MS Project End-Semester Progress Report

PersonaGenius - Smart Clustering for Persona Development

Student's Name: Munnazzah Aslam
ERP: 27229

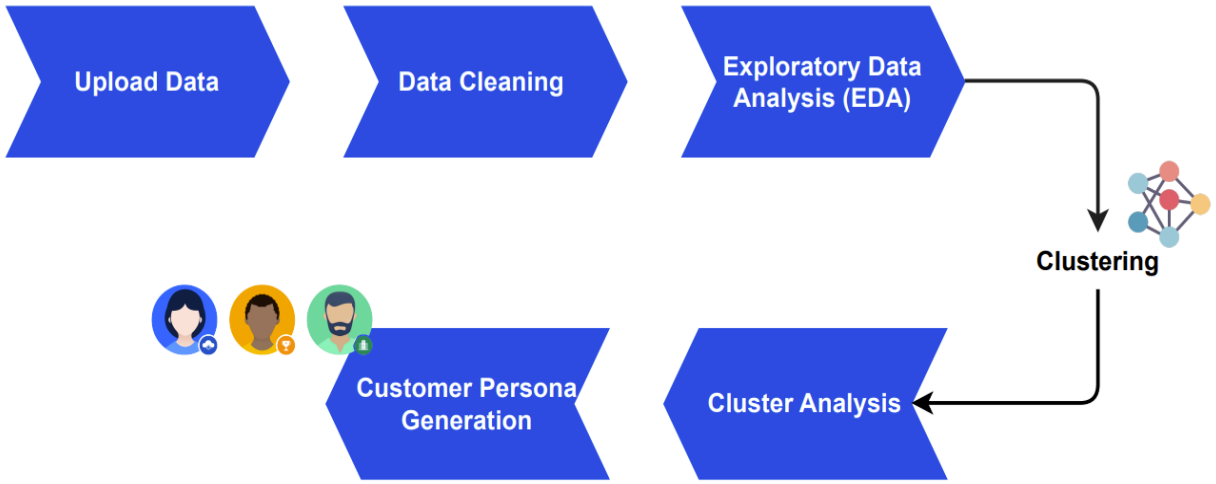
Supervisor's Name: Dr. Tariq Mehmood
(Digital) Signature of Supervisor:
Date: June 15, 2024

Introduction:

Customer segmentation is central to effective marketing strategies, but conventional methods often fall short in capturing the intricate nuances of diverse consumer bases. Our project addresses this issue by developing an innovative framework for customer persona development using clustering techniques. Traditional demographic-focused approaches provide limited insights into consumer behavior, neglecting crucial psychographic traits, behavioral patterns, and pain points necessary for tailored marketing strategies. By leveraging advanced clustering algorithms, our framework aims to overcome these limitations, enabling businesses to create detailed customer personas that offer a comprehensive understanding of their target audience.

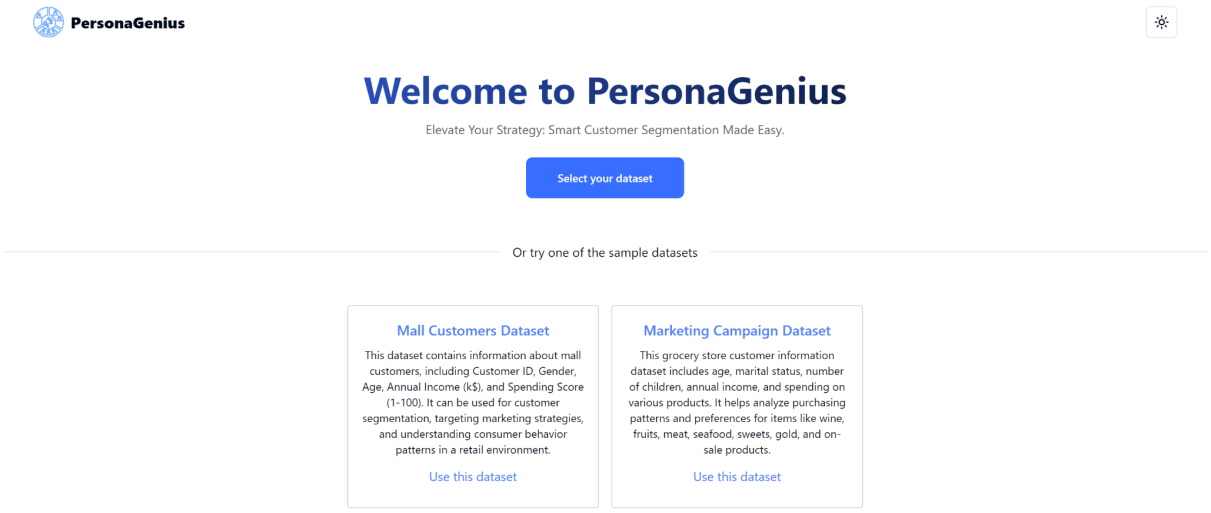
Furthermore, we aim to bridge the gap between theoretical insights and practical application by creating a user-friendly website. This platform will empower users to perform clustering analysis on their own data, facilitating the identification of customer segments and providing actionable insights for personalized marketing strategies. Our project combines research insights with user-friendly tools to modernize customer persona development and enhance targeted marketing strategies in the digital era.

