

Budget Buddy- A Budget tracking & managing Web application

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Abstract: BudgetBuddy is a full-stack personal finance management web application that enables users to track expenses, manage budgets, and monitor stock investments in real time. Built with React, Node.js, MongoDB, and Firebase Authentication, it offers multi-wallet support, transaction categorization, budget alerts, and live stock portfolio tracking powered by the Alpha Vantage API — all within a unified, responsive dashboard

Key Words: BudgetBuddy, Personal Finance Management, Expense Tracker, Budget Planner, Investment Portfolio, Stock Market Integration, Real-Time Data, Web Application

1. INTRODUCTION

In today's fast-paced financial landscape, managing personal finances effectively has become more critical than ever. With rising expenses, diverse income sources, and growing interest in stock market investments, individuals require a unified platform that simplifies financial decision-making and promotes better money management habits.

BudgetBuddy is a hybrid personal finance management application developed to address this need. It provides users with a comprehensive and intuitive interface to track daily expenses, manage multiple wallets, set and monitor budgets, and track real-time stock portfolio performance — all within a single platform accessible across devices.

By combining everyday financial management with investment tracking in a single hybrid application, BudgetBuddy empowers users to gain complete visibility over their financial health, make informed decisions, and work towards their financial goals with confidence.

2. PROBLEM STATEMENT

- No single platform consolidates expense tracking, budget management, and stock investment monitoring together in one place.
- Existing tools are either too complex or too basic, lacking features like multi-wallet support, real-time stock prices, and budget alerts simultaneously.
- Manual financial tracking leads to poor decisions, overspending, and missed investment

3. OBJECTIVES

- To develop a hybrid web application that consolidates expense tracking, budget management, and stock portfolio monitoring in a single platform.
- To implement secure user authentication using Firebase for reliable and safe access to personal financial data.
- To integrate real-time stock market data via Alpha Vantage API for live portfolio tracking and investment insights.
- To provide multi-wallet management enabling users to track finances across multiple accounts simultaneously.

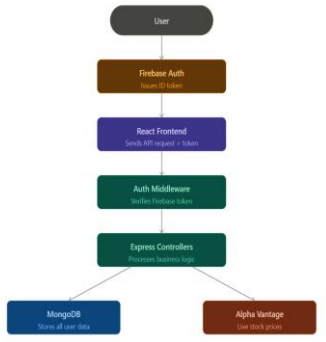
4. SYSTEM ARCHITECTURE

BudgetBuddy follows a three-tier client-server architecture:

Tier 1 — Frontend (React): Users interact via a React SPA covering dashboard, transactions, budgets, and investments. Firebase Authentication

handles login and issues an ID token attached to every API request.

multiple user roles and workflows. The system follows a **multi-layered architecture** consisting of the Presentation Layer, Service Layer, and Data Layer, supported by cloud services for authentication and messaging.



4.1 ARCHITECTURE OVERVIEW

BudgetBuddy follows a three-tier client-server architecture where a React frontend communicates with a Node.js and Express backend via RESTful APIs, backed by a MongoDB database for persistent data storage.

Firestore handles secure user identity on both the client and server side, with every API request verified using Firestore ID tokens. The backend manages all business logic, data operations via Mongoose, and automated recurring transactions through a daily cron job.

Real-time stock data is sourced from the Alpha Vantage API through a dedicated backend service with in-memory caching to optimize performance and respect API rate limits.

4.2 PRESENTATION LAYER (FRONTEND)

The frontend of BudgetBuddy is built using React, providing a dynamic and responsive single-page application experience. It serves as the primary interface through which users interact with the system.

Firestore manages user login and registration on the client side, issuing a secure ID token that is attached to every outgoing API request via Axios interceptors.

The interface is organized into key modules — Dashboard for financial overview, Transactions for income and expense management, Budgets for spending control, Wallets for multi-account tracking, and Investments for real-time portfolio and watchlist monitoring.

The UI is styled using Tailwind CSS with a dark theme, ensuring a clean, responsive, and accessible experience across all devices. Auto-refresh logic using setInterval keeps stock prices and portfolio data updated every 60 seconds without requiring manual reload.

