Abdelmalek Essaadi University

National School of Applied Sciences Al Hoceima

JAVA PROJECT REPORT

Field: Computer Science Engineering

Class: Second Year

Smart City Project:

A Comprehensive City Guide

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Abstract

This project is a semester-long initiative aimed at developing a **Smart City Guide** application using Java technologies and Big Data. The application is designed to store and display detailed information about a city, including hotels, restaurants, pharmacies, hospitals, stadiums and historical monuments.

For this project, we personalized the application to serve as a guide for tourists attending the **2030 FIFA World Cup**. The guide provides visitors with essential details about host countries and cities.

The goal of this project is to create a comprehensive and user-friendly platform that enhances the experience of World Cup attendees. By leveraging advanced Java frameworks and tools, this project demonstrates the practical implementation of software development techniques in addressing real-world challenges in urban exploration and event management.

List of abbreviations

Abbreviation	**Abbreviation Signification**
API	Application Programming Interface
OSM	OpenStreetMap
SQL	Structured Query Language
IDE	Integrated Development Environment
VSCODE	Visual Studio Code
POM	Project Object Model
MVN	Maven

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General Introduction

Tourism is vital to a country's economic growth and cultural exchange. Football, loved by millions worldwide, brings excitement and pride during the World Cup as fans cheer for their favorite teams and national squads. Therefore, the World Cup serves as a powerful catalyst for boosting tourism in host countries, leaving a lasting impact on their economies and global recognition.

To create meaningful connections with visitors, it is important to highlight the unique aspects of each city and provide easy access to relevant information. Smart city applications offer an innovative solution in this context by enhancing the tourism experience with tailored services and valuable insights about cities.

With this in mind, we developed *MondialCity*, a smart city application that combines the World Cup's role in promoting tourism with the benefits of smart city technology to offer an exceptional experience for visitors.

This report outlines the development and implementation of our smart city application, *MondialCity*, designed with a special focus on the **2030 FIFA World Cup**. The report is structured into the following main chapters:

- **Chapter 1: Project Description**
  This chapter introduces our application and provides an overview of the project. It highlights the key features available to both users and administrators.
- **Chapter 2: Methodologies**
  In this chapter, we discuss the methodologies used in the development of *MondialCity*. It covers the frontend development process and transitions into the backend development strategies.
- **Chapter 3: Demo**
  This chapter presents the visual representations of each development stage, presenting the step-by-step progression of the application through demo figures.
- **Chapter 4: Application Improvements and Perspectives**
  Here, we explore potential improvements for the application, such as automatic updates to data sources via APIs and multilingual support in the frontend. Additionally, we discuss future perspectives for enhancing the app.

- **Conclusion**

  The report concludes with a summary of the key points covered, emphasizing the achievements and potential future directions of the project.

Chapter 1: Project Description

1. Introduction

A smart city is designed to showcase and enhance the unique features of cities within a given country. Inspired by the goal of developing the tourism sector in Morocco, we envisioned a project named MondialCity centered around the **2030 FIFA World Cup**, which will be hosted by Morocco, Spain, and Portugal.

Our application provides users with all the essential information they need for a seamless journey in these three main countries. By aligning our project with this global event, we aim to enhance the visitor experience while contributing to the promotion of tourism in the host countries.

2. Project Overview

This project aims to develop an innovative Smart City Application designed to enhance user experiences by offering comprehensive information about cities services. By integrating modern technologies such as Java, Big Data, and interactive user interfaces .Also the application provides a centralized platform to access and manage city-related details efficiently by administrators.

2.1. <u>Features for Users</u>

MondialCity offer for users the following functionalities:

- ✓ Stadiums service :

At MondialCity, we understand that the excitement of the World Cup goes beyond the matches; it extends to the incredible venues where the games take place. To ensure fans enjoy every moment, our application includes a dedicated Stadiums Service, offering a curated list of the main grounds across Morocco, Portugal, and Spain.

From iconic stadiums in bustling cities to unique venues that promise unforgettable experiences, this feature provides users with comprehensive information about each stadium, including its name, seating capacity, precise location on map, and even images showcasing the venue's grandeur. This ensures that users can easily plan their visits and feel connected to the excitement of the World Cup.

- ✓ Hotels service :

The World Cup is not just about attending matches but also about creating unforgettable experiences during your stay. To ensure fans and visitors enjoy a comfortable and seamless trip, our application includes a dedicated Hotels Service.

This feature offers a organized list of accommodations across Morocco, Portugal, and Spain, tailored to diverse needs. From luxurious resorts in vibrant cities to cozy hotels near iconic stadiums, users can access comprehensive details, including the hotel’s name, interactive location on a map, guest ratings, official website links, phone numbers, and additional informations. The Hotels Service ensures every visitor finds their perfect stay for a memorable World Cup experience.

- ✓ Restaurants service :

During the World Cup, it's essential to enjoy the local culture and cuisine. To ensure fans and visitors have a complete experience, our application features a dedicated Restaurants Service. This service provides a list of dining options across Morocco, Portugal, and Spain, offering a variety of cuisines to suit every taste and budget.

- ✓ Historical monument service :

The word event offers an incredible opportunity to explore the rich history and culture of the host cities. The MondialCity application features a dedicated Historical Monument Service. This service provides a list of must-see historical monuments across Morocco, Portugal, and Spain, offering insights into the heritage and significance of each site.

- ✓ Hospital | Pharmacy service :

The health and safety of visitors are of utmost importance. To ensure that fans and visitors have access to necessary medical services, our application includes a dedicated Healthcaree Service. This service provides a list of hospitals and healthcare facilities across Morocco, Portugal, and Spain, offering a wide range of medical services for all types of emergencies and healthcare needs. Users can access detailed information, including the hospital’s name, location on map, contact details, available services, and visiting hours.this service ensures that visitors have easy access to the healthcare they need during their World Cup journey.

2.2 <u>Features for Admins :</u>

MondialCity offer for admins the following functionalities:

- Insert feature:

In our application, the admin can add new information about services, such as details for new hotels, hospitals, pharmacies, or stadiums, to the database.

- Update feature:

The admin can also update existing information about previous services, such as modifying a website, updating a phone number, or changing other details.

Insert faure:

- Delete feature:

MondialCity also offers admins the ability to delete expired information from the database.

- Select feature:

In our application, the admin can retrieve information from the database by selecting the desired collection to verify the data

Chapter 2: Methodologies

In this chapter, we discuss the methodologies employed in our application, highlighting both the frontend and backend strategies.

1. Frontend Development

1.1. Language: JavaFX (Java)

Our application is a javafx application , so its frontend is made by this tool.

JavaFX is an open source, next generation client application platform for desktop, mobile and embsedded systems built on Java. It is a collaborative effort by many individuals and companies with the goal of producing a modern, efficient, and fully featured toolkit for developing rich client applications [1].

JavaFX applications are built using two essential files:

- FXML File: This file defines the front-end structure of the application. It contains the layout and components of the page, such as JavaFX controls (e.g., Labels, Buttons) and layout containers (e.g., VBox, AnchorPane). These components are defined in a declarative XML format, making it easy to design the user interface.

  This file can be written in a special format, we can consult the JavaFX documentation [2] to understand well, or we can use **Scene Builder**, a visual design tool that simplifies the process of creating the user interface. Scene Builder closes the gap between designers and developers by creating user interfaces which can be directly used in a JavaFX application [1].

- Controller File: This file manages the behavior and logic of the application. It is linked to the FXML file and provides control over the elements defined in the FXML. Each component can be accessed and manipulated using its assigned fx:id. This file allows you to handle user interactions, update UI components, and manage application logic [3].

2. Backend Development

1.1 Data Sources

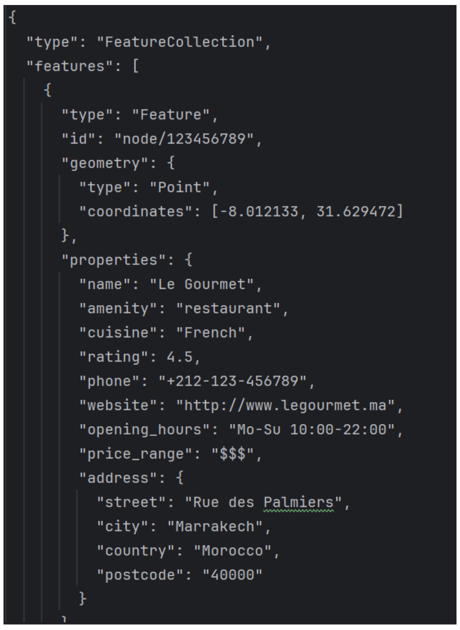
To ensure diversity and richness in our dataset, we use multiple sources for data collection. Some of the data is gathered through APIs, such as OpenStreetMap, to access real-time and structured information. Other data is manually created to meet specific project requirements or fill in gaps. Additionally, we incorporate publicly available datasets from platforms like Kaggle to complement our collection. This multi-source approach ensures a comprehensive and reliable dataset that supports robust analysis and application development.

APIs :

We collect data from APIs like OpenStreetMap, a collaborative project that provides free, editable, and high-quality geographic data. OpenStreetMap (OSM) allows users to contribute and access detailed information about roads, buildings, amenities, and other geographic features [4]. The data can be used for a variety of purposes, such as navigation, urban planning, and business analytics.

Using a script, we query OSM's Overpass API, a powerful tool for extracting specific geographic data from the OpenStreetMap database. For example, we can fetch details about restaurants in a city or region. This data is returned in a JSON format, which is structured and processed for further use.

Example of Extracted Restaurant Data (JSON Format):



```json
{
  "type": "FeatureCollection",
  "features": [
    {
      "type": "Feature",
      "id": "node/123456789",
      "geometry": {
        "type": "Point",
        "coordinates": [-8.012133, 31.629472]
      },
      "properties": {
        "name": "Le Gourmet",
        "amenity": "restaurant",
        "cuisine": "French",
        "rating": 4.5,
        "phone": "+212-123-456789",
        "website": "http://www.legourmet.ma",
        "opening_hours": "Mo-Su 10:00-22:00",
        "price_range": "$$$",
        "address": {
          "street": "Rue des Palmiers",
          "city": "Marrakech",
          "country": "Morocco",
          "postcode": "40000"
        }
```

Why Use OpenStreetMap and the Overpass API?

- **Free and Open Data:** Unlike proprietary mapping services, OSM data is free and openly accessible.
- **Customizable Queries:** The Overpass API allows for precise queries, enabling users to extract data specific to their needs (e.g., all restaurants in Marrakech).
- **Extensive Coverage:** OSM data is constantly updated by a global community of contributors, ensuring it remains accurate and comprehensive.
- **Rich Metadata:** In addition to geographic coordinates, the data includes attributes such as amenity type, contact details, opening hours, and more

Manual data collection :

We collect data from a variety of resources and also create our own personalized datasets when necessary. For example, to gather information about the stadiums that will host the FIFA World Cup 2030 in Spain, Morocco, and Portugal, we conducted extensive research across multiple websites, including Wikipedia [5], as no consolidated data currently exists. The dataset we created is unique and valuable, and we plan to share it on Kaggle [6] to benefit others who may use it in the future. Additionally, for other collections, we use tools like Serper.dev [7], which provide structured, high-quality data in a well-organized format, covering global information. After storing the collected data, we process it using Python to refine and structure it according to our needs, ensuring it is ready for analysis and application development.

Kaggle :

Kaggle is an environment where diverse datasets are shared and accessed. We leveraged Kaggle to collect data, such as a dataset containing information about over 10,000 hotels. To tailor the dataset to our specific requirements, we processed and filtered it to include only the data relevant to the cities and criteria we are focusing on. This approach ensures that our dataset is both precise and aligned with our project goals.

1.2 Data Processing:

Data Processing involves collecting ,cleaning , transforming, and analyzing the data to extract the meaninful insights. This step ensures data is prepared and structured to meet the application's needs.

1.2.1 *Languages*

- Java:

Figure 1: Java logo

Java provides a robust platform for building scalable and high-performance data processing solutions. It is commonly used in Big Data frameworks like Apache Hadoop and Apache Spark. In our project, we use Java with Apache Spark to process and clean data, making it structured and easy for our application to retrieve.

- Python :

Figure 2: Python logo

Python is commonly used in the field of Data Science, particularly in Big Data and Web Scraping. In our project, we use Python to scrape data from multiple websites to prepare our own datasets.

1.2.2 *Frameworks*

- Apache Spark :

Figure 3: Apache Spark logo

Apache Spark is a distributed data processing framework that supports large-scale data analysis. It provides libraries for batch and streaming data, machine learning, and graph processing. In our project, we use Apache Spark for its ability to process data quickly, which helps us clean the data and store it in a MongoDB database using the Spark MongoDB connector.

1.3 <u>Data Storage :</u>

The Data Storage module is a critical step of the application architecture, responsible for securely storing and managing all types of data generated or processed. This includes structured data, such as relational databases, and unstructured data, such as images, documents.

1.3.1 Relational Databases: SQL

Figure 4: SQL logo

SQL database or relational database is a collection of highly structured tables, wherein each row reflects a data entity, and every column defines a specific information field. Relational databases are built using the structured query language (SQL) to create, store, update, and retrieve data. Therefore, SQL is the underlying programming language for all relational database management systems (RDBMS) such as MySQL, Oracle, and Sybase, among others [8].

Using an SQL database in our application is essential for managing users' and admins' data effectively. It allows us to securely store and organize information such as user informations , roles, and permissions in structured tables, ensuring data consistency and integrity. SQL's relational model simplifies the handling of relationships, such as linking users to our application services or associating admins with system operations. Additionally, the SQL database supports robust querying for authentication, role-based access control, and data retrieval, while providing built-in mechanisms for data security, backup, and recovery. This makes SQL a reliable solution for managing sensitive user and admin data efficiently.

1.3.2 No Relational Databases : MongoDB

Figure 5: MongoDB logo

MongoDB is a popular NoSQL database designed to handle large volumes of unstructured or semi-structured data. Unlike relational databases, MongoDB stores data in a flexible, JSON-like format called documents, which allows for dynamic schema design. This makes it ideal for handling complex, hierarchical, or rapidly changing data. MongoDB is widely recognized for its scalability, high performance, and ability to process large datasets across distributed environments.

In our application, MongoDB is utilized to store and manage big data that powers the app's services. This data, which may hotels , stadiums, and restaurants details, is stored in a highly scalable and efficient manner to accommodate the application's growing needs. MongoDB's flexibility allows us to preprocess and structure the data before serving it to various components of the application, ensuring smooth and optimized performance for critical services.

1.4 <u>IDEs and tools :</u>

- *IntelliJ IDEA:*

IntelliJ IDEA is an Integrated Development Environment (IDE) for Java and Kotlin designed to maximize developer productivity. It does the routine and repetitive tasks for you by providing clever code completion, static code analysis, and refactorings, and lets you focus on the bright side of software development, making it not only productive but also an enjoyable experience [9].

In our project, IntelliJ IDEA is used primarily for front-end development with Java, including implementing JavaFX for user interface design. Additionally, it facilitates the integration of Java with Apache Spark for preprocessing and cleaning data before storing it in our databases.

- *Visual Studio Code (VSCode):*

Visual Studio Code (VSCode) is a lightweight yet powerful source code editor, supporting a wide range of programming languages and development tasks. It offers features like IntelliSense, debugging, and an extensive marketplace for extensions, making it an ideal tool for efficient coding.

In our project, we use VSCode to write and execute Python scripts for web scraping. It provides a seamless environment for scraping data from various sources, which is then processed and used to enrich our application's datasets.

- *MySQL Workbench :*

MySQL Workbench is a unified visual tool for database architects, developers, and DBAs. MySQL Workbench provides data modeling, SQL development, and comprehensive administration tools for server configuration, user administration, backup, and much more. MySQL Workbench is available on Windows, Linux and Mac OS X [10].

In our project, we use MySQL Workbench to design and manage the database schema, write complex queries, and visualize the relationships between tables. It streamlines database management tasks, ensuring our data is well-structured and optimized to support the application's functionality.

- *MongoDB Compass:*

MongoDB Compass is a powerful GUI for querying, aggregating, and analyzing your MongoDB data in a visual environment.Compass is free to use and source available, and can be run on macOS, Windows, and Linux [11].

In our project, we use MongoDB Compass to manage and explore large datasets stored in MongoDB. It helps us visualize data structures, optimize queries, and monitor database performance, ensuring that our data is efficiently processed and served to the application.

- *Docker Hub:*

Docker Hub is a cloud-based registry service that allows users to share and manage container images. It serves as a repository for storing and retrieving Docker images, facilitating the distribution of containerized applications across different environments. Docker Hub provides both public and private repositories and integrates with continuous integration/continuous deployment (CI/CD) pipelines for streamlined workflows.

In our project, we use Docker Hub to store and retrieve container images for running our MongoDB server. By pulling the official MongoDB image from Docker Hub, we can easily deploy and manage MongoDB instances in containers, ensuring consistency across development, testing, and production environments. Docker Hub simplifies the management of MongoDB servers, allowing us to quickly scale and deploy the necessary infrastructure without worrying about the underlying configurations.

- *Apache Maven:*

Apache Maven is a software project management and comprehension tool. Based on the concept of a project object model (POM), Maven can manage a project's build, reporting and documentation from a central piece of information.

In our project, we use Maven to manage Java dependencies and automate the build process. It helps ensure that all required libraries are included, facilitates the compilation of code, and packages the application for deployment. By using Maven, we can streamline the development lifecycle, improve consistency across environments, and ensure efficient versioning and dependency management.

