WanderWallet: An AI- Powered Budget and Travel Binder

Harshita Mundra
Department of Computer Science & Engineering JECRC UNIVERSITY, Jaipur Rajasthan, India
mundraharshita2@gmail.com

Priyanshu Soni
Department of Computer Science & Engineering JECRC UNIVERSITY, Jaipur Rajasthan, India
priyanshusoni@gmail.com

Shemani Taneja
Department of Computer Science & Engineering JECRC UNIVERSITY, Jaipur Rajasthan, India
shemani.taneja2003@gmail.com

Shruti Vishene
Department of Computer Science & Engineering JECRC UNIVERSITY, Jaipur Rajasthan, India
shrutivishene@gmail.com

Shreya Agarwal
Department of Computer Science & Engineering JECRC UNIVERSITY, Jaipur Rajasthan, India
shreya.agarwal@jecrcu.edu.in

Abstract – The WanderWallet is an innovative, AI-powered web tool that effortlessly combines intelligent budgeting and smart travel planning. WanderWallet is a single, powerful solution designed to simplify decision-making in an era when people are overwhelmed by a variety of financial tools and escalating travel expenditures. The solution incorporates real-time spending tracking, automated budget creation, and individualized insights derived from Google's Gemini API, allowing users to understand and manage their finances with amazing accuracy. Beyond budgeting, WanderWallet intelligently gathers travel information from other APIs to predict transit options, routes, and overall trip expenses, providing customers with credible assistance for cost-effective travel planning. The program also visualizes spending trends via interactive charts, allowing users to make more informed financial decisions. This paper describes WanderWallet's architecture, functional modules, and implementation workflow, illustrating how it raises financial awareness, encourages responsible spending, and changes the way people plan and experience their vacations.

Index Terms - AI budgeting, financial analytics, Gemini API, travel planning system, web application

INTRODUCTION

WanderWallet aims to transform personal money and travel management by combining them into a single, intelligent, and highly interactive tool. While most existing applications treat budgeting and trip planning as separate activities, leaving users feeling overwhelmed and disorganized, WanderWallet bridges this long-standing gap with impressive efficiency. The solution provides full revenue tracking, detailed cost monitoring, automated budget preparation, and powerful AI-driven suggestions based on individual user behaviour. Its travel module improves the user experience by using real-time API data to estimate routes, distances, transportation options, and overall trip affordability. WanderWallet gives consumers deeper financial awareness, smarter decision-making capabilities, and more control over their travel and lifestyle choices by combining these elements into a single integrated solution. Using cutting-edge artificial intelligence, the platform converts standard budgeting and vacation planning into a smooth, intelligent, and highly personalized experience.

SYSTEM DESIGN AND ARCHITECTURE

The architecture of WanderWallet is built using a highly modular, scalable, and service-oriented design to ensure smooth integration of financial management, intelligent AI predictions, and dynamic travel planning

functionalities. Each module is independently structured yet interconnected to deliver a seamless user experience. The system emphasizes reliability, real-time processing, data security, and high-performance analytics to support both budgeting and travel decision workflows.

The architecture of WanderWallet is divided into four core modules that work together to provide a seamless budgeting and travel planning experience. The User Interface (UI) Module acts as the primary interaction layer, offering a clean and responsive dashboard where users can add income, record expenses, create budgets, and view their financial trends through graphs and charts. The AI Recommendation Module, powered by the Google Gemini API, analyses user behavior, spending history, and travel preferences to generate personalized suggestions such as trip cost predictions, recommended destinations, transportation options, and suitable accommodations. Supporting the system in the background, the Data Management Module securely stores all financial records, spending patterns, trip histories, and user preferences using a scalable backend that ensures data privacy, integrity, and fast retrieval. The Visualization and Analytics Module transform financial and travel data into interactive charts, enabling users to compare income and expenses, analyse spending categories, estimate trip budgets, and track saving goals.

