

**Bon Voyage**

**AI-Powered Travel Recommendation Platform**

Course Code & Name: CSC301 - Seminar

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Date: 24/04/2025

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**Abstract**

Bon Voyage is an AI-assisted travel recommendation platform designed to simplify the trip planning process by providing a centralized and intelligent interface. The platform addresses the challenges travellers face when using multiple applications by combining AI-driven logic, real-time APIs, and a user-friendly frontend. Users input preferences such as destination type, climate, budget, and travel duration, and the system generates personalized suggestions tailored to their needs.

Key features include live flight pricing via the **Skyscanner API**, real-time currency exchange data, and an interactive **global heatmap** for visualizing weather conditions worldwide. These features empower users to make informed decisions about their travel destinations and budget management.

The platform is built using a full-stack architecture with **React.js** for the frontend, **Node.js** and **Express.js** for the backend, and **Prisma ORM** with a **PostgreSQL** database for efficient data management. This robust tech stack ensures scalability, modularity, and a seamless user experience.

Bon Voyage represents the future of AI-driven travel planning, combining cutting-edge technology with user-centered design to create a personalized and efficient journey planning experience.

**Introduction**

In today’s increasingly interconnected world, travel has become an essential part of personal and professional life. Whether for business, leisure, or education, individuals rely on travel for growth and exploration. However, the sheer number of digital tools available—ranging from flight booking websites and weather apps to itinerary planners and exchange rate calculators—can overwhelm users, particularly those seeking quick, customized, and budget-conscious travel solutions.

**Bon Voyage** was conceived to address this challenge by providing a single platform that consolidates key aspects of travel planning into an AI-powered interface. Rather than requiring users to navigate multiple apps or services, Bon Voyage allows them to input their preferences and receive personalized, context-aware travel recommendations. The platform integrates essential features such as weather heatmaps, live flight pricing, and real-time currency conversion within a responsive, modular web application, empowering users to make informed decisions quickly and efficiently.

This project reflects broader trends in digital transformation, including the rise of AI in consumer applications, the growing demand for responsive and mobile-first design, and the increasing need for real-time data access across global services. **Bon Voyage** aims to bridge the gap between abstract travel desires and actionable, concrete travel plans, offering a seamless, user-friendly experience for modern travelers.

**Related Work**

To understand the landscape in which **Bon Voyage** operates, it’s important to assess current travel planning solutions. Several platforms address parts of the trip planning process but fall short in providing a comprehensive solution. Below is a comparison:

* **TripHobo**: Known for itinerary creation, but lacks real-time updates like budget changes, currency fluctuations, or last-minute flight availability. Recommendations are static.
* **Google Travel**: Organizes trips based on email receipts, but lacks AI-based preference matching, weather filtering, and budget-driven destination ranking.
* **Hopper**: Focuses on price predictions for flights and accommodations, but doesn't offer full trip planning tools like currency converters or climate-based suggestions.
* **Rome2Rio**: Specializes in travel route mapping but lacks features for budgeting, personalization, or weather adaptation.

**Bon Voyage’s Key Differentiators:**

* Personalized AI-driven Recommendations: Combines user-defined preferences with intelligent algorithms to suggest and rank destinations based on climate, budget, and travel duration.
* Real-time Updates: Provides live updates for multiple parameters, including weather conditions, flight prices, and currency exchange rates, offering a dynamic travel planning experience.
* Interactive and Seamless UI: Features an interactive and user-friendly interface designed to simplify travel research and decision-making, making it accessible even for novice travellers.
* Modular and Extensible Architecture: Bon Voyage is designed with scalability in mind, allowing future integrations such as hotel booking systems, local experience recommendations, and more.

**Tech Stack**

**Frontend**

* React.js: A component-based JavaScript library used to build dynamic, reusable UI components, improving code clarity and development speed.
* Tailwind CSS: A utility-first CSS framework for rapid UI development, ensuring consistent and responsive designs across all devices.
* React Router: Enables smooth, single-page navigation without full page reloads, improving the user experience.
* Vite: A fast build tool for React that enhances development with fast hot module replacement (HMR) and optimized build speeds.

**Backend**

* Node.js: A non-blocking, event-driven JavaScript runtime, ideal for handling multiple simultaneous API requests.
* Express.js: A minimal web framework for routing and middleware, making it easy to create RESTful APIs.

**Database and ORM**

* PostgreSQL: A robust, open-source relational database for storing structured data like user preferences and travel logs.
* Prisma ORM: An ORM that simplifies database interactions with type safety and automatic migrations, improving security and efficiency.

