

Expense Tracker (Desktop App)

Name: Rhythm Paudel

Email: rhythmpaudel12@gmail.com

Github: github.com/rhythm-paudel

LinkedIn: linkedin.com/in/rhythmpaudel

Abstract

This documentation will provide a brief overview on a desktop application which can be used to track the financial change of the user. The user can perform various operation and view an overview of the cash flows, that were entered in the account. The application will deal mainly with inflows, outflows, and debts services.

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1. Introduction

This application is being developed to track a financial status of a user. It can be seen that, people often lose track of their saving, expenditures, or other transactions like debts. With problems like this, sometimes people also forget about the deadlines of debts. This desktop application is being developed to solve such problems.

In this application a user can register with their preferred currency, making them easy to track their expenses. User will also be provided with a dashboard upon logging in, with brief summary of the transactions, their inflows, outflows and debts. Additionally, user will also be able to filter transactions by date from the dashboard. The application will facilitate the user with various operations like adding and clearing debt, adding inflows and adding outflows. User can also perform searching operations, filtering the transactions by date, and sorting by date.

This application will be developed using C# programming language, which will use .Net as the framework. In .Net, MAUI application will be prepared from which html tags can be used for designing and C# coding can also be performed in the same file with the help of .razor file. The details of any operations or user will be saved in Json in local machine for ease of using the file and dealing with Json.

2. Features and functionalities

The application will have several functionalities that will help the user to simplify the user. The application is developed with a simple UI avoiding overcomplexities for the user. The application will have several functionalities like keeping track of transactions, and filtering transactions. The list of functions in the application are listed below with further explanation.

2.1. Registration

The user is able to register with a unique username, their selected password and preferred currency. Once the preferred currency is set, the user can directly login with their entered credentials.

Upon first opening the application user will be interacted with a login form. If there are no user, a new user can be registered.

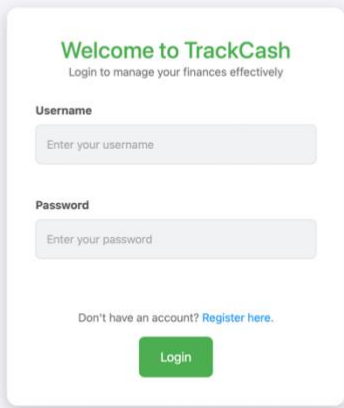
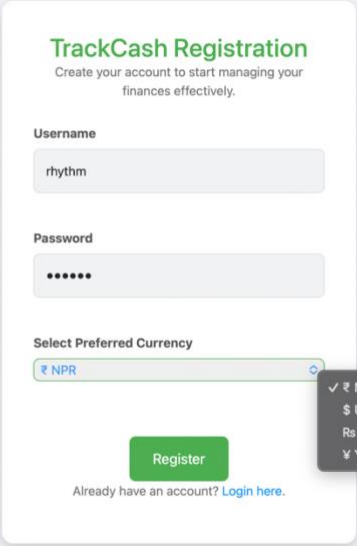
The image shows a login page for an application called 'TrackCash'. The page has a light purple background. In the center, there is a white login form with a green border. At the top of the form, it says 'Welcome to TrackCash' in green, followed by 'Login to manage your finances effectively' in a smaller font. Below this, there are two input fields: one for 'Username' with the placeholder text 'Enter your username', and one for 'Password' with the placeholder text 'Enter your password'. Below the password field, there is a link that says 'Don't have an account? Register here.' in blue. At the bottom of the form, there is a green 'Login' button.

Figure 1: Login page



TrackCash Registration
Create your account to start managing your finances effectively.

Username
rhythm

Password
•••••

Select Preferred Currency
₹ NPR

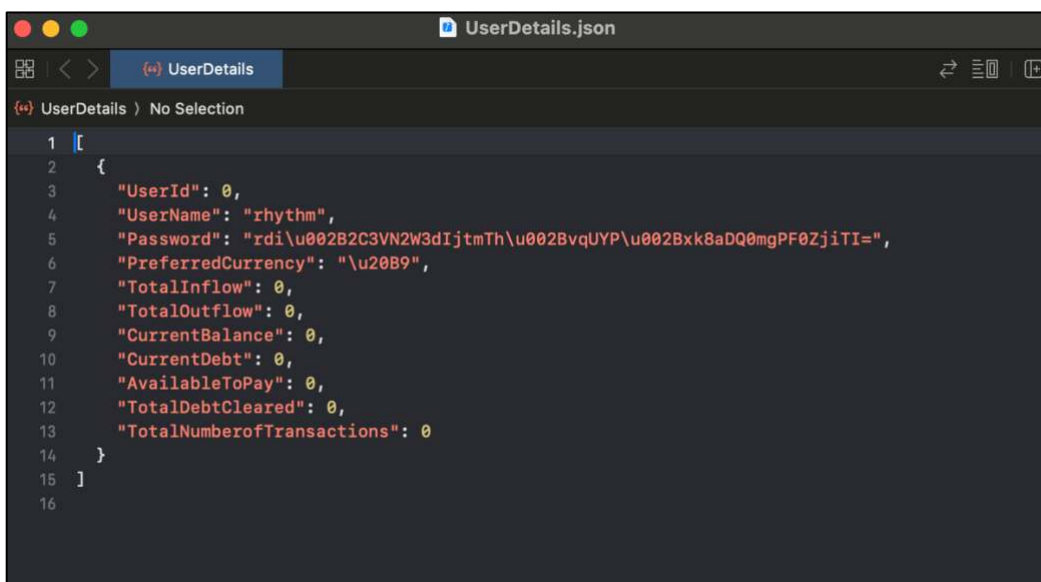
Register

Already have an account? [Login here.](#)

Dropdown menu options:
✓ ₹ NPR
\$ USD
Rs INR
¥ YEN

Figure 2: Registering a user

It can be seen that recently registered user has been stored in UserDetails.json. The preferred currency is set as code as the symbol “₹” is not supported in the text file. The password also has been hashed while saving the user.



```

1  [
2  {
3    "UserId": 0,
4    "UserName": "rhythm",
5    "Password": "rdi\u002B2C3VN2W3dIjtmTh\u002BvqUYP\u002Bxk8aDQ0mgPF0ZjiTI=",
6    "PreferredCurrency": "\u20B9",
7    "TotalInflow": 0,
8    "TotalOutflow": 0,
9    "CurrentBalance": 0,
10   "CurrentDebt": 0,
11   "AvailableToPay": 0,
12   "TotalDebtCleared": 0,
13   "TotalNumberOfTransactions": 0
14  }
15  ]
16

```

Figure 3: Userdetails.json

After the user is registered it is then redirected to the login page. However, the screenshot shown above only shows the status of user being saved. If user with same username is found a message is shown.

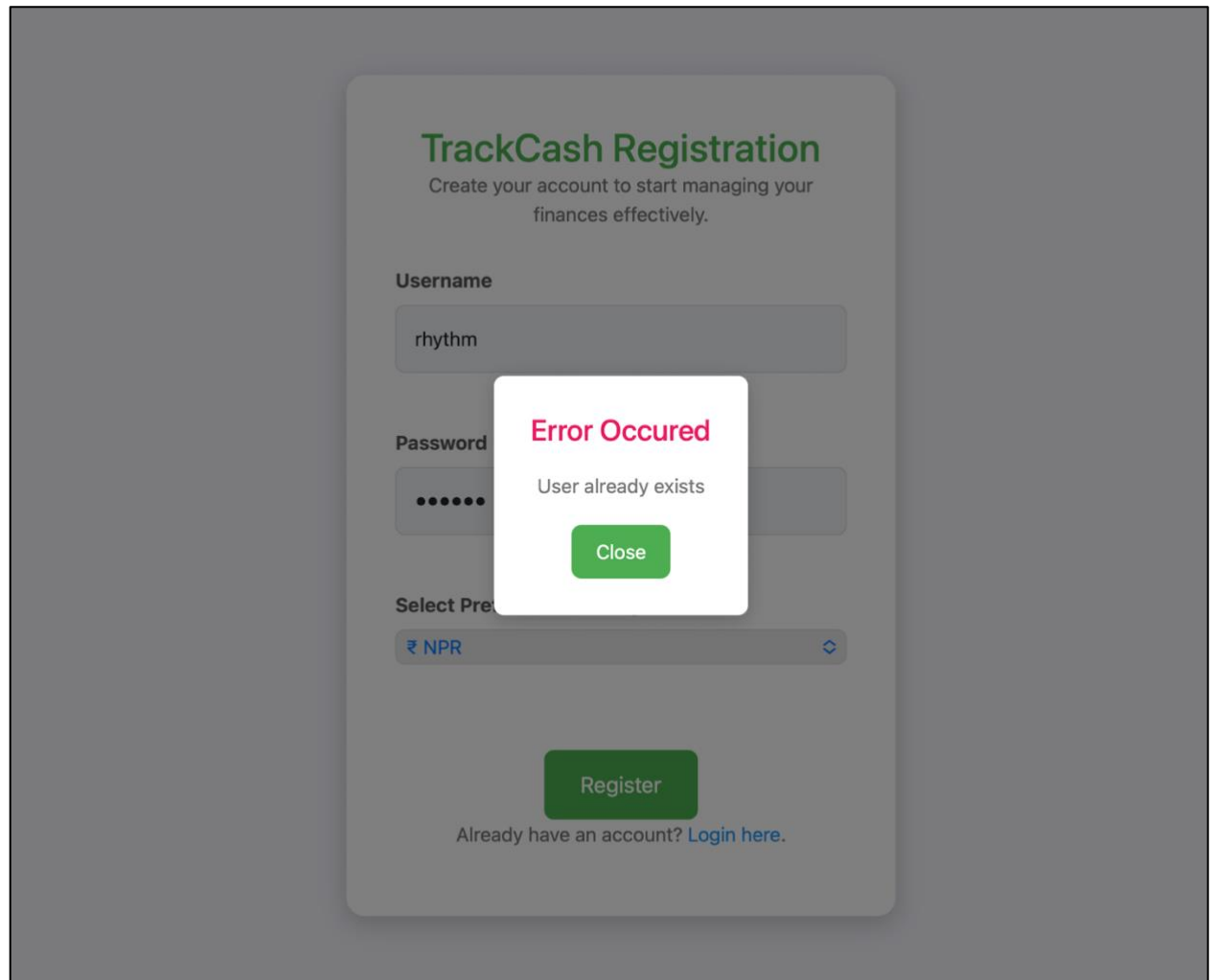


Figure 4: Existing user error message

2.2. Login

After the user is successfully registered, user can login with their username and password. If the password user entered do not match with the password saved in the Json file, user will get an error message. Similarly, if user tries to login with unavailable user will get a prompt accordingly.

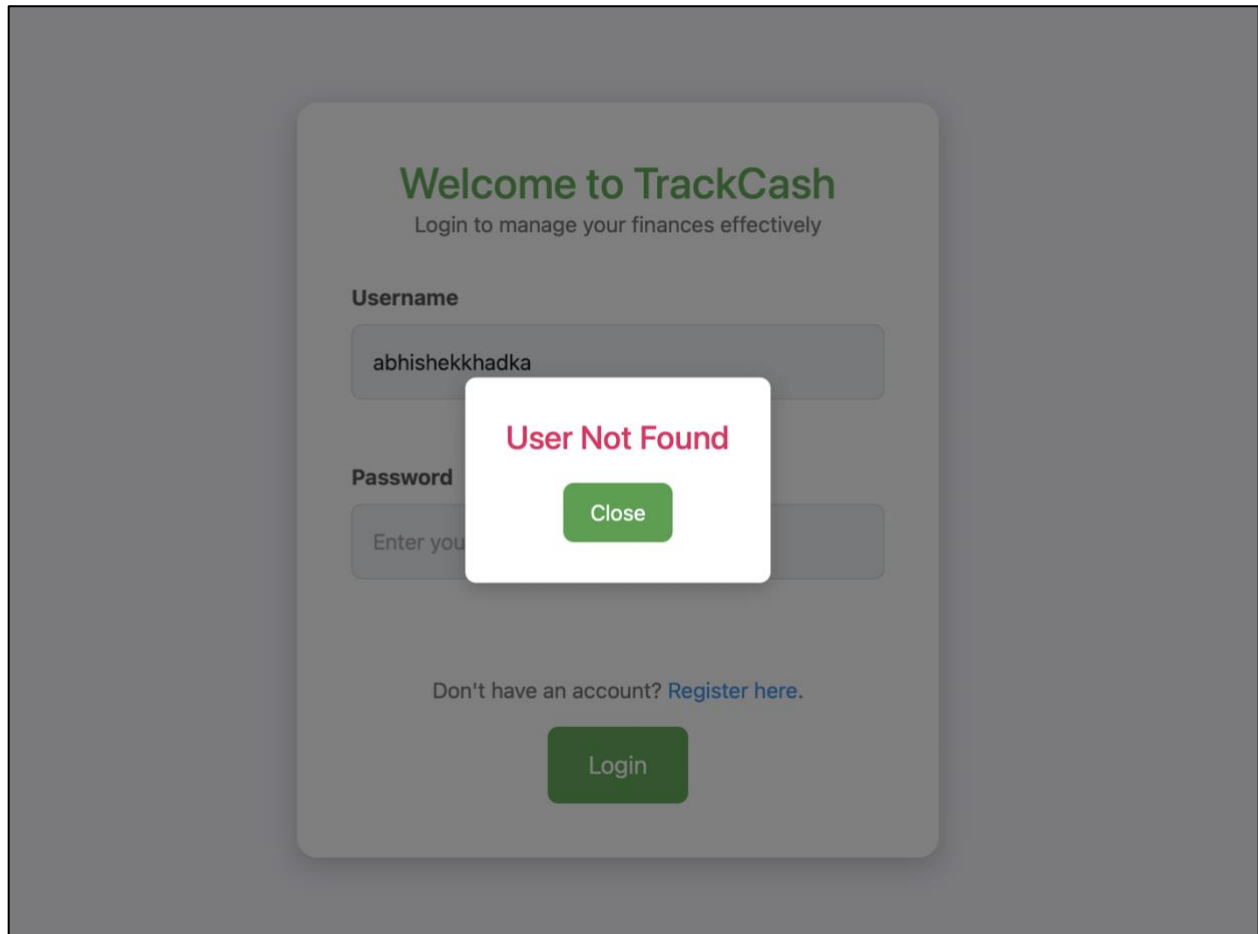


Figure 5: Not registered user message

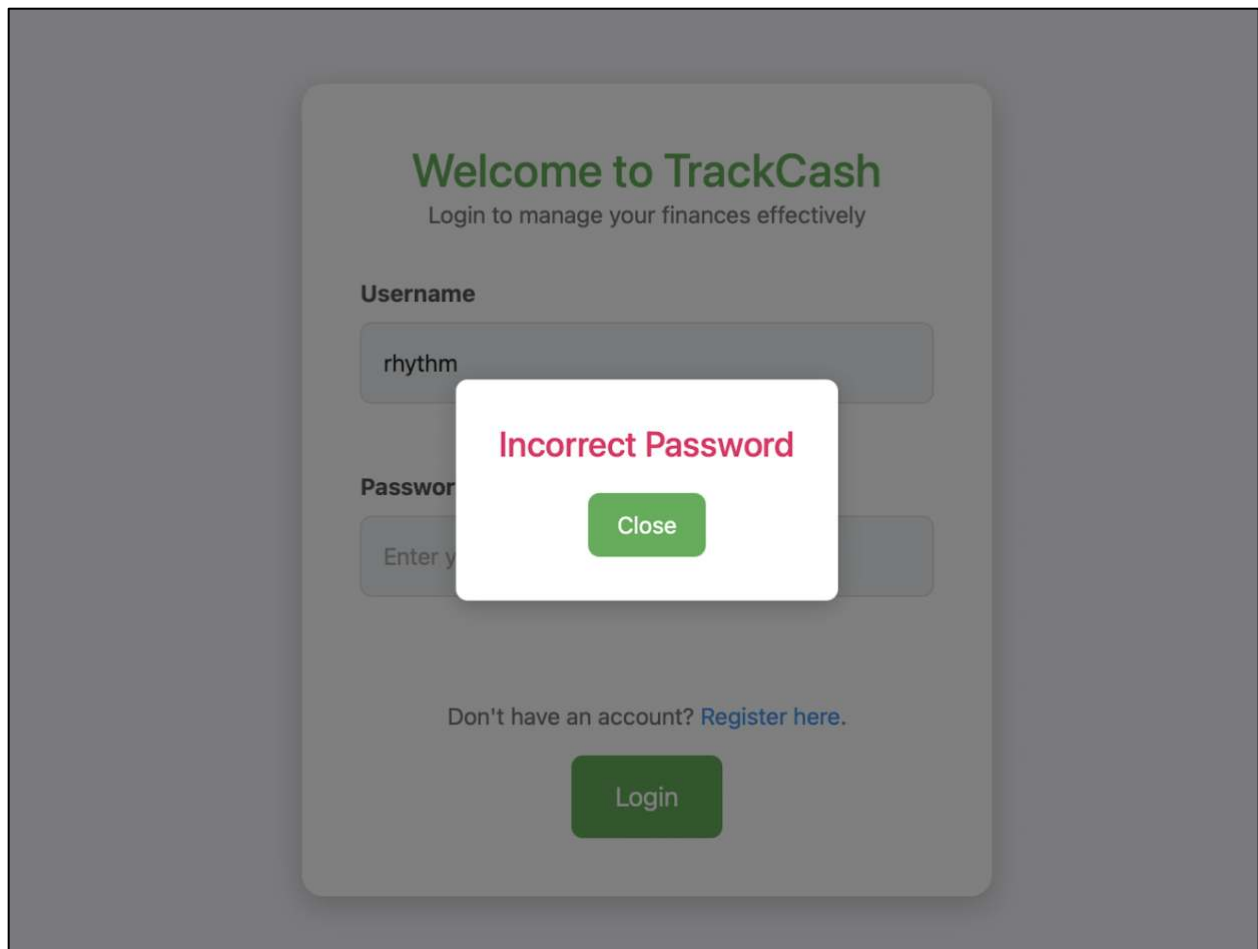


Figure 6: Incorrect login password

After successful login of user, user will be redirected to dashboard. If the user is found the user is also saved as a singleton scoped variable, which can be used to access the current user and details throughout the application.

Following code is invoked after a user is successfully found which can be accessed throughout the application.

```
//after the user logs in the values are set
1 usage  Rhythm Paudel
public void Login(UserModel user)
{
    UserID = user.UserId;
    PreferredCurrency = user.PreferredCurrency;
    UserName = user.UserName;
    totalInflow = user.TotalInflow;
    totalOutflow = user.TotalOutflow;
    currentBalance = user.CurrentBalance;
    currentDebt = user.CurrentDebt;
    User = user;
}
```

Figure 7: User session saving code snippet.