4.3 AUTHENTICATION AND NOTIFICATION LAYER

Authentication: BudgetBuddy uses Firestore Authentication for identity management. On login, Firestore issues a secure ID token which is attached to every API request via Axios interceptors. The backend's Auth Middleware verifies this token using Firestore Admin SDK before processing any request. Invalid or expired tokens return a 401 response and redirect the user to the login page.

Notification: React Hot Toast handles in-app notifications, providing instant feedback on user actions — success messages on adding transactions or stocks, error alerts on failed API calls, and warnings when mock stock data is being used due to API rate limits.

4.4 AUTHENTICATION AND USER LAYER

BudgetBuddy implements a secure and seamless authentication system using Firestore Authentication, ensuring that only verified users can access their financial data.

Authentication Flow: When a user registers or logs in, Firestore Authentication handles the identity verification on the client side and issues a secure ID token upon success. This token is stored in the browser session and automatically attached to every outgoing API request through Axios request interceptors in the frontend, ensuring all backend communication is authenticated.

Token Verification: On the backend, every incoming request passes through the Auth Middleware before reaching any controller or route. The middleware uses the Firestore Admin SDK to verify the ID token. If the token is valid, the corresponding user is fetched from MongoDB using their Firestore UID. If the user does not exist in the database — for example, on first login — the system automatically creates a new user profile, along with a default wallet and a set of default expense and income categories. If the token is invalid or expired, the middleware immediately returns a 401 Unauthorized response and the frontend redirects the user to the login page.

User Profile & Data Isolation: Each authenticated user has a dedicated profile stored in MongoDB containing their personal settings such as name, email, and preferred currency. All financial data — including wallets, transactions, budgets, portfolio holdings, and watchlist entries — is strictly scoped to the authenticated user, ensuring complete data privacy and isolation between accounts.

the system operates in a controlled and organized manner.

4. API LAYER(BACKEND-Express.js)

The API layer is built using Node.js and Express, serving as the bridge between the React frontend and backend services. All routes are prefixed with /api and organized into dedicated modules:

Request Lifecycle: Every request passes through Auth Middleware for token verification, then reaches the controller which processes business logic, interacts with MongoDB via Mongoose, and returns a JSON response to the frontend.

External Integration: Stock routes communicate with Alpha Vantage API through a dedicated Stock Service with 60-second caching to manage rate limits efficiently.

4.6 REAL TIME MESSAGING AND ALERTS

BudgetBuddy incorporates a lightweight real-time messaging and alert system to keep users informed of important financial events and action outcomes throughout the application.

In-App Notifications: React Hot Toast is used to deliver instant, non-intrusive toast notifications triggered by key user actions:

- Success alerts on adding transactions, budgets, wallets, or stocks
- Error alerts on failed API calls or validation errors

Portfolio Alerts: The investment module auto-refreshes stock prices every 60 seconds using setInterval, providing near real-time price updates. A mock data warning badge is displayed on each

holding card when live prices are unavailable, ensuring users are always aware of data accuracy.

4.7 DATABASE LAYER(MONGO DB ATLAS)

BudgetBuddy uses MongoDB as its primary database, accessed via Mongoose for structured schema management. All data is scoped to authenticated users ensuring complete privacy between accounts.

Collections:

- **Users** — profile, Firebase UID, currency preference
- **Transactions** — income and expense records with category and wallet reference
- **Budgets** — monthly limits per category with spending tracking
- **Categories** — user-defined income and expense categories
- **Wallets** — multiple accounts with balance and currency
- **Portfolio** — stock holdings with quantity and purchase price
- **Watchlist** — tracked stocks with latest price data

Key Features: On first login, a default wallet and 15 preset categories are automatically created for the user. Stock prices are cached in-memory for 60 seconds on the backend to reduce redundant API calls and improve performance.

features such as community interactions and real-time updates. The use of cloud infrastructure ensures that the data is securely stored and can be accessed reliably from different locations. Efficient data retrieval and storage mechanisms are implemented to support fast query execution and smooth system performance. Indexing techniques and optimized data structures are used to minimize response time and handle large volumes of data.

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4.9 SECURITY AND ACCESS CONTROL

BudgetBuddy implements multiple layers of security to protect user data and ensure authorized access throughout the application.

