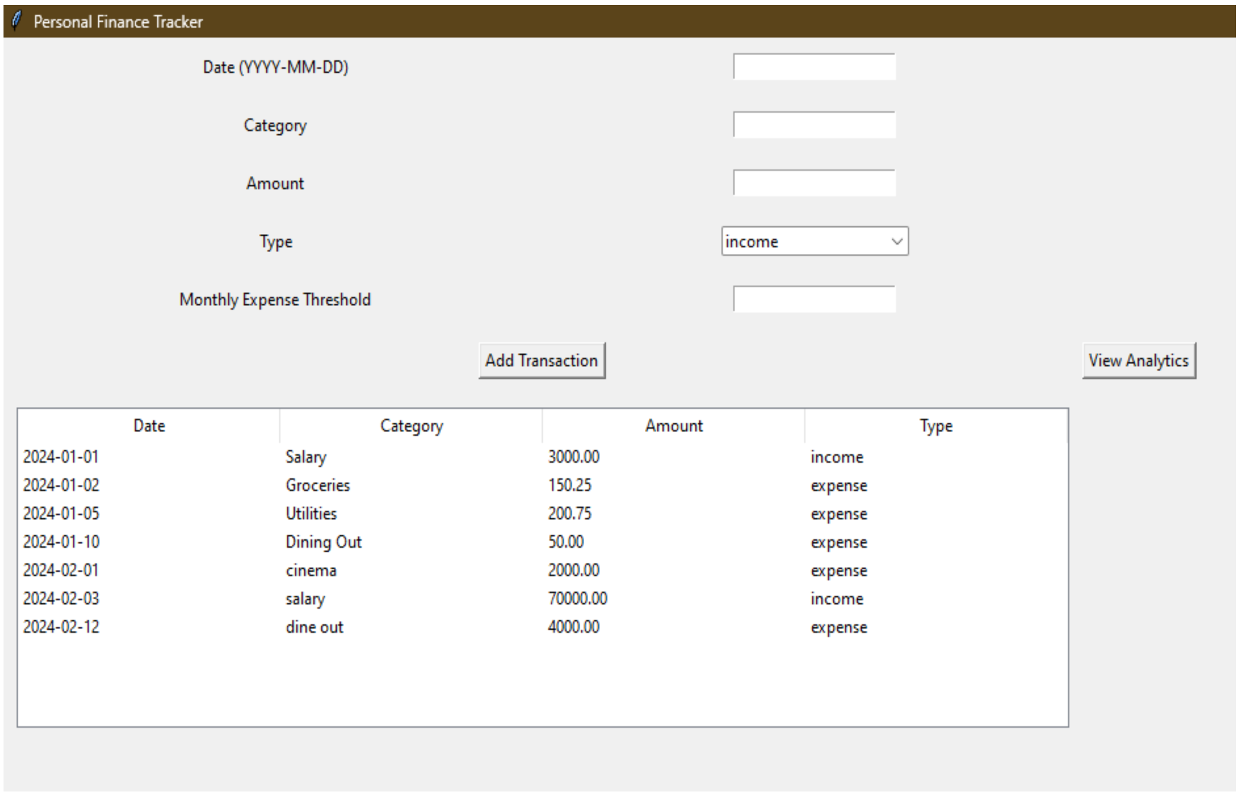


FIGURE 5.1.2: Login successful screen.

Figure 5.1.2: The image depicts a dialog box with the title "Success." It features an information icon represented by a blue circle with a white "i" in the center, followed by the message "Login successful!" below it. The dialog box includes an "OK" button at the bottom right, allowing the user to acknowledge and close the message. The background of the dialog box is white, with a brown title bar at the top containing a close button (X) on the far right. The overall appearance is consistent with typical success notifications in software applications.