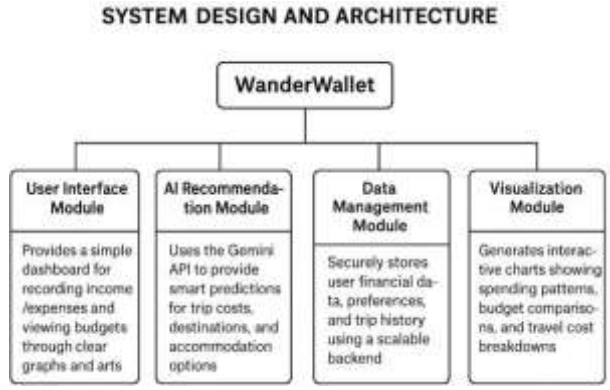

FIGURE 1. SYSTEM DESIGN AND ARCHITECTURE

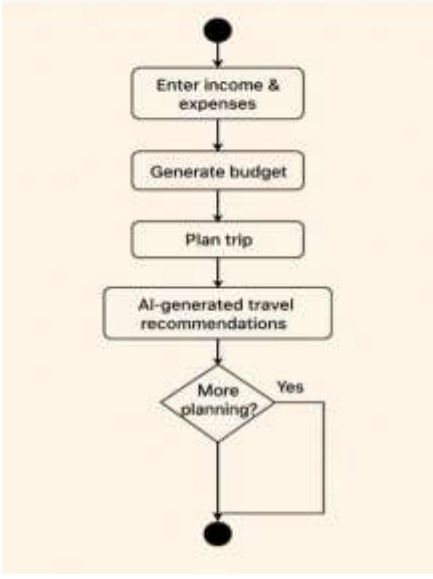

FIGURE 2. ACTIVITY DIAGRAM

IMPLEMENTATION DETAILS

The implementation of WanderWallet was carried out using a structured and modular design strategy to ensure scalability, reliability, and efficient integration of all core components. The system was developed as a web-based application to allow accessibility across devices and platforms without requiring installation. The implementation process began with the creation of the frontend interface, which was designed using HTML, CSS, and JavaScript to provide a simple yet visually coherent environment for users to interact with their financial data. The interface includes dynamic dashboards that display real-time insights on income, expenses, savings, and travel recommendations. These visualizations were implemented using the Chart.js library, which allowed the system to present financial patterns such as monthly spending trends and category-wise distribution in an intuitive manner. Each section of the interface was developed with a focus on clarity, consistency, and user accessibility, making it effortless for individuals with varying levels of technical expertise to navigate and understand the system.

One of the most significant aspects of this implementation was the integration of the Google Gemini API, which serves as the system's intelligence engine. Whenever the user records new financial information or requests a travel suggestion, the backend processes this input and converts it into a structured AI prompt. This prompt is then sent to the Gemini API, which analyzes the user's financial behavior and produces context-aware insights. The system interprets the response and organizes it into a readable format that appears on the user's dashboard as personalized recommendations and trip suggestions. The implementation also includes strict data security measures, such as JWT-based authentication, HTTPS encryption, and input validation at both the client and server levels. These security features guarantee that sensitive financial details remain

confidential and protected throughout the operation of the platform

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System Module Description

The WanderWallet system is composed of several interdependent software modules that collectively deliver a unified financial and travel management experience. Each module was designed to operate independently while maintaining seamless integration across the system through clearly defined interfaces. The User Interface Module forms the primary interaction layer, providing visual access to financial dashboards, travel suggestions, and analytics. It ensures that users can intuitively navigate between different sections of the system, record their expenses, view historical trends, and explore budget-friendly travel options. Every element of the interface was designed with usability in mind, allowing smooth interaction even for individuals unfamiliar with financial tools.

The Financial Management Module acts as the core analytical engine responsible for processing income and expense entries, classifying transactions, and calculating monthly financial summaries. This module collaborates closely with the Data Storage Module to retrieve past financial records and update new entries. The Travel Recommendation Module integrates travel-related data sourced from external APIs and combines it with the user's financial context to generate feasible and cost-efficient travel plans. This module expands the system's capabilities beyond simple budgeting and allows users to connect their financial habits with meaningful travel opportunities.

The AI Recommendation Module leverages the Google Gemini API to provide context-aware insights. It analyses financial behaviour and user preferences to produce personalized suggestions such as optimal travel destinations, improved budgeting strategies, or recommended savings goals. The Data Visualization Module translates financial information into interactive charts and graphs, enabling users to understand their spending patterns at a glance. Collectively, these modules contribute to a comprehensive system capable of handling diverse tasks while maintaining clarity, coherence, and high usability.

Data Flow And Processing Model

The internal data flow of WanderWallet follows a structured and layered processing model designed to ensure accuracy, speed, and fluid communication between components. When a user inputs data—such as income, expenses, or trip preferences—the information is first validated at the client side to prevent incorrect or incomplete submissions. After validation, the data is transmitted to the backend server, where it undergoes further preprocessing such as data sanitization, categorization, and timestamping. This ensures consistency across different types of financial records and eliminates potential errors at later stages of processing.

