**PROJECT REPORT ON ANALYZING PERSONAL EXPENSES**

**Project Vision**

This project, **"Analysing Personal Expenses"**, is designed to simulate a comprehensive expense tracker using Python, SQL, and Streamlit. The tracker processes realistic expense data generated via the Faker library, stores it in a SQL database, and visualizes insights through a Streamlit app. The project provides actionable insights into financial habits by analysing data across categories such as groceries, bills, and subscriptions.

**Project Highlights**

* **Technology-Driven Insights**: Harnessed Python, SQL, and Streamlit for a seamless tracking and analysis experience.
* **Innovative Simulations**: Generated lifelike expense data using the Faker library.
* **Data-Driven Decision-Making**: Delivered meaningful insights into financial behaviour and spending optimization.

**Skills Utilized**

* Python
* SQL
* Streamlit
* Data Visualization
* Financial Analysis

**Domain**

* Personal Finance and Expense Tracking

**Objectives**

The core objectives of the project are:

* Automating personal or business expense tracking.
* Analysing spending habits to provide actionable savings strategies.
* Building interactive financial dashboards to visualize income and expenditure trends.

**Methodology**

1. **Data Simulation**

* The Faker library generated 12 months of expense data across key categories such as groceries, bills, and subscriptions.
* **Dataset Features**:
  + **Date**: Transaction timestamp.
  + **Category**: Expense type (e.g., Transportation, Entertainment).
  + **Payment Mode**: Methods like UPI, cash, and cards.
  + **Amount**: Monetary value per transaction.
  + **Cashback**: Rebates received during the transactions.
* **Quality Assurance**: Ensured logical date ranges, accurate amounts, and relevant descriptions.

1. **Database Creation**

* Designed a scalable SQL schema for seamless storage and querying.
* Migrated generated data into a MySQL database using **MYSQL** for database connectivity and interaction.

**Exploratory Data Analysis (EDA)**

EDA was conducted using advanced Python libraries such as Pandas and Matplotlib, focusing on comprehensive and detailed analysis to extract valuable insights. The following key areas were explored:

1. **Monthly Expenditure & Growth**

* **Analysis**:
  + Aggregated expenses on a monthly basis to identify spending patterns.
  + Calculated monthly growth percentages using percentage change between consecutive months.
* **Visualizations**:
  + **Bar Chart**: Compared monthly growth.
* **Insights**:
  + Identified peak expenditure during festive seasons.
  + Months with declining expenses were analysed for savings opportunities.

1. **Spending by Category**

* **Analysis**:
  + Grouped and summed expenses by category to determine major spending areas.
  + Assessed category-wise variability over months to detect consistent high-expense contributors.
* **Visualizations**:
  + **Bar Chart**: Represented total spending per category.
* **Insights**:
  + Groceries and Entertainment emerged as top expense categories, contributing over 50% of total spending.
  + Categories like Insurance and Travel had sporadic spikes, indicating discretionary spending.

1. **Payment Mode Distribution**

* **Analysis**:
  + Counted transactions by payment mode to evaluate user preferences.
  + Analysed the proportion of cash versus online transactions.
  + Assessed cashback opportunities linked with specific payment methods.
* **Visualizations**:
  + **Bar Chart**: Displayed the frequency of transactions for each payment mode.
  + **Pie Chart**: Showed the percentage share of Cash and Online
* **Insights**:
  + Online Transactions used (80.6%).
  + Cash Transactions used only (119.4%).

Each of these analyses was visualized effectively to ensure the insights were both actionable and easily interpretable for stakeholders, providing a strong foundation for financial optimization.

**Streamlit App**

* **User-Centric Design**: The Streamlit app was developed with a strong emphasis on usability and functionality, incorporating the following key modules to maximize user engagement and data accessibility:

**1. Add Expenses**

* This page allows users to **input and store** expenses into a database.
* Users can manually enter expenses or generate random expense entries.
* It ensures that all financial transactions are **logged for future reference**.

**2. View Expenses**

* This page allows users to **review and track** their past expenses in a structured table format.
* Users can **filter expenses** based on **date, category, payment mode, or description** to find specific transactions.
* The table provides **real-time visibility** into spending habits, making it easier to track financial goals.
* Helps users **categorize transactions** and identify trends in their spending patterns.
* Supports **budget planning** by highlighting areas where users may need to adjust their expenses.