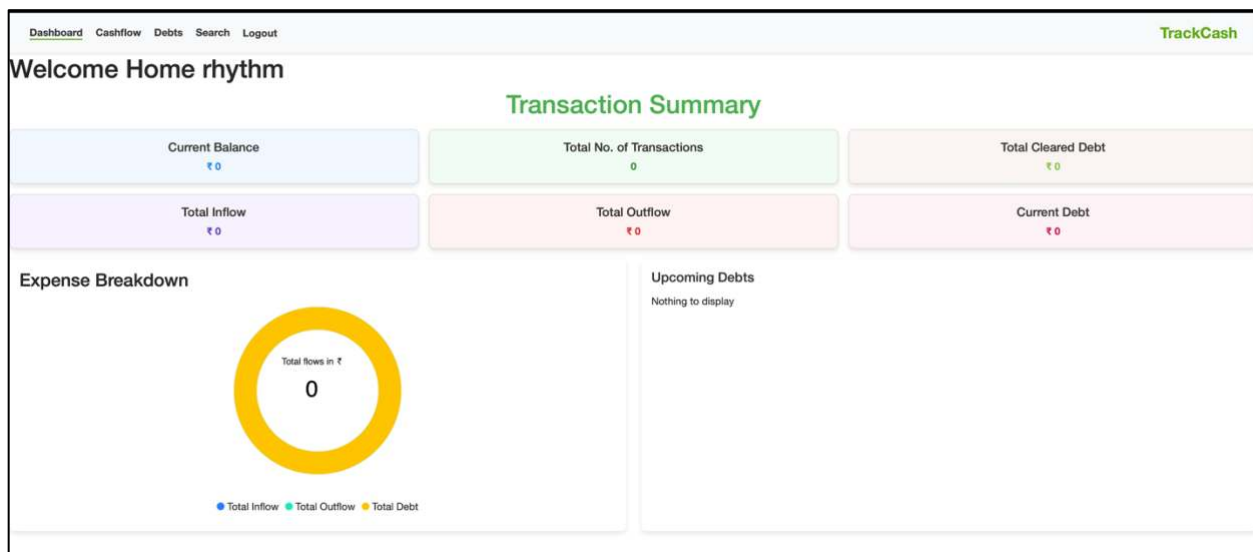


Figure 8: Dashboard (1)

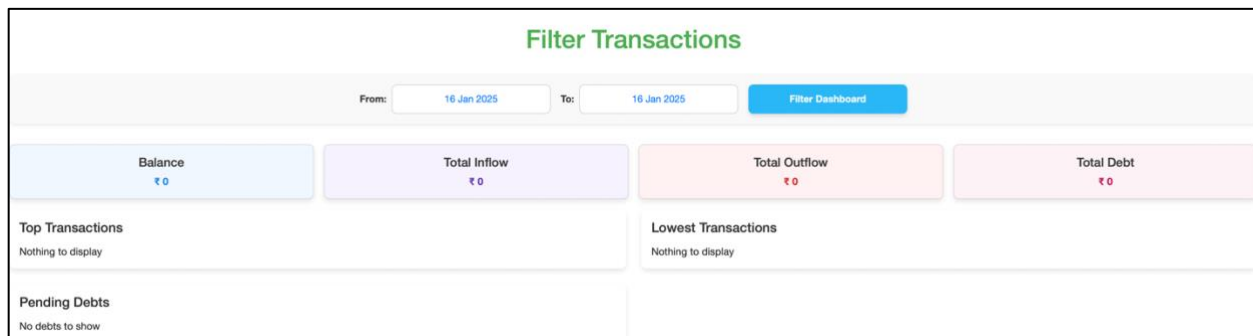


Figure 9: Dashboard (2)

2.3. Transaction management

The saved user can perform several transactions like, adding income, expense and tracking debt. Several conditions are also checked during the transaction process. For each transaction a form should be filled which has some mandatory and optional fields as well.

For each transaction, certain fields like description are optional. If the user wants a described version of transaction, user can add a note. However, for each transaction, one or many tags are compulsory for categorizing accordingly.

2.3.1. Adding inflows

This method is responsible for adding the balance of the user. For adding the balance several conditions are checked for form validation. However, unless the amount of transaction is not less than zero, without backend logic the amount is updated to current balance of the user.

The screenshot shows the 'Add Transaction' form within the 'TrackCash' application. The form is titled 'Add Transaction' and is set against a 'Cashflow' dashboard background. The form fields include:

- Transaction Name:** A text input field containing 'transaction-1'.
- Transaction Type:** Two radio buttons, 'Inflow' (selected) and 'Outflow'.
- Date:** A date picker showing '16 Jan 2025'.
- Tags:** A text input field containing 'Clothes'.
- Category Buttons:** A row of buttons for 'Yearly', 'Monthly', 'Food', 'Drinks', 'Clothes', 'Gadgets', 'Miscellaneous', 'Fuel', 'Rent', 'EMI', and 'Party'. The 'Clothes' button is highlighted.
- Amount:** A text input field containing '200'.
- Notes:** A text area containing the note 'Clothes these days are getting expensive'.
- Add Transaction Button:** A green button at the bottom of the form.

Figure 10: Adding transaction form.

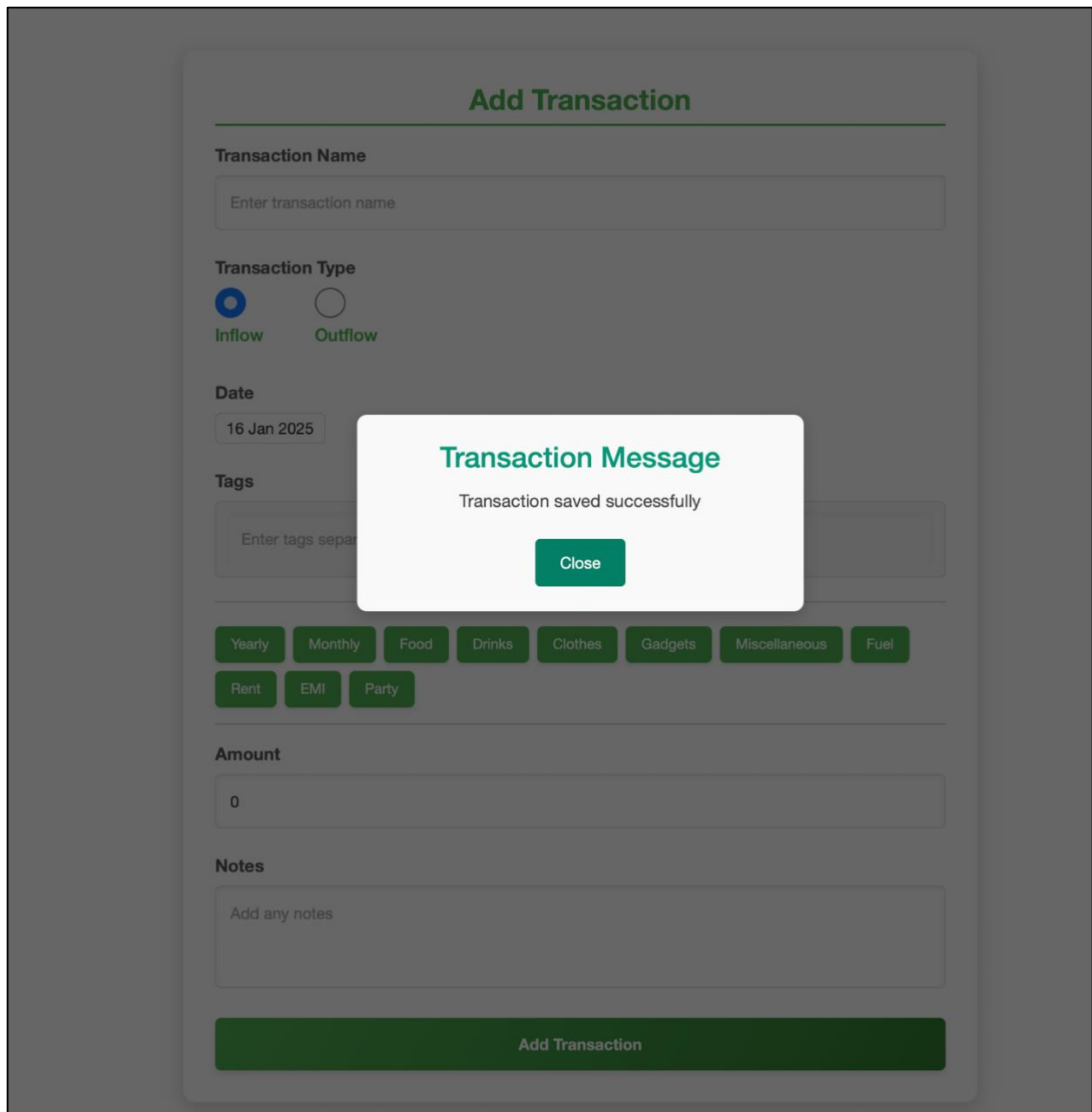


Figure 11: Transaction saved message.

After adding a transaction, user is prompted with a message. Similarly, JSON file for user and transaction are updated as well.

2.3.2. Adding debts

For adding debts, the current balance of the user is updated but the actual balance is not updated. In this application actual balance refers to the user's personal income, not debt. For adding a debt, a similar action is performed. After navigating to debt section from the navigation bar, the user should fill up necessary details. After the debts are filled the transaction and user files are updated. Additionally, a new debt is also added in debts Json file which will hold other debts details.

The screenshot shows the 'Add Debt' form within the TrackCash application. The form is titled 'Add Debt' and contains the following fields and controls:

- Transaction Name:** A text input field containing 'Debt-1'.
- Transaction Type:** Two radio buttons, 'Get Debt' (selected) and 'Clear Debt'.
- Notes:** A text input field containing 'Debt for paying college fee'.
- Date:** A date picker showing '16 Jan 2025'.
- Due Date:** A date picker showing '31 Jan 2025'.
- Debt From:** A text input field containing 'Abhishek Sir'.
- Amount:** A text input field containing '500'.
- Tags:** A list of tags including 'Monthly College' (selected), 'Yearly', 'Food', 'Drinks', 'Clothes', 'Gadgets', 'Miscellaneous', 'Fuel', 'Rent', 'EMI', and 'Party'.
- Buttons:** A large green 'Add Debt' button at the bottom.

Figure 12: Debt form filled up.

2.3.3. Adding outflow

The application also features a functionality of adding outflow which is calculated through user available balance. The outflow only works if the user has more or an equal amount in current balance than the amount, the user wants to spend.

The screenshot shows a web application interface for 'TrackCash'. The top navigation bar includes 'Dashboard', 'Cashflow', 'Debits', 'Search', and 'Logout'. The 'Cashflow' section is active, displaying the 'Add Transaction' form. The form has a green header 'Add Transaction'. It contains the following fields and controls:

- Transaction Name:** A text input field with the value 'Outflow'.
- Transaction Type:** Two radio buttons, 'Inflow' (unselected) and 'Outflow' (selected).
- Date:** A text input field with the value '16 Jan 2025'.
- Tags:** A text input field with the value 'Party'.
- Amount:** A text input field with the value '100'.
- Notes:** A text input field with the value 'Little bit of party'.
- Buttons:** A green button labeled 'Add Transaction' at the bottom of the form.

Figure 13: Adding outflow

2.3.4. Clearing debts

Along with adding a debt, the user is also able to clear their debts. However, if the debt to be paid is more than the available balance or the amount user want pay is more than the available balance the transaction is cancelled. For clearing debt in the debt section of the application clear debt button should be pressed, which will then list the available debts, and user can enter the amount they want to pay at once.

After selecting a pending debt, the relevant fields are filled automatically. Only data and amount field is accessible.

The screenshot displays the 'TrackCash' application interface. At the top, there is a navigation bar with links for 'Dashboard', 'Cashflow', 'Debts', 'Search', and 'Logout'. The 'Debts' section is active. Below the navigation bar, the 'Add Debt' form is shown. The form includes fields for 'Transaction Name' (Debt-1), 'Transaction Type' (radio buttons for 'Get Debt' and 'Clear Debt'), 'Notes' (Debt for paying college fee), 'Date' (16 Jan 2025), 'Due Date' (31 Jan 2025), 'Debt From' (Abhishek Sir), 'Amount' (500), and 'Tags' (Yearly, Monthly, Food, Drinks, Clothes, Gadgets, Miscellaneous, Fuel, Rent, EMI, Party). A 'Clear Debt' button is at the bottom of the form. Below the form, there is a table titled 'Pending Debts' with the following data:

Transaction Name	Debt From	Amount	Paid Amount	Left Amount	Due Date	Action
Debt-1	Abhishek Sir	500	0	500	2025-01-31	Select

At the bottom of the table, there is a pagination bar showing 'Previous', 'Page 1 of 1', and 'Next'.

Figure 14: Clearing debt

2.4. Filtering transaction

Users are able to search their entire transaction history via search feature available in the application. Users are able to search by title, date, tags for each type of transactions or all at once. Furthermore, user also have the ability to sort the transaction by date, which will return the transaction by date in ascending order.

Search

Search
Enter transaction name

Tags
Enter tags separated by space

☐ Cleared Debt
 ☐ Cash Inflow
 ☐ Cash Outflow
 From: To:
☒ Show All Transactions
 ☐ Pending Debts
 ☒ Sort By Date

TRANSACTION NAME	TRANSACTION TYPE	TRANSACTION DATE	DEBT FROM	DUE DATE	CLEARED DATE	LEFT AMOUNT	AMOUNT	TRANSACTION DESCRIPTION
transaction-1	inflow	2025-01-16	-	-	-	-	₹ 200	Clothes these days are getting expensive
Debt-1	debt	2025-01-16	Abhishek Sir	2025-01-31	1/16/2025 12:00:00 AM	₹ 0	₹ 500	Debt for paying college fee
For clearing debt	inflow	2025-01-16	-	-	-	-	₹ 10000	-
debt-2	debt	2025-01-16	no one	2025-01-17	-	₹ 30	₹ 30	-

Figure 15: Search feature

In this example, only date, all transaction and sorting by date filters are enabled. If there are no title and tags it will list all transaction according to other filters applied. User can enter multiple tags, and any match found will be displayed. If one or more tags matches the result will appear, which is also same for the title.

2.5. Dashboard statistics

For this application the dashboard is divided into two different sections. The first section will contain a brief summary of user current transaction. The second section of the dashboard will have initial values of overall transactions. However, after a user filters the transaction by the date, the transactions within the date range will only be listed.

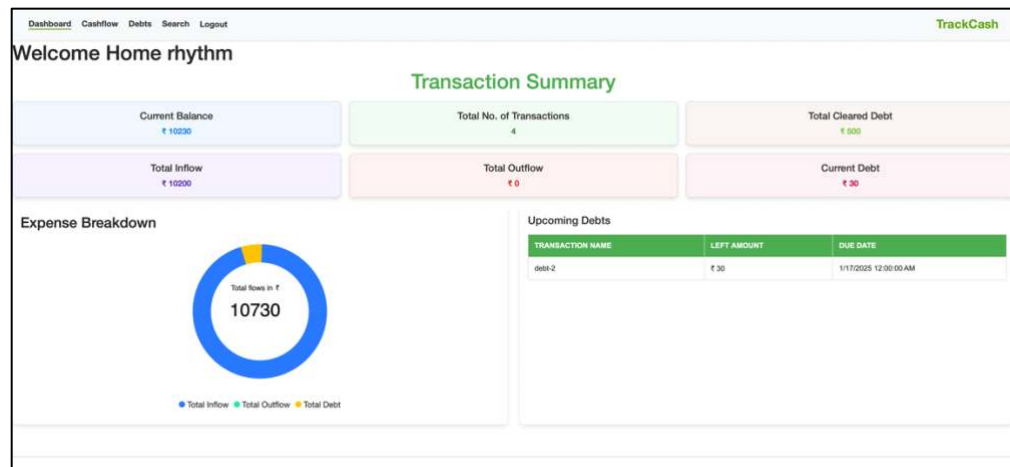


Figure 16: Dashboard summary.

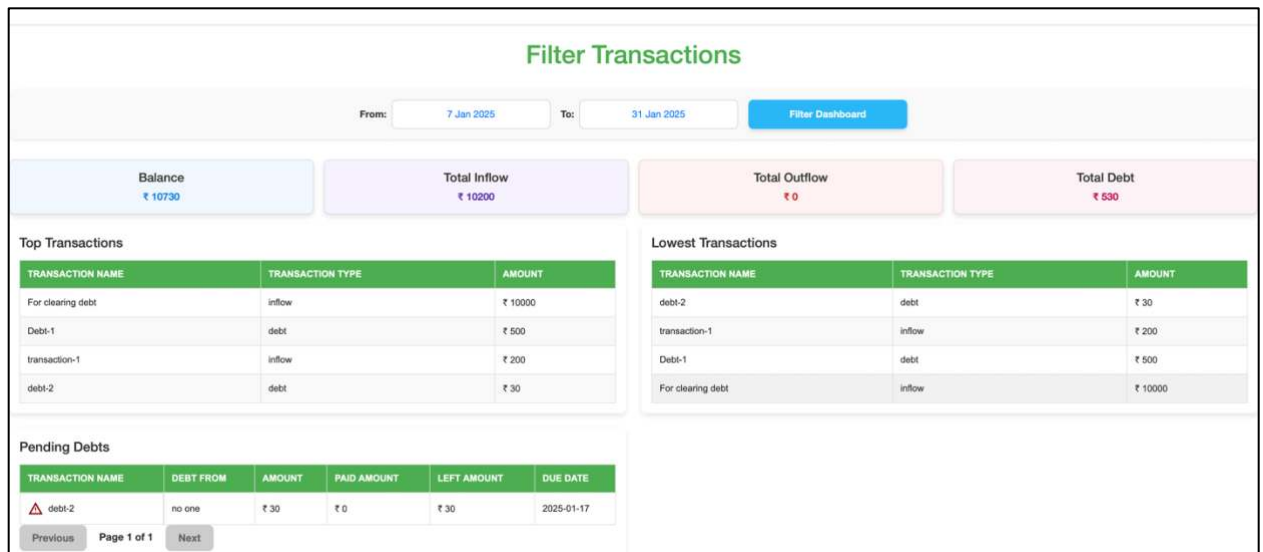


Figure 17: Dashboard filtering.

2.6. Pending debts

If the debts has not been cleared yet, then pending debts are highlighted, on dashboard and search section too.