Authentication: Firebase Authentication handles identity verification, issuing a secure ID token on login which expires automatically, reducing the risk of unauthorized access.

Token Verification: Every API request is validated through Auth Middleware using Firebase Admin SDK. Invalid or expired tokens immediately return a 401 Unauthorized response, blocking access to any protected route.

Data Isolation: All database records are strictly scoped to the authenticated user via a user reference field, preventing any cross-user data access.

Environment Security: Sensitive credentials including MongoDB URI, Firebase private key, and Alpha Vantage API key are stored in environment variables via .env file, never exposed in the codebase.

4.10 SCALABILITY AND PERFORMANCE

BudgetBuddy ensures performance through in-memory caching of stock prices for 60 seconds, reducing redundant Alpha Vantage API calls. Rate limits are handled gracefully by falling back to mock data when exceeded. MongoDB's document-based structure enables efficient user-scoped querying, while Mongoose enforces data integrity at the application level. A daily cron job offloads recurring transaction processing from the main request cycle. Frontend auto-refresh every 60 seconds keeps data fresh without overloading the backend. The modular separation of routes, controllers, services, and models ensures each layer can be independently optimized as the application scales.

4.11 SUMMARY

BudgetBuddy is a hybrid personal finance management application that consolidates expense tracking, budget planning, and real-time stock portfolio monitoring into a single unified platform. Built with React, Node.js, MongoDB, and Firebase Authentication, it follows a secure three-tier architecture ensuring clean separation of concerns and data privacy. Real-time stock data via Alpha Vantage, in-memory caching, automated cron jobs, and a responsive dark-themed UI collectively deliver a seamless and efficient financial management experience for everyday users, students, and retail investors. platform to handle increasing user demands and multi-college deployments. Furthermore, the architecture ensures efficient data flow and communication between components, supported by robust security measures and performance optimization techniques.

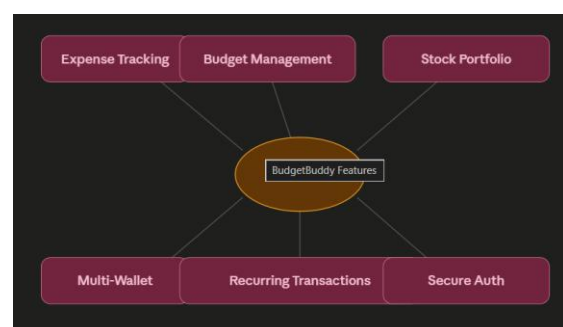


Fig-2 – features of Budget Buddy

5. SYSTEM FEATURES

BudgetBuddy provides a complete set of personal finance features including income and expense tracking with categorization, monthly budget management with visual alerts, and multi-wallet support for tracking multiple accounts. The investment module offers real-time stock portfolio tracking with live P&L updates via Alpha Vantage API, along with a watchlist for monitoring stocks. Recurring transactions are auto-processed daily via a cron job, while financial reports provide monthly summaries and spending insights. Firebase Authentication secures all routes with token-based access, and on first login a default wallet and 15 preset categories are automatically created. The entire app features a responsive dark-themed UI built with Tailwind CSS.

5.1 FEATURE OVERVIEW

BudgetBuddy delivers an all-in-one financial management experience combining everyday expense tracking with real-time investment monitoring. It supports multi-wallet management, category-based budgeting with alerts, and automated recurring transactions through a daily cron job. The stock portfolio module provides live price updates, P&L calculations, and a watchlist powered by Alpha Vantage API with 60-second auto-refresh. Secure Firebase Authentication protects all user data with token-based access control, while automated default setup ensures a ready-to-use experience from the first login. A responsive dark-themed UI built with Tailwind CSS ensures seamless usability across all devices. types of users with different responsibilities, ensuring that each user can efficiently perform their tasks within a controlled and secure framework. The feature set of Campus Connect is developed with a focus on usability, scalability, and reliability. organizers oversee and regulate these activities through approval and verification.