**Authentication**

* JWT (JSON Web Tokens): A stateless, token-based authentication system that securely handles user sessions. It stores user information in a compact token, eliminating the need for server-side session storage.

**API Integrations**

* Skyscanner API: Provides real-time flight data, including prices, availability, and airlines.
* ExchangeRate API: Converts currencies based on live exchange rates, helping users plan their budget effectively.
* OpenWeatherMap API with Leaflet.js: Displays global weather data on an interactive map, helping users choose destinations based on climate.

**Development Tools**

* Axios: Axios is a promise-based HTTP client for JavaScript that simplifies making asynchronous requests to both internal endpoints and third-party APIs. It supports features like request/response interception, error handling, and request cancellation, making it ideal for interacting with RESTful APIs.
* dotenv: Dotenv is a module that loads environment variables from a .env file into process.env. This is essential for securely storing sensitive data, such as API keys and database credentials, so they aren’t hardcoded in the application code.
* Vercel: Vercel is a cloud platform for frontend deployment, offering features like automatic continuous integration and deployment (CI/CD), global content delivery (CDN), and zero-downtime updates. Vercel’s serverless architecture helps deploy modern applications at scale, providing a smooth experience for developers and users alike.
* Render: Render is a platform for deploying backend services and serverless functions. It offers a managed environment for hosting and running web applications, APIs, and databases. Render simplifies the process of deployment, monitoring, and scaling applications without worrying about infrastructure management.

**Implementation**

**1 User Authentication and Session Control**

Bon Voyage uses JWT (JSON Web Tokens) for secure, stateless user authentication. Upon registration or login, the server generates a signed token and returns it to the client, where it is stored securely in local storage or a secure cookie.  
Backend middleware validates this token on protected routes to ensure only authenticated users can access features like AI-generated recommendations or saved preferences. Unauthenticated users trying to access these features are redirected to the login page with an alert message.

**2 User Interface Design and Navigation**

The frontend is built with React.js and styled using Tailwind CSS, enabling a modular and responsive user interface across all devices.

* Navigation Bar: A persistent navbar is present on all pages. It includes links to Home, About, Blog, Flights, Login/Register, and Logout (visible conditionally).  
  The Home button lets users return to the main landing page from anywhere in the app.
* Home Page: This is the default landing page upon opening the website. It displays:
  + Global Weather Heatmap
  + Live Currency Converter
  + AI Travel Recommendation form (only visible *after login*).

If an unauthenticated user tries to interact with the AI planner, a message is displayed:  
*“Please log in to use the AI-powered planner.”*

* About Page: A static informational page explaining:
  + The mission and vision of Bon Voyage
  + Why Bon Voyage is unique (AI integration, user-centric features, real-time data, etc.)
  + How it simplifies trip planning into one seamless platform
* Blog Page: Dynamically rendered blog entries appear as cards with images and a short description below each. It showcases:
  + Travel guides
  + Tips for safe travel
  + Destination highlights  
    Content is organized to help users explore ideas before planning a trip.
* Flights Page: Allows users to:
  + Enter origin and destination cities
  + View real-time flight options, costs, durations, and airlines using the Skyscanner API  
    Pagination ensures a clean UI for search results.

**3 AI Recommendation Engine**

The AI Recommendation Engine is a key feature of Bon Voyage, providing personalized travel recommendations based on user preferences. This module is activated after successful login to ensure privacy and a tailored experience.

User Input Form

On the Home page (once logged in), users fill out a form with the following fields:

* Preferred Climate: (e.g., tropical, cold, moderate)
* Budget: Range slider for setting the spending limit
* Destination Type: (e.g., urban, cultural, adventure, coastal)
* Trip Duration: Number of days (input field)

These preferences are validated both on the frontend (React.js) and backend (Express.js) to ensure correct data input.

Processing Logic

After the user submits their preferences, the backend processes the data:

* Matches it against a curated dataset of travel destinations.
* Uses rule-based logic and the Gemini API for personalized results, considering factors like climate, budget, and destination type.
* The matching destinations are scored based on the weighted importance of each parameter (e.g., prioritizing climate over budget).

Personalized Results Page

Once the recommendation is processed, the user is redirected to the /recommendations page. The page features a clean, minimalist layout to present the results clearly.