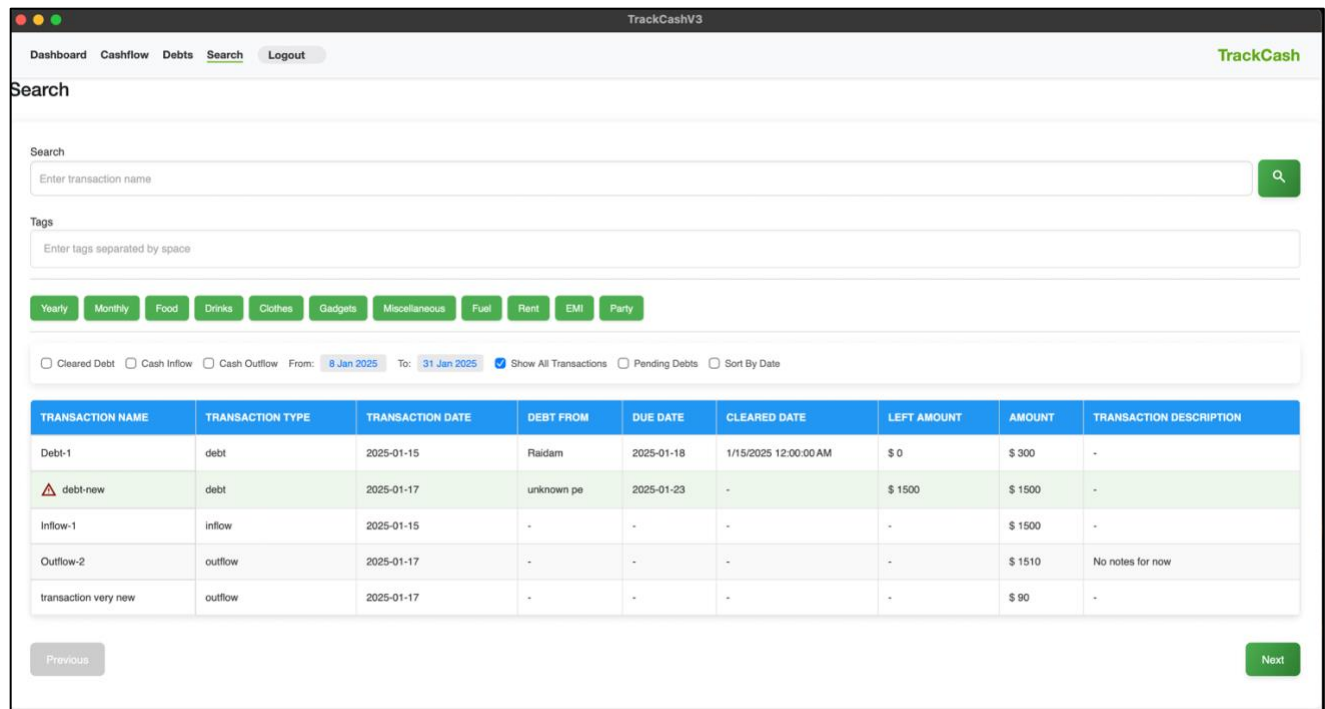


Figure 18: Pending debts highlight

2.7. Logout

If the user clicks on logout from the navigation bar, the user session is set to null and the user is redirected to user login page.

3. Proof of work

This section of the documentation will cover the proof of work, several UML diagrams and testing section. For testing, each function will be tested in every way possible.

3.1. Designs

3.1.1. Data entity model

Entity relationship diagram represent several entity that are related with each other. This entities define how records will be stored in database. In this application the entities are treated as a separate Json file.

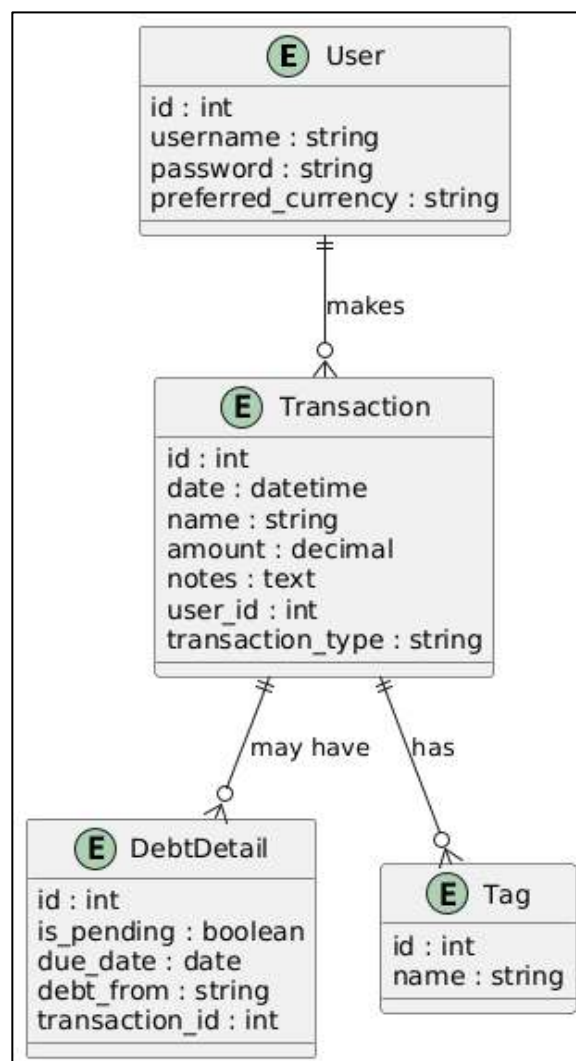


Figure 19: Entity relationship diagram

3.1.2. Class diagram

Class diagram represents how the classes are made and how the flow is working between classes. Since the application was made using MVC pattern, the whole development process was developed into model, which holds the data structure from the database, view which is responsible for UI and controller which holds all the logic and flow of the data throughout the system. Depending on the complexity of the application controller can be further divided into services layer. In the context of this application, controller and services are considered same.

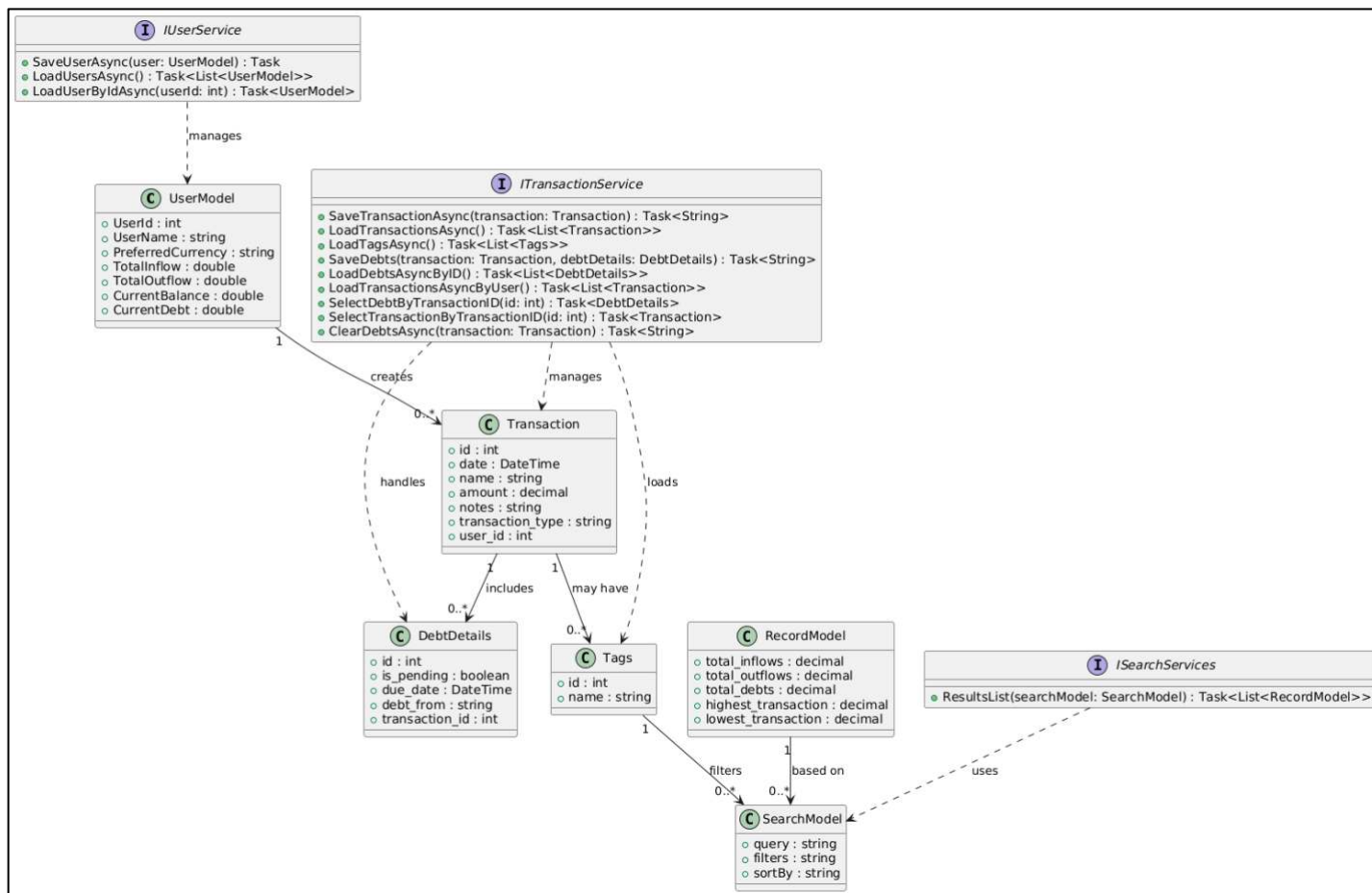


Figure 20: Class diagram

3.1.3. Use case diagram

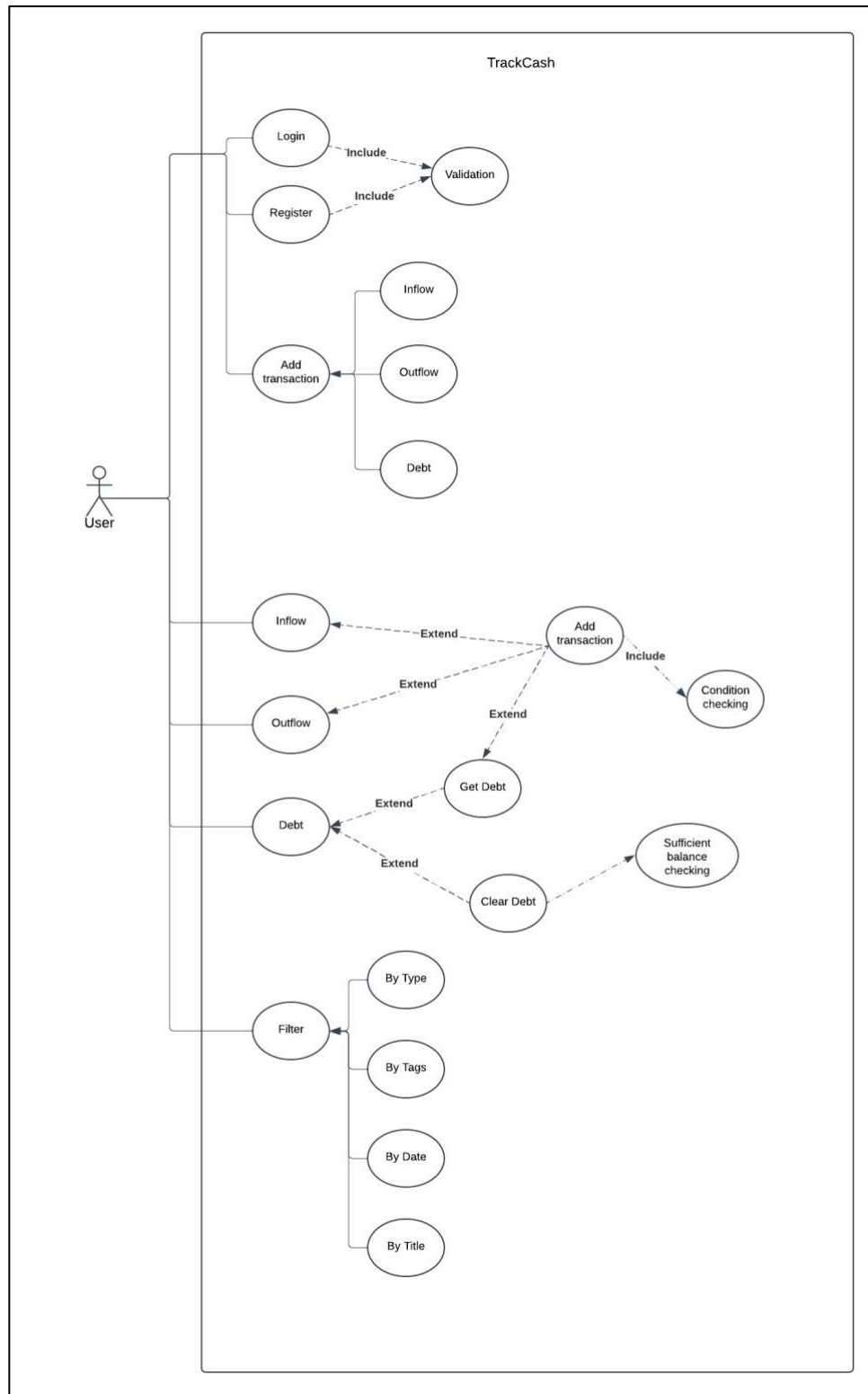


Figure 21: Use case diagram

3.2. Version control system

Version control system or VCS, refers to a system that helps in maintaining the history of development of application. It is widely used to keep track of changes, or sometimes is very helpful to rollback incase of system failure or unexpected error handled.

Similarly, to keep track of changes and to prevent in whole system failure, a git was initialized to for VCS. Furthermore, Github repository was used for pushing it online, which can be used for collaboration purpose as well.

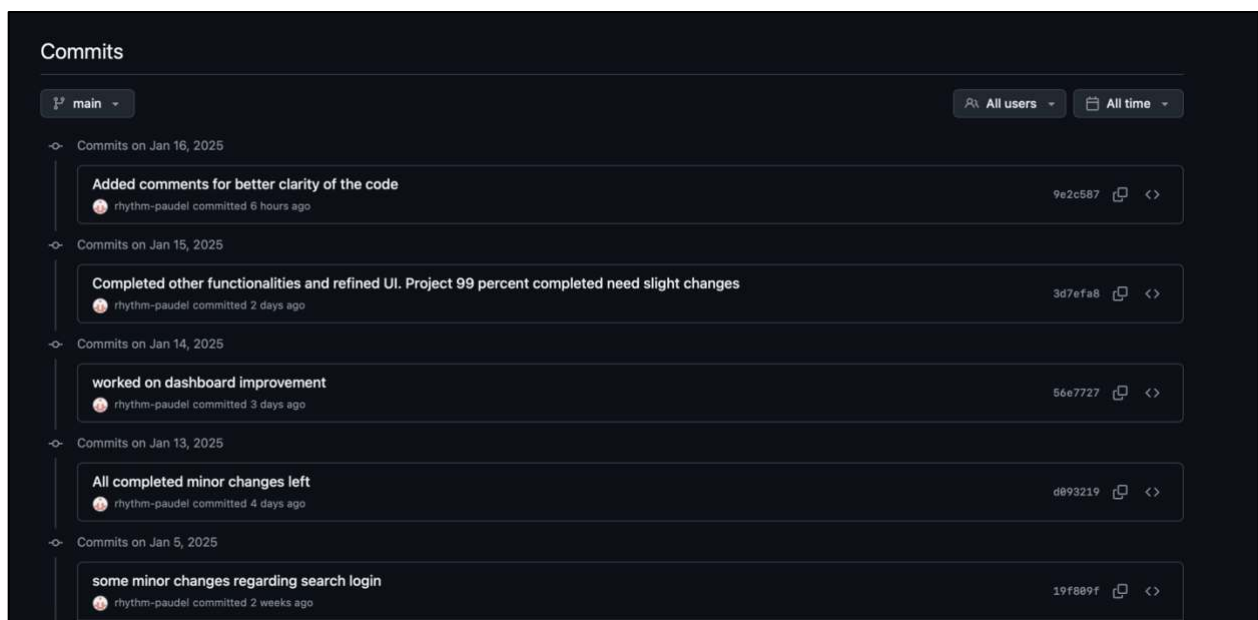


Figure 22: Github repository (1)

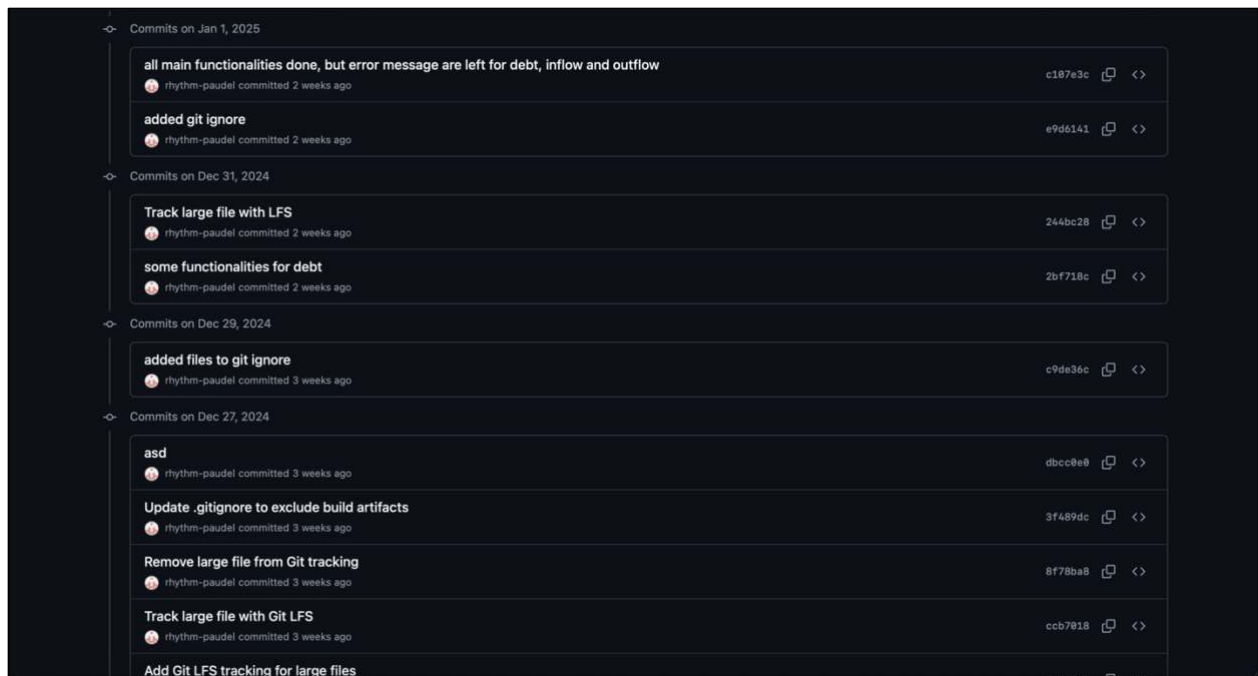


Figure 23: Github repository(2)

3.3. Testing

3.3.1. Register

Test case 01	
Objective	For user to be registered successfully.
Action	1) Click on “Register Here” 2) Enter username, password and preferred currency. 3) Click on “Register Here”
Expected Result	The user should be redirected to login page.
Actual Result	The user was redirected to login page after user registration.
Conclusion	Test was successful.