- *Scene Builder*

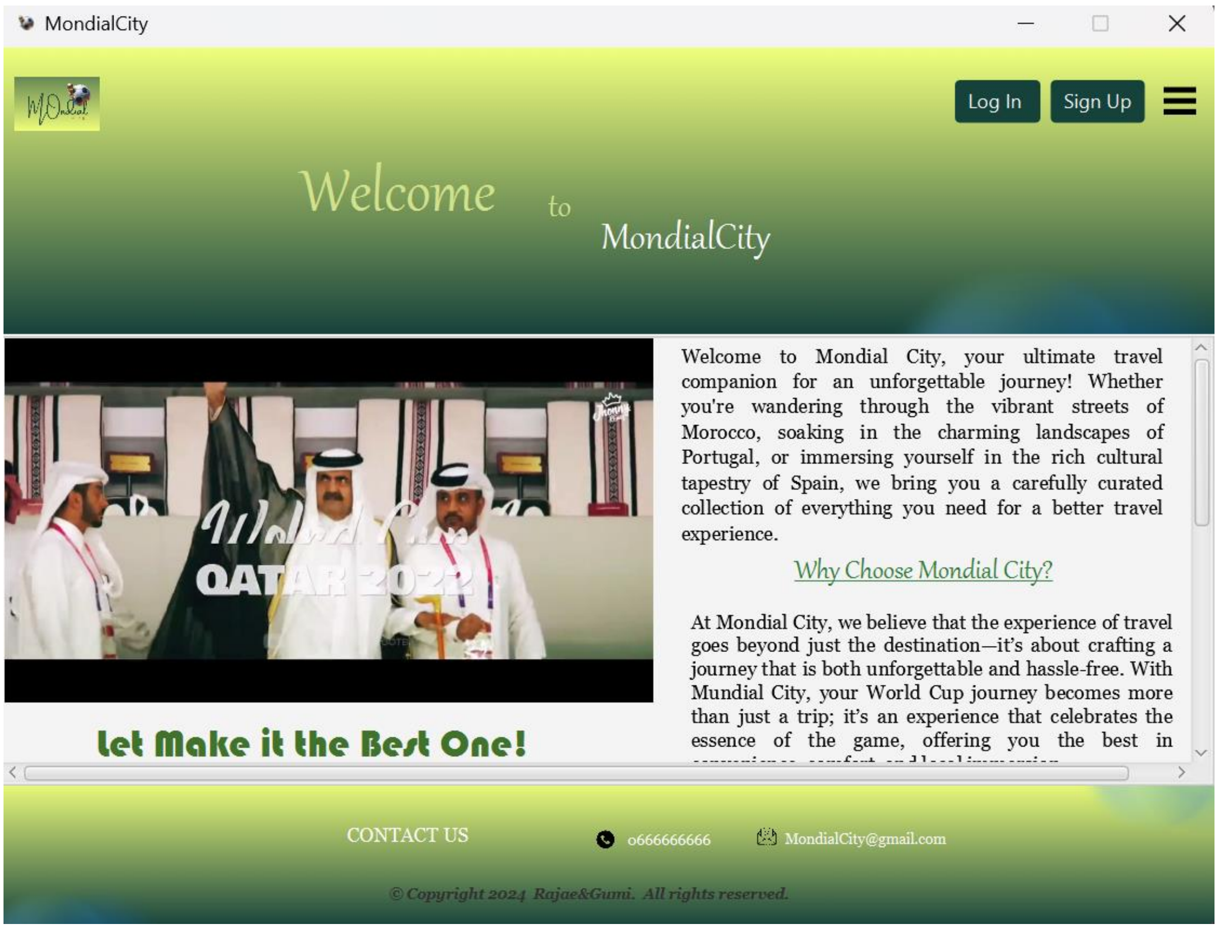
Scene Builder is a visual layout tool for JavaFX applications, allowing developers to design user interfaces (UIs) by dragging and dropping UI components. It generates FXML files, which are used to define the structure of the UI, and simplifies the process of creating complex UIs without writing extensive code. Scene Builder integrates seamlessly with JavaFX, providing a user-friendly interface to manage layouts, controls, and styles.

Scene Builder helps us to design the front-end UI for our JavaFX application. It enables us to quickly build and prototype user interfaces by visually arranging components, and then generate the corresponding FXML code. This improves the efficiency of UI development and ensures that the user interface is intuitive and responsive, while also simplifying the process of linking the UI with Java logic.

Chapter 3: Demo

In this chapter, we will present a step-by-step demonstration of our app, MondialCity, to explore its features and showcase its functionality. This walkthrough will provide a clear understanding of how the app works and the various capabilities it offers to users.

If you are not a registered user, you will have access to specific pages of the app. The first page that appears is designed to provide an overview of the application and its main features. It serves as an introduction to MondialCity, offering essential navigation options for unregistered users. We've used the colors yellow and green throughout the app, as they represent the vibrant spirit of the FIFA World Cup. Each detail in our app has been thoughtfully designed to convey a sense of excitement and significance, ensuring that everything feels special and meaningful to the user.



Welcome to Mondial City, your ultimate travel companion for an unforgettable journey! Whether you're wandering through the vibrant streets of Morocco, soaking in the charming landscapes of Portugal, or immersing yourself in the rich cultural tapestry of Spain, we bring you a carefully curated collection of everything you need for a better travel experience.

Why Choose Mondial City?

At Mondial City, we believe that the experience of travel goes beyond just the destination—it's about crafting a journey that is both unforgettable and hassle-free. With Mundial City, your World Cup journey becomes more than just a trip; it's an experience that celebrates the essence of the game, offering you the best in

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Figure 6: Home page

This is the first page displayed—**the home page**. It greets the user with a welcoming message, and on the right side of the page, there is a script that introduces our app, explaining who we are, why users should choose us, and what makes us unique. On the left side of the page, there's a video recapping the highlights of the FIFA World Cup 2022, setting the stage for the anticipation of the FIFA World Cup 2030, which we aim to make the best one yet.

When we scroll down, on the right side, we will find a functional form where users can fill in their details to contact us. This form allows users to send inquiries, feedback, or suggestions directly to our team. On the left side, we will see a section highlighting some of the key features of **MondialCity**, giving users an overview of the app's capabilities and what they can expect to experience.

In the bottom of the page we find informations about us to contact us and the copyright.

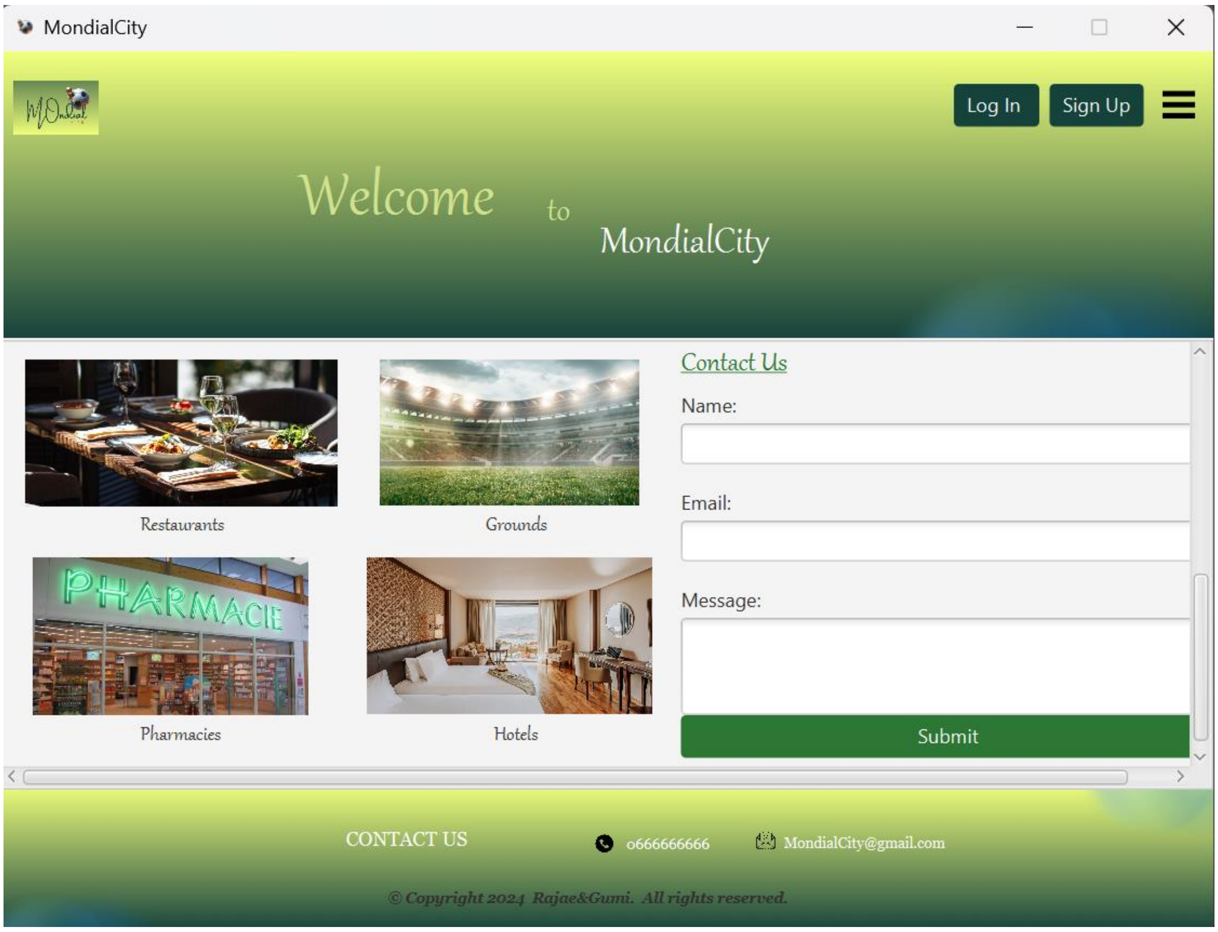
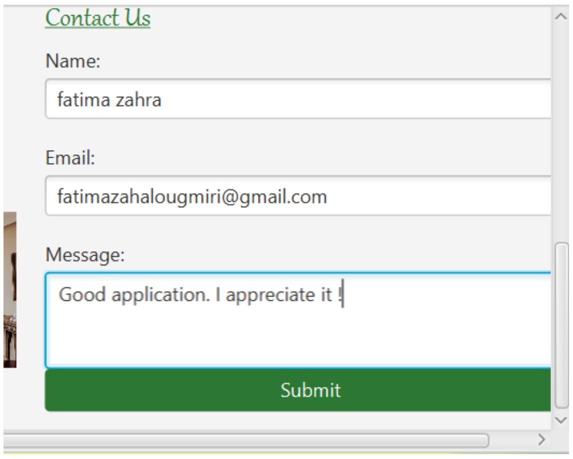


Figure 6: Home page

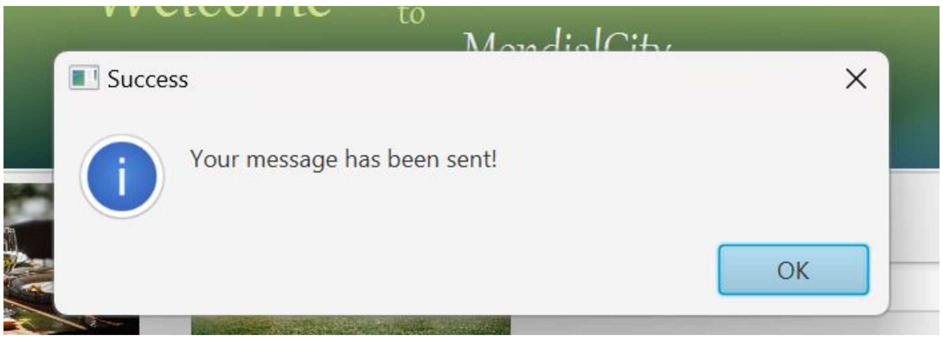
We fill in the form as the following figure shows:



Name:
fatima zahra
Email:
fatimazahalougmiri@gmail.com
Message:
Good application. I appreciate it !

Figure 7: Contact form

And we click on the button submit, then this information box displays which confirm to us that the message has been sent:



Your message has been sent!

Figure 8: Message information

Returning to the home page, at the top, you will find two buttons: one for **Login** and one for **Sign Up**, allowing users to access their accounts or create a new one. Additionally, there is a **MenuButton** that, when clicked, displays a list of the app's features, giving users easy access to the different functionalities **MondialCity** offers.

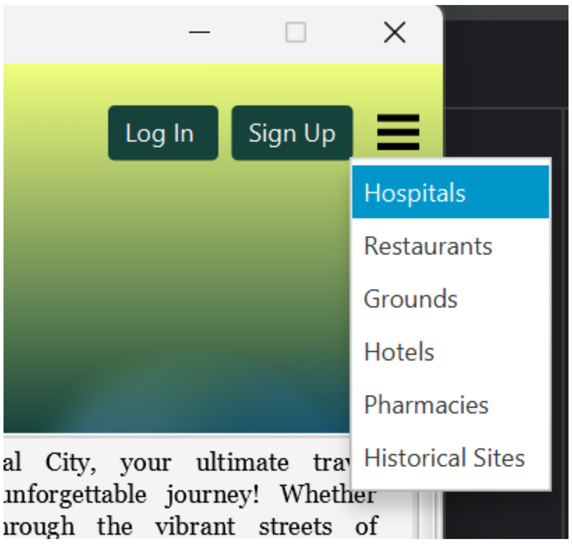
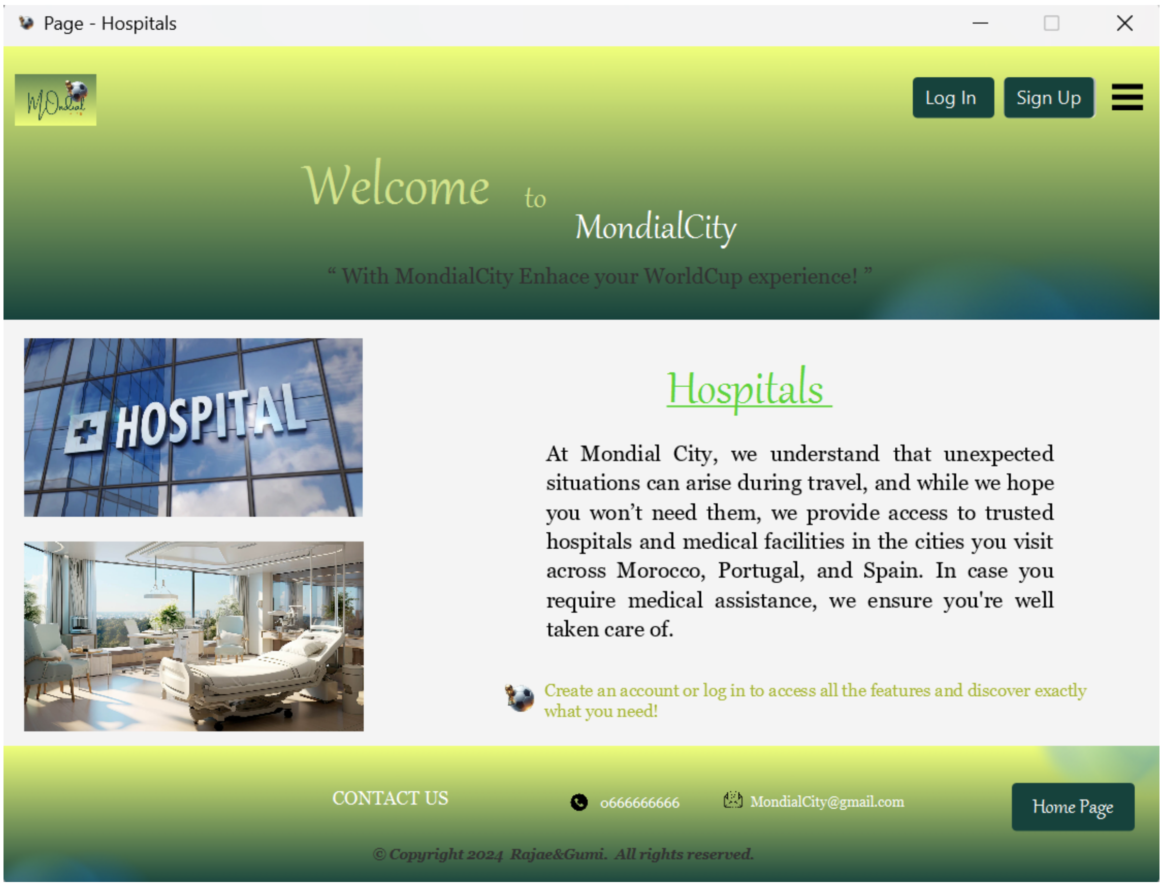


Figure 9: MenuButton Features

When we click on each feature, a new page is displayed, providing detailed information about the specific service we offer. This page explains the functionality, benefits, and how users can make the most of the feature, ensuring they fully understand the value it brings to their experience on **MondialCity**.

For example, when we click on Hospitals the following page appears:



At Mondial City, we understand that unexpected situations can arise during travel, and while we hope you won't need them, we provide access to trusted hospitals and medical facilities in the cities you visit across Morocco, Portugal, and Spain. In case you require medical assistance, we ensure you're well taken care of.

Create an account or log in to access all the features and discover exactly what you need!

Figure 10: Hospitals description page

The same process applies to all features. When users click on any feature, a dedicated page is displayed with detailed information about the service. Additionally, at the top of the page, the **Login** and **Sign Up** buttons are present, allowing users to access their account or create a new one from any page.

When the **Sign Up** button is clicked, the following page appears:

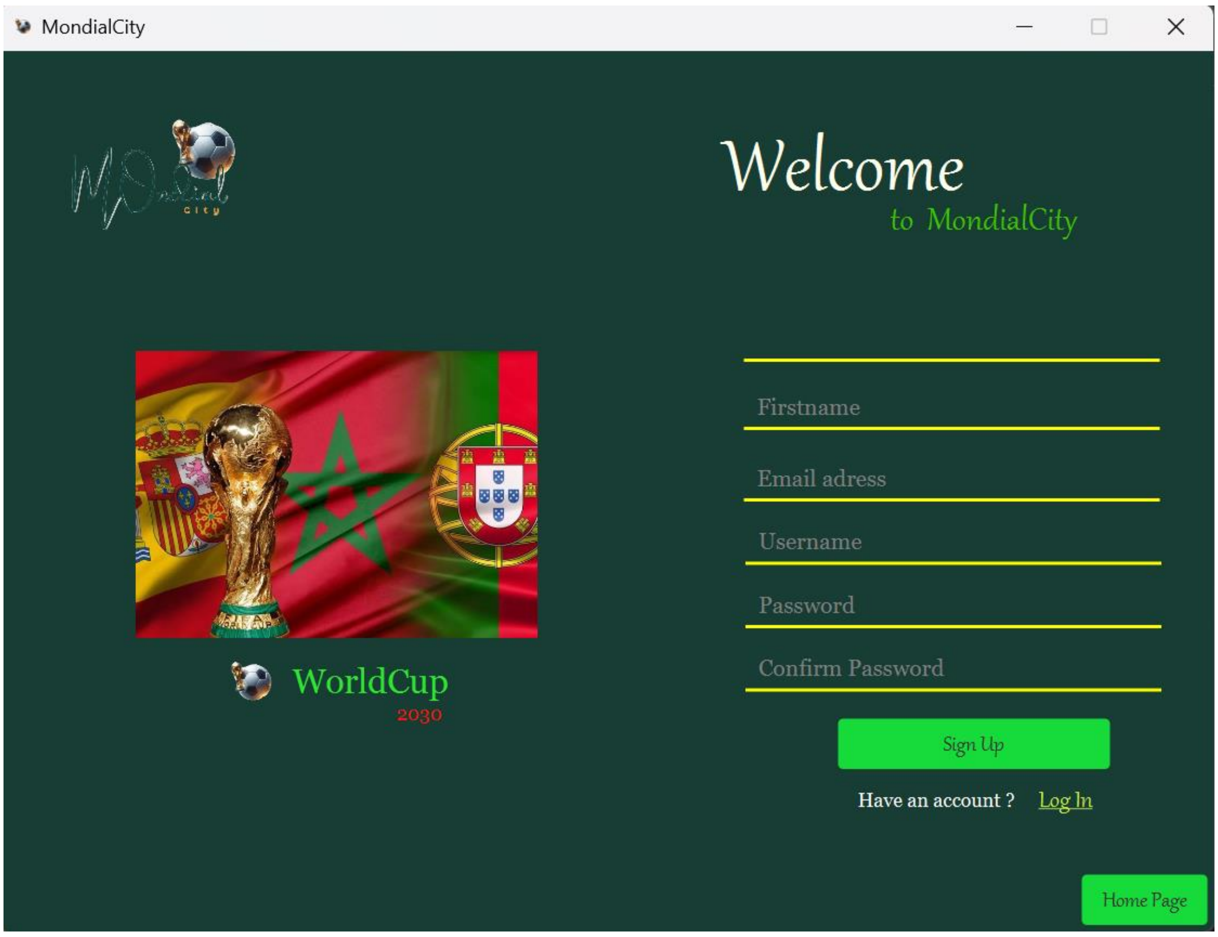


Figure 11: Sign up page

The **Sign Up** page contains a form that users can fill in to register for an account. There is also a **Login** link on the page, which allows users to easily switch to the **Login** page if they already have an account. At the bottom of the page, there is a **Home Page** button. When clicked, it will take the user back to the home page, providing easy navigation throughout the app.