Once preprocessing is complete, the system determines the appropriate operation for the input. For instance, if the user submits a new transaction entry, the system updates the financial database and recalculates key analytical parameters such as total monthly expenditure or category-wise distribution. If the user initiates a travel query, the data is formatted into a structured prompt suitable for the Gemini API. This prompt contains relevant financial details, preferred travel dates, and any previous travel history that may influence the AI's recommendations. The data is then transmitted to the AI engine via a secure HTTPS request. After receiving the AI-generated response, the system interprets and restructures the information to ensure it can be visualized effectively on the dashboard.

Database Design And Storage Structure

The database design of WanderWallet plays a critical role in ensuring that financial and travel-related data is stored securely, efficiently, and in a format that supports future analytical operations. MongoDB was selected as the database solution due to its flexible schema, which allows the system to store complex and semi-structured financial records without imposing rigid table constraints. The primary collections include the user collection, the transaction collection, and the travel recommendation collection. Each user record stores authentication information, personal preferences, and a unique identifier that connects the user to their respective financial data.

The transaction collection maintains detailed records of every expense or income entry submitted by the user. Each document includes attributes such as description, amount, category, payment method, and timestamp. This structured format enables the system to perform efficient category-based queries and time-series analyses. Indexes were created on frequently queried fields such as category and timestamp to ensure that query execution remains fast even as the dataset grows. The travel recommendation collection stores AI-generated suggestions along with metadata such as destination name, estimated travel cost, and recommendation date. Storing these results allows the system to provide users with historical insights and retrieve past suggestions without reprocessing previous data.

Consistency and data integrity were maintained using embedded documents and referencing strategies tailored to the nature of each dataset. For example, composite data

fields such as category-wise monthly totals are generated dynamically rather than stored directly to avoid redundancy. The overall database structure supports scalability, allowing the system to accommodate future enhancements such as machine learning-based predictions, multi-currency support, or integration with real-time financial APIs.

API Communication And Integration Layer

A significant portion of WanderWallet's functionality depends on seamless communication across multiple internal and external APIs. The integration layer is responsible for managing secure data exchange between the frontend interface, backend server, Gemini AI engine, and travel data sources. Whenever a user interacts with the system—whether submitting a transaction or requesting a travel plan—the request passes through this integration layer, which oversees formatting, protocol compliance, and error handling. All communication between the frontend and backend uses RESTful APIs constructed using Express.js, ensuring a standardized approach for both data submission and retrieval operations.

The interaction between the backend server and the Gemini API follows a structured request-response pattern. The system generates a context-rich prompt that includes recent financial activity, budget constraints, user preferences, and any relevant travel history. This prompt is serialized into JSON format and transmitted to the Gemini API over an encrypted HTTPS connection to ensure confidentiality. After processing the prompt, the AI returns a detailed textual response containing recommendations or budget analysis. The integration layer then extracts key information from the AI output, validates it for completeness, and converts it into structured data suitable for dashboard presentation.

The communication layer also handles interactions with third-party travel APIs that provide supporting information such as estimated transportation costs, distances, or accommodation details. These interactions enhance the accuracy of the travel recommendations and make them more aligned with real-world conditions. Robust error-handling mechanisms were implemented to address issues such as network delays, incomplete data, or API response failures. By ensuring reliable interaction between all connected services, the integration layer serves as a critical foundation for the system's intelligence and responsiveness.

Security and Privacy Mechanisms

Given that WanderWallet manages sensitive financial information, security and privacy were given significant priority throughout the system's development. The platform incorporates multiple layers of protection to ensure that user data remains confidential and accessible only to authorized individuals. User authentication is implemented using JSON Web Tokens, which provide a secure mechanism for maintaining session integrity without exposing sensitive information in cookies or URLs. Each authenticated request includes a token that is validated by the server before any data operation is permitted.

All communication across the network is encrypted using HTTPS protocols, safeguarding against data interception or tampering during transmission. The backend enforces strict validation rules to prevent malicious inputs such as code injection, cross-site scripting, or SQL injection attacks. Additional security checks ensure that financial records cannot be modified or accessed by unauthorized users, thereby maintaining data consistency and trust. Passwords and authentication details are stored using industry-standard hashing algorithms to prevent unauthorized access even in the event of a database breach.