Table 1: Registration testing

Welcome to TrackCash
 Login to manage your finances effectively

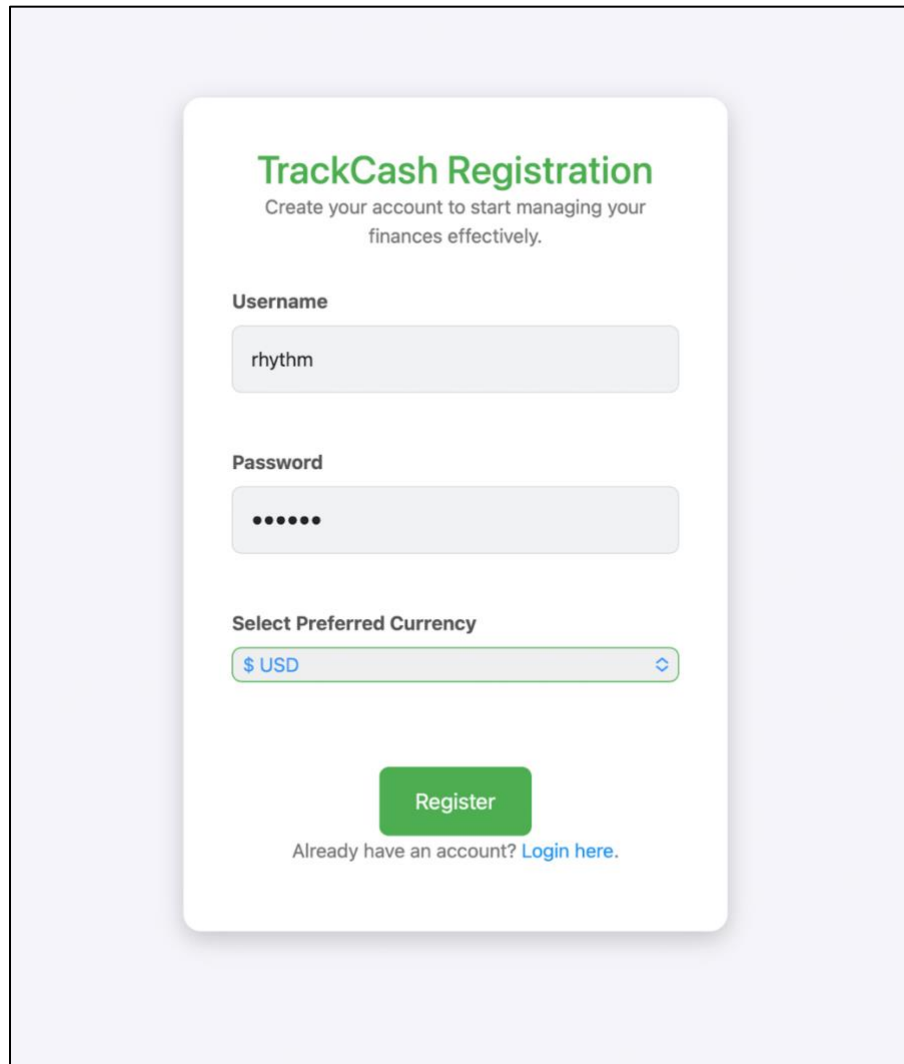
Username
 Enter your username

Password
 Enter your password

Don't have an account? [Register here.](#)

Login

Figure 24: Locating registration page



The image shows a registration form for 'TrackCash'. The form is centered on a light purple background. It has a white background with rounded corners and a subtle shadow. The title 'TrackCash Registration' is in green. Below it is a subtitle in grey. The form contains three input fields: 'Username' with the text 'rhythm', 'Password' with six dots, and 'Select Preferred Currency' with a dropdown menu showing '\$ USD'. A green 'Register' button is at the bottom. Below the button is a link for existing users.

TrackCash Registration
Create your account to start managing your finances effectively.

Username
rhythm

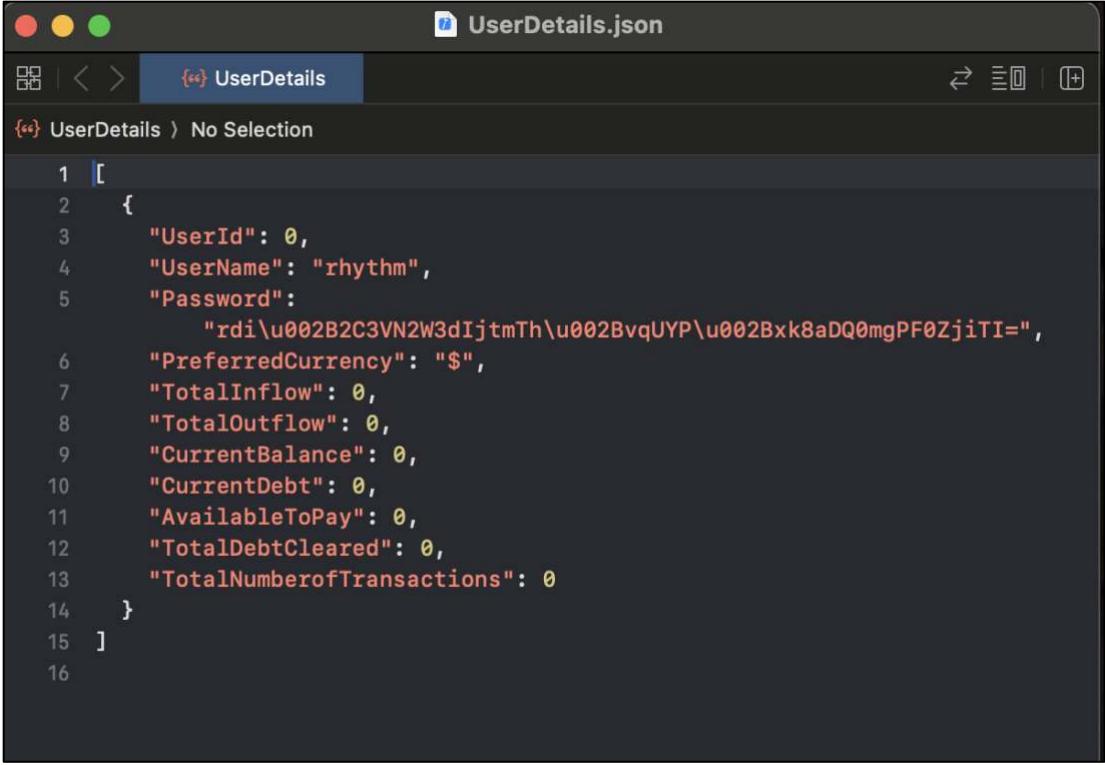
Password
••••••

Select Preferred Currency
\$ USD

Register

Already have an account? [Login here.](#)

Figure 25: Registration of new user



```
1  [
2    {
3      "UserId": 0,
4      "UserName": "rhythm",
5      "Password":
6        "rdi\u002B2C3VN2W3dIjtmTh\u002BvqUYP\u002Bxk8aDQ0mgPF0ZjiTI=",
7      "PreferredCurrency": "$",
8      "TotalInflow": 0,
9      "TotalOutflow": 0,
10     "CurrentBalance": 0,
11     "CurrentDebt": 0,
12     "AvailableToPay": 0,
13     "TotalDebtCleared": 0,
14     "TotalNumberOfTransactions": 0
15   }
16 ]
```

Figure 26: User registered in Json file.

3.3.2. Login

Test case 02	
Objective	For user to be logged in successfully.
Action	1) Enter username, password. 2) Click on "Login"
Expected Result	The user should be redirected to dashboard
Actual Result	The user was redirected to dashboard page after user registration.
Conclusion	Test was successful.

Table 2: Login test

Welcome to TrackCash
Login to manage your finances effectively

Username
rhythm

Password
.....

Don't have an account? [Register here.](#)

Login

Figure 27: Logging in

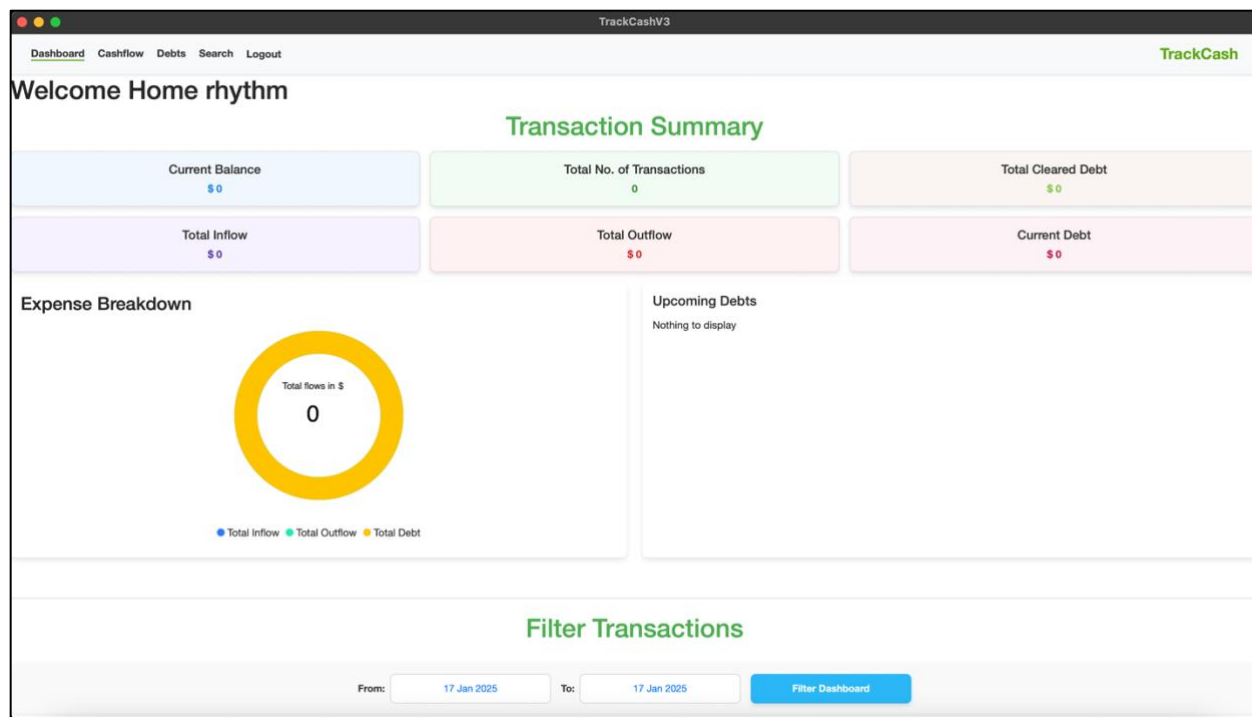


Figure 28: Dashboard redirected after login

3.3.3. Adding Inflow

Test case 03	
Objective	To add inflow and update current balance of user
Action	1) Navigate to cashflow section 2) Click on add transaction 3) Fill up required details 4) Select transaction type as inflow 5) Click on add transaction
Expected Result	On first try error message should popup and second time the transaction should be added.
Actual Result	An error prompt was received and on the second try the transaction was added successfully.
Conclusion	Test was successful.

Table 3: Adding inflow test

The Json file of users and transaction was updated after the transaction was added.