So we create an account like this :

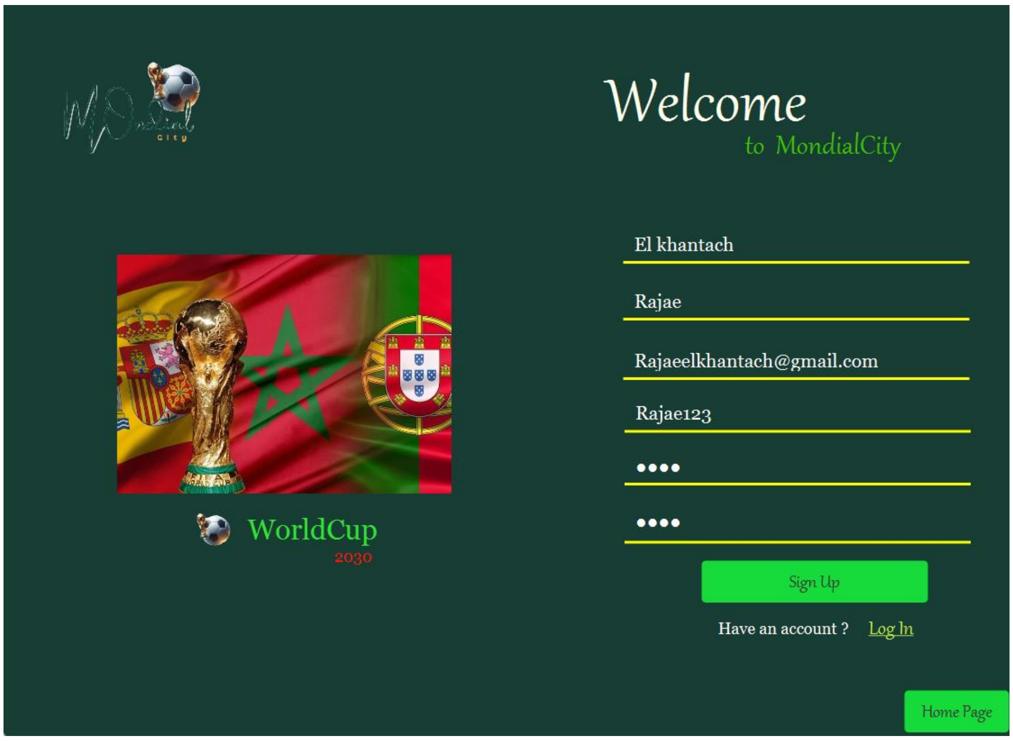


Figure 12: Sign up test page

When we click on the button sign up the login page appears:

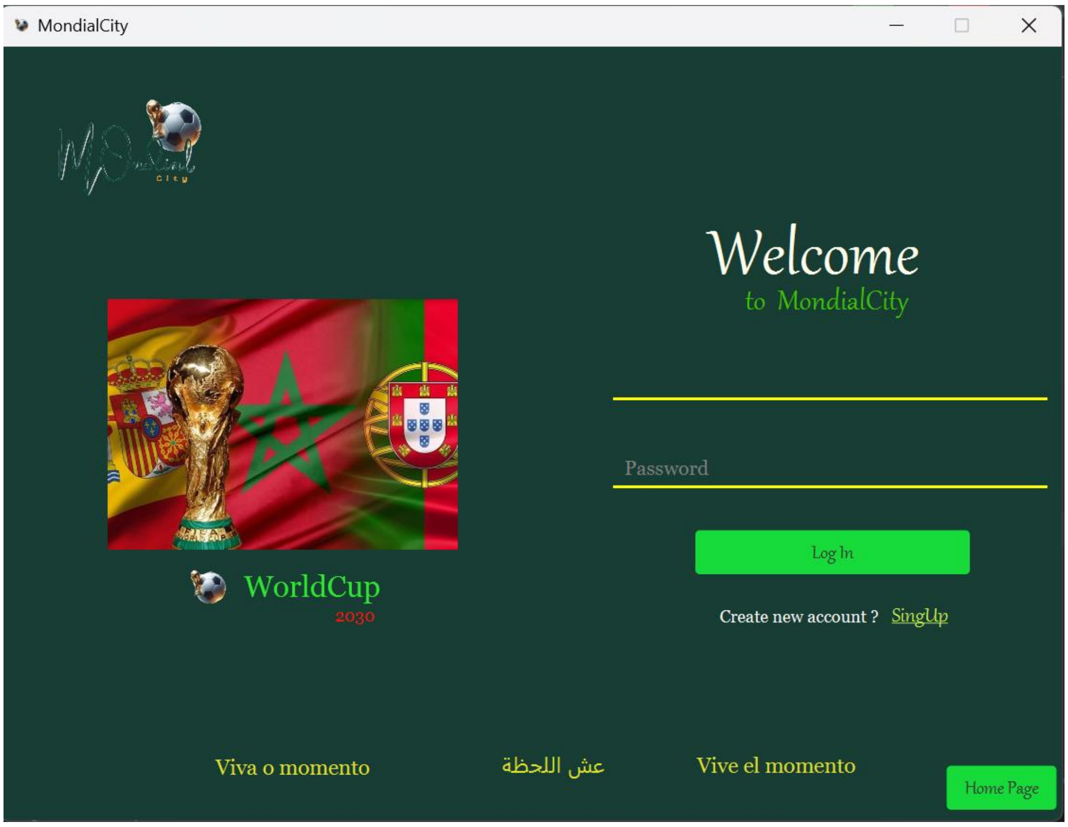


Figure 13: Login page

The **Login** page contains a form where users can log in using their username and password. The design of this page mirrors that of the **Sign Up** page, maintaining a consistent look and feel. Additionally, we have included the expression **"Live the Moment"** in the three languages of the host countries—Spanish, Moroccan Arabic, and Portuguese. This phrase carries a special meaning, symbolizing that by creating an account and using our app, users will experience the excitement and energy of the **FIFA World Cup 2030**. It emphasizes the idea of being part of a unique, unforgettable moment.

So we login with the account created before :

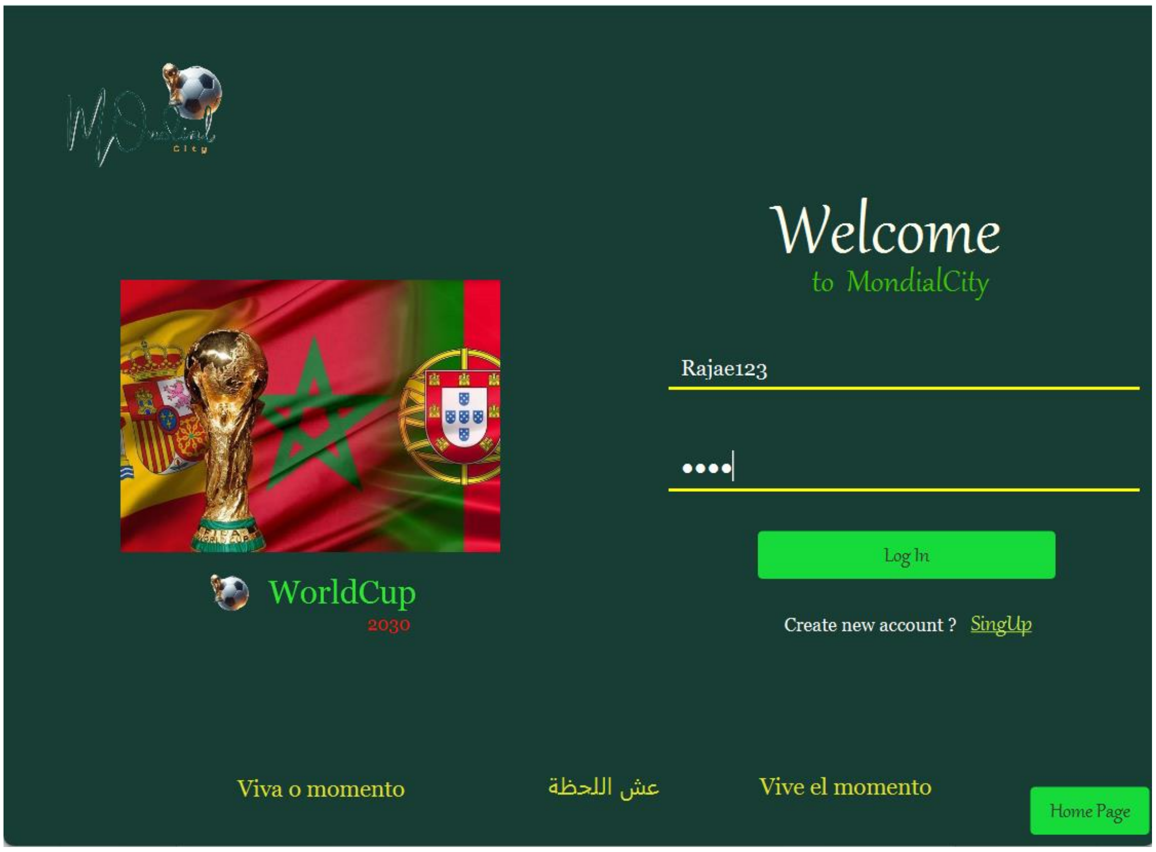
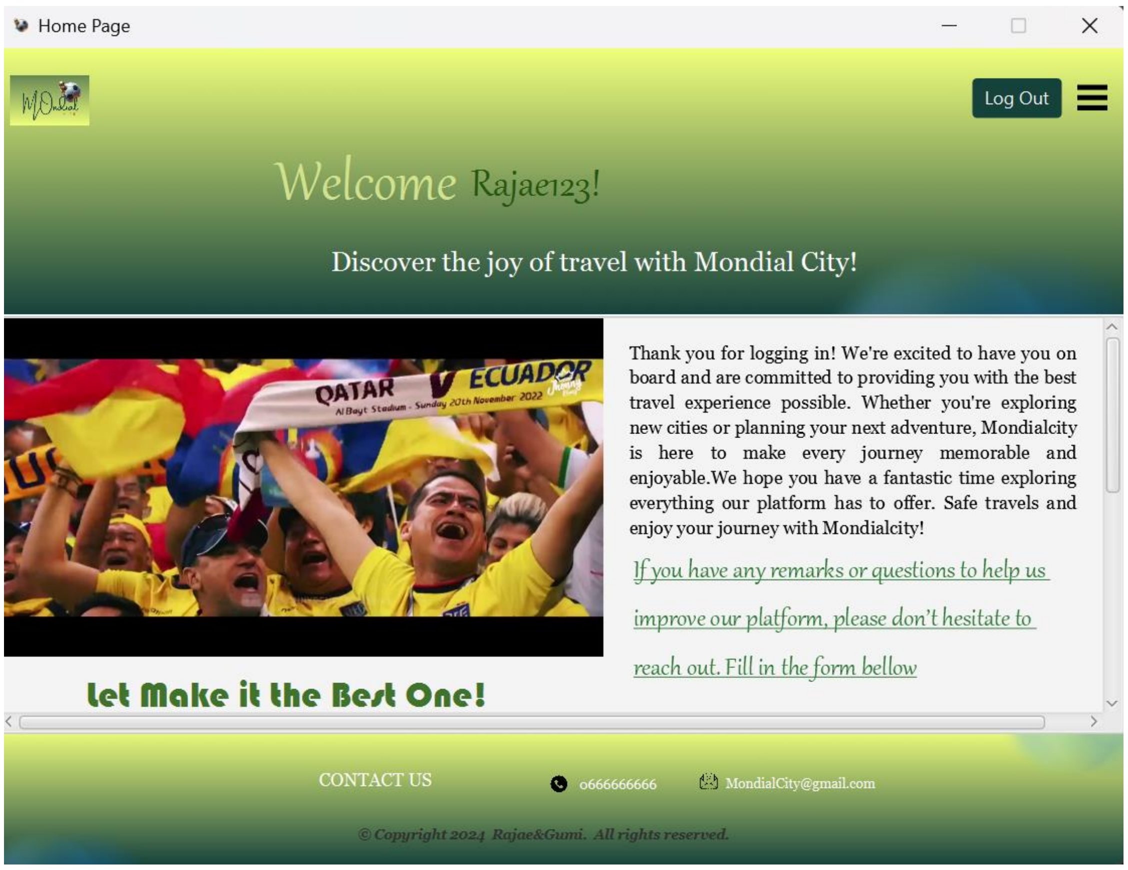


Figure 14: Login test page

When we click on login button the following page appears which is the home page of the user:


Home Page
Log Out
Welcome Rajae123!
Discover the joy of travel with Mondial City!
let Make it the Best One!
CONTACT US
0666666666
MondialCity@gmail.com
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Thank you for logging in! We're excited to have you on board and are committed to providing you with the best travel experience possible. Whether you're exploring new cities or planning your next adventure, Mondialcity is here to make every journey memorable and enjoyable.We hope you have a fantastic time exploring everything our platform has to offer. Safe travels and enjoy your journey with Mondialcity!

If you have any remarks or questions to help us improve our platform, please don't hesitate to reach out. Fill in the form bellow

Figure 15: User home page

The **home page** displayed for a registered user is similar to the one for an unregistered user, with a few differences. The user's **username** is now displayed, and the script on the right side of the page changes to thank the user for choosing our app. At the top, there is a **Logout** button, allowing the user to log out, and a **MenuButton** that still provides access to the same features as before. However, here, when the user clicks on each feature, additional pages are displayed that grant access to specific data and functionality, tailored to their registered account.

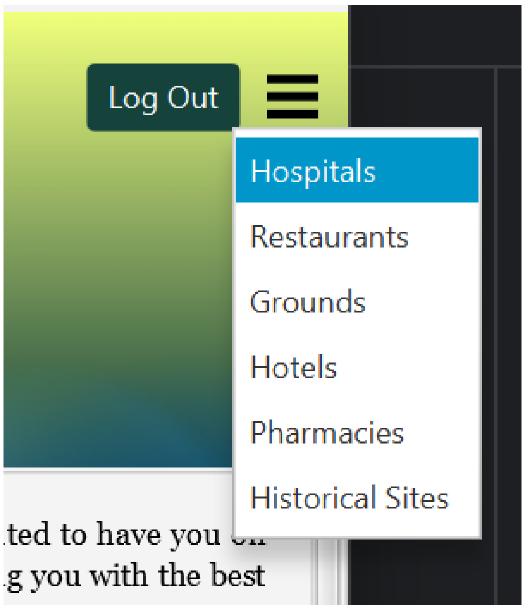
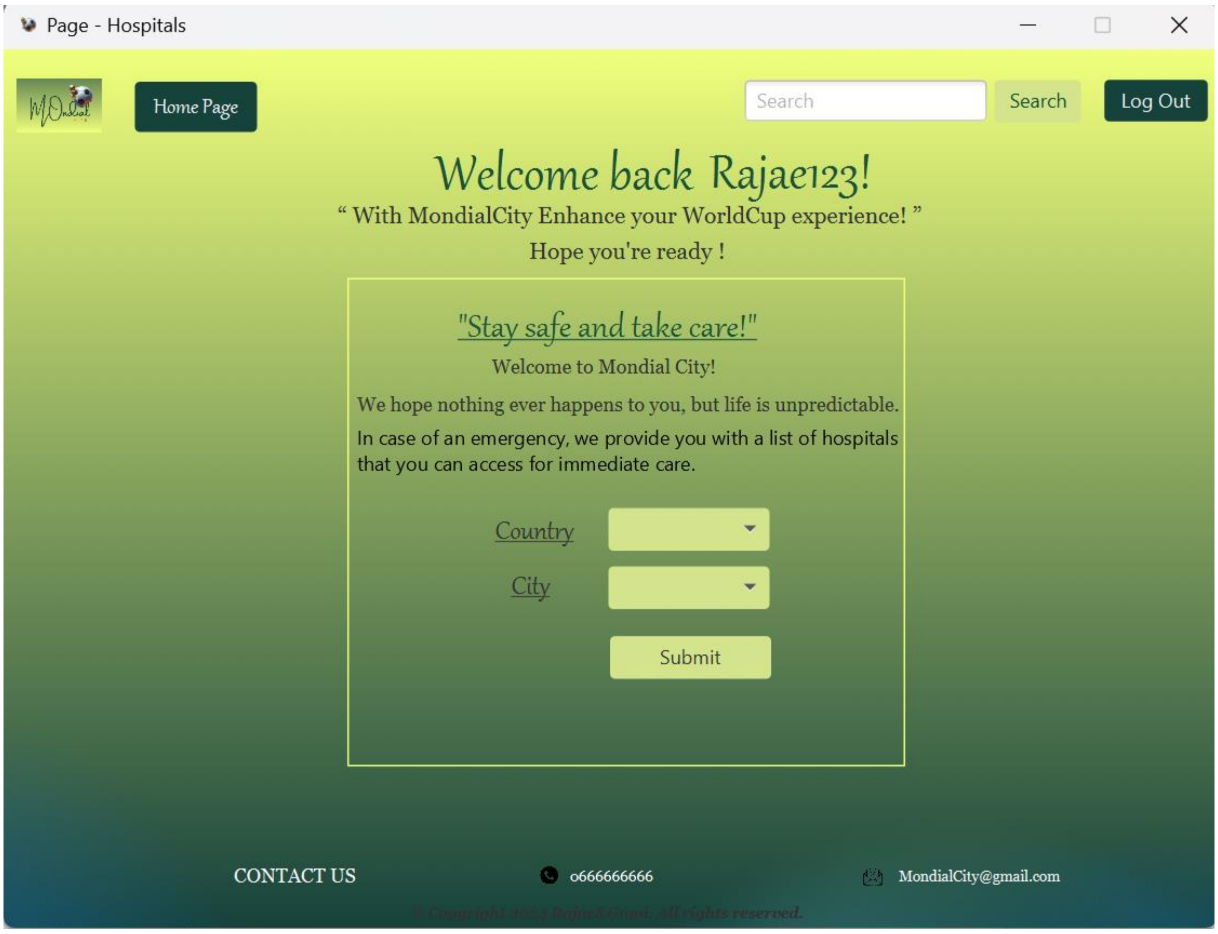


Figure 16: MenuButton features

If we click on hospitals the following page appears:


Page - Hospitals

Home Page

Search

Log Out

Welcome back Rajae123!