Page Layout:

* Left Panel:
  + Displays a recap of the user’s input preferences, such as:
    - Climate: *Cold*
    - Budget: *Under $1000*
    - Destination Type: *Cultural*
    - Duration: *7 Days*
  + This helps the user recall the factors that influenced their travel recommendation.
* Right Panel:
  + Recommended Destination: Displays the city and country name (e.g., *Prague, Czech Republic*)
  + Below this, a list of top places to visit in the destination city, displayed as plain text or in a simple list format. This list includes:
    - Prague Castle
    - Charles Bridge
    - Old Town Square
  + The destinations are listed without images, focusing purely on the location names for a straightforward, text-based presentation.

UI Highlights:

* The page layout is designed using Tailwind CSS, ensuring responsive design for both desktop and mobile screens.
* The recommendations page only appears after the user logs in, with an automatic redirect to the page after successful authentication.
* The top places to visit are presented simply and efficiently, allowing users to easily explore without distractions.

**4 Weather Heatmap Visualization**

An interactive map using Leaflet.js displays real-time weather data globally.

* Colored gradients show regional temperatures
* Tooltips show the temperature and region
* A legend explains the heatmap color range
* Data is refreshed hourly from the OpenWeatherMap API

This module helps users visually identify regions matching their weather preferences.

**5 Currency Exchange Module**

* The currency converter allows users to select any two currencies and convert a custom amount from one to the other.
* The backend communicates with the ExchangeRate API to fetch live conversion rates and calculates the result based on the entered amount. Short-term caching is implemented to reduce redundant API calls and enhance performance.

**6 Flight Price Integration**

The Flights page pulls real-time results from the Skyscanner API.  
Users can:

* Search for flights between any two cities
* See results with airline name, price, travel duration, and timings  
  The system handles edge cases like no results or API delays with fallback messages and loading states for a smooth UX.

**7 Hosting and Deployment**

* Frontend: Deployed via Vercel, offering automatic deployment from GitHub, fast CDN delivery, and HTTPS by default.
* Backend: Deployed separately using Render, handling REST API logic, database queries, and API integrations.
* Environment Variables are securely stored in .env files and never exposed in the client.

**Results**

The Bon Voyage platform successfully delivers a user-friendly and efficient travel planning experience. Here are the key outcomes:

1. AI Recommendation Engine
   * Personalized Suggestions: Provides tailored destination recommendations based on user preferences like climate, budget, and duration.
   * User Experience: Clear, intuitive interface with easy navigation enhances overall user satisfaction.
2. Weather Heatmap Visualization
   * Interactive Map: Global temperature data is visualized with color-coded markers, helping users assess climates for potential destinations.
   * Legend: The accompanying legend simplifies understanding of the temperature data.
3. Currency Conversion Module
   * Real-Time Conversions: Accurate exchange rates simplify currency management for international travel.
   * User Feedback: Caching improves performance, and users find it convenient for quick conversions.
4. Flight Search Integration
   * Flight Information: Provides essential flight details such as prices, timings, and airlines directly on the platform.
   * User Experience: Smooth functionality with room for more filtering options to improve precision.
5. Overall Performance
   * Scalability & Responsiveness: The platform ensures smooth performance and responsive design across devices.
   * Real-Time Updates: Weather and currency data are updated in real time for accurate information.

**Conclusions**

Bon Voyage successfully addresses the complex challenges of travel planning by integrating AI-driven recommendations, real-time data, and an intuitive user interface. By combining personalized destination suggestions, live flight pricing, real-time currency conversion, and weather visualization, the platform streamlines the trip planning process, offering users a one-stop solution for their travel needs.

The implementation of robust technologies like React.js, Node.js, and PostgreSQL ensures that the system is scalable, responsive, and secure, providing a seamless experience across devices. The modular design allows for future enhancements, such as hotel booking or additional destination filtering options, making Bon Voyage a flexible and evolving platform.

While the core features perform as intended, there are areas for future improvement. These include:

* Enhanced AI Logic: Future versions of the AI engine could incorporate machine learning for deeper personalization, learning from user preferences and behavior to provide even more accurate recommendations.
* Flight Price Alerts: Introducing an alert system for fluctuating flight prices would further enhance user experience by notifying users when the best deals are available.
* User Reviews and Ratings: Adding user-generated content, such as reviews for destinations, activities, and accommodations, would increase trust and provide valuable insights for future travelers.
* Hotel and Local Experience Integration: Expanding the platform to include hotel bookings, local experiences, and activity recommendations would make it an even more comprehensive travel planning tool.

Despite these opportunities for growth, Bon Voyage marks a significant step toward simplifying and enhancing the travel planning journey for users worldwide.

**References**

The following resources and documentation were referred to during the development of the Bon Voyage platform:

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