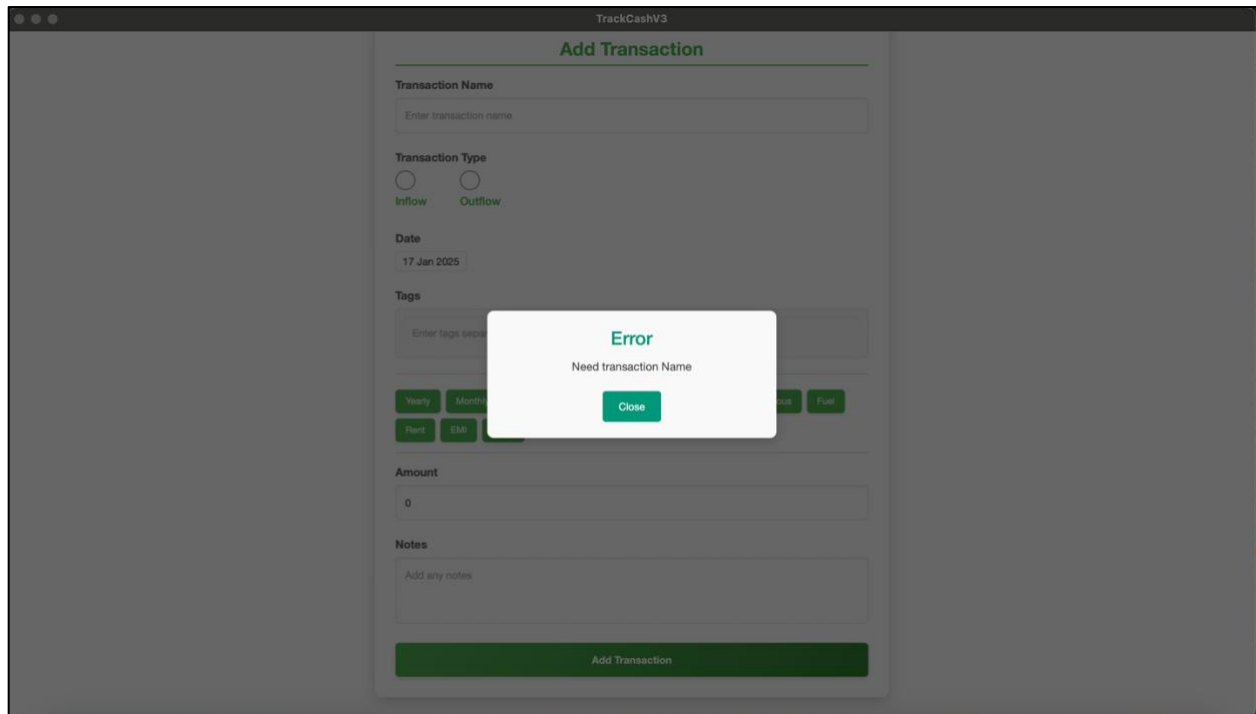


Figure 29: Error message due to incomplete form details

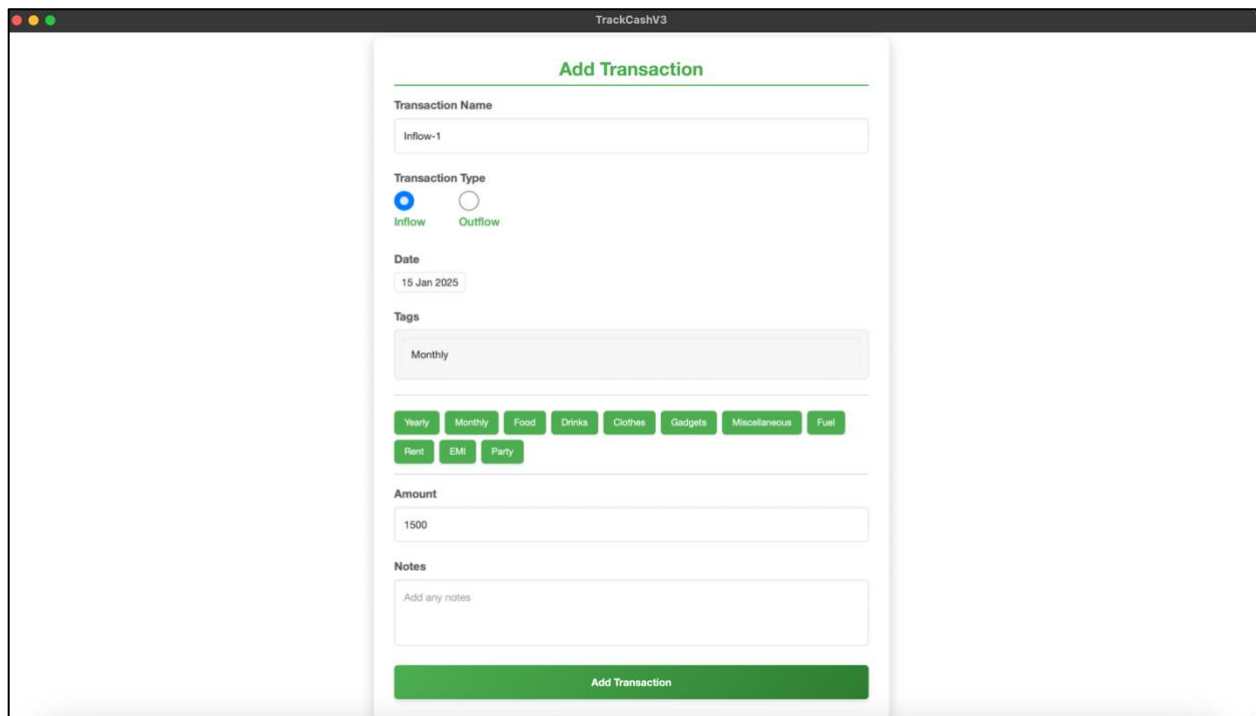


Figure 30: Transaction detail for inflow

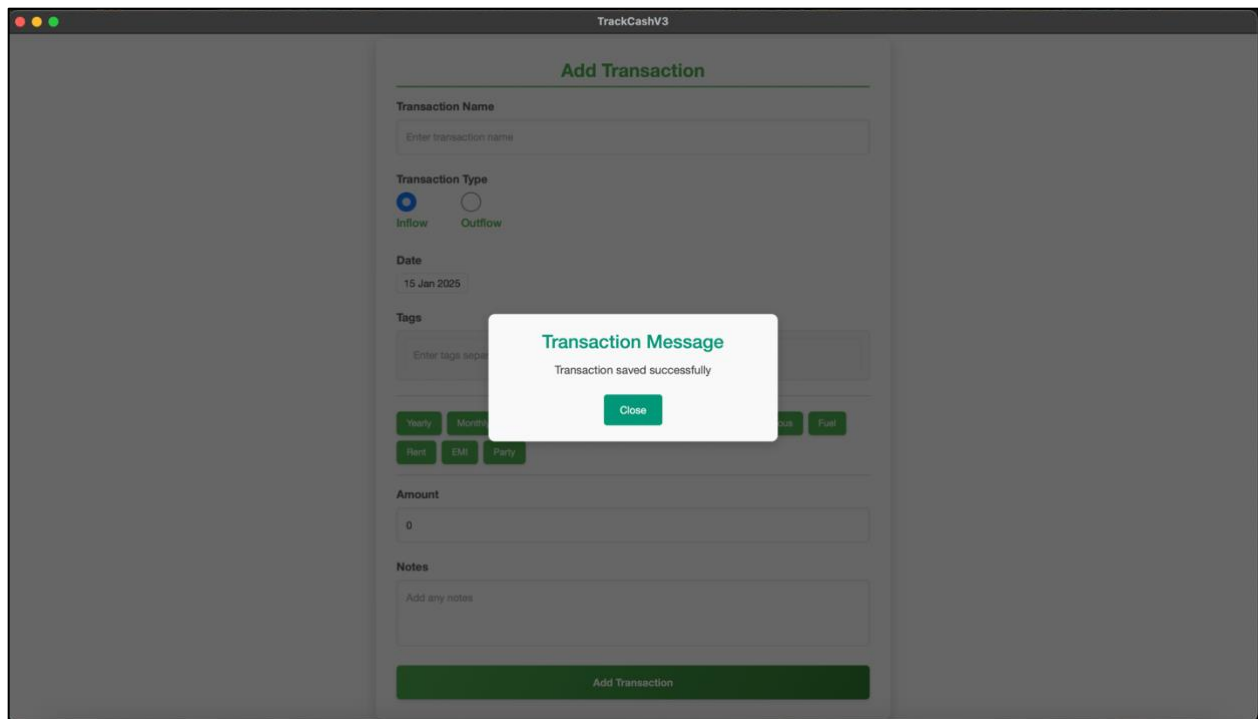


Figure 31: Inflow saved message

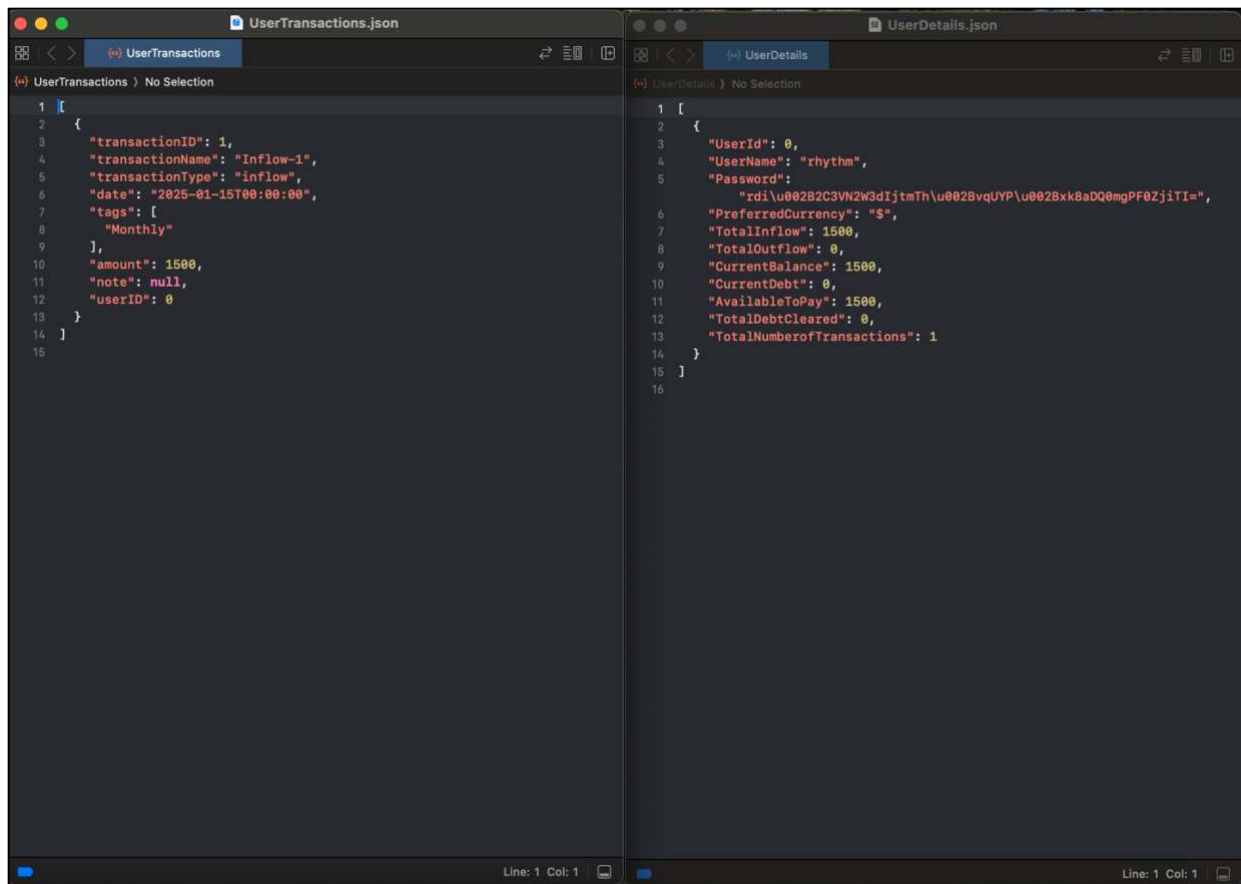


Figure 32: Update on Json file after inflow added

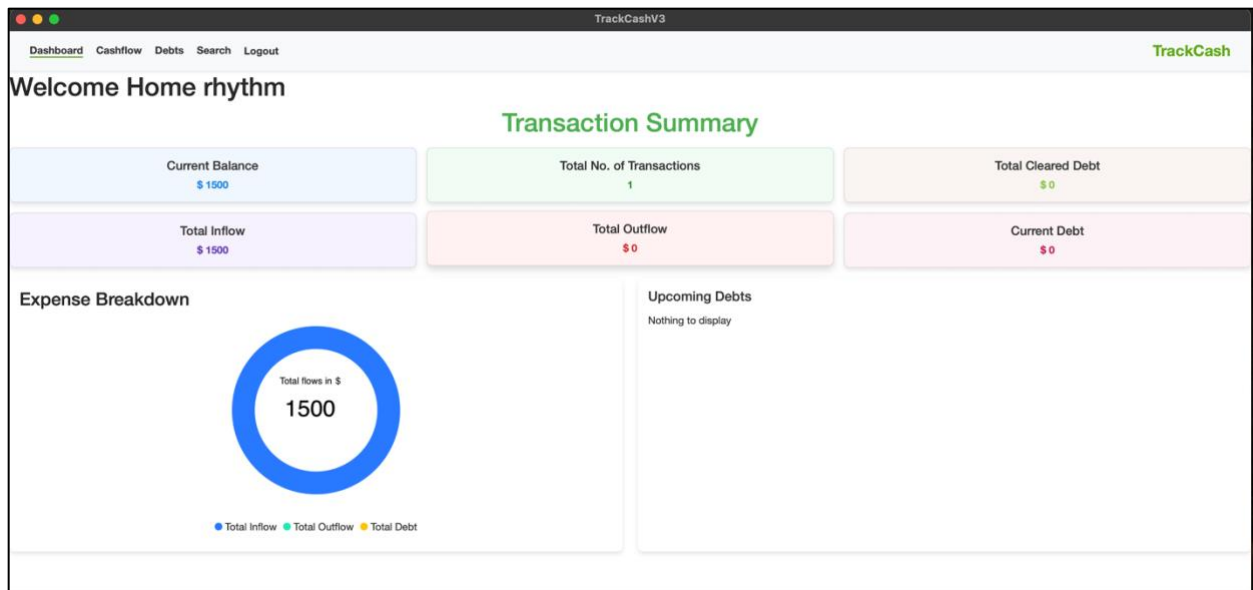


Figure 33: Updated dashboard after inflow added

3.3.4. Adding debt

Test case 04	
Objective	To add debt and update current balance of user
Action	1) Navigate to debt section 2) Click on get debt 3) Fill up required details 4) Add debt
Expected Result	Debt should be added, transaction should be added, and user details should be updated
Actual Result	Debt was added, transaction was added and user details was updated.
Conclusion	Test was successful.

Table 4: Adding debt test

TrackCashV3

Dashboard Cashflow **Debts** Search Logout

TrackCash

Debts

Add Debt

Transaction Name: Debt-1

Transaction Type: ☒ Get Debt ☐ Clear Debt

Notes: Add any notes

Date: 15 Jan 2025

Due Date: 18 Jan 2025

Debt From: Raidam

Amount: 300

Tags: Drinks

Yearly Monthly Food Drinks Clothes Gadgets Miscellaneous Fuel Rent EMI Party

Add Debt

Figure 34: Get debt transaction.

TrackCashV3

Dashboard Cashflow **Debts** Search Logout

TrackCash

Debts

Add Debt

Transaction Name: Enter transaction name

Transaction Type: ☒ Get Debt ☐ Clear Debt

Notes: Add any notes

Date: 15 Jan 2025

Debt From: Enter name

Amount: 0

Yearly Monthly Food Drinks Clothes Gadgets Miscellaneous Fuel Rent EMI Party

Add Debt

Transaction Message

Transaction saved successfully

Close

Figure 35: Get debt transaction saved message

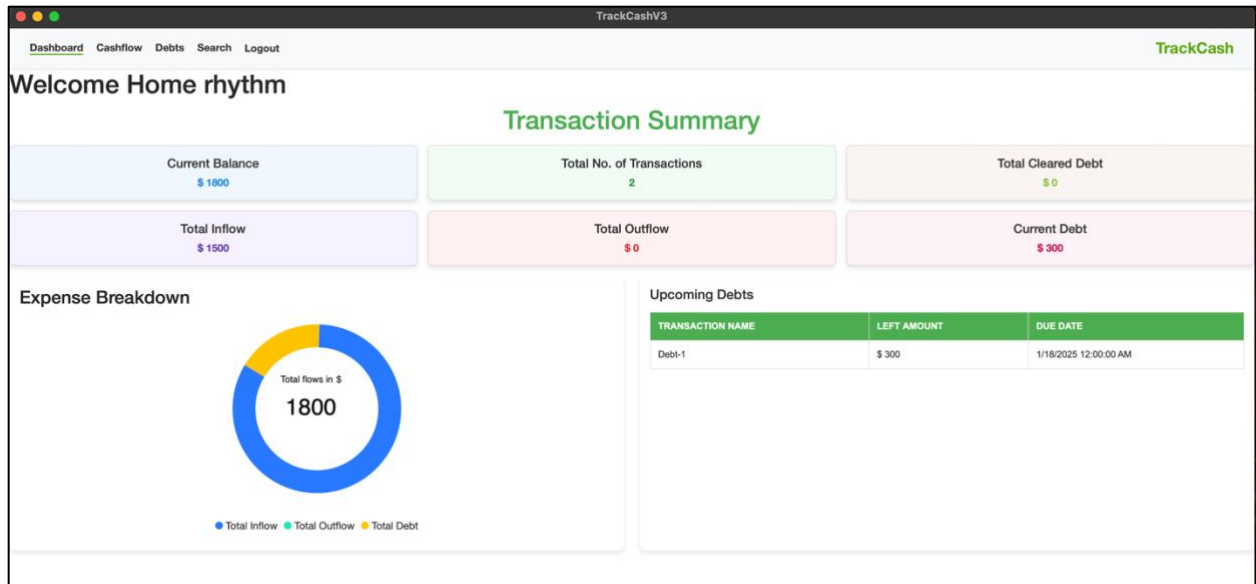


Figure 36: Updated dashboard after adding debt.

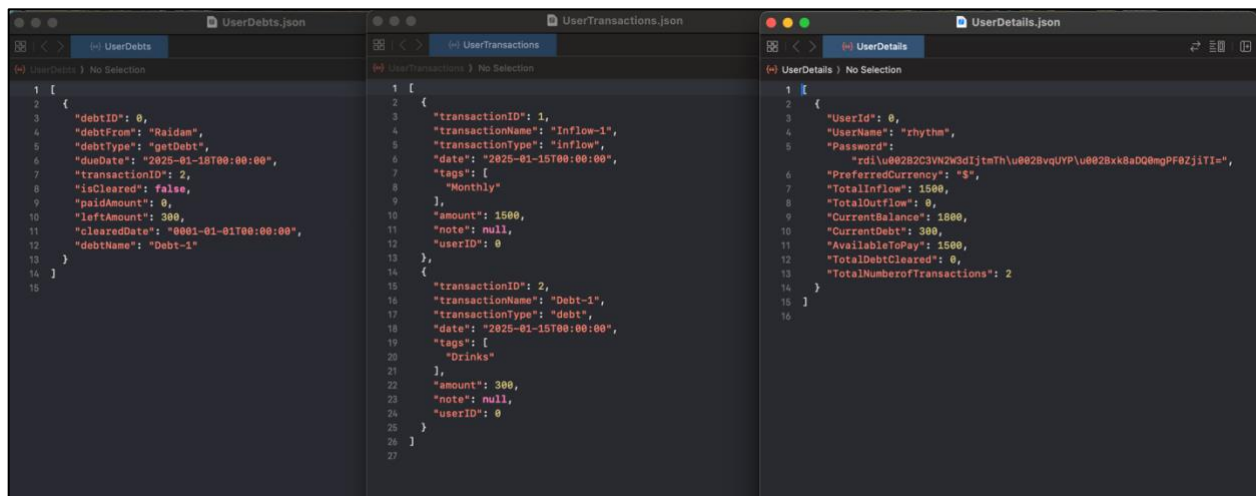


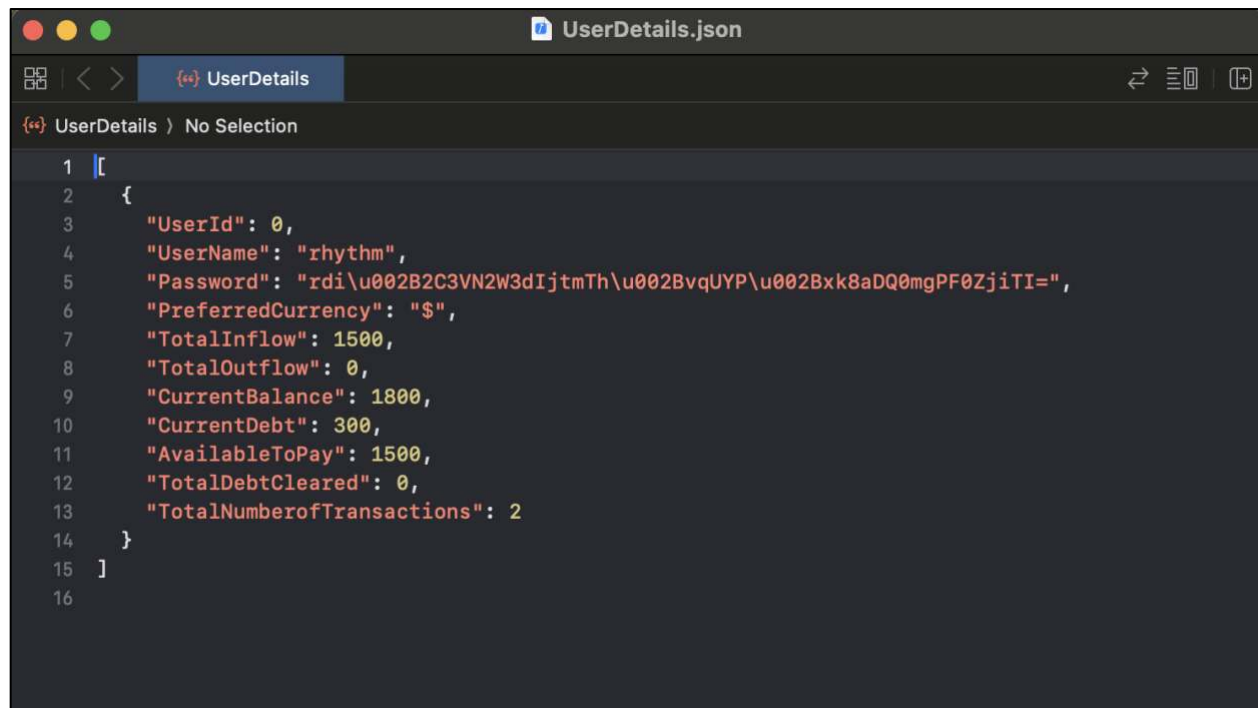
Figure 37: Updated Json file after adding debt

3.3.5. Adding outflow

Test case 05	
Objective	To add outflow and update current balance of user
Action	1) Navigate to cashflow section 2) Click on outflow 3) Fill up required details 4) Click on add transaction

Expected Result	If user has taken debt first the outflow should be deducted from debt balance not from inflow amount. If debt balance is finished then amount is deducted from inflow balance.
Actual Result	The entered amount was deducted first from debt balance and then available to pay balance
Conclusion	Test was successful.

Table 5: Adding outflow test



```

1  [
2  {
3      "UserId": 0,
4      "UserName": "rhythm",
5      "Password": "rdi\u002B2C3VN2W3dIjtmTh\u002BvqUYP\u002Bxk8aDQ0mgPF0ZjiTI=",
6      "PreferredCurrency": "$",
7      "TotalInflow": 1500,
8      "TotalOutflow": 0,
9      "CurrentBalance": 1800,
10     "CurrentDebt": 300,
11     "AvailableToPay": 1500,
12     "TotalDebtCleared": 0,
13     "TotalNumberOfTransactions": 2
14 }
15 ]
16

```

Figure 38: Before cash outflow (Json file).

Add Transaction

Transaction Name

Outflow-2

Transaction Type

☐ Inflow ☒ Outflow

Date

17 Jan 2025

Tags

Party

Yearly

Monthly

Food

Drinks

Clothes

Gadgets

Miscellaneous

Fuel

Rent

EMI

Party

Amount

1510

Notes

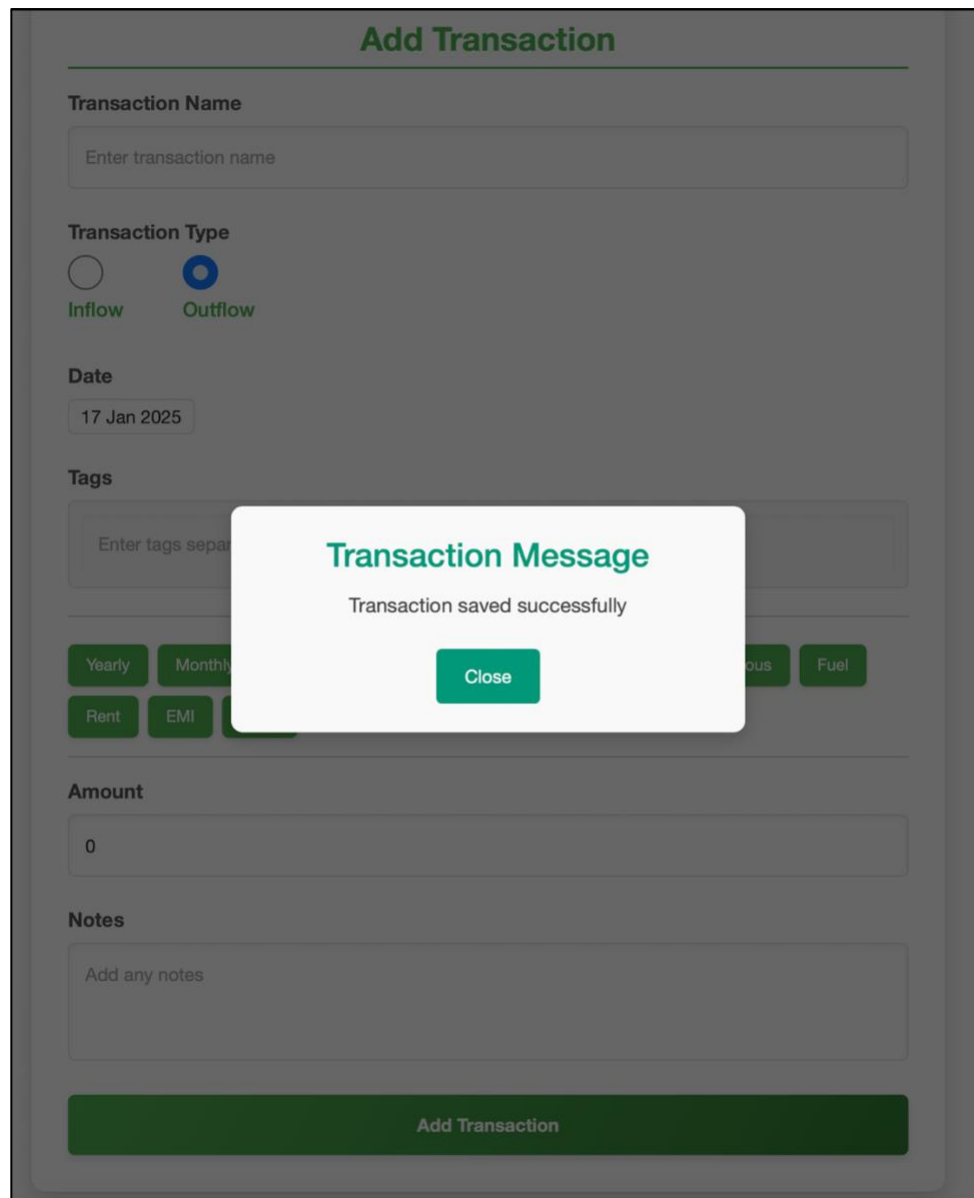
No notes for now

Add Transaction

Figure 39: Filled form for outflow

Here 1510 is entered and the user debt was 300. So, if 1510 is entered the outflow should firstly be deducted by 300 making the user available to pay as it is. Once the 300 which is debt income is exceeded, only then the inflow current balance should be deducted. In this case user current balance and available to pay balance after the transaction should be 290. But if the user entered 290 instead of 1510, the user's current balance would be $1800 - 290$, i.e. 1510 but there would not be any change in available to pay balance, because the debt balance was not fully spent.