" With MondialCity Enhance your WorldCup experience! "

Hope you're ready !

"Stay safe and take care!"

Welcome to Mondial City!

We hope nothing ever happens to you, but life is unpredictable.

In case of an emergency, we provide you with a list of hospitals that you can access for immediate care.

Country

City

Submit

CONTACT US 0666666666 MondialCity@gmail.com

Figure 17: Hospitals feature page

At the top of the page, we find several key elements:

- Our logo, which appears on all pages for consistent branding.
- A Home Page button, allowing users to return to the homepage easily.
- A Search Bar, where users can type to search for specific content.
- A Search Button, which, when clicked, will execute the search based on the input.
- The Logout Button, allowing users to log out of their account.

In the center of the page, there is a short script providing information about our service. Below that, two ChoiceBoxes are available, where users can select the country and city they are interested in. This allows users to filter and tailor their search to the relevant location.

If we click on the country choicebox three countries appear: Morocco, Spain and Portugal.

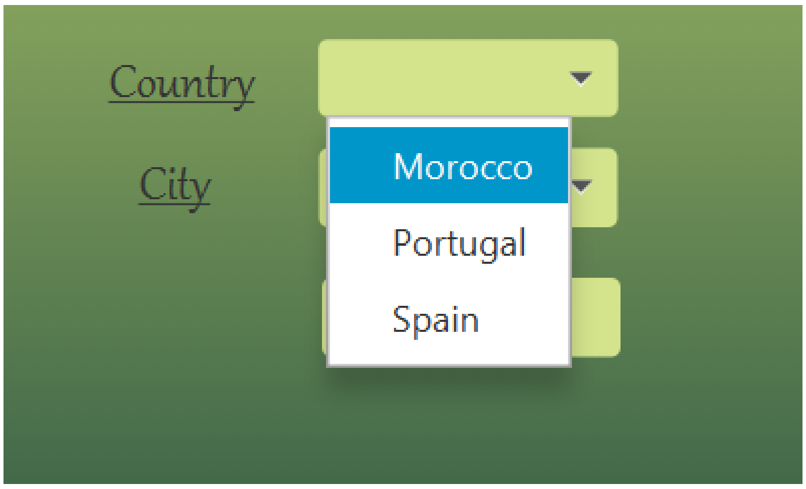


Figure 18: Data of countries

If we choose Morocco the following cities appear:

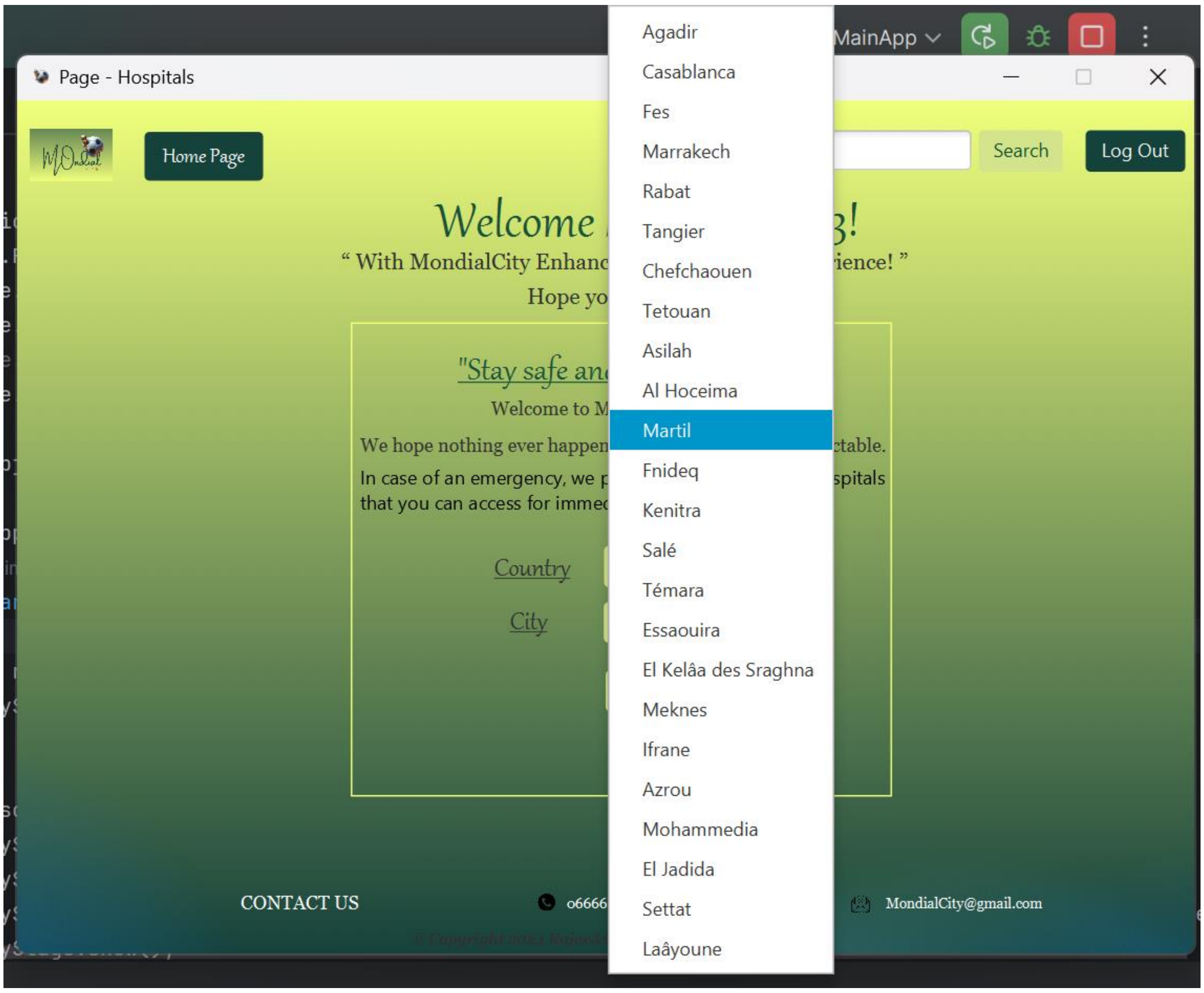
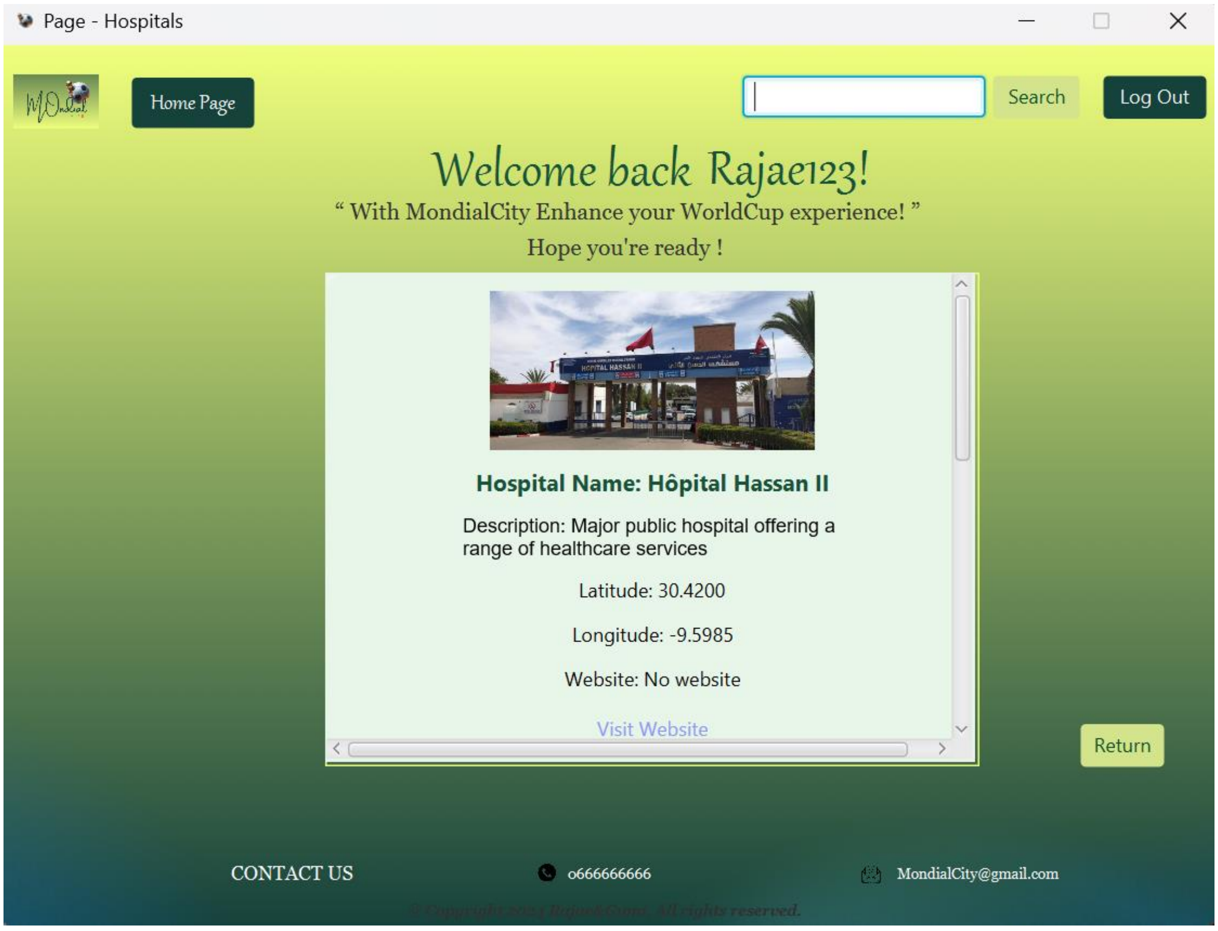


Figure 19: Data of Morocco cities

If we choose one of the cities like Agadir the following box appears:


Page - Hospitals

Welcome back Rajae123!

" With MondialCity Enhance your WorldCup experience! "

Hope you're ready !

Hospital Name: Hôpital Hassan II

Description: Major public hospital offering a range of healthcare services

Latitude: 30.4200

Longitude: -9.5985

Website: No website

Visit Website

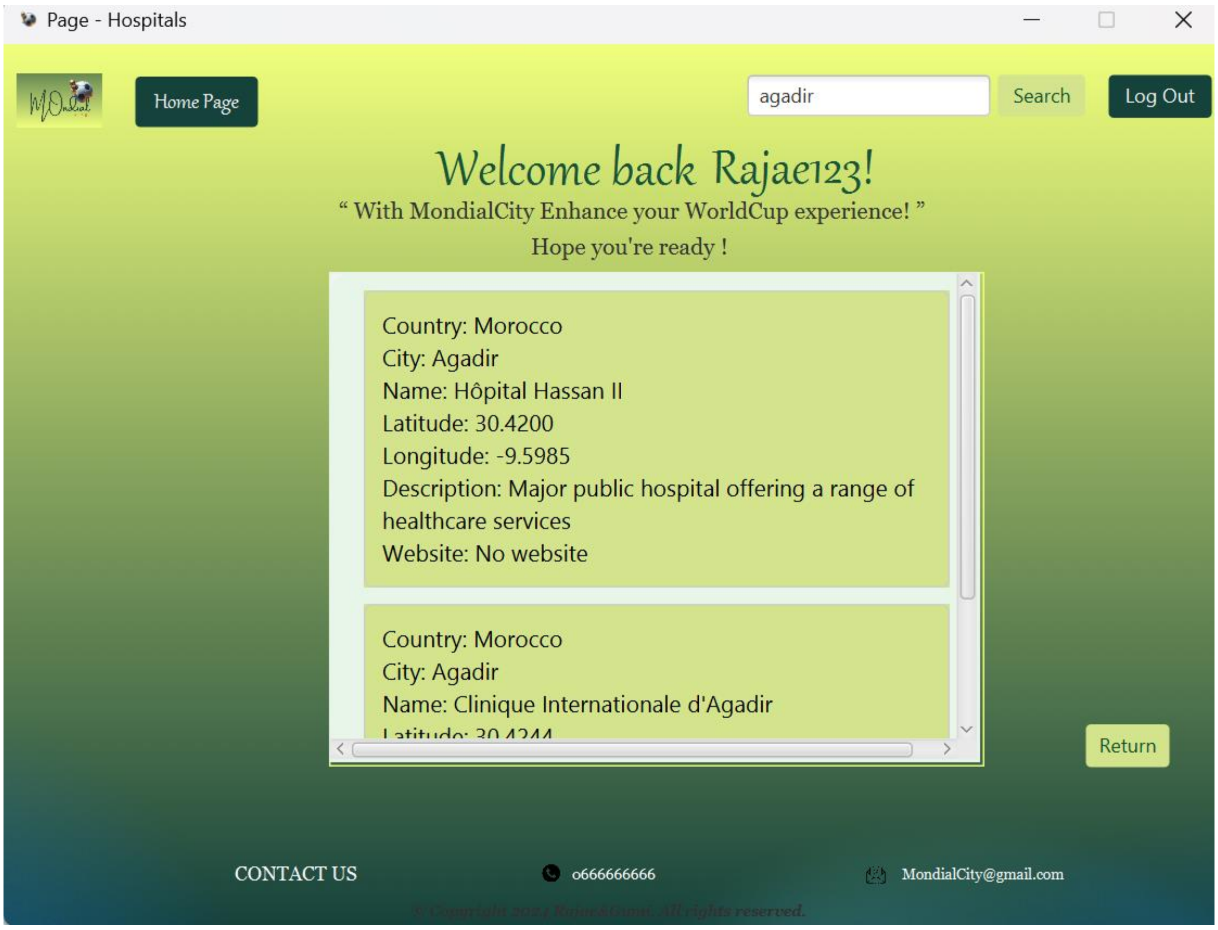
Figure 20: Data of selected hospitals

Here we find the informations about the hospitals like:

Hospital name, description, latitude and longitude and its website (if there is no website, it will be displayed)

If we click on the button return we return to the previous page to choose another city or another country.

If we write in the search bar a country or city or the name of hospital or any word we want it will display the matching results of this word for example we tap the city Agadir to see if the results are matching:



Welcome back Rajae123!

“ With MondialCity Enhance your WorldCup experience! ”

Hope you're ready !

Country: Morocco
City: Agadir
Name: Hôpital Hassan II
Latitude: 30.4200
Longitude: -9.5985
Description: Major public hospital offering a range of healthcare services
Website: No website

Country: Morocco
City: Agadir
Name: Clinique Internationale d'Agadir

Figure 21: Data of searched hospitals

And the same thing for the others countries, here we find the cities of Portugal and Spain:

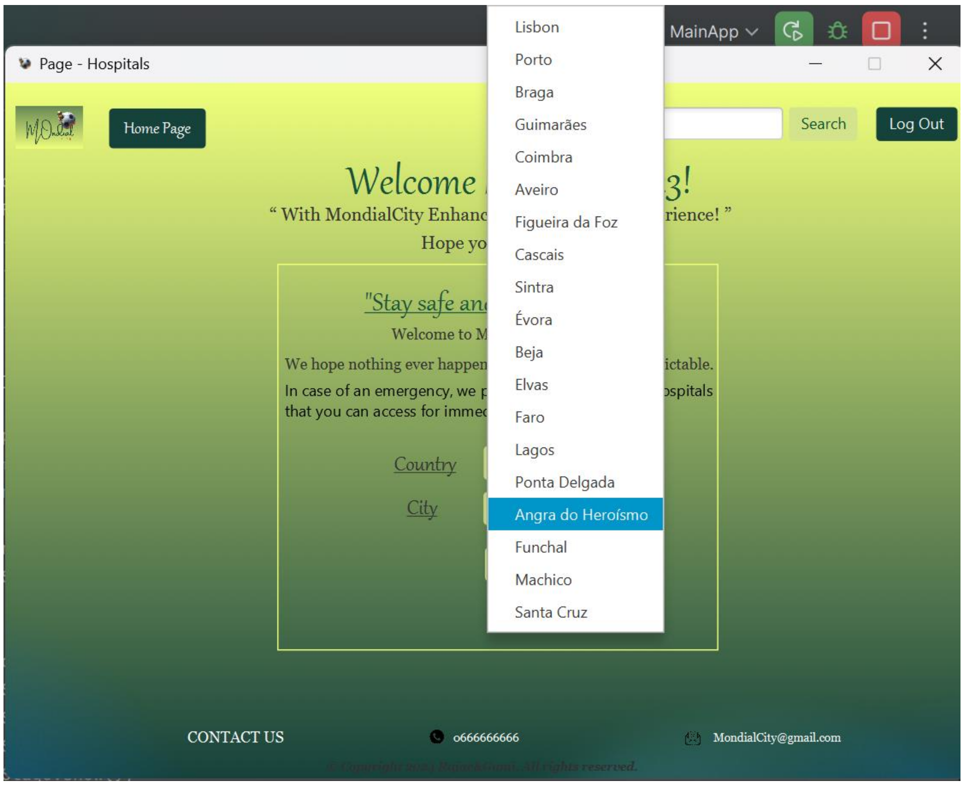


Figure 22: Data of Portugal cities

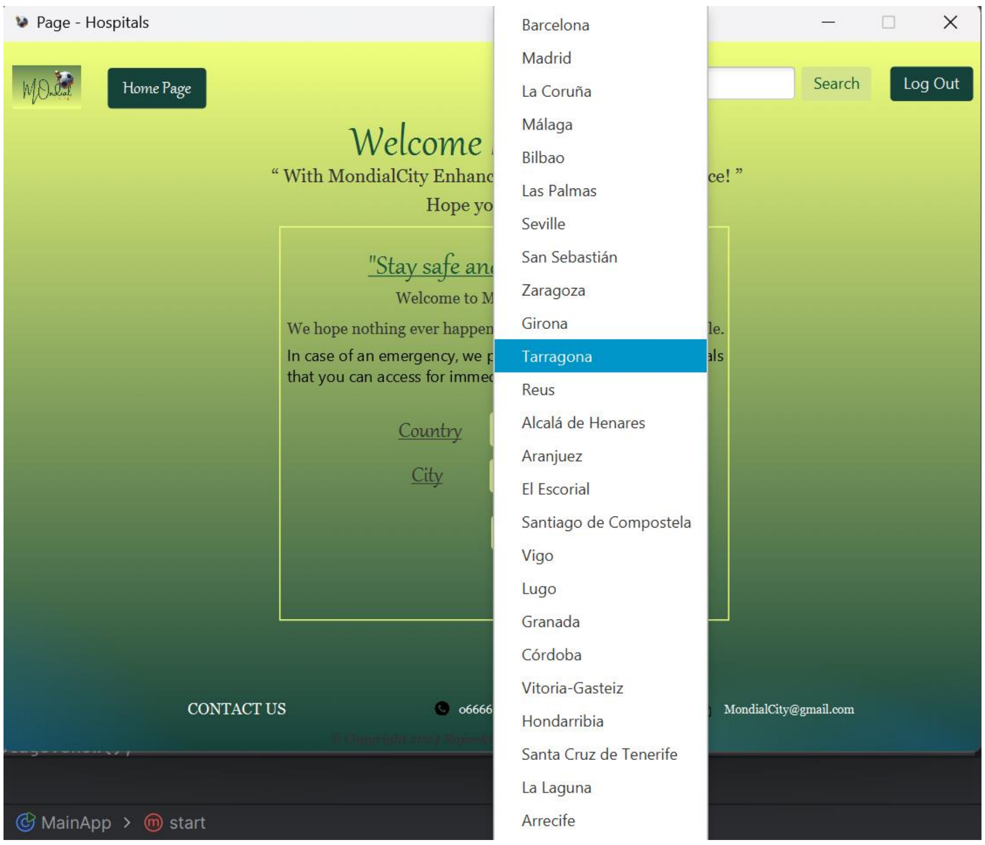
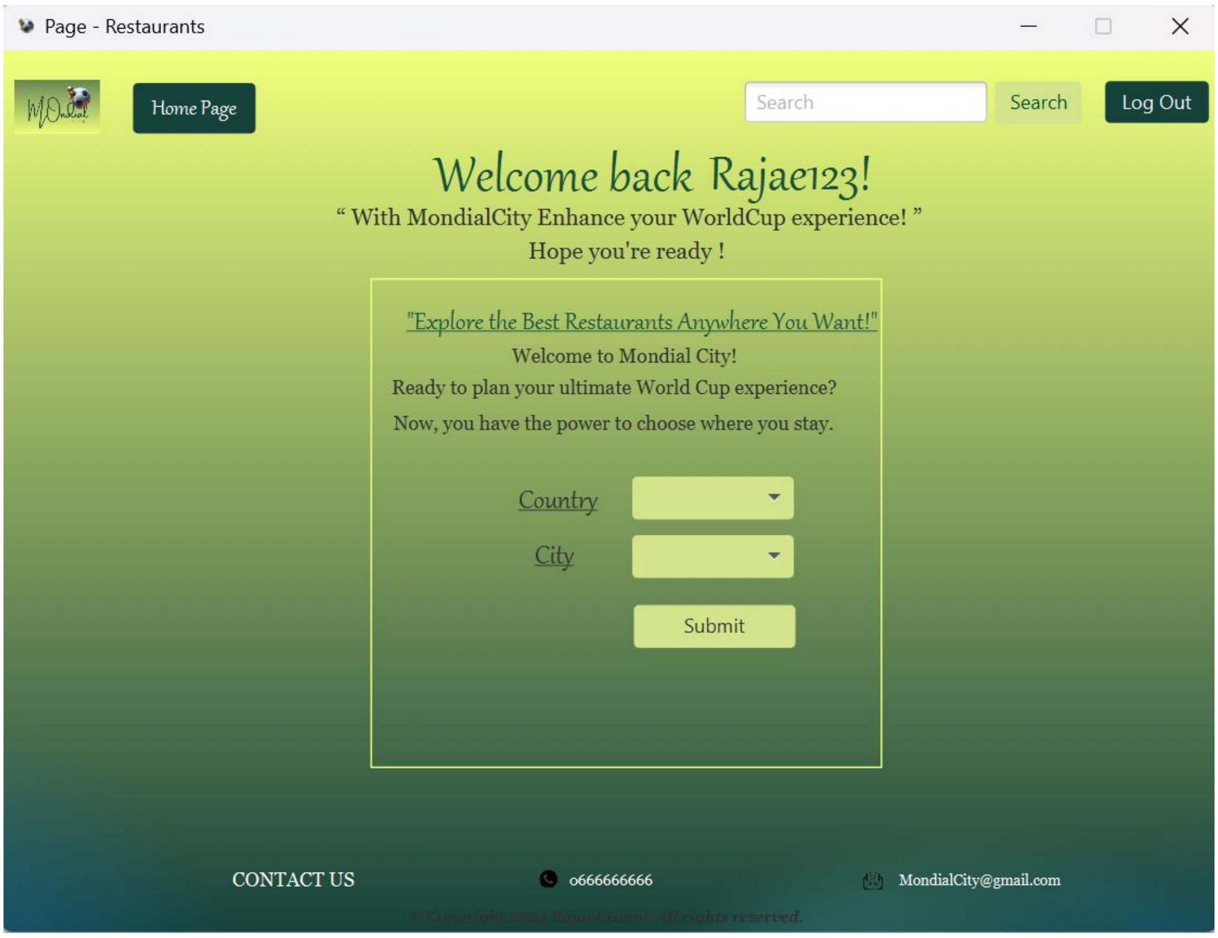


Figure 23: Data of Spain cities

For the feature of restaurants the following page appears:


Page - Restaurants

Welcome back Rajae123!

" With MondialCity Enhance your WorldCup experience! "

Hope you're ready !

"Explore the Best Restaurants Anywhere You Want!"

Welcome to Mondial City!

Ready to plan your ultimate World Cup experience?

Now, you have the power to choose where you stay.

Country

City

CONTACT US 0666666666 MondialCity@gmail.com

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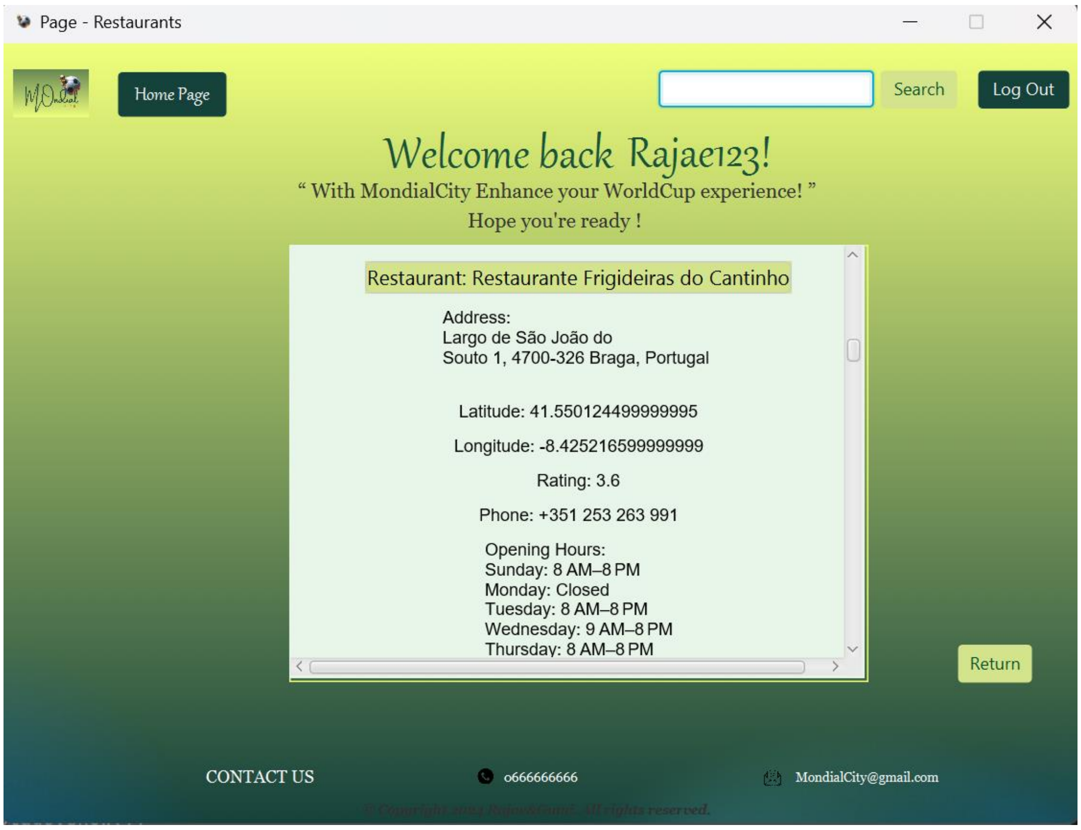
Figure 24: Restaurants feature page

Again we choose the country and the city that we want ; for example we choose Portugal-Braga



Page - Restaurants

Home Page

Search

Log Out

Welcome back Rajae123!

" With MondialCity Enhance your WorldCup experience! "

Hope you're ready !

Restaurant: Restaurante Frigideiras do Cantinho

Address:
Largo de São João do
Souto 1, 4700-326 Braga, Portugal

Latitude: 41.550124499999995

Longitude: -8.425216599999999

Rating: 3.6

Phone: +351 253 263 991

Opening Hours:
Sunday: 8 AM–8 PM
Monday: Closed
Tuesday: 8 AM–8 PM
Wednesday: 9 AM–8 PM
Thursday: 8 AM–8 PM

Return

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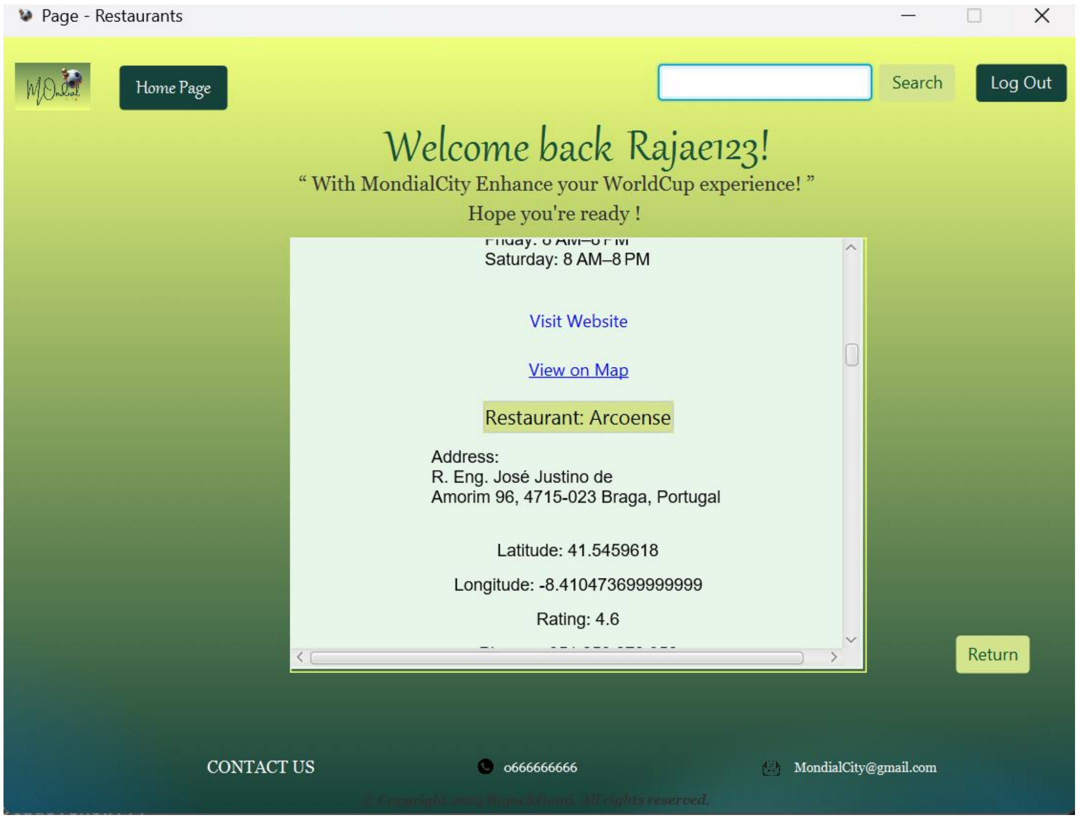

Page - Restaurants

Home Page

Search

Log Out

Welcome back Rajae123!

" With MondialCity Enhance your WorldCup experience! "

Hope you're ready !

Saturday: 8 AM–8 PM

Visit Website

View on Map

Restaurant: Arcoense

Address:
R. Eng. José Justino de
Amorim 96, 4715-023 Braga, Portugal

Latitude: 41.5459618

Longitude: -8.410473699999999

Rating: 4.6

Return

CONTACT US

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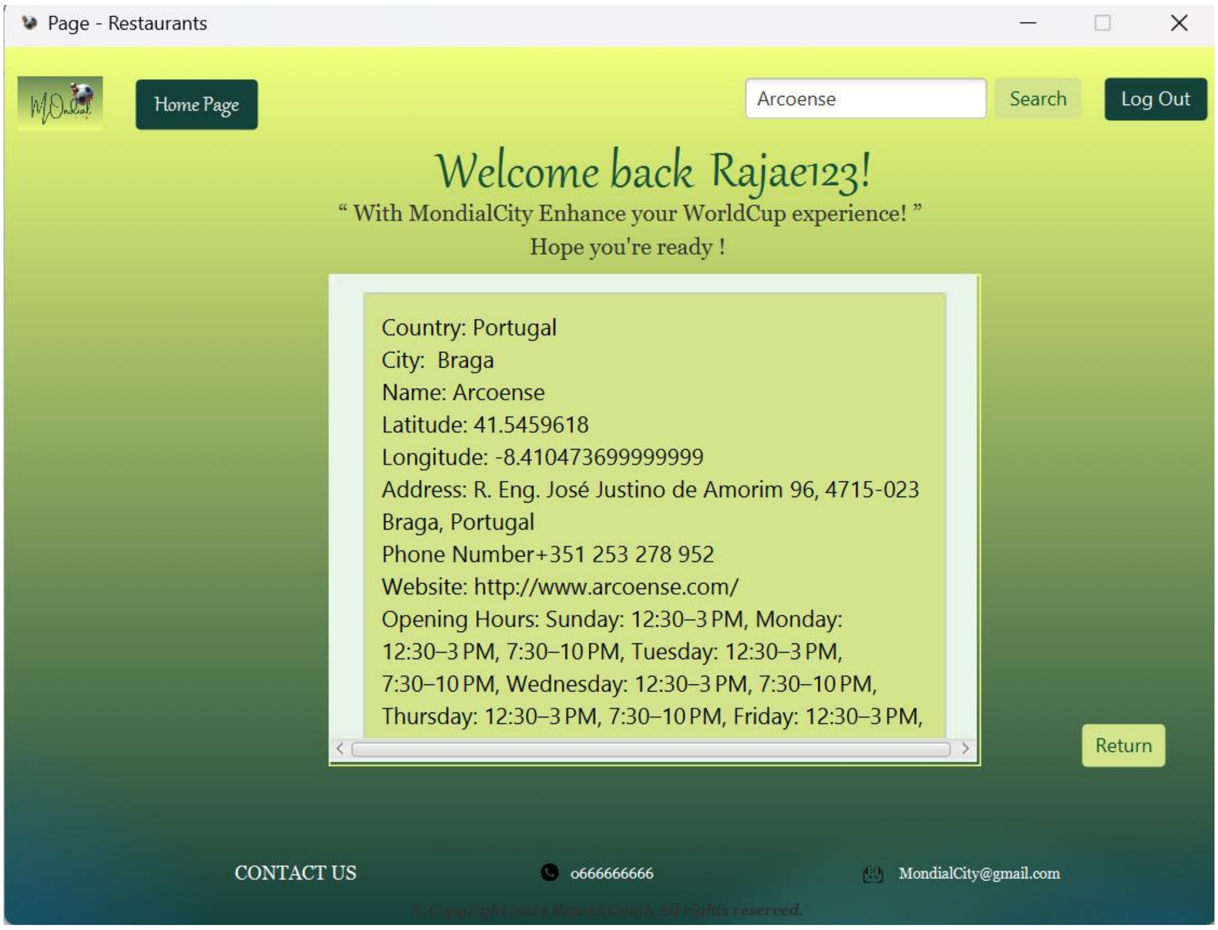
MondialCity@gmail.com

Figure 25: Data of selected Restaurants

The informations about the restaurants appear like : address, latitude ,longitude , phone ,opening hours, website and map link (when we click on it the pages opened in the browser)