5.2 ROLE BASED ACCESS

BudgetBuddy implements user-level role based access control to ensure complete data privacy and security across all accounts. Every user is assigned a unique identity through Firebase Authentication upon registration. All API routes are protected by Auth Middleware which verifies the Firebase ID token on every request, ensuring only authenticated users can access the system. Each user's data including transactions, budgets, wallets,

portfolio, and watchlist is strictly scoped to their own account using a user reference field in every MongoDB collection, preventing any cross-user data access. Unauthorized or unauthenticated requests are immediately rejected with a 401 response and redirected to the login page, ensuring no sensitive financial data is ever exposed to unauthorized parties..

5.3 FEATURES LIFECYCLE MANAGEMENT

BudgetBuddy does not include an Event Lifecycle Management feature as it is a personal finance and investment tracking application. This feature is typically found in event management systems like CampusConnect.

If you meant something related to BudgetBuddy, I can write about:

- **Transaction lifecycle** — how a transaction is created, processed, and stored
- **Stock data lifecycle** — how live prices are fetched, cached, and refreshed
- **Budget lifecycle** — how budgets are created, tracked, and alerted

5.4 User Onboarding Experience

BudgetBuddy provides a seamless and instant onboarding experience for new users. Upon first registration via Firebase Authentication, the system automatically detects a new user and triggers a one-time setup process in the background. A default wallet is created along with 15 preset income and expense categories covering common financial activities such as Food, Transportation, Shopping, Healthcare, Salary, and Freelance. This eliminates the need for any manual configuration, allowing users to start tracking their finances immediately after login. The clean dark-themed dashboard greets the user with an organized layout covering transactions, budgets, wallets, and investments, making navigation intuitive from the very first interaction.

5.5 PUSH NOTIFICATIONS

BudgetBuddy incorporates a lightweight in-app notification system to keep users informed of important actions and events throughout the application. Real-time toast notifications are

triggered via React Hot Toast for key user interactions such as successfully adding transactions, budgets, wallets, or stock holdings, as well as error alerts on failed operations or validation issues. Budget warning indicators notify users when monthly spending approaches or exceeds the set limit, promoting timely financial decisions. The investment module displays mock data warnings when live stock prices are unavailable due to API rate limits, ensuring users are always aware of data accuracy. Stock prices auto-refresh every 60 seconds providing near real-time portfolio updates without requiring any manual action from the user.

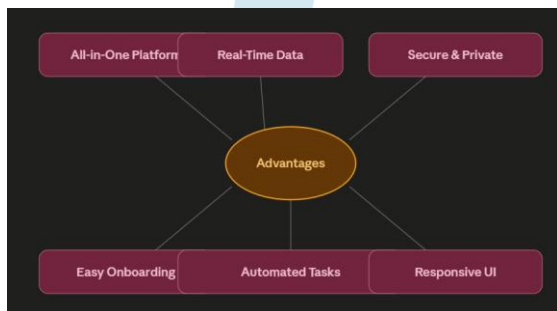


Fig. 3. Advantages Of Budget Buddy

6 . ADVANTAGES

BudgetBuddy offers a unified platform that combines expense tracking, budget management, and real-time stock investment monitoring in a single application, eliminating the need for multiple fragmented tools. Real-time stock data powered by Alpha Vantage API with 60-second auto-refresh ensures users always have up-to-date portfolio and P&L information. Firebase Authentication with token-based middleware guarantees secure and private access to financial data with complete isolation between user accounts. New users benefit from instant onboarding with auto-created default wallets and preset categories, making the app ready to use from the very first login. Recurring transactions are automatically processed daily via a backend cron job, reducing manual effort and improving financial accuracy. The responsive dark-themed UI built with Tailwind CSS delivers a clean, consistent, and accessible experience across both desktop and mobile devices, making personal finance management convenient for everyone.

6.1 Centralized Financial Management

BudgetBuddy provides a unified platform where all personal finance activities including expense tracking, budget planning, multi-wallet management, and real-time stock investment monitoring are managed in one place. This eliminates the need for multiple fragmented financial applications and ensures better visibility and control over an individual's complete financial health. Users can seamlessly switch between managing daily transactions and monitoring their investment portfolio without leaving the platform, making comprehensive financial management accessible and convenient for everyone.