Here available to pay means, the amount that can be used to pay debt, as debt cannot be cleared from debt.



The image shows a web application interface for adding a transaction. The form is titled "Add Transaction" in green. It contains several input fields and buttons:

- Transaction Name:** A text input field with the placeholder "Enter transaction name".
- Transaction Type:** Two radio buttons labeled "Inflow" and "Outflow". The "Outflow" button is selected, indicated by a blue dot.
- Date:** A date input field showing "17 Jan 2025".
- Tags:** A text input field with the placeholder "Enter tags separated by commas".
- Amount:** A text input field showing "0".
- Notes:** A text input field with the placeholder "Add any notes".
- Buttons:** A green "Add Transaction" button at the bottom. A modal dialog box is overlaid on the form, displaying a success message.

The modal dialog box is titled "Transaction Message" and contains the text "Transaction saved successfully". It has a green "Close" button.

Figure 40: Outflow transaction message

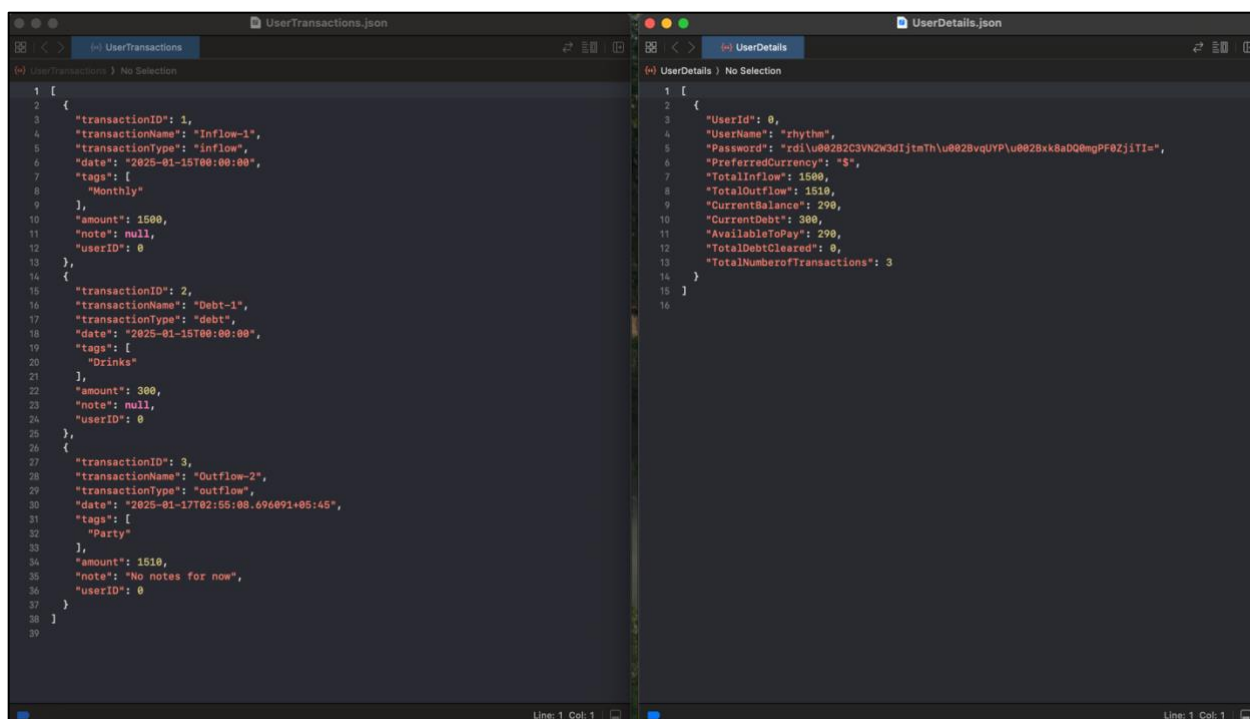


Figure 41: Updated Json after outflow

3.3.6. Outflow Test 2

Since the obtained debt can only use for outflow, during outflow first the balance obtained from debt is taken. This is also useful as available to pay section is used for paying debts, which is only used after balance from taken debt is finished.

Test case 06	
Objective	To add outflow and update current balance of user
Action	1) Navigate to debt section 2) Add new debt of 1500. 3) Click on outflow 4) Fill up required details 5) Click on add transaction
Expected Result	Available to pay section should not be deducted, but current balance should be deducted.

Actual Result	The entered amount was deducted from current balance and not available to pay.
Conclusion	Test was successful.

Table 6: Outflow test 2

Add Debt

Transaction Name
debt-new

Transaction Type
☒ Get Debt ☐ Clear Debt

Notes
Add any notes

Date
17 Jan 2025

Due Date
23 Jan 2025

Debt From
unknown pe

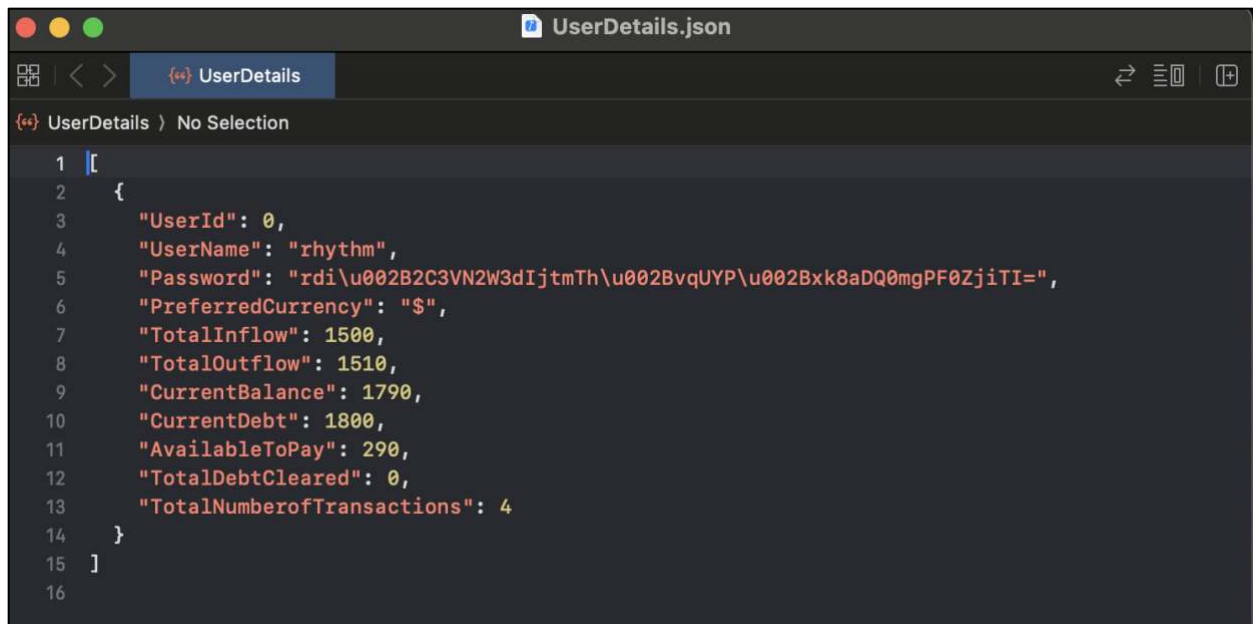
Amount
1500

Tags
Gadgets

Yearly Monthly Food Drinks
Clothes Gadgets Miscellaneous
Fuel Rent EMI Party

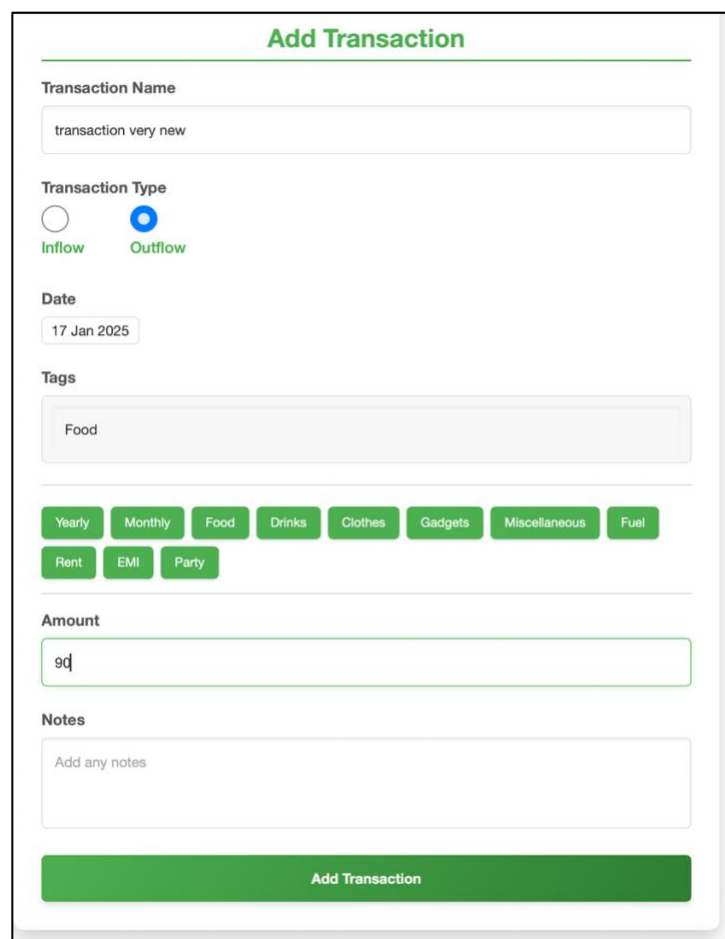
Add Debt

Figure 42: Debt addition (2)



```
1  [
2    {
3      "UserId": 0,
4      "UserName": "rhythm",
5      "Password": "rdi\u002B2C3VN2W3dIjtmTh\u002BvqUYp\u002Bxk8aDQ0mgPF0ZjiTI=",
6      "PreferredCurrency": "$",
7      "TotalInflow": 1500,
8      "TotalOutflow": 1510,
9      "CurrentBalance": 1790,
10     "CurrentDebt": 1800,
11     "AvailableToPay": 290,
12     "TotalDebtCleared": 0,
13     "TotalNumberOfTransactions": 4
14   }
15 ]
16
```

Figure 43: Updated Json after adding debt



Add Transaction

Transaction Name
transaction very new

Transaction Type
☐ Inflow ☒ Outflow

Date
17 Jan 2025

Tags
Food

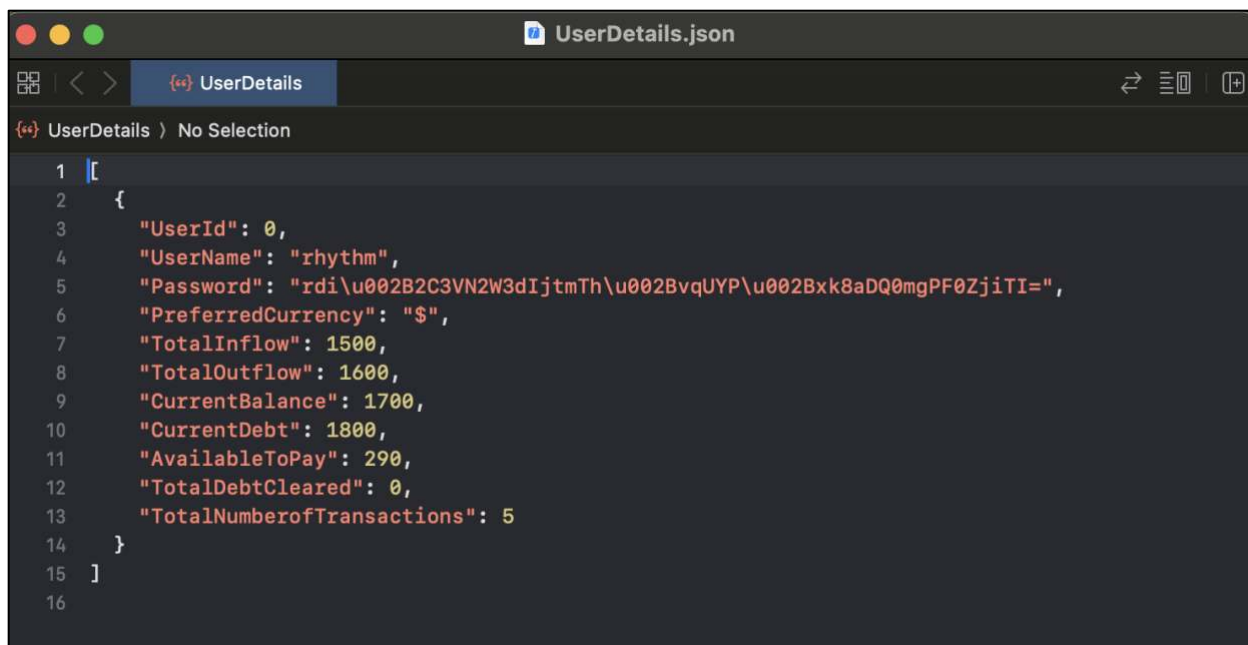
Yearly Monthly Food Drinks Clothes Gadgets Miscellaneous Fuel
Rent EMI Party

Amount
90

Notes
Add any notes

Add Transaction

Figure 44: Outflow for test



```

1  [
2    {
3      "UserId": 0,
4      "UserName": "rhythm",
5      "Password": "rdi\u002B2C3VN2W3dIjtmTh\u002BvqUYP\u002Bxk8aDQ0mgPF0ZjiTI=",
6      "PreferredCurrency": "$",
7      "TotalInflow": 1500,
8      "TotalOutflow": 1600,
9      "CurrentBalance": 1700,
10     "CurrentDebt": 1800,
11     "AvailableToPay": 290,
12     "TotalDebtCleared": 0,
13     "TotalNumberOfTransactions": 5
14   }
15 ]
16

```

Figure 45: Update in available to pay

3.3.7. Searching and filtering

Test case 07	
Objective	To obtain the result as per the filtering.
Action	1) Navigate to search section 2) Select "Show all transaction". 3) Click on search button. 4) Select the transaction date of a cleared date. 5) Select "cleared debt". 6) Select "Drinks" tag 7) Click on search button. 8) Select "Cash Inflow" 9) Type "flow" on seach bar 10)Click on search buttton. 11)Select future date 12)Select "Show all transaction 13)Click on search button

Expected Result	Output data should be filtered by the input value.
Actual Result	Output data was filtered by the input value
Conclusion	Test was successful.

Table 7: Search test

Note: Although a single tag is selected for testing purpose, multiple tags work in the same way.

The screenshot shows the 'Search' page of the TrackCash application. At the top, there are navigation tabs: Dashboard, Cashflow, Debts, Search (active), and Logout. The 'Search' section includes a search bar with the placeholder 'Enter transaction name' and a green search button. Below the search bar is a 'Tags' section with the placeholder 'Enter tags separated by space'. A row of category buttons is displayed: Yearly, Monthly, Food, Drinks, Clothes, Gadgets, Miscellaneous, Fuel, Rent, EMI, and Party. Below these buttons are filters for transaction status: Cleared Debt, Cash Inflow, Cash Outflow, Pending Debts, and Sort By Date. A date range selector shows 'From: 17 Jan 2025' and 'To: 17 Jan 2025'. A checkbox labeled 'Show All Transactions' is checked and highlighted with a red arrow and the number '1'. The search results are displayed in a table with the following data:

TRANSACTION NAME	TRANSACTION TYPE	TRANSACTION DATE	DEBIT FROM	DUE DATE	CLEARED DATE	LEFT AMOUNT	AMOUNT	TRANSACTION DESCRIPTION
debt-new	debt	2025-01-17	unknown pe	2025-01-23	-	\$ 1500	\$ 1500	-
Outflow-2	outflow	2025-01-17	-	-	-	-	\$ 1510	No notes for now
transaction very new	outflow	2025-01-17	-	-	-	-	\$ 90	-
for clear	inflow	2025-01-17	-	-	-	-	\$ 1500	For clearing debt

At the bottom of the table, there are 'Previous' and 'Next' buttons. A red arrow and the number '2' point to the search button.

Figure 46: Show all transaction result

TrackCashV3

Dashboard Cashflow Debts **Search** Logout

TrackCash

Search

Enter transaction name

Tags

Drinks

Yearly Monthly Food Drinks Clothes Gadgets Miscellaneous Fuel Rent EMI Party

☒ Cleared Debt ☐ Cash Inflow ☐ Cash Outflow From: 15 Jan 2025 To: 17 Jan 2025 ☐ Show All Transactions ☐ Pending Debts ☐ Sort By Date

TRANSACTION NAME	TRANSACTION TYPE	TRANSACTION DATE	DEBT FROM	DUE DATE	CLEARED DATE	LEFT AMOUNT	AMOUNT	TRANSACTION DESCRIPTION
Debt-1	debt	2025-01-15	Raidam	2025-01-18	1/15/2025 12:00:00AM	\$ 0	\$ 300	-

Previous Next

Figure 47: Cleared debt search filter

TrackCashV3

Dashboard Cashflow Debts **Search** Logout

TrackCash

Search

flow

Tags

Enter tags separated by space

Yearly Monthly Food Drinks Clothes Gadgets Miscellaneous Fuel Rent EMI Party

☐ Cleared Debt ☐ Cash Inflow ☒ Cash Outflow From: 15 Jan 2025 To: 17 Jan 2025 ☐ Show All Transactions ☐ Pending Debts ☐ Sort By Date

TRANSACTION NAME	TRANSACTION TYPE	TRANSACTION DATE	AMOUNT	TRANSACTION DESCRIPTION
Outflow-2	outflow	2025-01-17	\$ 1510	No notes for now

Previous Next

Figure 48: Cash Inflow search filter

The screenshot shows the TrackCashV3 application interface. The top navigation bar includes links for Dashboard, Cashflow, Debts, Search (active), and Logout. The Search page features a search bar with the placeholder "Enter transaction name" and a green search button. Below the search bar is a tags input field with the placeholder "Enter tags separated by space". A row of category buttons includes Yearly, Monthly, Food, Drinks, Clothes, Gadgets, Miscellaneous, Fuel, Rent, EMI, and Party. The date filtering section shows a "From" date of 25 Jan 2025 (annotated with a red '1') and a "To" date of 31 Jan 2025 (annotated with a red '2'). There are checkboxes for "Cleared Debt", "Cash Inflow", "Cash Outflow", "Show All Transactions" (checked), "Pending Debts", and "Sort By Date". A table header is visible with columns: TRANSACTION NAME, TRANSACTION TYPE, TRANSACTION DATE, DEBT FROM, DUE DATE, CLEARED DATE, LEFT AMOUNT, AMOUNT, and TRANSACTION DESCRIPTION. Below the table header, it says "No Records To Display". At the bottom, there are "Previous" and "Next" buttons. A red arrow labeled '3' points to the search button.