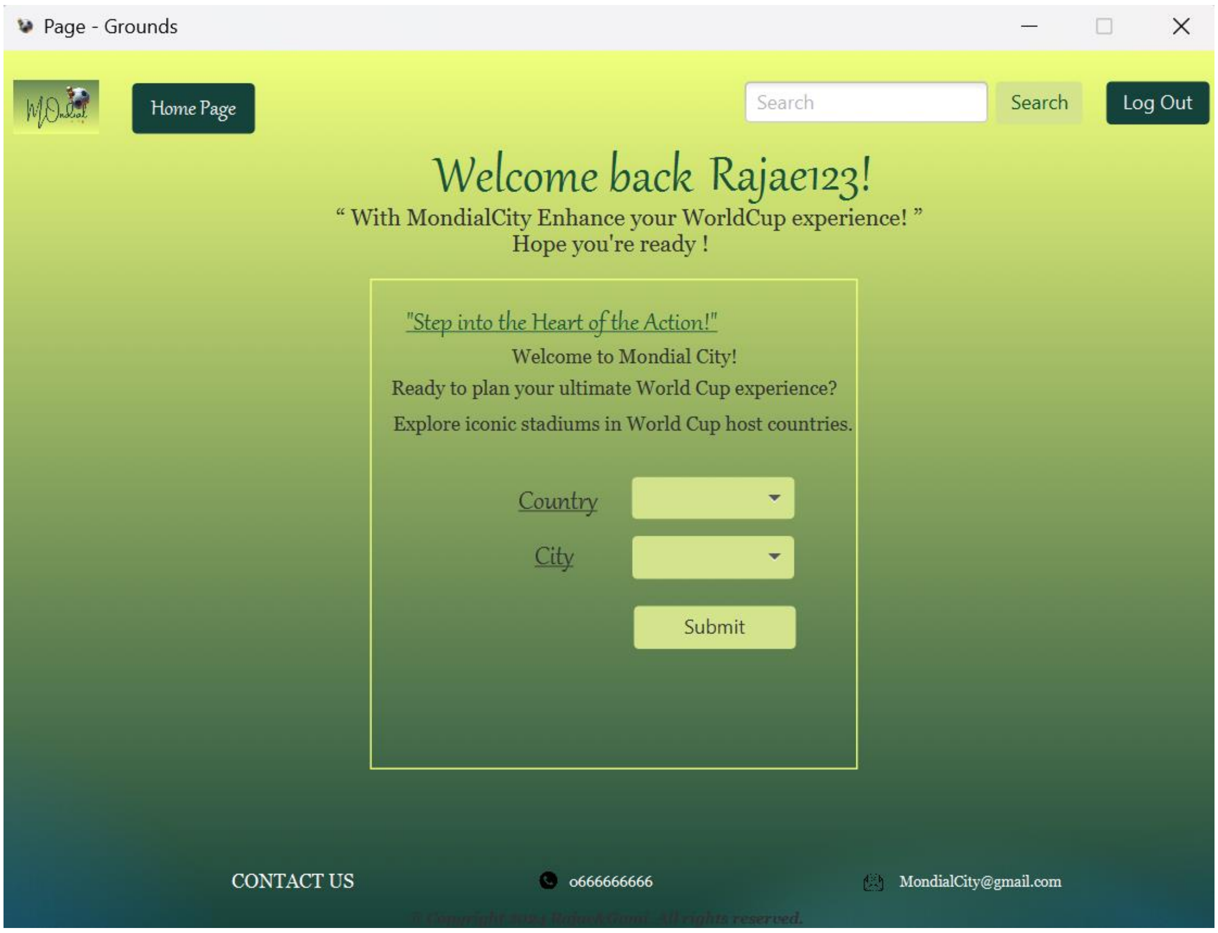
And if we search by the name of restaurant Arcoense, its informations appear:



Country: Portugal
City: Braga
Name: Arcoense
Latitude: 41.5459618
Longitude: -8.410473699999999
Address: R. Eng. José Justino de Amorim 96, 4715-023 Braga, Portugal
Phone Number+351 253 278 952
Website: http://www.arcoense.com/
Opening Hours: Sunday: 12:30–3 PM, Monday: 12:30–3 PM, 7:30–10 PM, Tuesday: 12:30–3 PM, 7:30–10 PM, Wednesday: 12:30–3 PM, 7:30–10 PM, Thursday: 12:30–3 PM, 7:30–10 PM, Friday: 12:30–3 PM,

Figure 26: Data of searched Restaurants

This is the page that appear when we choose grounds features:


Page - Grounds

Home Page

Search

Log Out

Welcome back Rajae123!

“ With MondialCity Enhance your WorldCup experience! ”
Hope you're ready !

"Step into the Heart of the Action!"

Welcome to Mondial City!

Ready to plan your ultimate World Cup experience?

Explore iconic stadiums in World Cup host countries.

Country

City

Submit

CONTACT US

0666666666

MondialCity@gmail.com

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Figure 27: Grounds feature page

When we click on the country choicebox the following countries appear :

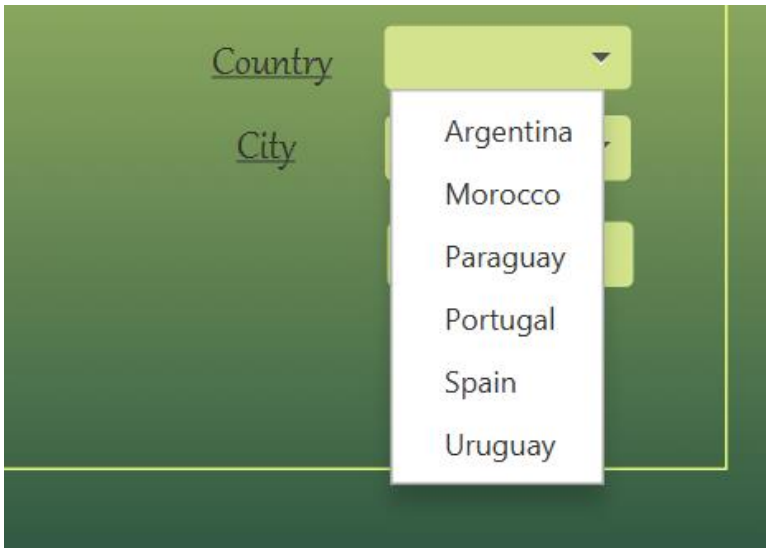
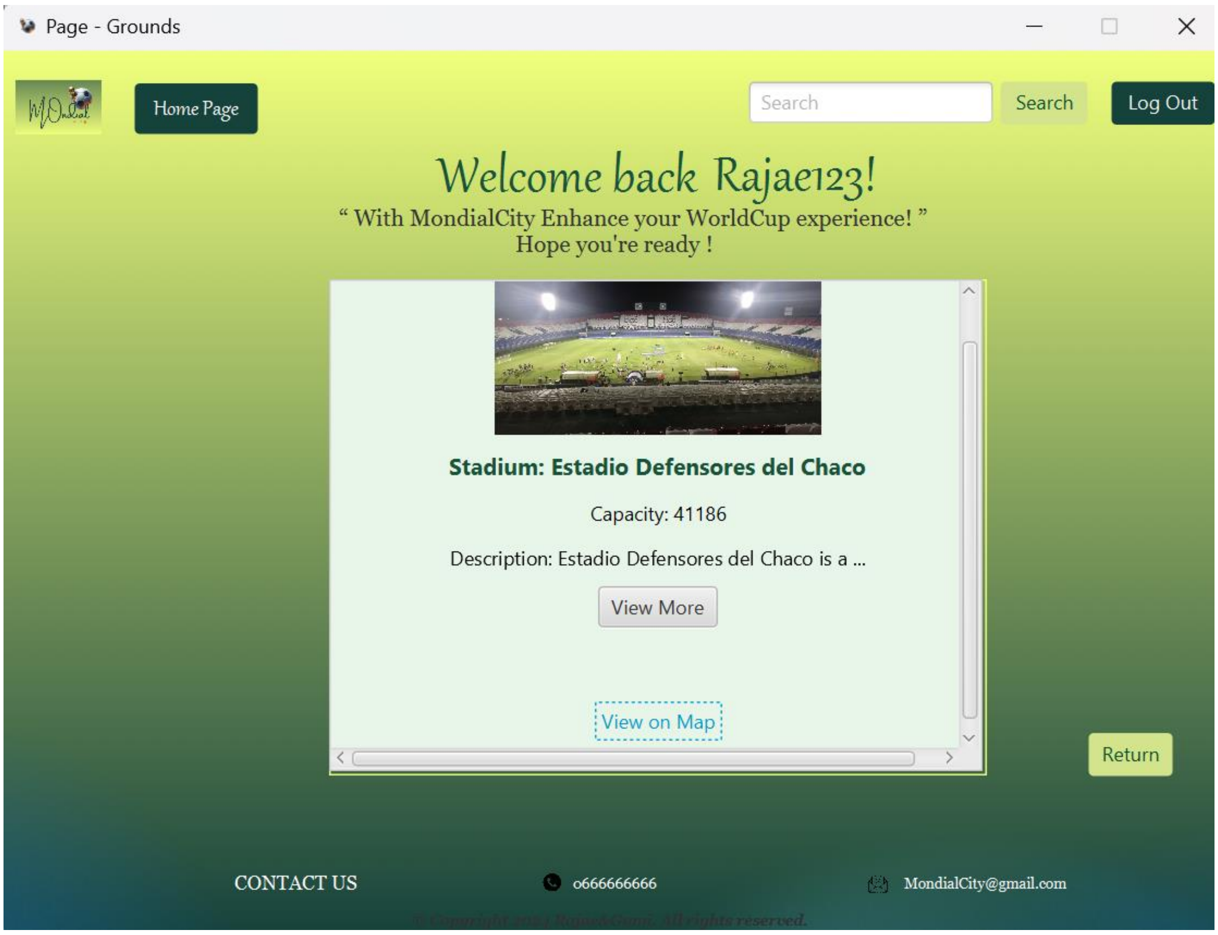


Figure 18: Data of countries

We add as we see here the countries: Argentina, Paraguay and Uruguay because they are the countries that will host the opening of FIFA WORLD CUP 2030.

This is the display of Paraguay-Asuncion


Page - Grounds

Home Page

Search

Search

Log Out

Welcome back Rajae123!

“ With MondialCity Enhance your WorldCup experience! ”
Hope you're ready !

Stadium: Estadio Defensores del Chaco

Capacity: 41186

Description: Estadio Defensores del Chaco is a ...

View More

View on Map

Return

CONTACT US

0666666666

MondialCity@gmail.com

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Figure 28: Data of selected Grounds

When we click on view more, it displays more about the description, and when we click on view map, it leads the users to the position of the stadium in google maps.

The same structure applies to all other features. Each feature has its own main page, following the same layout with minor adjustments based on the specific functionality.

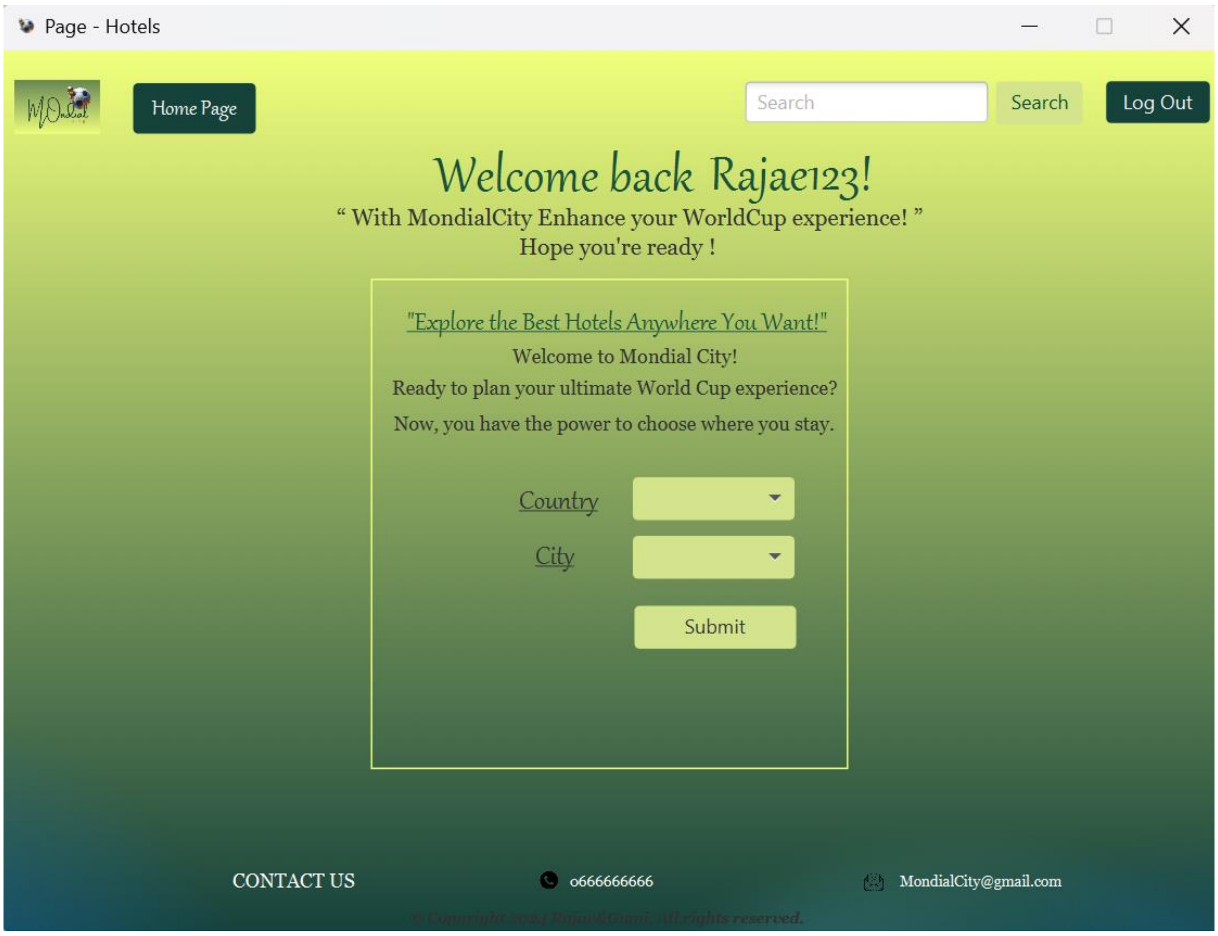
For example:

- The top of each page contains the **logo**, **Home Page button**, **Search Bar**, **Search Button**, and **Logout Button**, ensuring easy navigation throughout the app.

- In the center of each page, a brief **script** explains the feature's purpose, followed by relevant elements such as **ChoiceBoxes** or other interactive components tailored to the specific feature.
- For each feature, we provide an **example** to illustrate how the user can interact with the feature, giving them a clear understanding of its value and functionality.

Hotels feature:

The main page:



Welcome back Rajae123!

“ With MondialCity Enhance your WorldCup experience! ”

Hope you're ready !

"Explore the Best Hotels Anywhere You Want!"

Welcome to Mondial City!

Ready to plan your ultimate World Cup experience?

Now, you have the power to choose where you stay.

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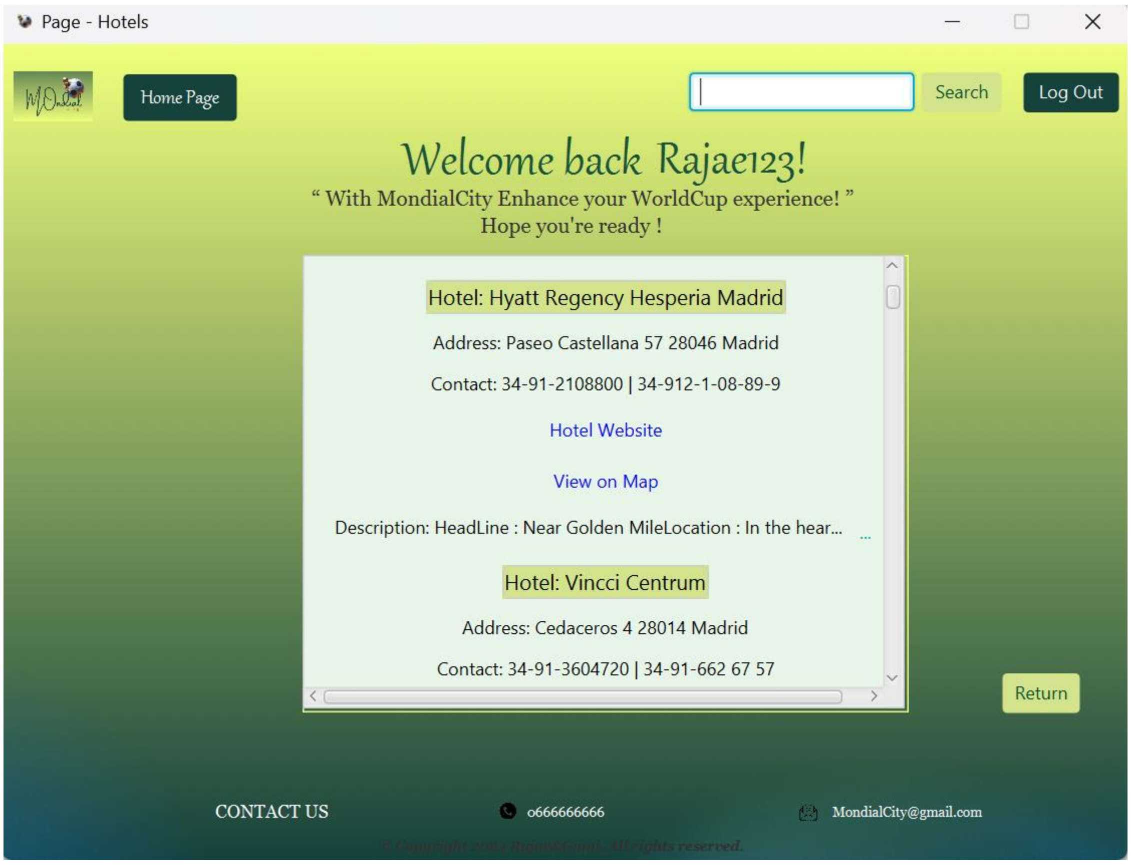
Figure 29: Hotels feature page

Example of Barcelone-Madrid:



Page - Hotels

Welcome back Rajae123!

" With MondialCity Enhance your WorldCup experience! "
Hope you're ready !

Hotel: Hyatt Regency Hesperia Madrid

Address: Paseo Castellana 57 28046 Madrid

Contact: 34-91-2108800 | 34-912-1-08-89-9

Hotel Website

View on Map

Description: HeadLine : Near Golden MileLocation : In the hear...

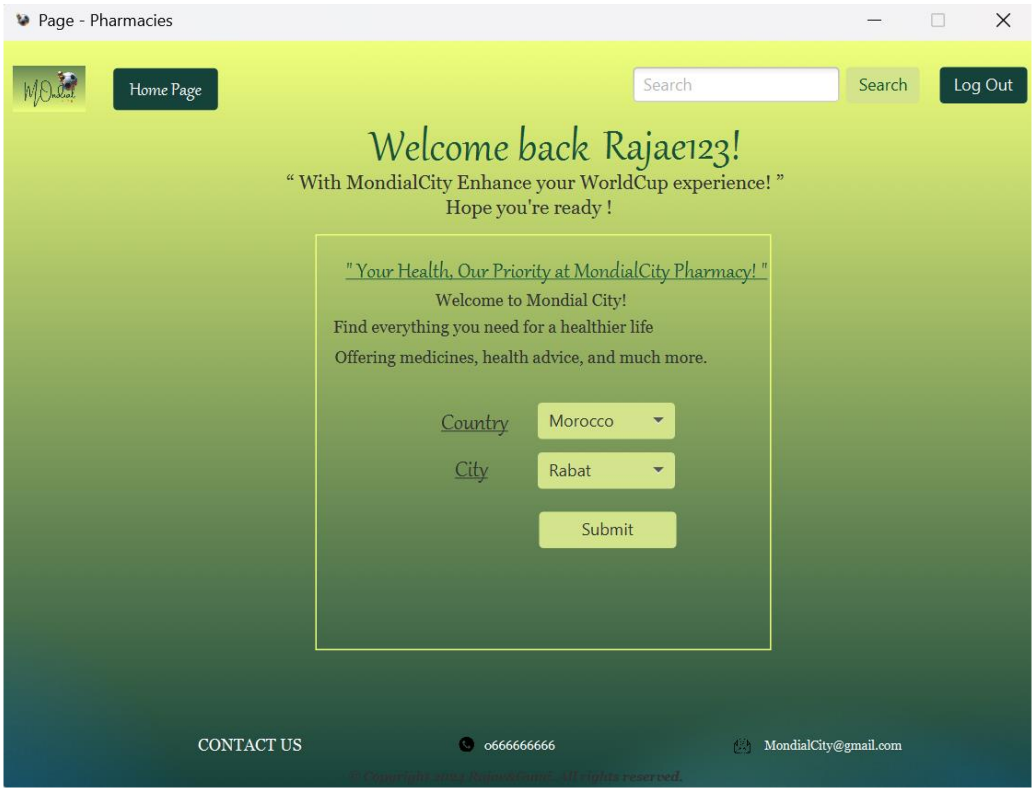
Hotel: Vincci Centrum

Address: Cedaceros 4 28014 Madrid

Contact: 34-91-3604720 | 34-91-662 67 57

Figure 30: Data of selected Hotels

Pharmacies feature:


Page - Pharmacies

Welcome back Rajae123!