Functionalities of PersonaGenius



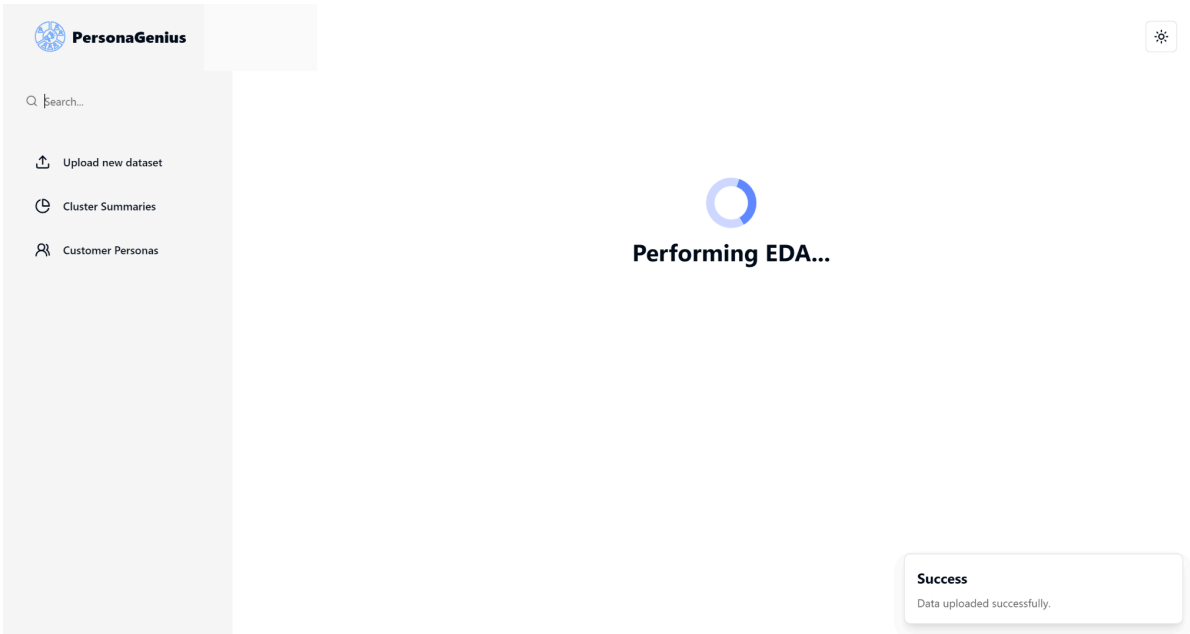
- **Dataset Upload:**

  Users can easily upload their own datasets or choose from a selection of sample datasets provided by PersonaGenius.



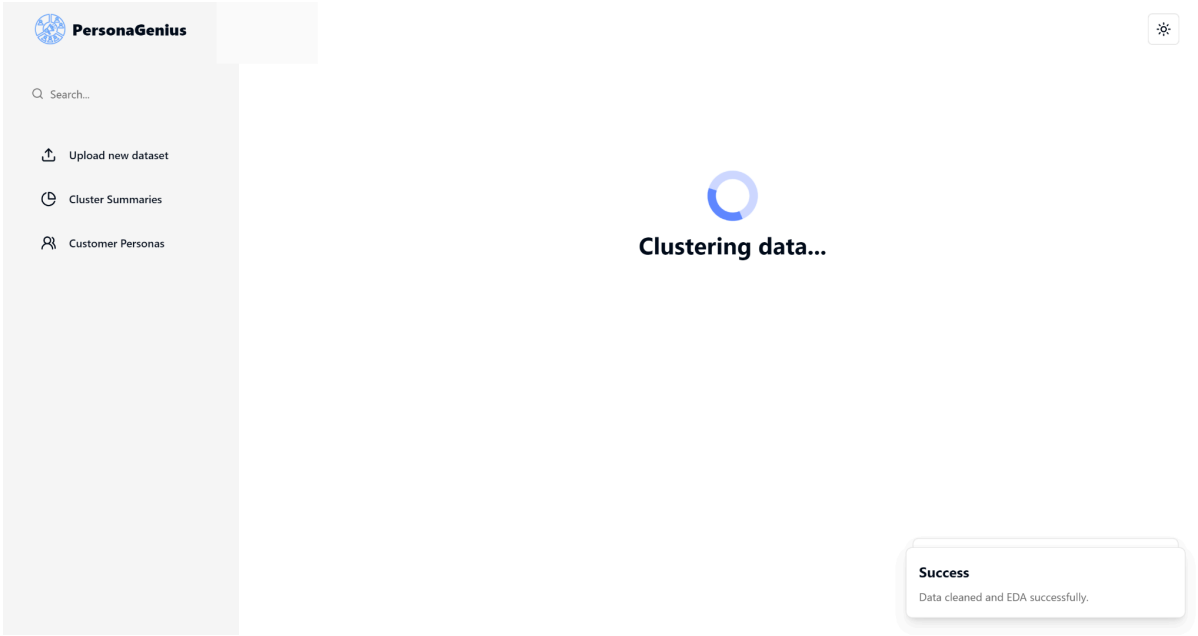
- **Data Cleaning and Exploratory Data Analysis (EDA):**

  PersonaGenius automatically performs data cleaning tasks to ensure that the uploaded datasets are accurate and free from inconsistencies or errors. The platform then conducts exploratory data analysis to uncover patterns, trends, and relationships within the data. This helps to gain insights into the characteristics of their customer base before proceeding to clustering.