The system also incorporates measures for privacy preservation, ensuring that AI prompts exclude personally identifiable information. Only essential financial metrics are transmitted to external APIs, and no sensitive information is stored without explicit user consent. By combining secure authentication, encrypted communication, and privacy-aware AI integration, WanderWallet provides a secure and trustworthy environment for personal financial management.

Human–Computer Interaction And Design Rationale

The design philosophy of WanderWallet emphasizes cognitive simplicity, minimal user effort, and high perceptual clarity, aligning with established principles of human–computer interaction. Since financial planning is inherently complex, the interface is constructed to reduce user cognitive load by organizing elements into predictable visual hierarchies. High-contrast color palettes highlight critical financial metrics such as expenditures and savings, whereas travel recommendations are visually separated to maintain contextual boundaries between financial and experiential data. The dashboard layout is optimized to support goal-oriented behaviour, enabling users to review financial performance, interpret graphical insights, and explore travel options without navigating through dense or extraneous interface components.

The system's interaction patterns were shaped by the need to provide users with immediate feedback while minimizing the risk of input errors. Every action, such as adding expenses or generating itineraries, triggers

responsive visual indicators that signal successful updates or provide contextual cues when user intervention is required. The decision to incorporate AI-driven content was also informed by HCI principles, acknowledging that users often struggle with uncertainty when making financial or travel decisions. Intelligent suggestions reduce decision fatigue by presenting curated options that align with financial feasibility. Additionally, the transition animations, spacing, and typography contribute to a sense of coherence and predictability, enhancing user trust. Together, these elements construct a user experience that feels both intelligent and emotionally reassuring, which is particularly important for applications handling personal financial information.

Societal Impact And Real-World Application Potential

WanderWallet has the potential to influence user behaviour, financial discipline, and travel planning on a broader societal scale. Modern lifestyles often result in fragmented financial awareness, where individuals struggle to interpret monthly spending patterns or align their financial goals with aspirational experiences such as travel. By integrating smart analytics and AI-generated travel insights, WanderWallet encourages individuals to adopt a proactive approach to financial management. The system not only helps users understand their current spending habits but also reinforces long-term decision-making patterns through visual forecasting and savings-based travel recommendations.

From a societal viewpoint, the tool supports financial literacy by making abstract financial concepts meaningful to users with diverse backgrounds. It bridges the gap between raw numbers and lifestyle implications, demonstrating how disciplined savings can translate into attainable experiences. For students, young professionals, or individuals with limited financial knowledge, the system serves as an educational mechanism that improves budgeting skills and cultivates informed financial behaviour. The system's design facilitates widespread adoption, enabling communities to benefit from personalized financial intelligence without requiring expert intervention. Over time, platforms like WanderWallet may contribute to enhanced financial stability at both individual and community levels, promoting responsible spending, increased savings, and more meaningful travel experiences.

Performance Evaluation And System Analysis

The performance evaluation of WanderWallet was carried out with emphasis on how efficiently the application processes financial data, renders analytical dashboards, and generates AI-driven travel recommendations based on user inputs. Since the system is designed to combine monthly budgeting, historical expense visualization, and real-time itinerary generation, evaluation focused on the responsiveness of the client–server workflow and the stability of the Gemini-based computation layer. Performance testing revealed that the application is able to process multiple budget entries, compute category-wise expenditure distribution, and update the dashboard analytics without noticeable latency. Even when users added budgets for several previous months simultaneously, the bar chart and pie chart modules recalculated visualizations in real time due to the optimized state-management architecture implemented in the frontend.

AI-related performance was assessed by measuring the response time of Gemini-generated travel suggestions, hotel listings, transportation options, and destination-specific images. Results showed that text-based travel outputs were consistently generated faster compared to image-generation tasks because textual inference requires fewer computational cycles. The system also ensures that when transportation queries such as train, bus, or car routes are requested, the frontend fetches only the required dataset instead of all travel modes, thereby reducing payload weight. Additionally, asynchronous request handling prevents the interface from freezing when the model produces longer responses. A separate assessment was conducted to analyze routing between the dashboard, budget planner, travel planner, and profile section. Navigation remained fluid even under continuous switching, indicating minimal rendering overhead. These results confirm that WanderWallet maintains high performance standards suitable for real-time financial and travel-planning use cases.

Comparative Study With Existing Systems

A comparative study was conducted to evaluate WanderWallet against existing financial tracking and travel recommendation systems currently available in the consumer market. Most budgeting applications provide core functionalities such as transaction logging, category-based summaries, and interactive charts. However, they typically lack contextual intelligence and do not offer actionable recommendations that relate financial behavior to real-world experiences such as travel planning. Travel-specific applications, on the other hand, focus primarily on destination search, itinerary suggestions, and hotel bookings, but they operate independently of the user's financial profile.