Personal Finance Tracker

Date (YYYY-MM-DD)	
Category	
Amount	
Type	income
Monthly Expense Threshold	

Date	Category	Amount	Type
2024-01-01	Salary	3000.00	income
2024-01-02	Groceries	150.25	expense
2024-01-05	Utilities	200.75	expense
2024-01-10	Dining Out	50.00	expense
2024-02-01	cinema	2000.00	expense
2024-02-03	salary	70000.00	income
2024-02-12	dine out	4000.00	expense

FIGURE 5.1.3: Transaction details page

Figure 5.1.3: The image displays a user interface for a "Personal Finance Tracker" application. The top section of the interface contains fields for entering new transactions, arranged in a vertical format. These fields include:

Date (YYYY-MM-DD): An empty text box for entering the date of the transaction.
Category: An empty text box for specifying the category of the transaction.
Amount: An empty text box for entering the transaction amount.
Type: A dropdown menu with options for categorizing the transaction as either "income" or "expense," with "income" currently selected.
Monthly Expense Threshold: An empty text box for setting a threshold for monthly expenses.
There are two buttons below these input fields:

Add Transaction: A button that likely adds the entered transaction to the list.
View Analytics: A button that presumably provides access to analytical tools or reports.
Below the input section is a detailed table that lists recorded transactions. This table is organized into four columns:

Date: Displays the date of each transaction.
Category: Shows the category to which each transaction belongs.
Amount: Lists the amount of money involved in each transaction.
Type: Indicates whether the transaction is an income or an expense.
The transactions displayed in the table have various dates, categories, amounts, and types, providing a clear and organized view of the user's financial activities. The table is positioned in the lower part of the interface, making it easy to review past transactions while entering new ones. The overall layout is straightforward and user-friendly, with a white background and a brown title bar at the top. The design suggests a focus on ease of use and clarity for managing personal finances.