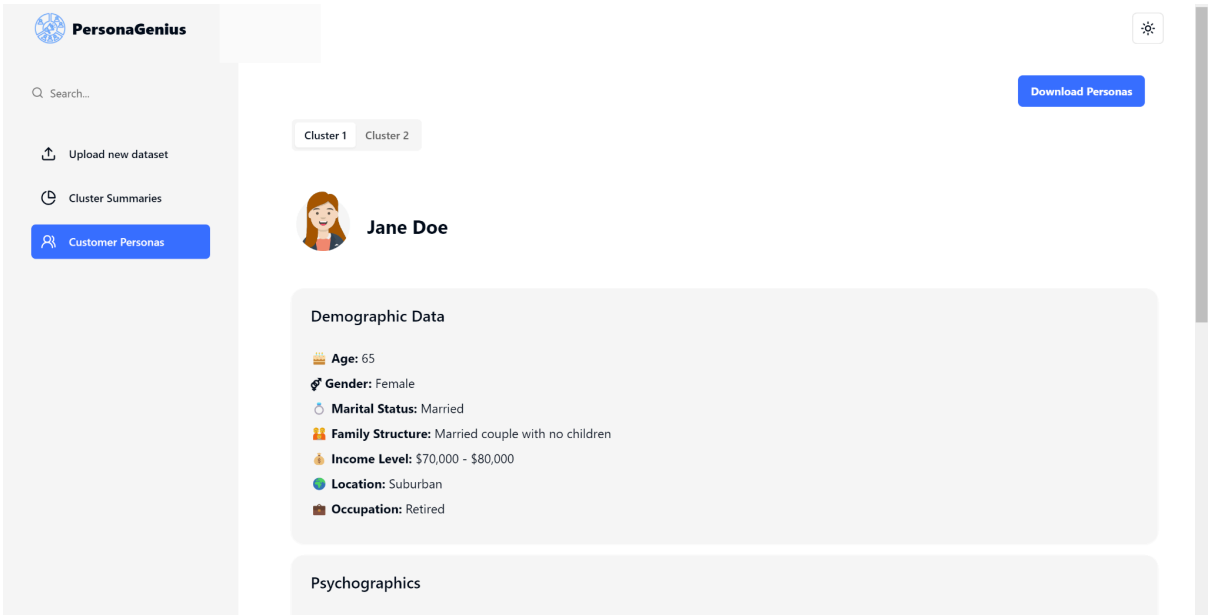
- **Clustering Analysis:**

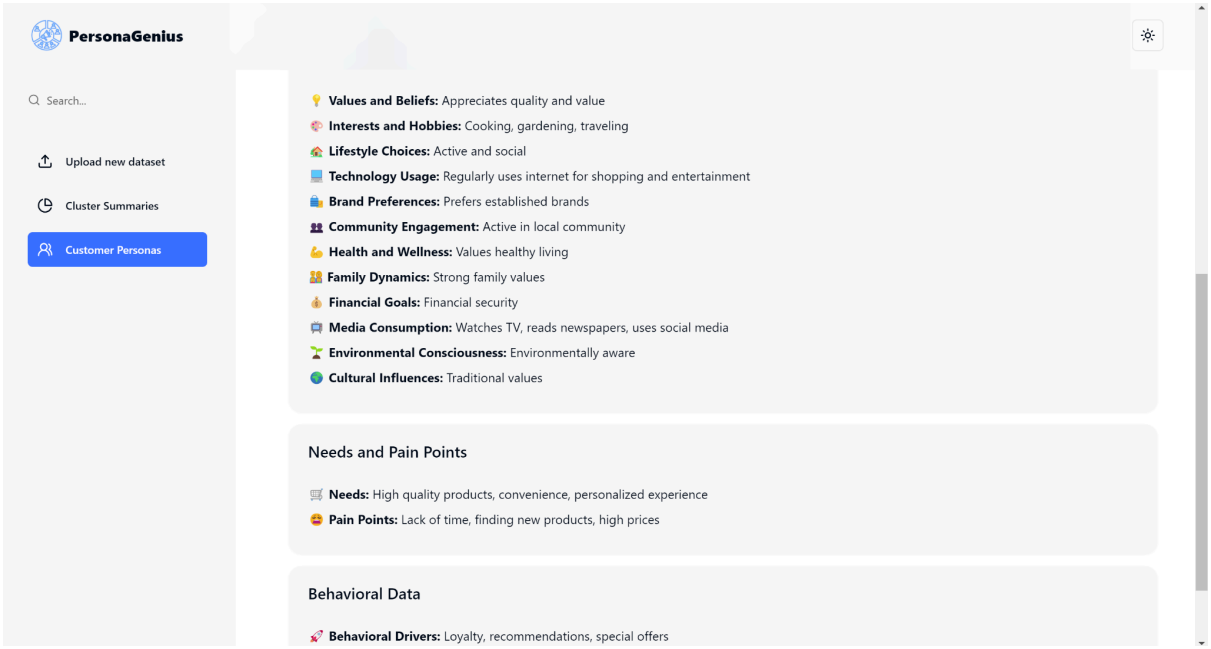
  PersonaGenius utilizes the k-means clustering algorithm to segment the customer data into distinct groups based on similarities in their attributes.