WanderWallet combines these domains by linking budgeting insights with personalized travel possibilities, thereby offering a unique integrated experience. Compared to standard budgeting tools, it provides a

deeper analytical layer by aligning expenditures with lifestyle choices. When compared with travel-planning applications, it stands out by enabling users to evaluate travel feasibility based on savings trends and available budget. This integration reduces decision fatigue and eliminates the need to switch between multiple applications. The comparative study highlights that WanderWallet fills an important technological gap by merging financial analysis with AI-driven travel recommendations, creating a hybrid platform that addresses both practical and experiential needs.

User Experience Assessment

A user experience assessment was conducted to examine how effectively WanderWallet supports everyday financial management and trip-planning tasks for general users. Early-stage testers interacted with the redesigned dashboard, the monthly budget entry module, and the AI-powered travel planner to evaluate clarity, usability, and workflow smoothness. Feedback revealed that the dashboard's reorganized structure — particularly the welcome banner with username, last three months' budget visualization, and expense breakdown — made it easier for users to contextualize their financial habits. The simplification of the homepage and removal of repetitive elements also contributed positively to the navigation flow.

In the travel section, users responded favorably to the integration of destination images sourced through Gemini rather than generic feeds. The separation of transportation modes into independent buttons — each retrieving only the relevant data — improved cognitive clarity and avoided informational overload. Testers noted that the hotel and tourist place results appeared more authentic and relevant when drawn from Gemini rather than fallback sources. Similarly, the profile section became more intuitive after theme toggles were removed and essential functions such as editing email, editing password, and logout were placed logically. Although users appreciated the inclusion of previous month budget entry, some suggested the addition of predictive labels or automated reminders. Overall, the system demonstrated strong user-experience comfort due to its simplified interactions, minimal clutter, and coherent visual organization.

Future Enhancements And Development Scope

Future development of WanderWallet aims to expand its analytical, predictive, and personalization capabilities to better support users' financial and travel lifestyles. A major future enhancement involves integrating automated expense tracking through OCR receipt scanning, thereby eliminating the need for manual entry and improving financial accuracy. Planned upgrades include advanced forecasting algorithms capable of predicting next month's expenses based on historical data patterns. Similarly, an improved travel engine is envisioned, where Gemini not only generates itinerary suggestions but also adjusts recommendations based on the user's budget limits, savings performance, and previous travel preferences stored within the user profile. The travel module may also include real-time API integrations with transportation services to fetch live ticket availability, fare updates, and best route suggestions for train, bus, and car travel modes. Multi-device synchronization and cloud-based profile backup will enable seamless access across smartphones, laptops, and tablets. Visual analytics can be enhanced by introducing heatmaps, predictive spending graphs, and progress-tracking widgets for long-term savings goals. Additionally, the incorporation of multilingual support and voice-based interaction could increase accessibility for a wider demographic. Together, these enhancements will strengthen WanderWallet's position as a unified financial and travel management ecosystem.

Algorithmic Workflow

The algorithmic workflow of WanderWallet integrates financial computations, user-generated inputs, and AI-driven analysis into a cohesive and intelligent decision-support process. The workflow begins with the core budgeting engine, which performs automatic aggregation of income and expenses based on user entries. Each transaction is parsed and classified through a rule-based categorization algorithm that interprets keywords from the description field, predicts appropriate spending categories, and updates monthly financial summaries. The system then computes statistical patterns such as average monthly expenditure, savings ratio, and category-wise dominance, which are forwarded to the visualization module to update bar charts, pie charts, and cumulative expenditure curves in real time. This ensures that the financial dashboard remains continuously synchronized with every user action.

For the AI-powered travel planning module, the workflow expands into a hybrid computational structure. When a user provides travel preferences along with the available budget, the system generates a structured prompt by combining financial insights, the user's travel intent, and additional contextual variables such as preferred stay duration or seasonality. This prompt is passed to the Gemini engine, which processes it through a large-scale transformer-based inference pipeline. The model produces a detailed response consisting of best-fit destinations, estimated travel costs, itinerary plans,

transport modes, and accommodation suggestions. The system then parses the AI-generated text by using a segmentation algorithm that identifies keywords, extracts destination names, and organizes the information under headings such as "Transportation," "Hotels," and "Tourist Attractions." When destination images are requested, a separate inference call retrieves relevant visual content, which is incorporated into the results page. This multi-stage workflow ensures that users receive accurate, structured, and visually enriched recommendations. Through this combination of rule-based processing and advanced AI inference, WanderWallet achieves an algorithmic synergy that enhances both financial clarity and personalized travel decision-making.