**2. Analyze Expenses**

* Offers **visual insights** using **bar charts** and data summaries.
* Users can **filter expenses by category** and **payment mode** to focus on specific spending areas.
* Helps in understanding **spending patterns** over time.
* Useful for **identifying unnecessary expenses** and optimizing financial decisions.
* Supports better **financial management** by showing trends and anomalies

Each module was carefully designed to ensure ease of use while enabling users to uncover meaningful insights and take control of their finances efficiently.

**Challenges Faced and Resolutions**

1. **Data Simulation Complexity:**
   * Challenge: Generating realistic expense data that aligns with typical financial patterns.
   * Resolution: Used Faker library's advanced features and validation checks to ensure data consistency and accuracy.
2. **Integration with Streamlit:**
   * Challenge: Ensuring seamless connectivity between the SQL database and the Streamlit app.
   * Resolution: Utilized caching mechanisms.
3. **Visualization Design:**
   * Challenge: Creating intuitive and visually appealing charts.
   * Resolution: Iterated on visualization styles and user feedback to improve clarity and engagement.

**SQL Queries and Visualizations**

* **Sample SQL Queries**
* Expense by Category: Identifies spending across categories like groceries and subscriptions.
* Monthly Expenditure: Provides monthly expense breakdown and trends.
* Cashback Analysis: Tracks cashback received and averages by month.
* Transaction Comparison: Compares online vs. cash transactions.

**Sample Visualizations**

1. Monthly Expenditure & Growth:
   * Line chart showing total expenses and growth rates.
2. Spending by Category:
   * Bar chart of categorized spending.
3. Payment Mode Distribution:
   * Pie and bar charts depicting transaction distribution.

**Key Insights**

1. **Expense Trends**

* **High Expenditure Categories:** Over half of the total spending was concentrated on Subscription and Investment, highlighting essential areas for cost management.
* **Monthly Spending Peaks:** Significant expenditure spikes were observed during festive periods, reflecting seasonal spending behaviors.
* **Payment Modes:** A clear preference for online payments (80.6%) indicates increasing reliance on digital transactions over traditional cash payments.

1. **Cashback Opportunities**

* An average monthly cashback of 4% was identified, presenting opportunities to enhance savings through optimized payment strategies, such as using cards or apps with higher cashback benefits.

1. **Spending Patterns**

* **Highest Expenditure Day:** A specific day recorded the maximum single-day expenditure of **$705165.12**, emphasizing the need to budget for similar high-spend days in the future.
* **Low Spending Days:** Monday consistently showed lower spending, indicating an opportunity to schedule bulk purchases or savings strategies for these days.

1. **Visualizations**

* **Expenditure Growth:** Depicted monthly spending trends, showcasing growth during high-spending periods and potential areas to reduce expenses.
* **Category Breakdown:** Provided a comprehensive overview of spending by category using bar and pie charts, helping users identify key areas for budgeting.
* **Payment Analysis:** Visualized the distribution of transactions across various payment modes, with insights into optimizing usage for better financial benefits.

**Recommendations**

1. **Optimize High-Expense Categories**
   * Reduce spending in Subscription by reviewing recurring expenses.
2. **Plan Purchases Strategically**
   * Schedule larger purchases on low-spending days.
3. **Maximize Cashback**
   * Use payment methods offering better cashback rates.
4. **Budget for High-Spending Months**
   * Allocate funds strategically for months like April.
5. **Enhance Payment Mode Utilization**
   * Diversify payment modes for better rewards.

**Results**

1. Functional Streamlit app displaying:
   * Spending patterns.
   * Outputs of 15 SQL queries.
2. Identification of key trends such as top spending categories and monthly breakdowns.
3. Data-driven insights into effective financial management.

**Conclusion**The Expense Tracker app's powerful data simulation and perceptive graphics are prime examples of financial management innovation. Providing users with practical suggestions, it is a flexible tool for encouraging financial self-control and maximizing spending. Its user-friendly design and scalability make it a significant tool for small business and personal finance.

**Future Improvements**

1. Integration with real-time data sources (e.g., bank statements).
2. Enhanced AI-based insights using machine learning models.
3. Multi-user support for family or business use cases.