- **Persona Generation:**

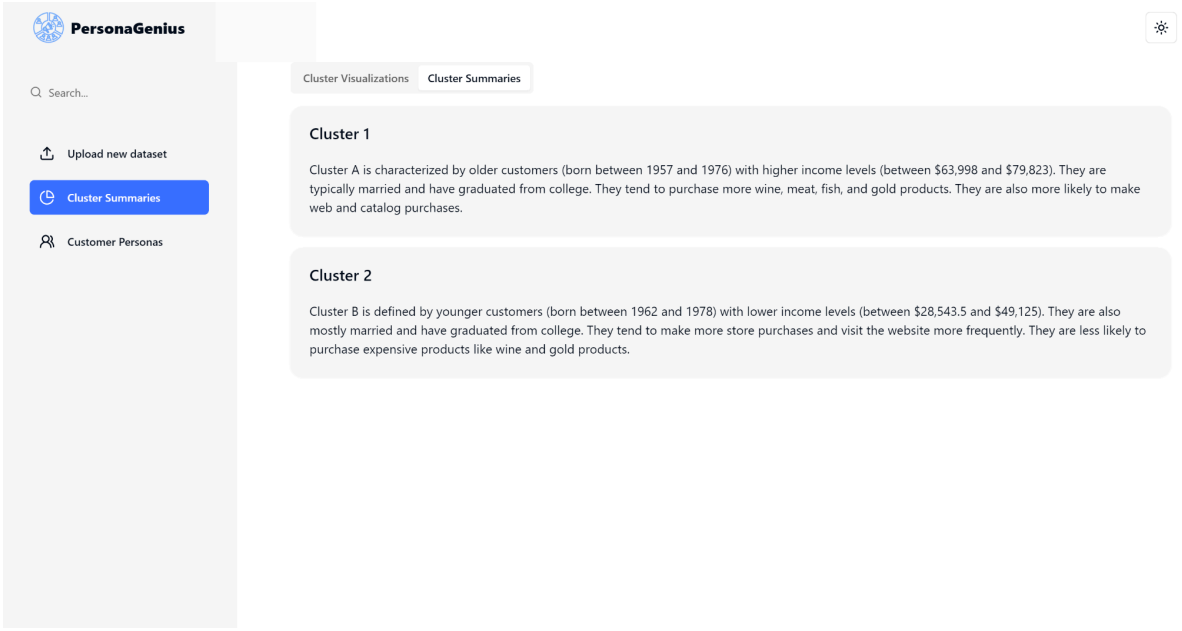
  After clustering, PersonaGenius generates customer personas by analyzing the clusters and identifying common characteristics, behaviors, and pain points within each segment.