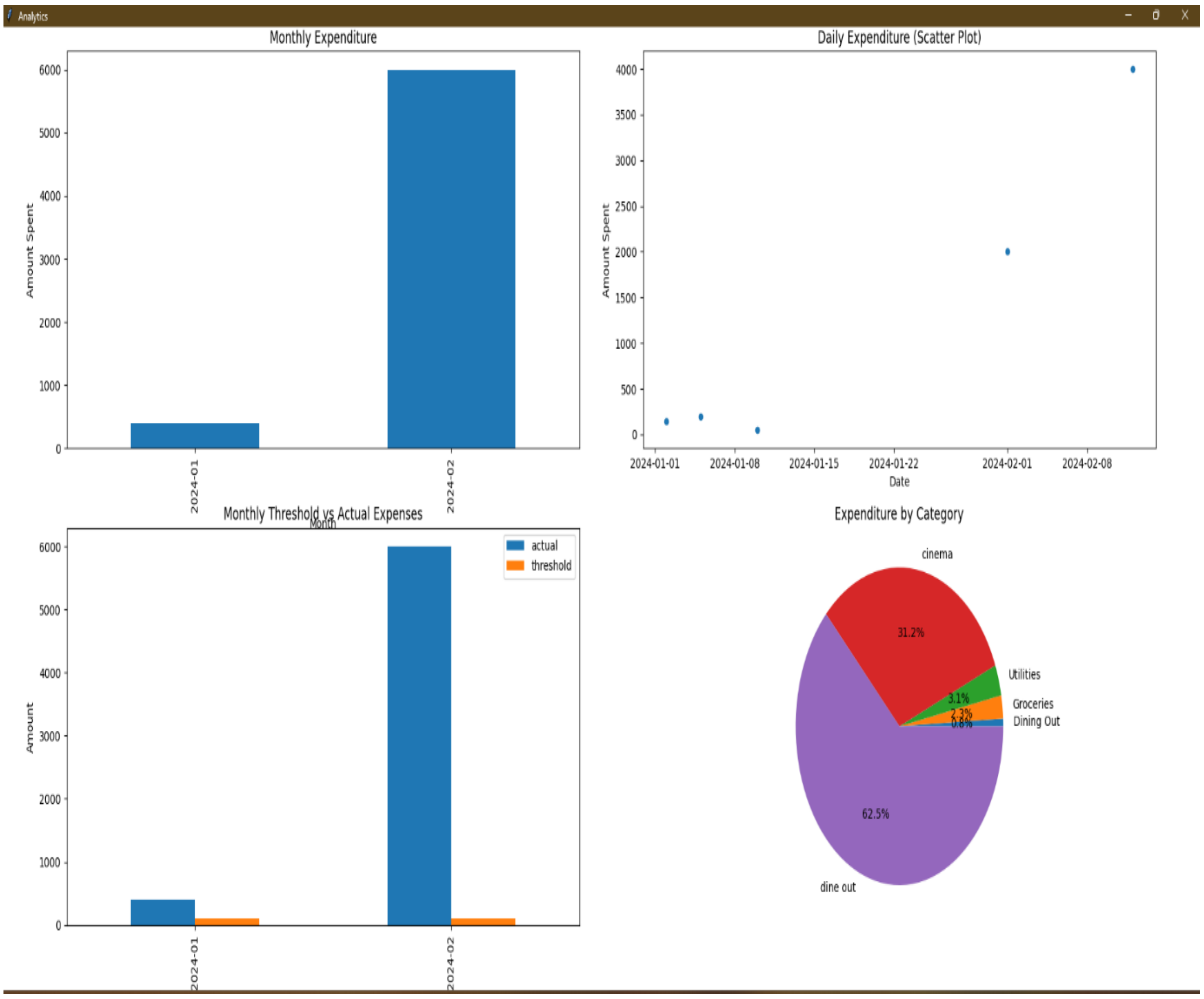


FIGURE 5.1.4: Analytics page

Figure 5.1.4: The image displays an "Analytics" interface for a "Personal Finance Tracker" application, featuring four distinct charts that visualize various aspects of the user's financial data.

Monthly Expenditure: This bar chart, located in the top-left quadrant, shows the amount spent each month. The x-axis represents different months, while the y-axis indicates the amount spent. One month shows a low expenditure compared to another month, which has a significantly higher amount.

Daily Expenditure (Scatter Plot): Positioned in the top-right quadrant, this scatter plot presents daily expenditure over a period of time. The x-axis represents a range of dates, and the y-axis represents the amount spent. Each point on the plot corresponds to a specific expenditure on a given date, with a few scattered points indicating expenditures on certain days.

Monthly Threshold vs. Actual Expenses: This bar chart, in the bottom-left quadrant, compares the actual expenses to the monthly threshold for different months. The x-axis represents the months, and the y-axis represents the amount. The chart uses different colors for actual expenses and thresholds, showing that in one month, actual expenses greatly exceed the threshold.

Expenditure by Category: This pie chart, located in the bottom-right quadrant, breaks down expenses by category. The categories are represented by different colors and percentages. One category occupies the largest portion of the pie chart, followed by another category with a significant portion, while the remaining categories take up smaller segments.

Each chart provides a different perspective on the user's spending habits, making it easier to analyze and understand financial patterns and discrepancies. The overall layout is clear, with a brown title bar at the top indicating the section name "Analytics."

CH 6. FUTURE SCOPE

The future scope of the Personal Finance Tracker application is vast, with several potential enhancements and new features that can significantly increase its utility and appeal to a broader audience. One of the key future developments could be the integration of machine learning algorithms to provide predictive analytics. By analyzing historical transaction data, the application could forecast future spending patterns and suggest personalized budget plans. This would enable users to anticipate financial challenges and make proactive decisions to ensure their financial stability.

Another promising area for expansion is the incorporation of multi-currency support. As the world becomes increasingly globalized, users may need to manage finances across different currencies. By enabling multi-currency tracking and automatic currency conversion based on real-time exchange rates, the application can cater to the needs of expatriates, travelers, and international businesspersons. This feature would make the Personal Finance Tracker more versatile and useful in a variety of financial contexts.