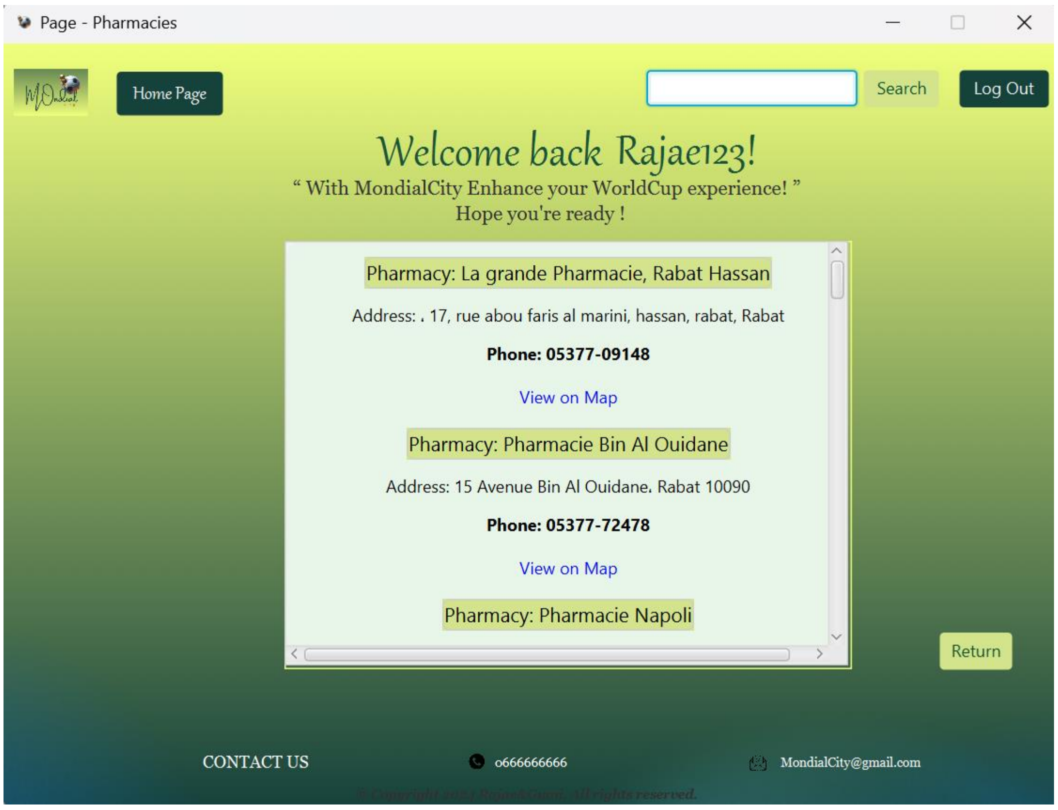
“ With MondialCity Enhance your WorldCup experience! ”
Hope you're ready !

" Your Health, Our Priority at MondialCity Pharmacy! "
Welcome to Mondial City!
Find everything you need for a healthier life
Offering medicines, health advice, and much more.

Country: Morocco
City: Rabat

Figure 31: Pharmacies feature page

Example of Morocco-Rabat:


Page - Pharmacies

Welcome back Rajae123!

“ With MondialCity Enhance your WorldCup experience! ”
Hope you're ready !

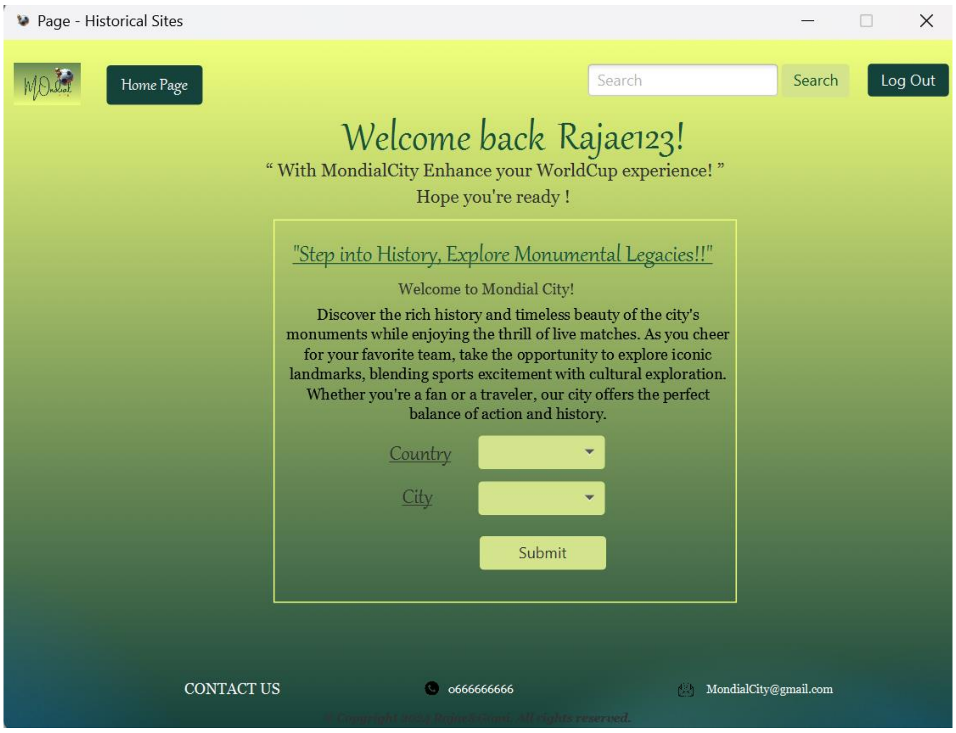
Pharmacy: La grande Pharmacie, Rabat Hassan
Address: . 17, rue abou faris al marini, hassan, rabat, Rabat
Phone: 05377-09148
View on Map

Pharmacy: Pharmacie Bin Al Ouidane
Address: 15 Avenue Bin Al Ouidane, Rabat 10090
Phone: 05377-72478
View on Map

Pharmacy: Pharmacie Napoli

Figure 32: Data of selected Pharmacies

Historical-sites feature:



Welcome back Rajae123!

" With MondialCity Enhance your WorldCup experience! "

Hope you're ready !

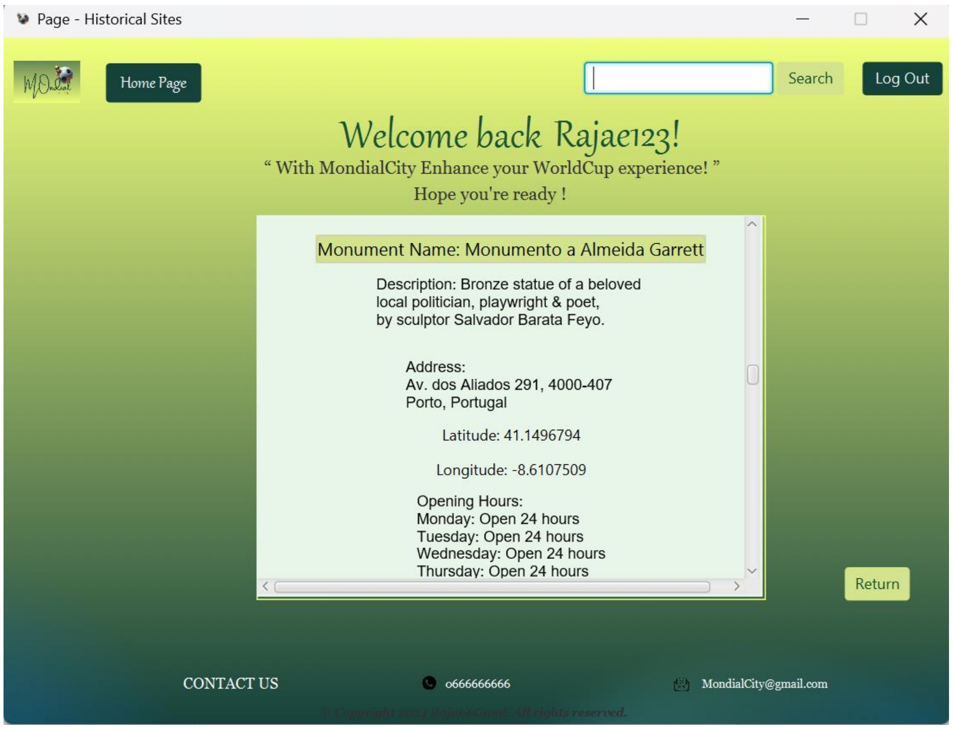
"Step into History, Explore Monumental Legacies!!"

Welcome to Mondial City!

Discover the rich history and timeless beauty of the city's monuments while enjoying the thrill of live matches. As you cheer for your favorite team, take the opportunity to explore iconic landmarks, blending sports excitement with cultural exploration. Whether you're a fan or a traveler, our city offers the perfect balance of action and history.

Figure 33: Historical sites feature page

Example of Portugal-Porto:



Welcome back Rajae123!

" With MondialCity Enhance your WorldCup experience! "

Hope you're ready !

Monument Name: Monumento a Almeida Garrett

Description: Bronze statue of a beloved
local politician, playwright & poet,
by sculptor Salvador Barata Feyo.

Address:
Av. dos Aliados 291, 4000-407
Porto, Portugal

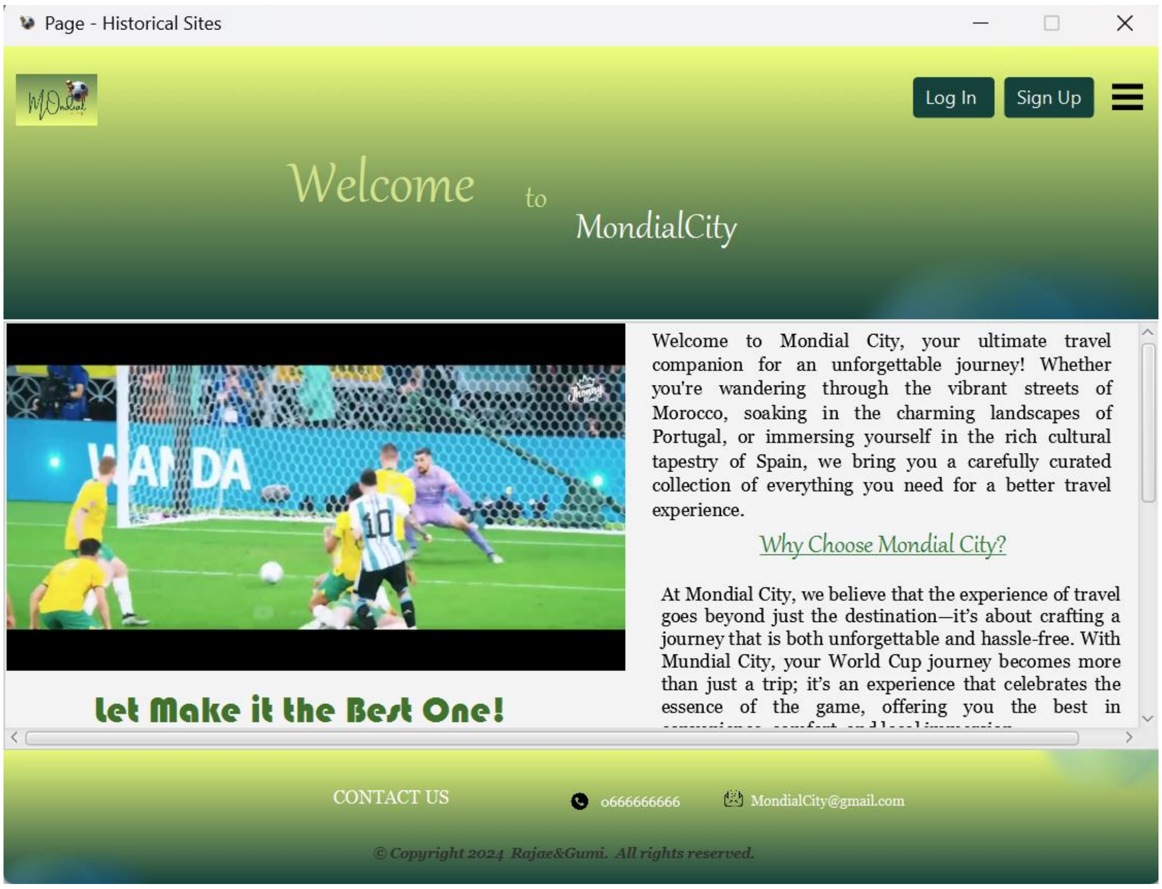
Latitude: 41.1496794

Longitude: -8.6107509

Opening Hours:
Monday: Open 24 hours
Tuesday: Open 24 hours
Wednesday: Open 24 hours
Thursday: Open 24 hours

Figure 34: Data of selected Historical sites

So when we click on the logout button we return to the home page :



Welcome to Mondial City, your ultimate travel companion for an unforgettable journey! Whether you're wandering through the vibrant streets of Morocco, soaking in the charming landscapes of Portugal, or immersing yourself in the rich cultural tapestry of Spain, we bring you a carefully curated collection of everything you need for a better travel experience.

Why Choose Mondial City?

At Mondial City, we believe that the experience of travel goes beyond just the destination—it's about crafting a journey that is both unforgettable and hassle-free. With Mundial City, your World Cup journey becomes more than just a trip; it's an experience that celebrates the essence of the game, offering you the best in

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Figure 1: Home page

Now, we present the features available to admins, who have the ability to manage the data within the app. Admins can **insert**, **update**, and **delete** data, as well as **select** from the available data to perform their tasks. To access these features, admins are provided with pre-created accounts. Once logged in, they can easily manage the data through their admin interface, allowing them to perform their work efficiently. The admin functionalities are designed to ensure that only authorized users have access to these powerful tools, keeping the data secure and up to date.

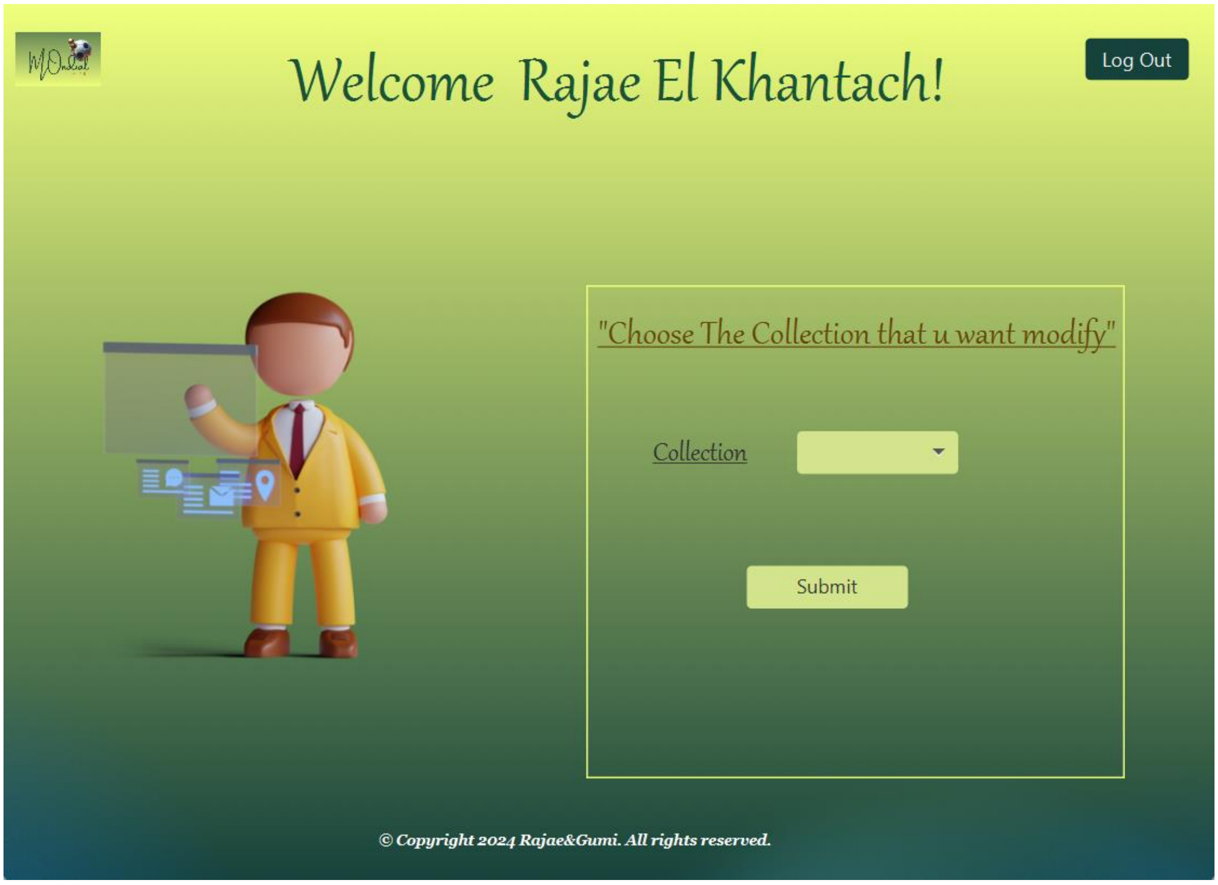

Welcome Rajae El Khantach!
Log Out
"Choose The Collection that u want modify"
Collection
Submit
© Copyright 2024 Rajae&Gumi. All rights reserved.