6.2 Transparent Budget Tracking

BudgetBuddy incorporates a structured budget management system where users can set monthly spending limits per category and monitor progress in real time. This ensures all expenses are tracked and categorized accurately, reducing the chances of overspending and improving financial transparency for the user.

6.3 Secure Digital Authentication

BudgetBuddy provides a secure and efficient digital authentication system that simplifies the process of accessing personal financial data while ensuring complete data privacy and reliability. Firebase Authentication handles user registration and login through a secure online interface, eliminating the need for manual credential management. Token-based middleware verifies every request on the backend, ensuring only authenticated users can access their financial records, making the platform safe and trustworthy for managing sensitive financial information.

6.4 REAL TIME ALERTS AND UPDATES

BudgetBuddy provides real-time notifications for important financial activities such as transaction additions, budget limit warnings, and stock price updates. React Hot Toast delivers instant in-app alerts ensuring users are immediately informed of successful operations, errors, or validation issues. The investment module auto-refreshes live stock prices every 60 seconds, keeping portfolio data current without any manual action. Budget progress indicators notify users when monthly spending approaches or exceeds the set limit,

enabling prompt financial decisions and better money management.

6.5 Personalized User Experience

BudgetBuddy provides a personalized and efficient financial management experience that simplifies the process of tracking expenses, managing budgets, and monitoring investments while ensuring data accuracy and reliability. The platform allows users to manage their finances through an intuitive online interface, eliminating the need for manual or paper-based financial tracking methods. By digitizing the entire financial management process, the system reduces errors, saves time, and improves overall efficiency.

The platform is integrated with Firebase Authentication to ensure that only verified users can access their personal financial data. Upon first login, a default wallet and 15 preset income and expense categories are automatically created, providing users with a ready-to-use personalized environment instantly. Each user's data including transactions, budgets, wallets, portfolio, and watchlist is strictly isolated to their own account, ensuring complete privacy and a fully personalized financial management experience tailored to individual needs.

6.6 ROLE- BASED SECURITY AND TRUST

BudgetBuddy implements user-level access control ensuring that each user can only access their own financial data and functionalities. Firebase Authentication verifies every user identity while token-based middleware on the backend restricts access to authenticated requests only. All data including transactions, budgets, wallets, and portfolio holdings is strictly scoped to the authenticated user, preventing any cross-user data access. This enhances security, prevents unauthorized misuse, and builds trust among users in managing their sensitive financial information.

6.7 Scalable and Future-Ready Architecture

BudgetBuddy is built on a scalable cloud-based architecture designed to support a growing number of users and data volume. Its modular separation of frontend, backend, and database layers ensures each component can be independently scaled or optimized. MongoDB's flexible document-based structure, combined with in-memory caching and