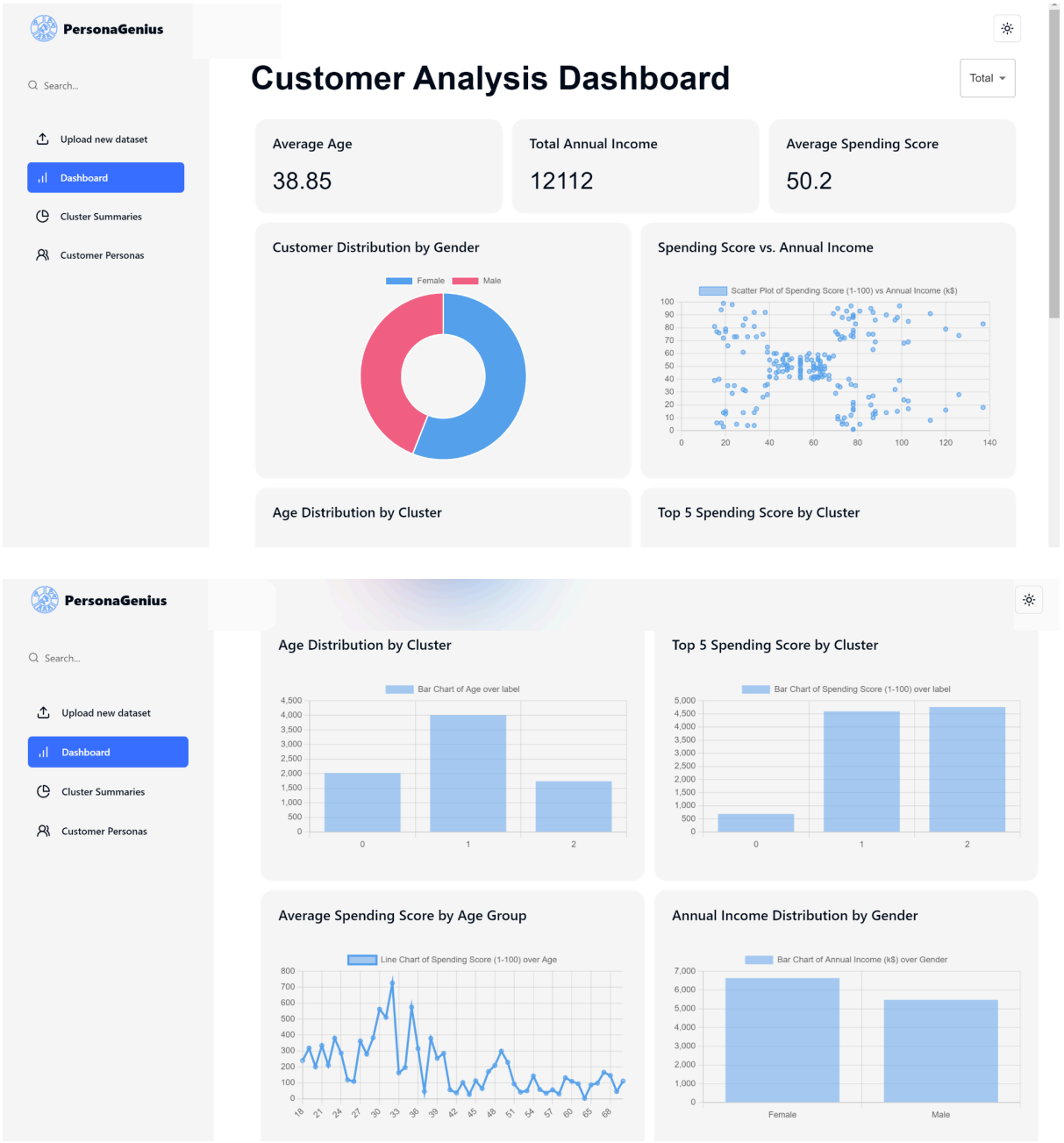
- **<u>Summary Generation:</u>**

  PersonaGenius utilizes Gemini AI to generate summaries from the clustered data.