Expanding the platform's accessibility through mobile application development is also a critical future scope. With the rise in smartphone usage, developing Android and iOS versions of the Personal Finance Tracker would allow users to manage their finances on the go. Mobile apps could offer push notifications for budget alerts, expense reminders, and financial insights, ensuring that users are always in control of their financial health, regardless of their location.

Another significant enhancement could be the integration with external financial services and APIs. Linking the application with bank accounts, credit cards, and digital wallets can automate the process of transaction entry, reducing manual input and the risk of errors. Users would benefit from real-time updates on their financial status, and the application could provide a more holistic view of their financial situation by aggregating data from multiple sources. Additionally, partnerships with financial advisory services could offer users personalized financial advice based on their spending habits and financial goals.

Lastly, incorporating advanced security features to protect user data is paramount as the application evolves. Implementing two-factor authentication, end-to-end encryption, and regular security audits can ensure that users' sensitive financial information remains secure. As data privacy concerns continue to grow, emphasizing robust security measures will build user trust and make the application more attractive to a security-conscious audience. Moreover, compliance with global data protection regulations such as GDPR and CCPA can expand the application’s user base to include individuals from regions with stringent data protection laws.

In conclusion, the future of the Personal Finance Tracker is bright, with numerous opportunities for enhancement and expansion. By integrating predictive analytics, multi-currency support, mobile accessibility, external financial service integration, and advanced security features, the application can evolve into a comprehensive, user-friendly, and secure platform for managing personal finances effectively. These developments will not only increase the application's functionality and user base but also solidify its position as an indispensable tool for financial management.

CH 7. CONCLUSION

The Personal Finance Tracker project exemplifies the synergy between Python programming, SQL database management, and GUI development using Tkinter. Through its intuitive interface and robust functionalities, the application empowers users to effectively manage their financial activities.

Python, with its rich ecosystem of libraries and frameworks, serves as the backbone of the project. Modules such as `mysql.connector`, `pandas`, and `matplotlib` enable seamless interaction with the MySQL database, efficient data manipulation, and insightful visualization of financial data. Python's simplicity and versatility make it an ideal choice for developing such applications, facilitating rapid development and easy maintenance.

The utilization of SQL (Structured Query Language) enhances the project's database management capabilities. SQL enables the creation, modification, and retrieval of data stored in the MySQL database. By executing SQL queries, the application efficiently manages user authentication, transaction storage, and data retrieval, ensuring data integrity and security.

The graphical user interface (GUI) developed using Tkinter provides users with a seamless and intuitive experience. With widgets like entry fields, buttons, and treeviews, users can easily input transaction details, view their transaction history, and access analytics features. Tkinter's cross-platform compatibility and ease of use ensure that the application runs smoothly on various operating systems, catering to a wide user base.

The project's main features include user authentication, transaction management, and analytics visualization. The login functionality ensures secure access to user-specific data, safeguarding sensitive financial information. Users can add transactions, specifying the date, category, amount, and type (income or expense), providing a comprehensive record of their financial activities.

The analytics feature offers valuable insights into spending patterns and trends. Through visualizations such as bar plots, scatter plots, histograms, and pie charts, users can analyze their expenditure over time, track monthly expenses against predefined thresholds, and understand their spending habits across different categories. This functionality empowers users to make informed financial decisions and adopt better budgeting strategies.

In conclusion, the Personal Finance Tracker project demonstrates the effective integration of Python, SQL, and Tkinter to develop a user-friendly and feature-rich application for personal financial management. By leveraging the strengths of each technology, the application provides users with a comprehensive platform to track, analyze, and optimize their financial health. With further enhancements and refinements, this project has the potential to become an invaluable tool for individuals seeking to achieve their financial goals and improve their financial well-being.

CH 8. REFERENCES

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