TrackCashV3

Dashboard Cashflow Debts **Search** Logout

TrackCash

Search

Search

Enter transaction name

Tags

Enter tags separated by space

Yearly Monthly Food Drinks Clothes Gadgets Miscellaneous Fuel Rent EMI Party

☐ Cleared Debt ☐ Cash Inflow ☐ Cash Outflow From: 25 Jan 2025 To: 31 Jan 2025 ☒ Show All Transactions ☐ Pending Debts ☐ Sort By Date

TRANSACTION NAME	TRANSACTION TYPE	TRANSACTION DATE	DEBT FROM	DUE DATE	CLEARED DATE	LEFT AMOUNT	AMOUNT	TRANSACTION DESCRIPTION
No Records To Display								

Previous Next

Figure 49: Date filtering

3.3.8. Dashboard testing

Test case 08	
Objective	To obtain the result as per the filtering.
Action	1) Navigate to homepage 2) Select transaction from date and to date that has transactions. 3) Click on filter button. 4) Select transaction from date and to date that has no transactions but a debt to be paid between that date. 5) Click on filter button.
Expected Result	Output data should be filtered by the input value.
Actual Result	Output data was filtered by the input value
Conclusion	Test was successful.

Table 8: Dashboard test

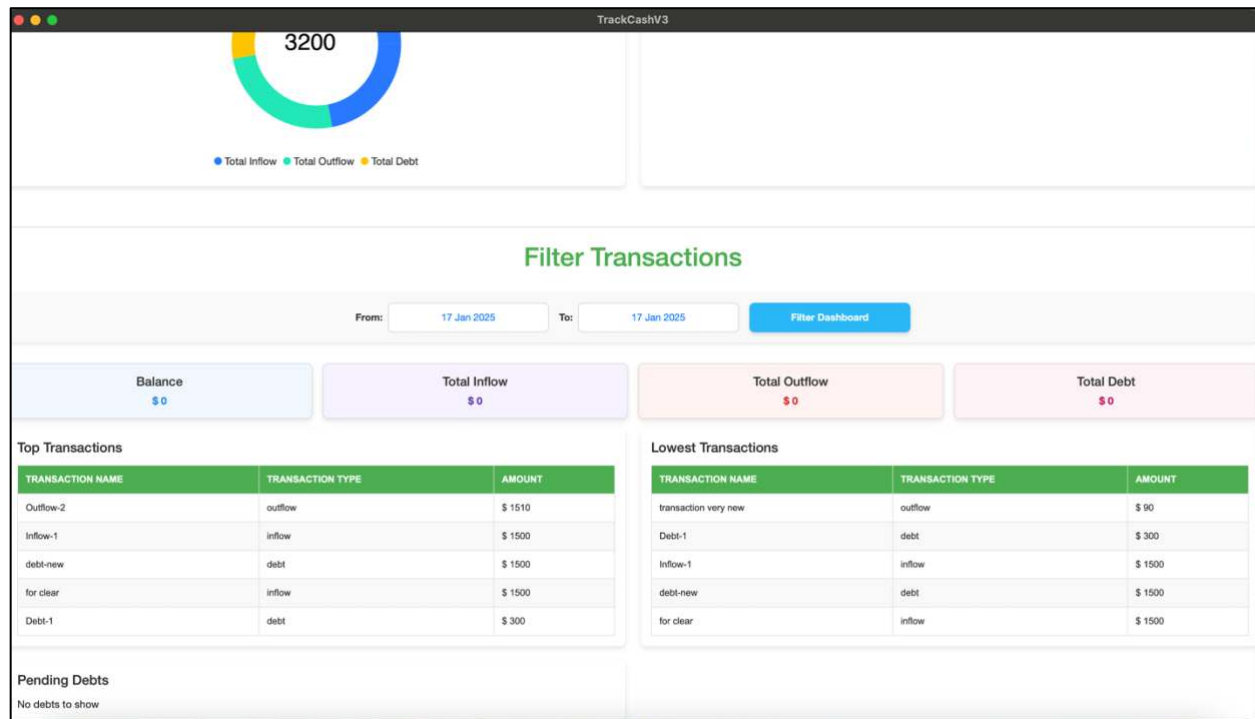


Figure 50: Dashboard before filtering

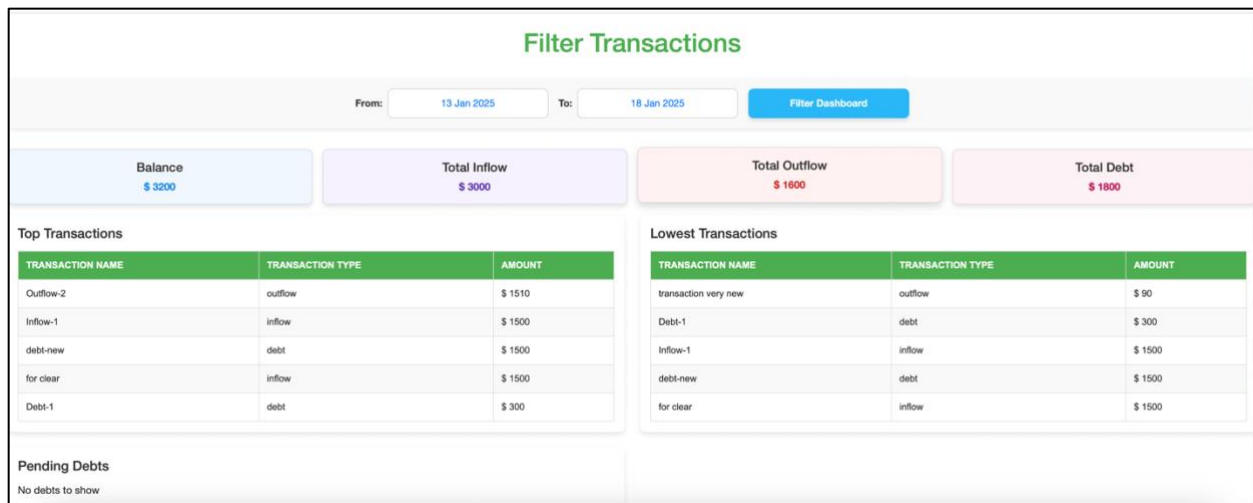


Figure 51: Dashboard with date filtering (1)

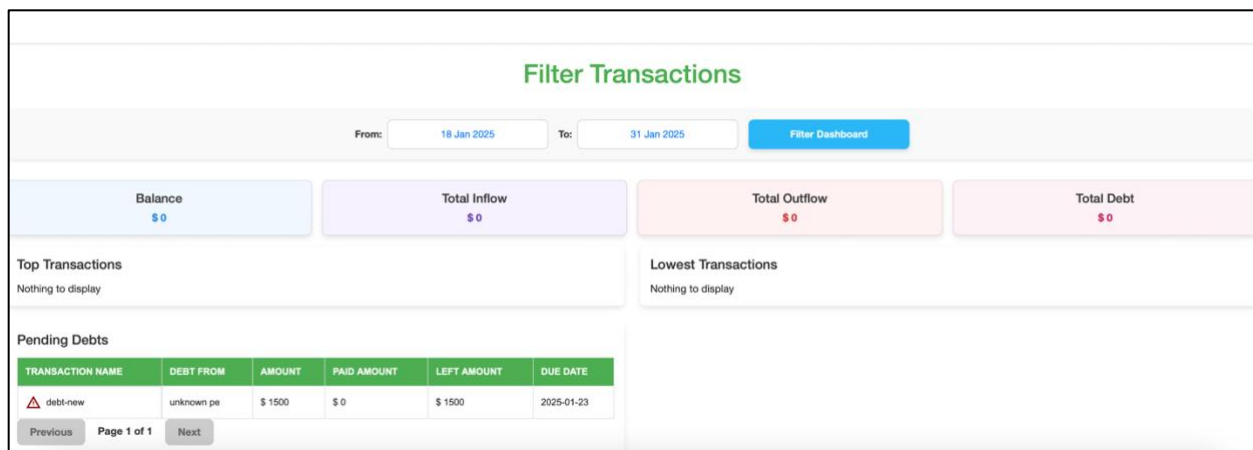


Figure 52: Dashboard with date filtering (2)

3.3.9. Insufficient balance outflow testing

Test case 09	
Objective	To make sure outflow transaction is stopped if balance is not sufficient.
Action	1) Navigate to cashflow page 2) Enter required fields. 3) Enter amount more than balance 4) Click on add transaction button.
Expected Result	A proper error message should be shown.
Actual Result	A proper error message was shown.
Conclusion	Test was successful.

Table 9: Insufficient balance outflow testing

The screenshot displays the 'Add Transaction' form with the following details:

- Transaction Name:** Outflow unlimited
- Transaction Type:** Outflow (selected with a blue dot)
- Date:** 14 Jan 2025
- Tags:** Miscellaneous
- Category Buttons:** Yearly, Monthly, Food, Drinks, Clothes, Gadgets, Miscellaneous, Fuel, Rent, EMI, Party
- Amount:** 10000000
- Notes:** Add any notes
- Action Button:** Add Transaction

Figure 53: Large amount outflow

Add Transaction

Transaction Name
Enter transaction name

Transaction Type
☐ Inflow
 ☒ Outflow

Date
14 Jan 2025

Tags
Enter tags separated by commas

Amount
0

Notes
Add any notes

Transaction Message
Current balance is too low
Close

Add Transaction

Figure 54: Low balance message.

3.3.10. Clearing debt testing

Test case 10	
Objective	To make sure debts are being cleared if sufficient balance
Action	1) Navigate to debt page 2) Select clear debt. 3) Select a pending debt from the list 4) Enter amount

	5) Click “Clear Debt”
Expected Result	Debt should be cleared
Actual Result	Debt was cleared
Conclusion	Test was successful.

Table 10: Clear debt testing

The screenshot shows the TrackCashV3 application interface. At the top, there's a header bar with the title 'TrackCashV3'. Below it, a modal form titled 'Add Debt' is displayed. The form has several input fields: 'Transaction Name' (with 'debt-new' entered), 'Transaction Type' (with 'Clear Debt' selected), 'Notes' (with 'Add any notes' placeholder), 'Date' (with '17 Jan 2025' selected), 'Due Date' (with '23 Jan 2025' selected), 'Debt From' (with 'unknown pe' entered), 'Amount' (with '1500' entered), and 'Tags' (with a placeholder 'Enter tags separated by space'). There are also several category buttons: 'Yearly', 'Monthly', 'Food', 'Drinks', 'Clothes', 'Gadgets', 'Miscellaneous', 'Fuel', 'Rent', 'EMI', and 'Party'. A large green 'Clear Debt' button is at the bottom of the form. Below the form, there's a section titled 'Pending Debts' which contains a table with the following data:

Transaction Name	Debt From	Amount	Paid Amount	Left Amount	Due Date	Action
debt-new	unknown pe	1500	0	1500	2025-01-23	Select

Figure 55: Clearing debt

The screenshot shows two JSON files in a code editor. The left file is 'UserDebts.json' and the right file is 'UserDetails.json'. In 'UserDebts.json', the first object has 'isCleared' set to false. In 'UserDetails.json', 'CurrentDebt' is 1500 and 'AvailableToPay' is 1490. Red boxes highlight these specific values in both files.

```

1 {
2   "debtID": 0,
3   "debtFrom": "unknown pe",
4   "debtType": "getDebt",
5   "dueDate": "2025-01-23T00:00:00",
6   "transactionID": 4,
7   "isCleared": false,
8   "paidAmount": 0,
9   "leftAmount": 1500,
10  "clearedDate": "0001-01-01T00:00:00",
11  "debtName": "debt-new"
12 }
13
14 {
15   "debtID": 0,
16   "debtFrom": "Raider",
17   "debtType": "getDebt",
18   "dueDate": "2025-01-10T00:00:00",
19   "transactionID": 2,
20   "isCleared": true,
21   "paidAmount": 300,
22   "leftAmount": 0,
23   "clearedDate": "2025-01-10T00:00:00",
24   "debtName": "Debt-1"
25 }
26
27

```

```

1 {
2   "UserId": 0,
3   "UserName": "rhythm",
4   "Password": "rdi\u002B2C3V2W3dIjtmTh\u002Bvq\u002Bxk8aDQmgPF6Zj1Tl=",
5   "PreferredCurrency": "$",
6   "TotalInflow": 3000,
7   "TotalOutflow": 1000,
8   "CurrentBalance": 2000,
9   "CurrentDebt": 1500,
10  "AvailableToPay": 1490,
11  "TotalDebtCleared": 300,
12  "TotalNumberOfTransactions": 6
13 }
14
15
16

```

Figure 56: Json before clearing debt

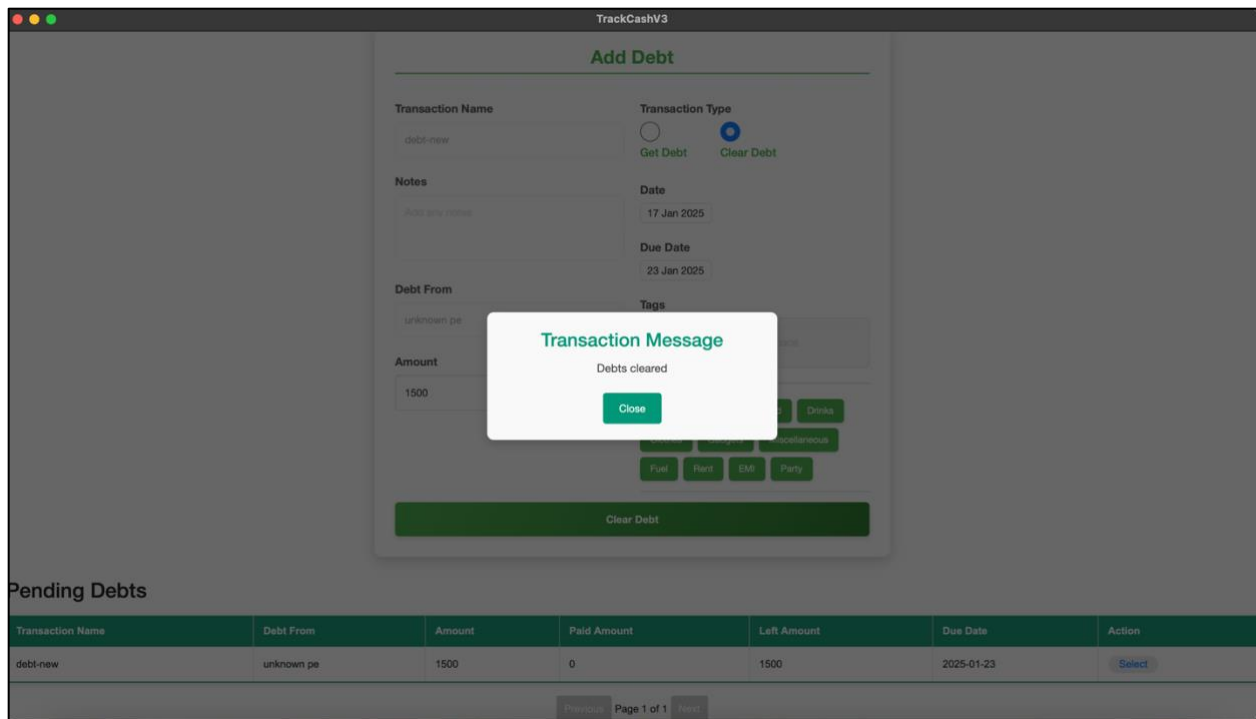


Figure 57: Debts cleared message

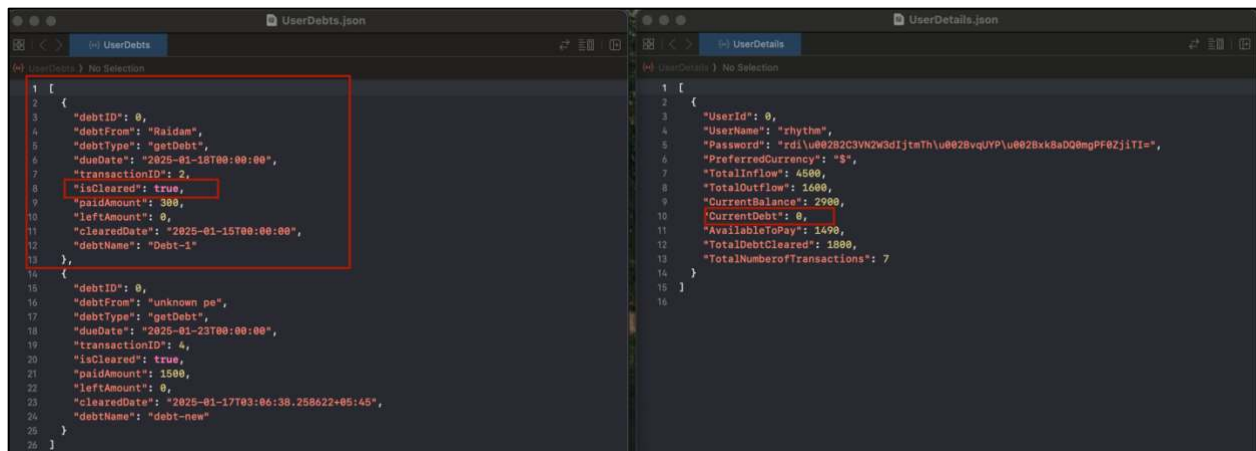


Figure 58: Json after clearing debt

NOTE: There might be slight changes in Json before clearing debt and after clearing, because a inflow was 1500 was added between the process.

3.3.11. Insufficient balance to clear debt

Test case 11	
Objective	To make sure a proper message is displayed if debts cannot be cleared
Action	1) Navigate to debt page

	2) Select clear debt. 3) Select a pending debt from the list that has more amount than available to pay balance 4) Enter amount 5) Click "Clear Debt"
Expected Result	Debt should not be cleared
Actual Result	Debt was not cleared with proper information.
Conclusion	Test was successful.

Table 11: Insufficient balance to clear debt testing

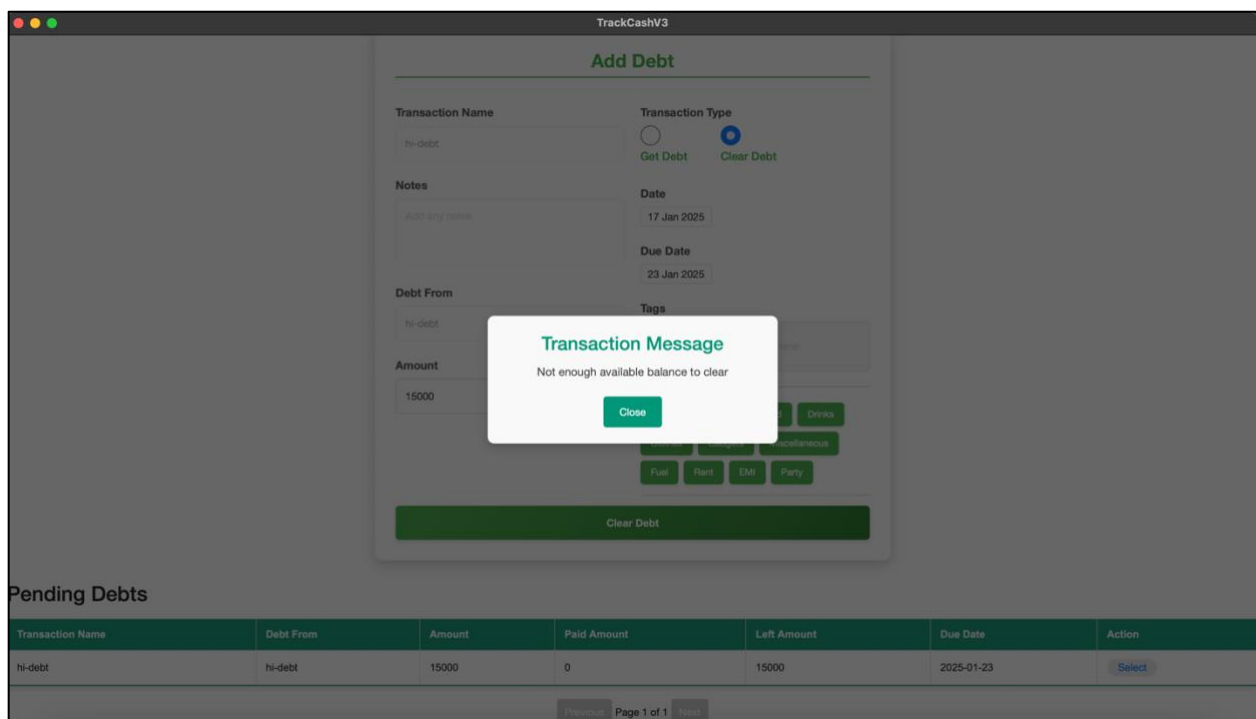


Figure 59: Error message while clearing debt

4. Individual Reflections

4.1. Roles and responsibilities

As an individual developer working on the development, there were some primary responsibilities that needed a high attention. Some major responsibilities were requirement analysis, where the system requirement was understood properly to make sure the application did not go out of scope.