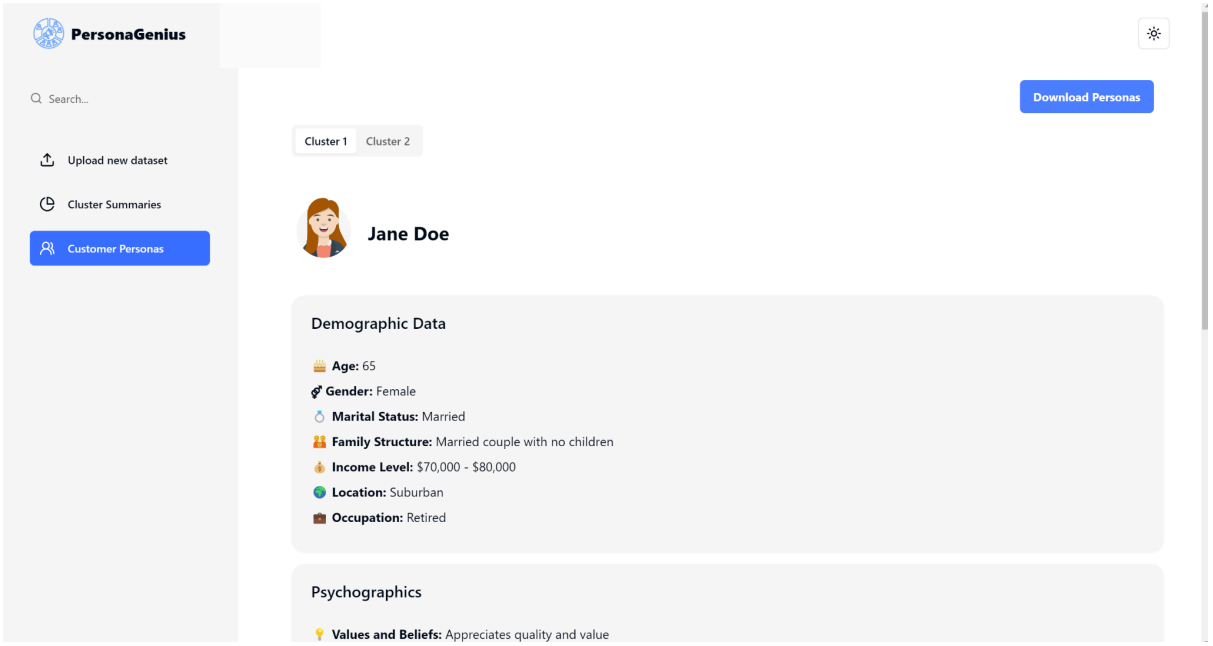
- **Visualizations:**

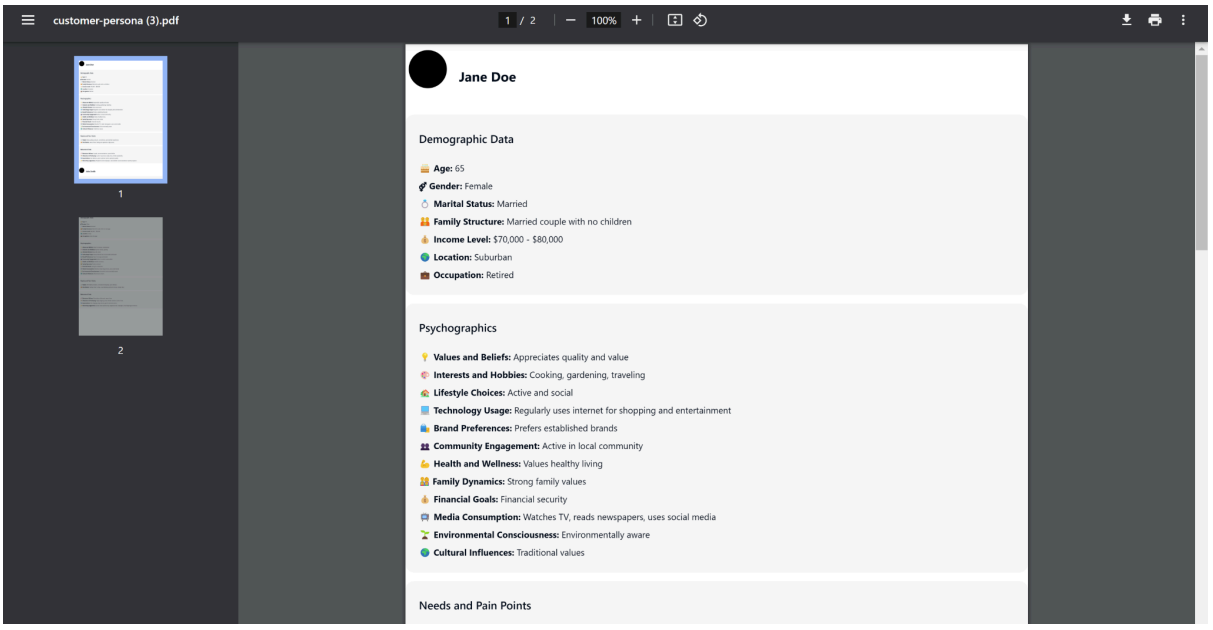
  PersonaGenius produces visualizations such as charts, graphs, and plots to present the clustering results, persona profiles, and summary data in an intuitive and informative manner.