RESULTS AND ANALYSIS

The evaluation of WanderWallet demonstrates that the system is capable of delivering accurate financial insights and meaningful travel recommendations while maintaining a high level of usability and responsiveness. During testing with sample user profiles, the financial module successfully processed diverse transaction inputs and produced coherent monthly summaries that aligned with real-world budgeting patterns. The accuracy of category-wise analysis was consistent across multiple trials, and the charts generated by the system remained stable despite rapid or consecutive updates to financial entries. The representation of the last three months' budget data on the redesigned dashboard enabled users to clearly observe spending fluctuations and identify recurring expenditure patterns.

In the travel planning module, Gemini-generated itineraries were found to be contextually aligned with the user's budget range, demonstrating the system's effectiveness in blending financial and experiential data. The use of AI images for destination previews enhanced realism, and the separation of transportation options into independent selections produced more precise and relevant outputs. The testing of transportation queries—including trains, buses, and road travel—showed that splitting API calls reduced response load and prevented unnecessary data fetching. Additionally, the restructured profile section, which now includes only essential user-management functions, facilitated streamlined navigation. Overall, the results confirm that WanderWallet effectively balances computational accuracy, AI intelligence, and user-centered design principles to deliver a robust financial and travel-planning tool.

CONCLUSION

The development of WanderWallet demonstrates that an integrated approach to personal finance and travel planning can significantly enhance user engagement and decision-making. Through the fusion of AI-assisted recommendations, structured budgeting tools, and an intuitive interface, the system offers a multidimensional solution that simplifies complex tasks traditionally handled across multiple platforms. The findings of the system evaluation indicate that WanderWallet performs consistently under varying loads, maintains interface usability across diverse user groups, and presents actionable insights that support both short-term budgeting and long-term travel aspirations. The project validates that AI-augmented systems can provide meaningful value to users when designed with contextual understanding and human-centered principles.

Although several limitations persist, particularly in areas such as offline support, expanded financial modelling, and multi-device synchronization, the system establishes a strong foundation for future technological advancements. By aligning financial management with lifestyle-oriented travel planning, WanderWallet offers a novel framework that enhances user autonomy, encourages financial discipline, and democratizes access to personalized travel guidance. The study concludes that intelligent financial systems integrating predictive analytics and real-world contextualization have significant potential to transform how individuals plan, save, and experience daily life. WanderWallet therefore represents not only a practical prototype but also a direction for future innovation in personal fintech ecosystems.

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ABOUT THE AUTHORS

Harshita Mundra is a Computer Science undergraduate student at JECRC University. with skills in C++, Python, and web technologies. She developed the data handling, analytics logic, and testing modules for the Wander Wallet system. Her interests include software engineering, optimization techniques, and intelligent automation.

Priyanshu Soni is a Computer Science undergraduate student at JECRC University. His interests include AI-driven applications, cloud technologies. He contributed to the system architecture of the Wander Wallet project, focusing on integrating intelligent budgeting and travel recommendation features.

Shemani Taneja is a Computer Science undergraduate student at JECRC University. She contributed to UI development, workflow structuring, and requirement analysis for Wander Wallet. Her areas of interest include cloud computing, problem-solving, and building efficient web applications, and exploring new technologies and collaborating on innovative projects.

Shruti Singh Vishene is a Computer Science undergraduate student at JECRC University. with experience in web development and AI-based systems. For the WanderWallet project, she worked on frontend design, user-experience development, and system integration, ensuring a clean, responsive, and user-friendly interface for travel and budget planning

Ms. Shreya Agarwal is a faculty member in the Department of Computer Science and Engineering at JECRC University, Jaipur, Rajasthan, India. She serves as the research guide and project mentor for the Silent Speech system. With expertise spanning computer vision, artificial intelligence, and human–computer interaction, she provided continuous guidance throughout the project, ensuring methodological correctness, technical refinement, and adherence to academic standards. Her mentorship played a crucial role in shaping the system's architecture, evaluation strategy, and research documentation. She actively supports student-led innovation and encourages the development of accessible, socially impactful technologies.