■ Expense Sharing System – Project Report

■ Introduction

Managing shared expenses among friends or groups can be challenging, especially when multiple payments and participants are involved. This project implements a Python-based Expense Sharing System to automate recording expenses, splitting costs fairly, and calculating settlements. Inspired by Splitwise and Google Pay, the system ensures fairness and transparency.

■■ Methodology

The system follows two approaches for splitting expenses:

1. **Equal Contribution:** Each expense is split equally among participants.

2. **Weighted Contribution:** (Future enhancement) Expenses split in predefined ratios.

Special Case Handling includes:

1. Refunds – Negative expenses handled as reimbursements.

2. Missed payments – Adjust balances if participants are added later.

3. Multiple transactions – Settlement ensures minimal number of payments.

■ Dataset & Preprocessing

Expenses are stored in a dataset (CSV/DF) with columns: Payer, Amount, Participants, Split_Amount, and Timestamp. Preprocessing includes standardizing names, converting amounts, expanding participants, and tracking balances.

■ Data Science Implementation

1. Libraries: Pandas, NumPy, Matplotlib/Seaborn.

2. Analytics: Track total spending per user/group.

3. Visualization: Bar (spending per user), Pie (distribution), Line (trend over time).

■ Results and Insights

Sample Input:

Friends: Alice, Bob, Charlie

Expense 1: Alice paid ■300 for Alice, Bob, Charlie

Expense 2: Bob paid ■150 for Bob, Charlie

Output Settlement:

Charlie owes Alice: ■100

Analytics Insights:

1   Alice contributed the most (■300).

2   Bob spent moderately (■150).

3   Charlie spent nothing but owes ■100.

■ Improvements & Challenges

Challenges:

1   Dynamic inputs with varied participants.

2   Floating-point precision in splits.

3   Ensuring minimal settlement transactions.

Future Improvements:

1   Weighted contribution support.

2   Export reports as PDF/Excel.

3   Integration with UPI/Payment APIs.

4   Web/Mobile app dashboards.