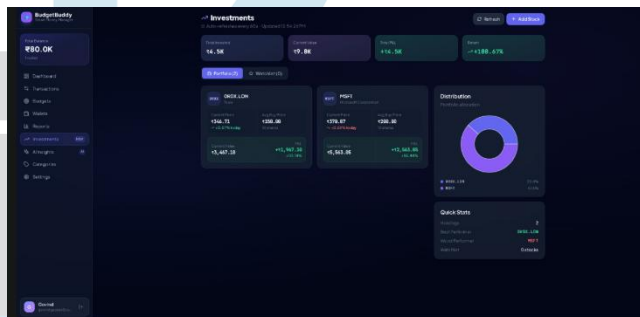
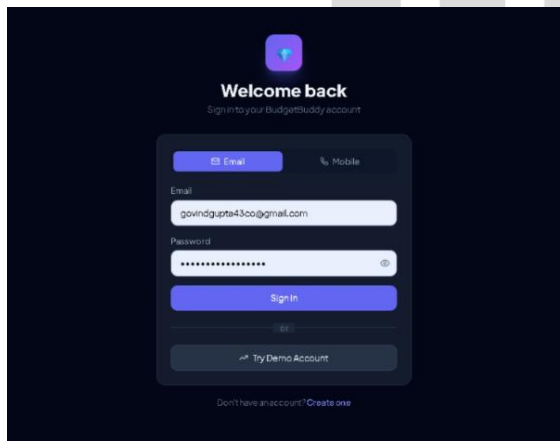
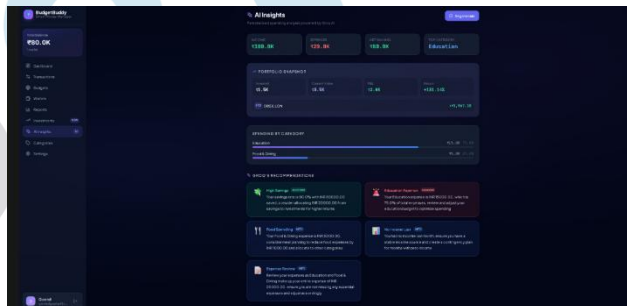
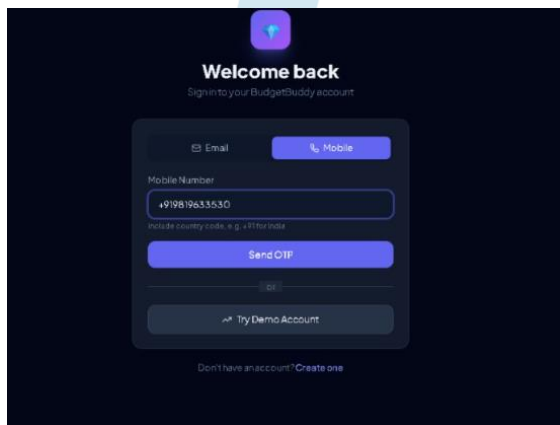
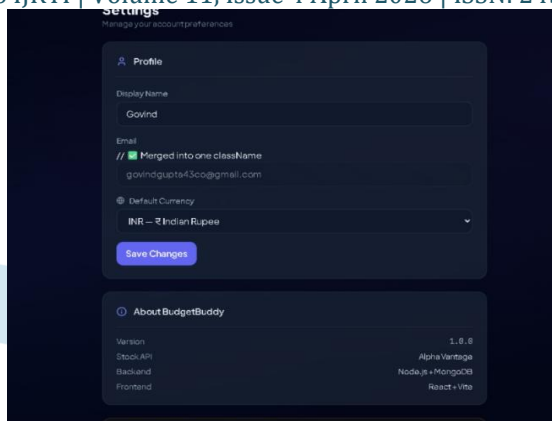
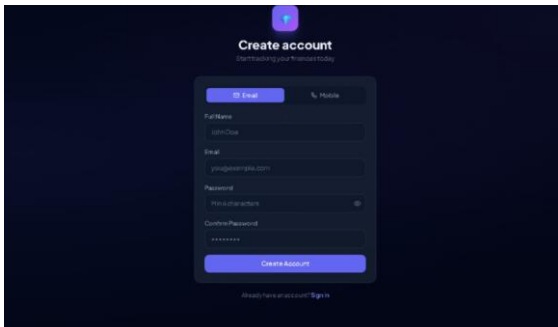
automated cron jobs, ensures consistent performance under increasing load, making BudgetBuddy suitable for large-scale deployment and future feature expansion.