- **Exporting and Sharing:**

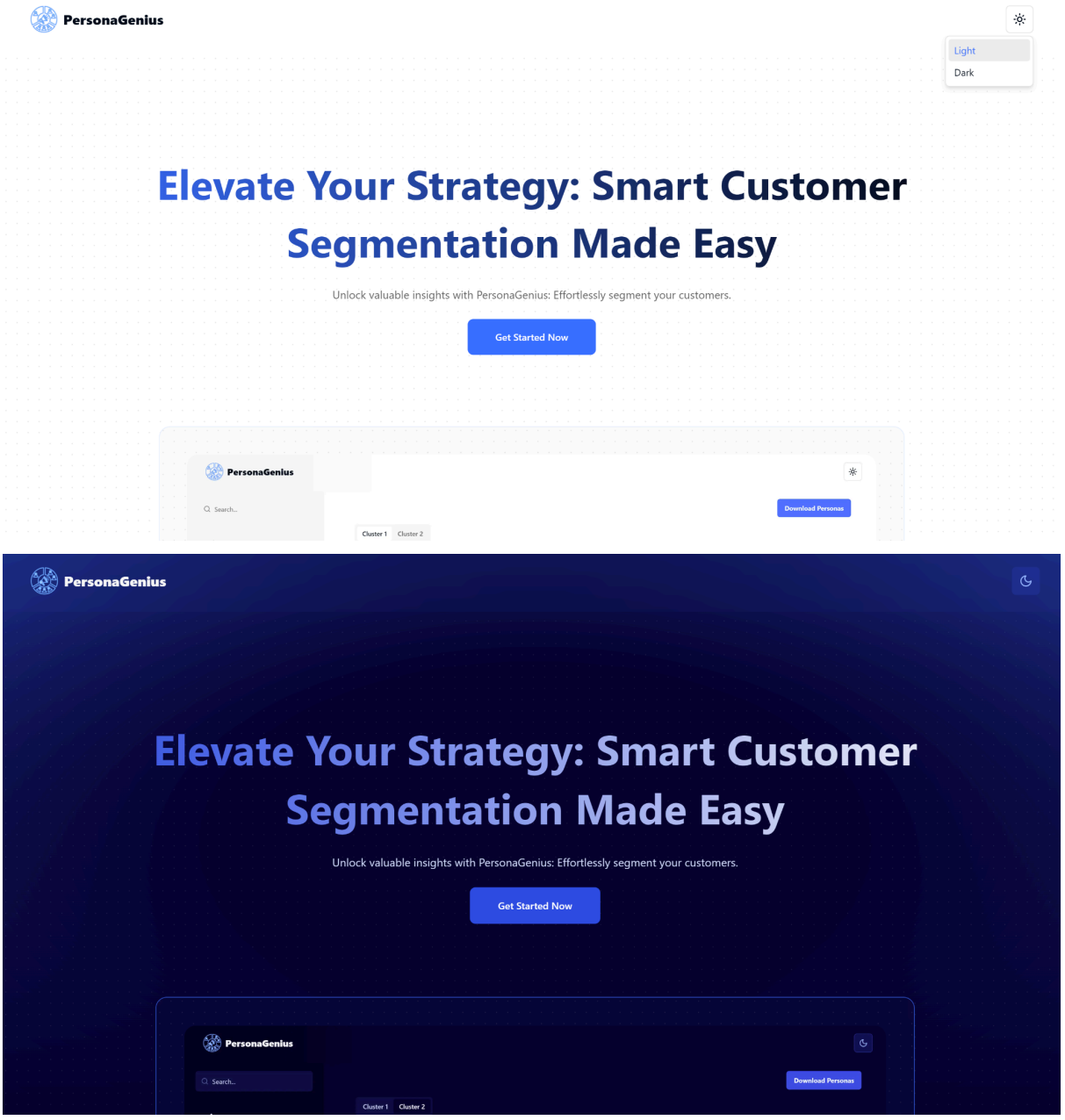
  Users can export the generated personas, summaries, and visualizations for further analysis or sharing with stakeholders within their organization.