Similarly, design and development were a huge task that played a vital role in development as seventy eighty percent of the progress falls under this stage. All the logic and functionalities of the application was developed in this phase.

Testing and debugging was performed after the completion of the application. For this application, blackbox testing was performed. For each and every functionality of the application, testing was performed to ensure the application was working properly and as expected.

4.2. Challenges faced

Integrating the search feature, was a challenge as multiple filtering was needed. The transaction loading part was easy, but obtaining result with all searches, tags and other filters enabled was challenging.

Since this was a completely new programming language, framework, adapting to the working environment was time consuming. The configuration of the project was a challenge as many problems occurred during the initial setup.

Keeping the UI simple yet integrating complex logic in the backend and making the application with required features was a challenging task. While designing the dashboard, the logic behind was time consuming and logically confusing, yet making it meaningful from the user perspective was one of the hardest challenges faced during this development.

Using third party libraries like MudBlazor for graphical representation was initially confusing to set up. Since Json was used a local storage, there was some performance issues as the application is not properly optimized when it needs to operate with whole Json file instead of needed records only.

4.3. Learnings and growth

4.3.1. Technical skills

A completely new and demanding programming language was learned properly during the development of this project. Getting familiar with popular frameworks like .Net was a challenge but a rewarding task. Concept of working with files asynchronously was further clarified. Development of MAUI hybrid app was also learned that uses razor files. Many technical skills were developed during the development of this application.

4.3.2. Problem-solving skill

The project helped in enhancing the debugging skill and solving problems that were faced constantly developing as many unexpected errors had occurred and some of errors had no messages. Furthermore, designing modular for problems was improved as it was highly required for the reusability of the code.

4.3.3. Project management

During the development, the management skill was developed drastically. The project could not be completed all at once, which required a well-planned division of tasks, priority wise. The project was divided into manageable tasks which helped in completion of development on time.

4.3.4. Documentation

This documentation is being written for both technical and non-technical readers, which should be considered. Hence, some part may be totally technical, it was kept as simple as possible. Describing a technical documentation to a non-technical reader helped in writing the documentation in more organized way.

4.4. Impact on future work

This project has significantly contributed to boost knowledge in various aspect including technical and non-technical skills. Working with one of the most demanding programming languages along with handling real-world based problems has boosted the thinking way. The application development has also opened path to solving other complex problem with ease and proper management. Additionally, importance of performance and prioritizing task lesson was learned which can be implemented while creating other applications.

5. Conclusion

The primary goal of this project was to create a well-developed and robust application that could be used to keep track of personal finances. The system is able to keep track of inflows, outflows, and debt. The system can filter the transactions according to need. The application fulfills the basic requirement for a finance tracking with some additional useful features.

Using .Net framework, a blazor hybrid application was developed that required a high level logical thinking and problem-solving skill with existing programming knowledge. The application was developed fulfilling the requirements that were required in the application yet maintaining a simple UI yet including all the necessary features.

5.1. Key findings

- The use of modular programming ensured the code is kept cleaned and developed for maximum reusability.
- Features like sorting date, filtering date by title, tags, date, and by transaction type provided a summary of the financial data to the user.
- Challenges occurred while working with asynchronous file and other bugs were successfully resolved by debugging and testing of the application.

5.2. Limitations

- Real-time synchronization with other cloud platform is yet to be developed.
- Users are not able to delete certain transactions.
- Due to Json file loading and uploading performance issues could be found when dealing with larger data.
- A report generation is yet to be implemented which could hold the details of the transactions of the user.

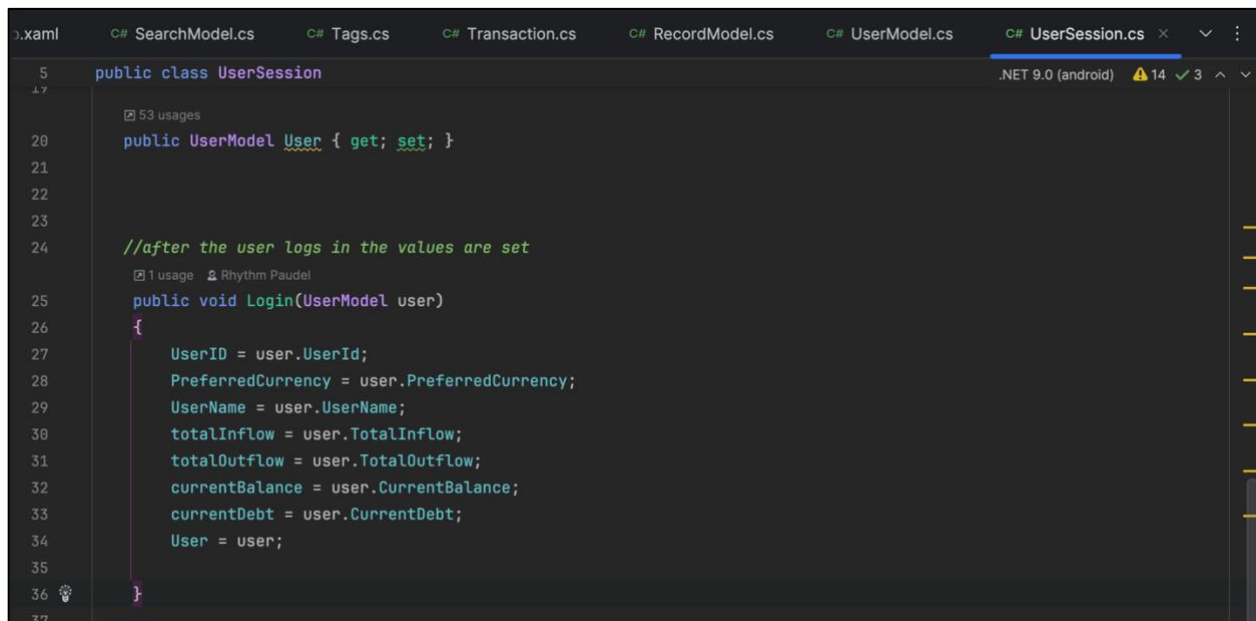
5.3. Future work

- The application could be developed for cross-platforms devices ensuring the easiness of the accessibility.
- Certain common features like, report download, and transaction deletion could be added.

- AI could be used for predicting the spending behavior of the user, and helping the user to control the expenses.
- The service could be made cloud based integrated with database, ensuring the application is well optimized.

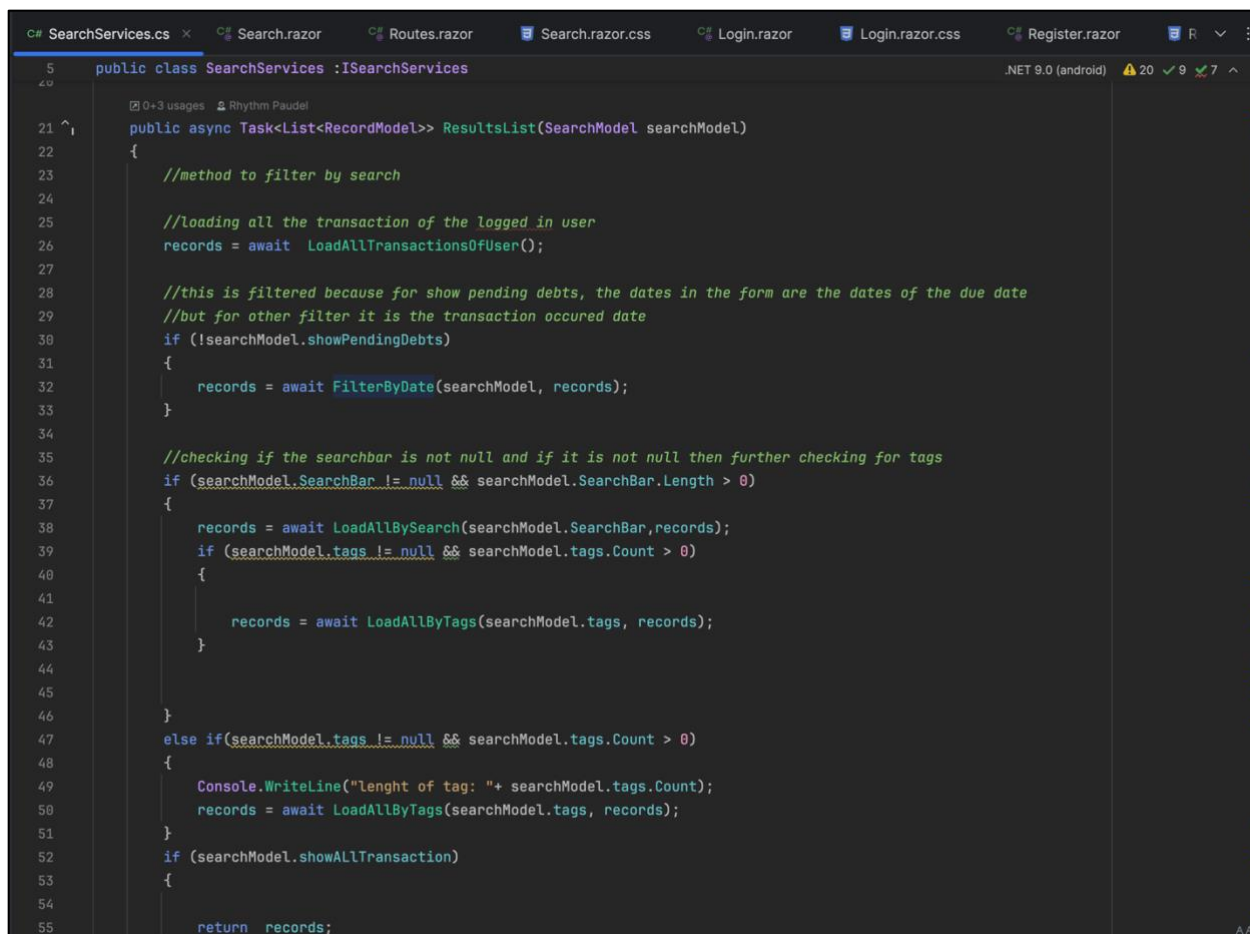
6. Appendix

6.1. Code snippets



```
5 public class UserSession
6
7
8
9
10
11
12
13
14
15
16
17
18
19 public UserModel User { get; set; }
20
21
22
23
24 //after the user logs in the values are set
25 public void Login(UserModel user)
26 {
27     UserID = user.UserId;
28     PreferredCurrency = user.PreferredCurrency;
29     UserName = user.UserName;
30     totalInflow = user.TotalInflow;
31     totalOutflow = user.TotalOutflow;
32     currentBalance = user.CurrentBalance;
33     currentDebt = user.CurrentDebt;
34     User = user;
35 }
36
37
```

Figure 60: Logic for maintaining user log in session

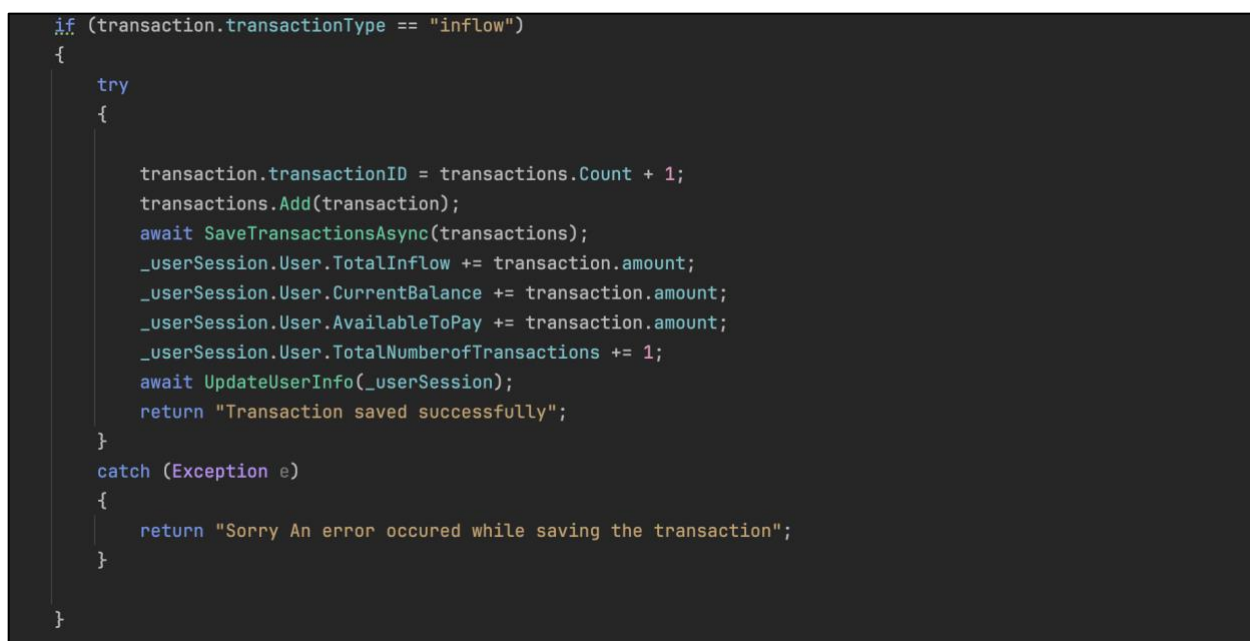


```

5 public class SearchServices : ISearchServices
6 {
7     //0+3 usages Rhythm Paudel
8     public async Task<List<RecordModel>> ResultsList(SearchModel searchModel)
9     {
10         //method to filter by search
11
12         //loading all the transaction of the logged in user
13         records = await LoadAllTransactionsOfUser();
14
15         //this is filtered because for show pending debts, the dates in the form are the dates of the due date
16         //but for other filter it is the transaction occurred date
17         if (!searchModel.showPendingDebts)
18         {
19             records = await FilterByDate(searchModel, records);
20         }
21
22         //checking if the searchBar is not null and if it is not null then further checking for tags
23         if (searchModel.SearchBar != null && searchModel.SearchBar.Length > 0)
24         {
25             records = await LoadAllBySearch(searchModel.SearchBar, records);
26             if (searchModel.tags != null && searchModel.tags.Count > 0)
27             {
28                 records = await LoadAllByTags(searchModel.tags, records);
29             }
30         }
31         else if (searchModel.tags != null && searchModel.tags.Count > 0)
32         {
33             Console.WriteLine("length of tag: " + searchModel.tags.Count);
34             records = await LoadAllByTags(searchModel.tags, records);
35         }
36         if (searchModel.showAllTransaction)
37         {
38             return records;
39         }
40     }
41 }

```

Figure 61: Logic for filtering transactions



```

1 if (transaction.transactionType == "inflow")
2 {
3     try
4     {
5         transaction.transactionID = transactions.Count + 1;
6         transactions.Add(transaction);
7         await SaveTransactionsAsync(transactions);
8         _userSession.User.TotalInflow += transaction.amount;
9         _userSession.User.CurrentBalance += transaction.amount;
10        _userSession.User.AvailableToPay += transaction.amount;
11        _userSession.User.TotalNumberOfTransactions += 1;
12        await UpdateUserInfo(_userSession);
13        return "Transaction saved successfully";
14    }
15    catch (Exception e)
16    {
17        return "Sorry An error occurred while saving the transaction";
18    }
19 }

```

Figure 62: Inflow logic

```
//outflow transaction logic
if (transaction.transactionType == "outflow")
{
    if (_userSession.User.CurrentBalance >= transaction.amount)
    {
        try
        {
            //adding transaction
            transaction.transactionID = transactions.Count + 1;
            transactions.Add(transaction);
            await SaveTransactionsAsync(transactions);
            _userSession.User.TotalOutflow += transaction.amount;

            //finding the difference
            double difference = _userSession.User.CurrentBalance - _userSession.User.AvailableToPay;
            _userSession.User.CurrentBalance -= transaction.amount;

            //this is checked because if the user has debt and inflow balance the outflow firstly is dedecuted f
            if (difference < transaction.amount)
            {
                _userSession.User.AvailableToPay -= transaction.amount-difference;
            }
            _userSession.User.TotalNumberOfTransactions += 1;
            await UpdateUserInfo(_userSession);
            return "Transaction saved successfully";
        }
        catch (Exception e)
        {
            return "Sorry An error occured while saving the transaction";
        }
    }
    return "Current balance is too low";
}
```

Figure 63: Outflow logic

```
public class TransactionService: ITransactionService
{
    public async Task<string> ClearDebtsAsync(Transaction transaction)
    {
        try
        {
            DebtDetails debtDetails = await SelectDebtByTransactionID(transaction.transactionID);

            //since the user can also pay only certain amount of the debt the condition for paying the debt is checked
            if ((_userSession.User.AvailableToPay >= debtDetails.leftAmount &&
                transaction.amount <= debtDetails.leftAmount) || (transaction.amount <= _userSession.User.AvailableToPay
                && transaction.amount <= debtDetails.leftAmount))
            {
                debtDetails.paidAmount += transaction.amount;
                debtDetails.leftAmount -= transaction.amount;

                //if only certain amount is paid is cleared field should be updated accordingly
                debtDetails.isCleared = debtDetails.leftAmount > 0 ? false : true;
                if (debtDetails.isCleared)
                {
                    debtDetails.clearedDate = transaction.date;
                }

                //updating current logged in user information and updating debts in json file
                await UpdateDebtsAsync(debtDetails);
                _userSession.User.CurrentDebt -= transaction.amount;
                _userSession.User.CurrentBalance -= transaction.amount;
                _userSession.User.AvailableToPay -= transaction.amount;
                _userSession.User.TotalDebtCleared += transaction.amount;
                await UpdateUserInfo(_userSession);

                return "Debts cleared";
            }

            return "Not enough available balance to clear";
        }
        catch (Exception ex)
        {
            //
        }
    }
}
```

Figure 64: Clearing debt logic