7. FUTURE SCOPE

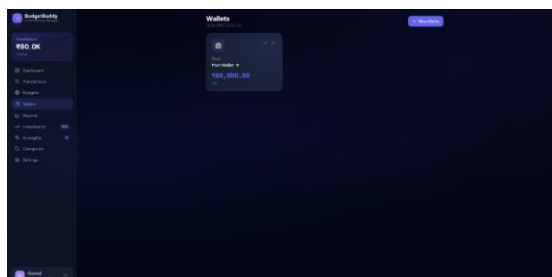
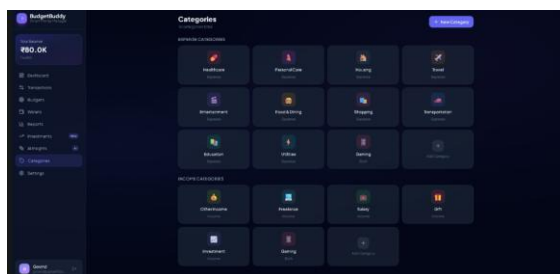
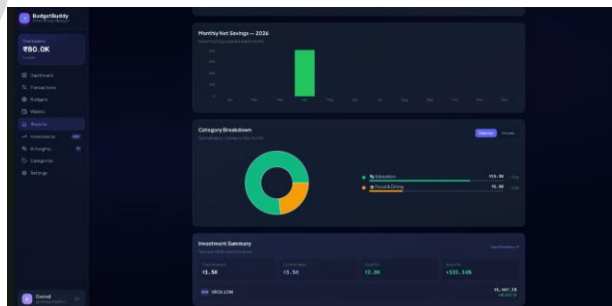
- Integration of **WebSocket-based real-time stock streaming** for instant price updates without polling.
- Addition of **AI-powered financial insights** to provide personalized spending analysis and investment suggestions.
- Implementation of **multi-currency support** for users managing finances across different countries.
- Introduction of **mobile application** using React Native for native iOS and Android experience.
- Integration of **payment gateways** to allow direct fund transfers between wallets within the platform.
- Addition of **tax calculation and reporting** features to assist users during filing season.
- Support for **multiple user roles** such as family accounts enabling shared budget tracking.
- Integration of **bank statement import** via CSV or PDF for automatic transaction population.
- Enhanced **data visualization** with advanced charts for deeper portfolio and spending trend analysis.
- Implementation of **two-factor authentication** for an additional layer of account security.

10. IMAGES OF Budget Buddy

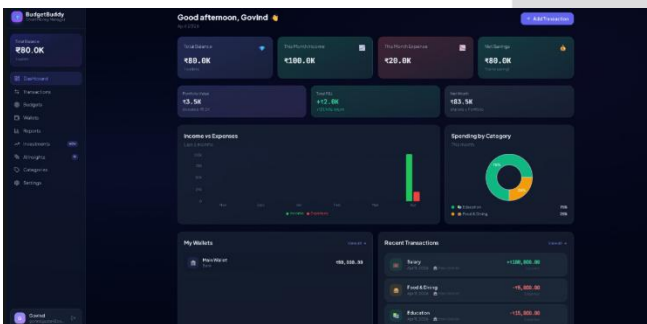
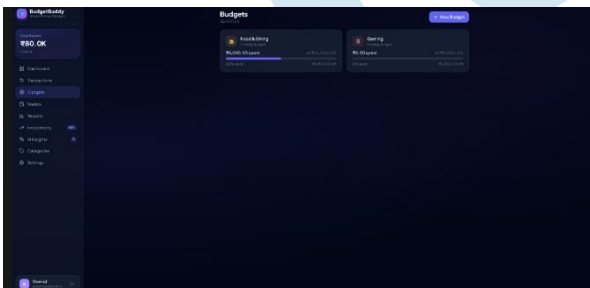
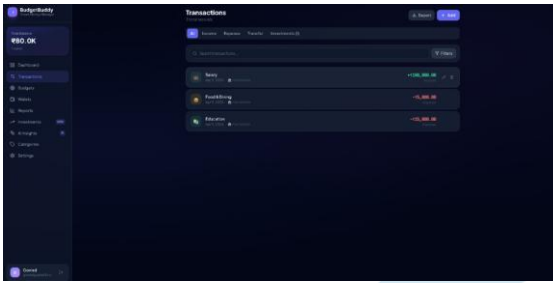
REGISTRATIONS:



Features:



scalable three-tier architecture using React, Node.js, MongoDB, and Firebase Authentication, the application ensures data privacy, real-time performance, and a seamless user experience across all devices. The integration of Alpha Vantage API with intelligent caching, automated recurring transaction processing via cron jobs, and instant in-app notifications collectively deliver a reliable and efficient financial management solution. BudgetBuddy empowers students, young professionals, and retail investors to take complete control of their financial health through a single intuitive platform, laying a strong foundation for future enhancements such as AI-driven insights, mobile applications, and advanced reporting capabilities.



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11. CONCLUSION

BudgetBuddy is a comprehensive hybrid personal finance management application that successfully bridges the gap between everyday expense tracking and real-time investment monitoring. By integrating expense management, budget planning, multi-wallet support, and live stock portfolio tracking into a single unified platform, it addresses the limitations of fragmented financial tools available today. Built on a secure and