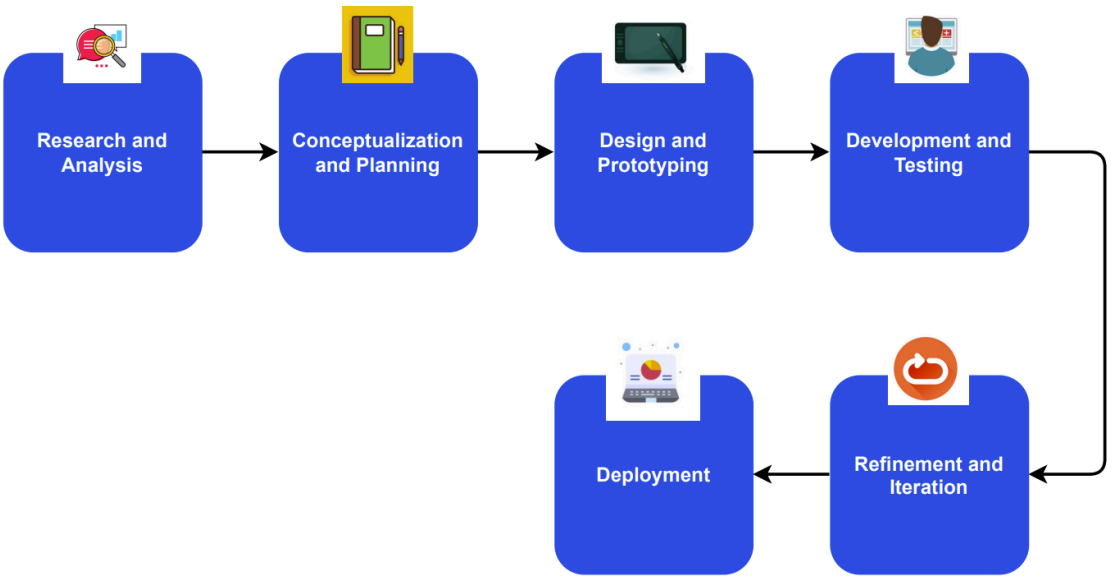


- **Customizable User Experience:**

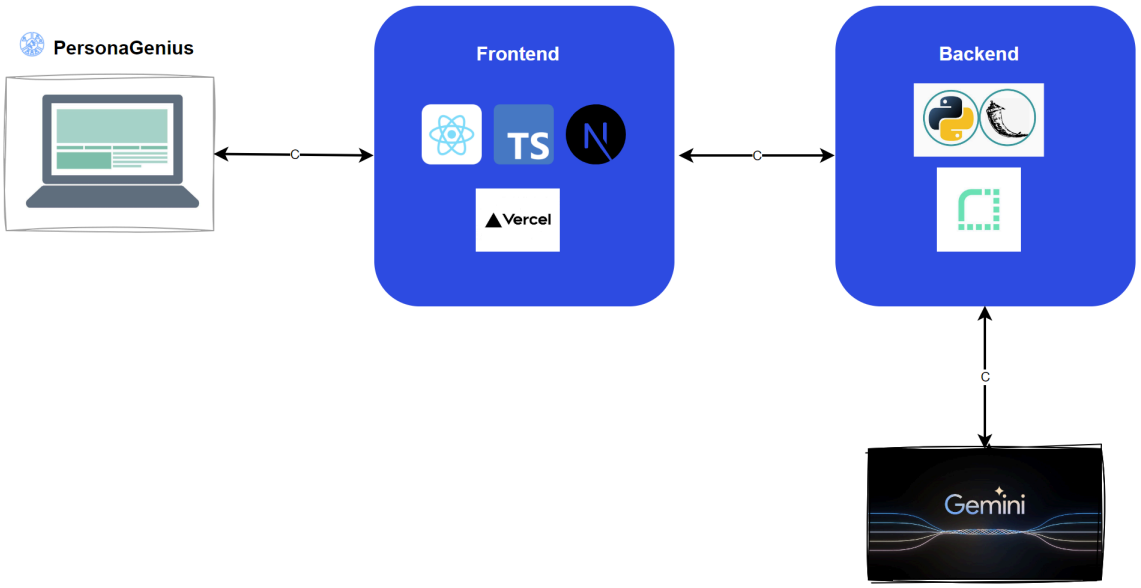
  PersonaGenius lets you personalize your workspace with custom themes. Choose between a dark theme or a light theme to match your style or environment. Plus, our platform adapts seamlessly to your device, whether it's a desktop, tablet, or phone. So, you can access PersonaGenius anytime, anywhere, and work however you like.



Project Phases:



Design Methodology Diagram:



Components of System Architecture:

- **PersonaGenius (User Interface):** The user interface (UI) serves as the primary point of interaction for users, enabling them to upload datasets, execute clustering, and visualize the generated personas and insights.

- **Frontend:** The frontend handles all client-side operations and presentation, facilitating communication with the backend for data exchange.

  Components:
  1. React: A JavaScript library for building user interfaces, particularly single-page applications.
  2. Next.js: A React framework that supports server-side rendering and static site generation to improve performance and SEO.
  3. TypeScript: A statically typed superset of JavaScript that enhances code quality and maintainability.

- **Backend:** The backend manages business logic, data processing, clustering, and AI functionalities. It processes uploaded datasets and generates personas and visualizations.

  Components:
  1. Python: The primary programming language for backend development due to its versatility and extensive library support.
  2. Flask: A lightweight WSGI web application framework used to build the backend services and APIs.
  3. Google Generative AI - Gemini: For generating detailed personas from the clustered data.

- **Deployment Environment**

1. **Vercel:** The frontend application is deployed on Vercel, providing efficient and reliable hosting with support for serverless functions and static site generation.
2. **Render:** The backend application is deployed on Render, a platform that ensures scalability and manages infrastructure for web applications and APIs.

Data Flow and Interaction:

1. User Interaction:
Users interact with the PersonaGenius interface to upload datasets and initiate the processes of clustering and persona generation.

2. Frontend Processing:
The frontend captures user inputs and communicates with the backend through APIs.

3. Backend Processing:

- The backend processes the incoming data, performing tasks such as data cleaning and exploratory data analysis using Pandas and Numpy.
- Machine learning algorithms are applied using Torch and Scikit-learn to cluster the data.
- Detailed personas are generated with the help of Google Generative AI - Gemini and Langchain.

4. Data Visualization:
Visualizations are created using Matplotlib and Seaborn and sent back to the frontend for display.

5. Frontend Display:
The frontend displays the generated personas and visualizations, providing a comprehensive view of the clustering results.

Implementation Details:

Category	Details
Frontend	• React (v18.0) • Next.js (v14.2.3) • TypeScript (v5.3.3) • Radix UI (v1.1.2)
Backend	• Python (v3.11) • Flask (v3.0.3) • Torch (v2.3.1) • Scikit-learn (v1.5.0) • Google Generative AI - Gemini (v0.6.0) • Langchain (v0.2.3)
Deployment Environment	• Frontend: Vercel • Backend: Render

Datasets	• UCI Bank Marketing Dataset • Customer Segmentation Dataset • Marketing Campaign • Clustering Dataset • Sales Dataset

Potential Impact of PersonaGenius:

While we haven't conducted a formal demo yet, PersonaGenius holds promise for various industries. By providing detailed insights into customer behavior and preferences, it could revolutionize marketing strategies, leading to more personalized campaigns and improved customer satisfaction. However, before it's ready for sale, we need to conduct thorough validation and testing, and define a clear business model and pricing strategy.

Github Repo Link:

Repository Link: https://github.com/MunnazzahAslam/PersonaGenius

Project Live Link: https://persona-genius.vercel.app

References:

[1] https://github.com/MunnazzahAslam/customer-segmentation

[2] https://github.com/tinacypeng/customer-persona-generator

[3] https://github.com/MunnazzahAslam/DarazDataset

[4] https://github.com/rahulsingh2312/innov_2024_k-means-gamble

[5] https://python.langchain.com/v0.1/docs/integrations/chat/google_generative_ai/

[6] https://link.springer.com/article/10.1007/s10618-022-00869-6