Figure 35: Admin Home page

The first feature for the admin is the ability to choose a collection from the collections stored in MongoDB. When the admin clicks on this feature, a list of all available collections is displayed. This allows the admin to easily browse through the data stored in the database and select the collection they wish to manage, whether it's for inserting, updating, deleting, or viewing the data. This feature provides a streamlined way for the admin to access and interact with the database collections.

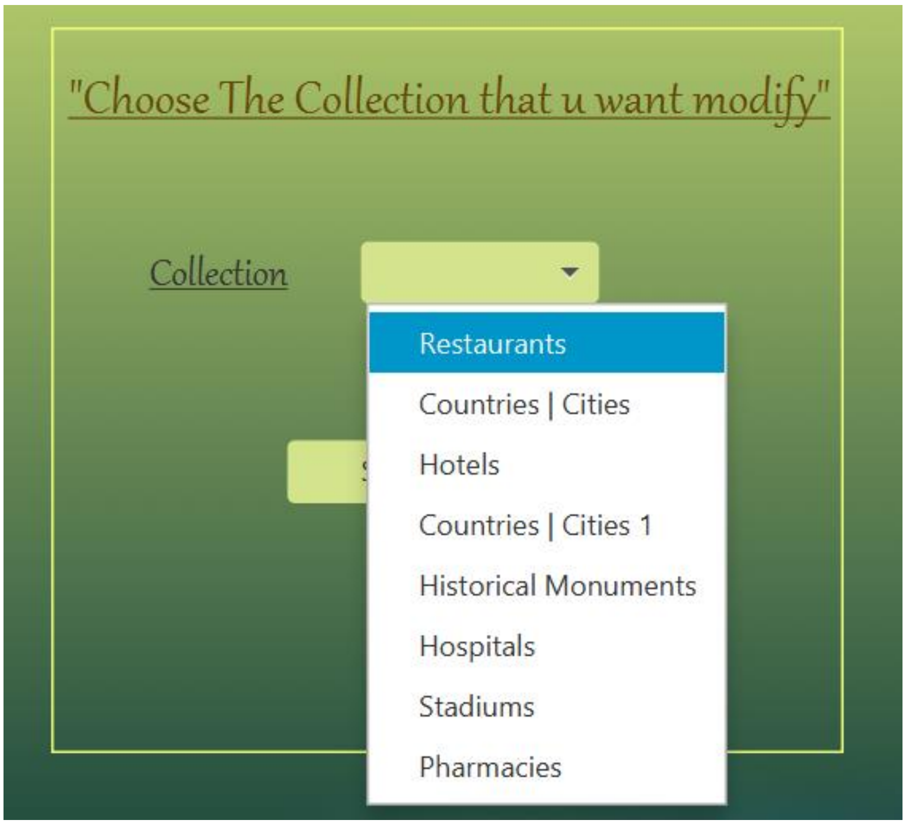


Figure 36: Data of collections

If the admin chooses the restaurants collection and clicks Submit, the next step is to select the action they want to perform. A set of options will appear, allowing the admin to choose from the following actions:

Insert: To add new data to the collection.

Update: To modify existing data within the collection.

Delete: To remove data from the collection.

Select: To view or retrieve data from the collection.

Once the admin selects an action, they can proceed with the appropriate operation, ensuring smooth and controlled management of the data.

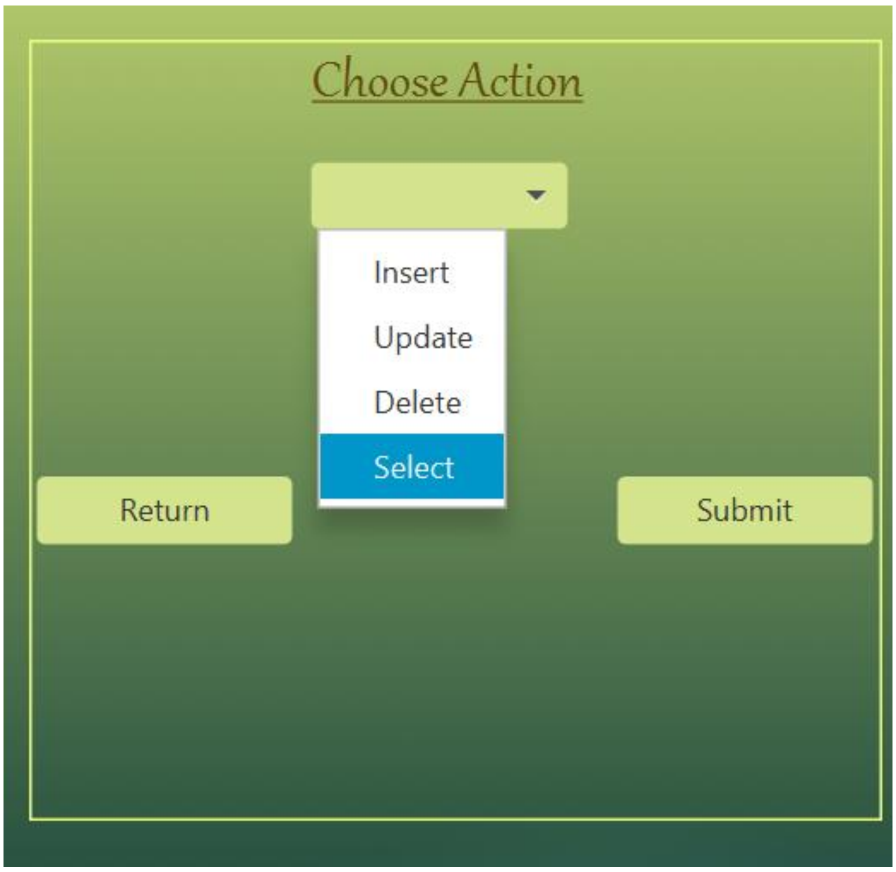
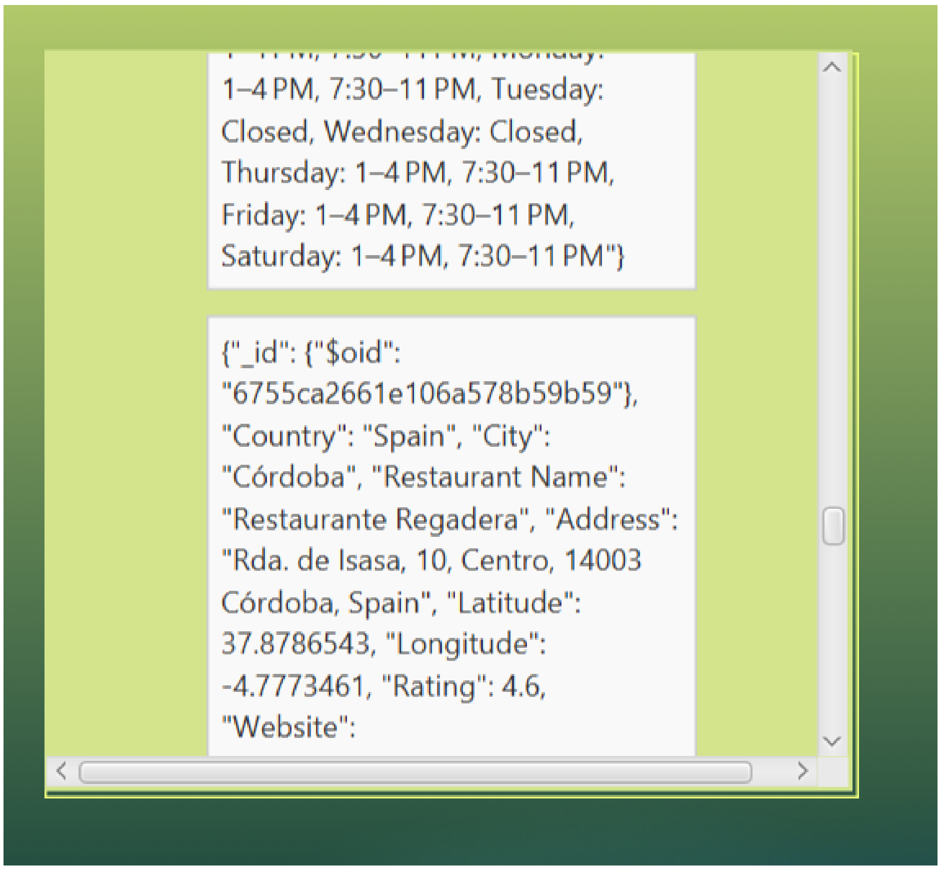


Figure 37: Data Actions

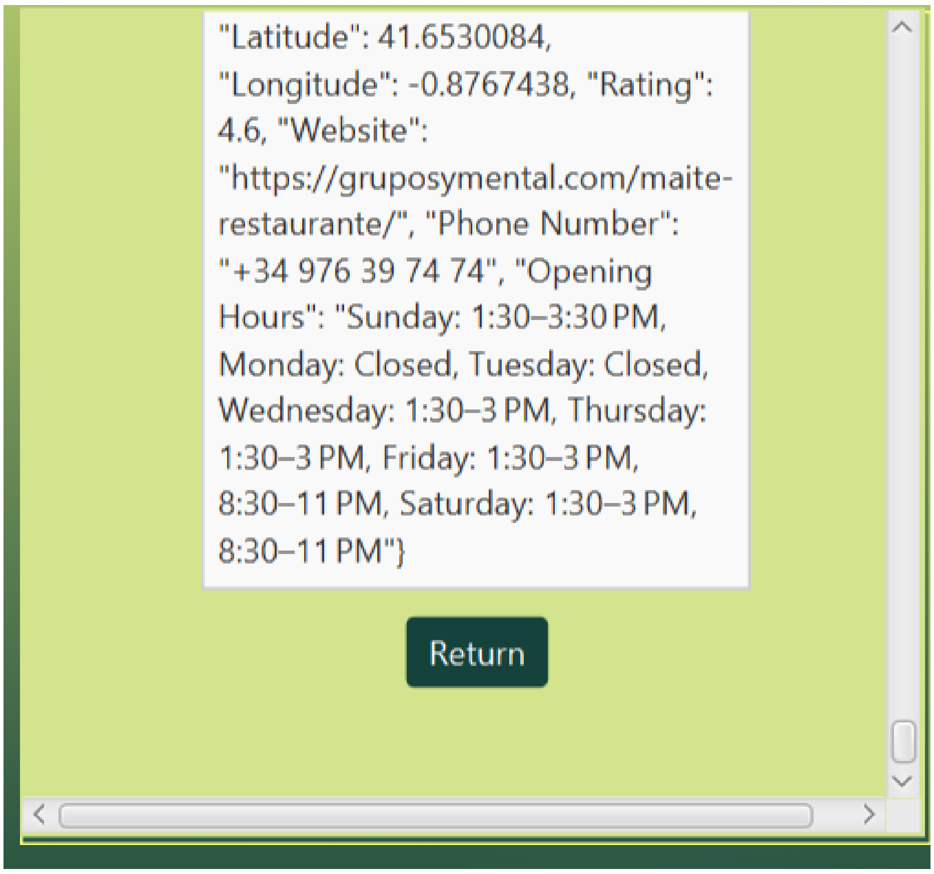
If he clicks on Select, the dataset of restaurants appears:



```
1–4 PM, 7:30–11 PM, Tuesday:
Closed, Wednesday: Closed,
Thursday: 1–4 PM, 7:30–11 PM,
Friday: 1–4 PM, 7:30–11 PM,
Saturday: 1–4 PM, 7:30–11 PM"}

{"_id": {"$oid":
"6755ca2661e106a578b59b59"},
"Country": "Spain", "City":
"Córdoba", "Restaurant Name":
"Restaurante Regadera", "Address":
"Rda. de Isasa, 10, Centro, 14003
Córdoba, Spain", "Latitude":
37.8786543, "Longitude":
-4.7773461, "Rating": 4.6,
"Website":
```

Figure 38: Data of select action

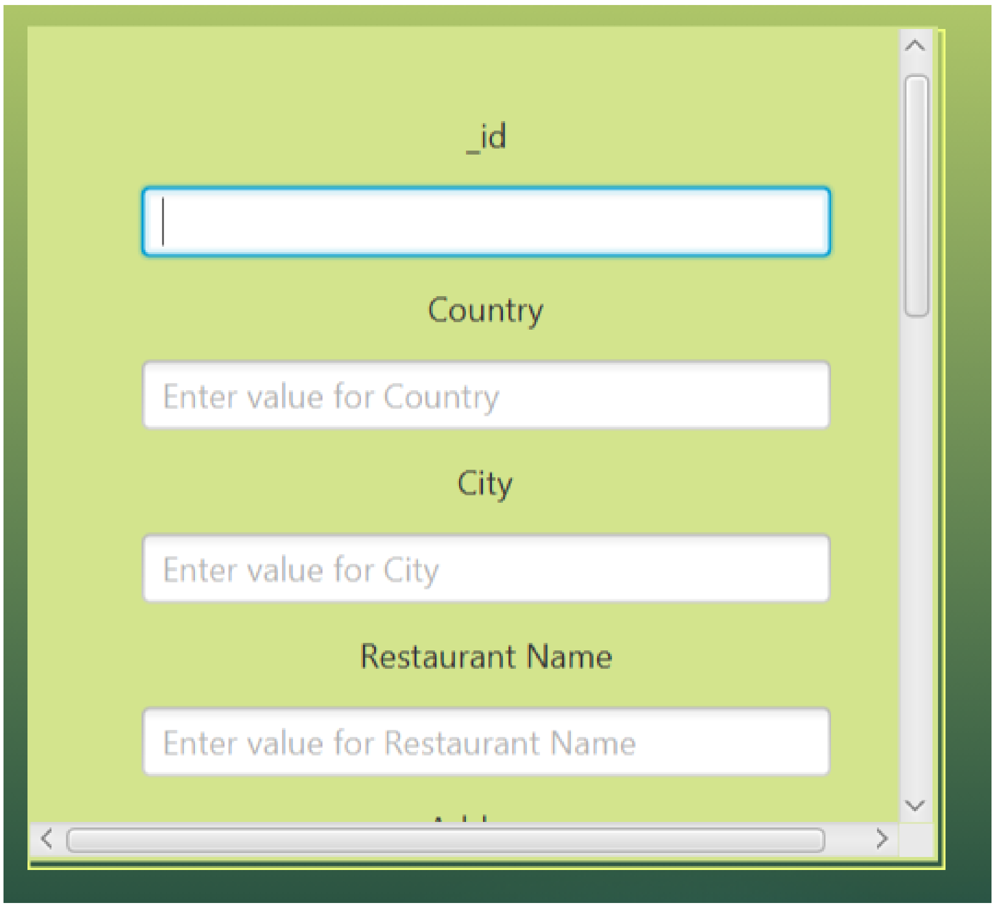


```
"Latitude": 41.6530084,
"Longitude": -0.8767438, "Rating":
4.6, "Website":
"https://gruposymental.com/maite-
restaurante/", "Phone Number":
"+34 976 39 74 74", "Opening
Hours": "Sunday: 1:30–3:30 PM,
Monday: Closed, Tuesday: Closed,
Wednesday: 1:30–3 PM, Thursday:
1:30–3 PM, Friday: 1:30–3 PM,
8:30–11 PM, Saturday: 1:30–3 PM,
8:30–11 PM"}
```

Figure 39: Data of select action

When the admin clicks on **Return**, they will be taken back to the previous page where they can choose another action, such as updating, deleting, or selecting data from the collection.

For example, if the admin selects the **Insert** action, the attributes from the restaurant dataset will appear on the screen. The admin will need to fill in all the required fields with the necessary information. Once all fields are completed, the admin can click on **Insert**, which will add the new data to the collection in the database. This ensures that the data is correctly entered and stored in the system.


_id

Country

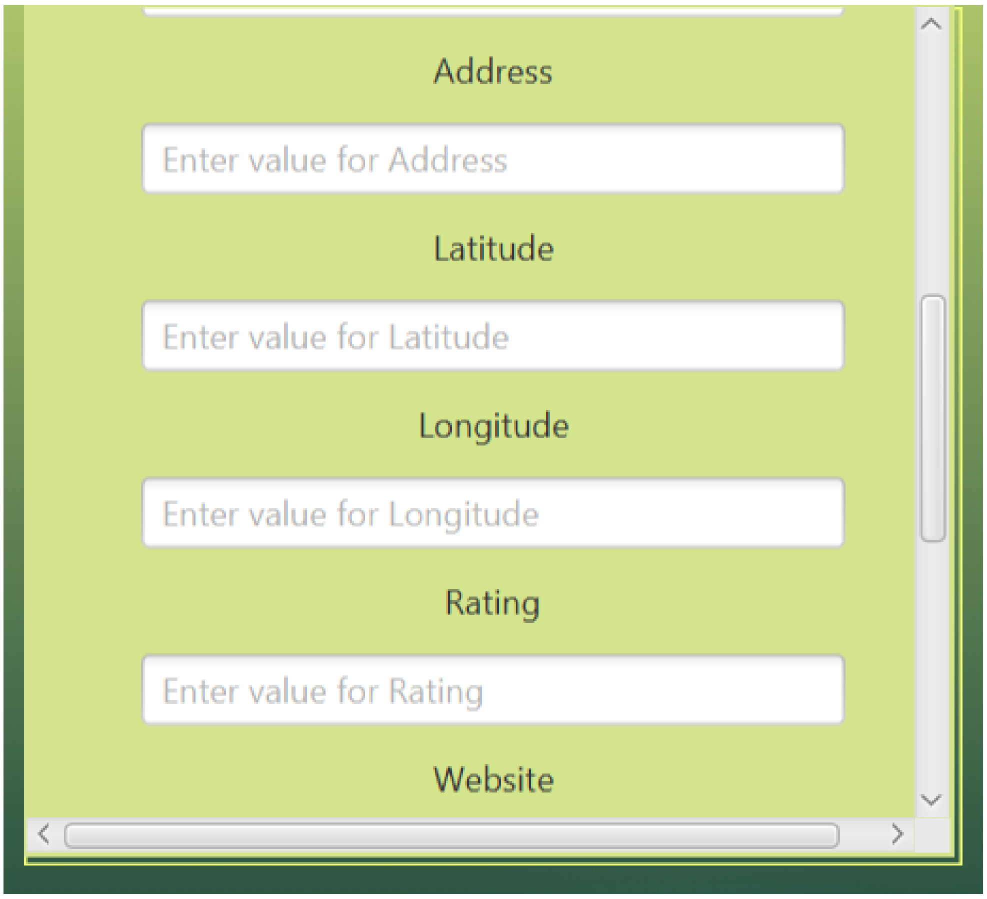
Enter value for Country

City

Enter value for City

Restaurant Name

Enter value for Restaurant Name


Address

Enter value for Address

Latitude

Enter value for Latitude

Longitude

Enter value for Longitude

Rating

Enter value for Rating

Website

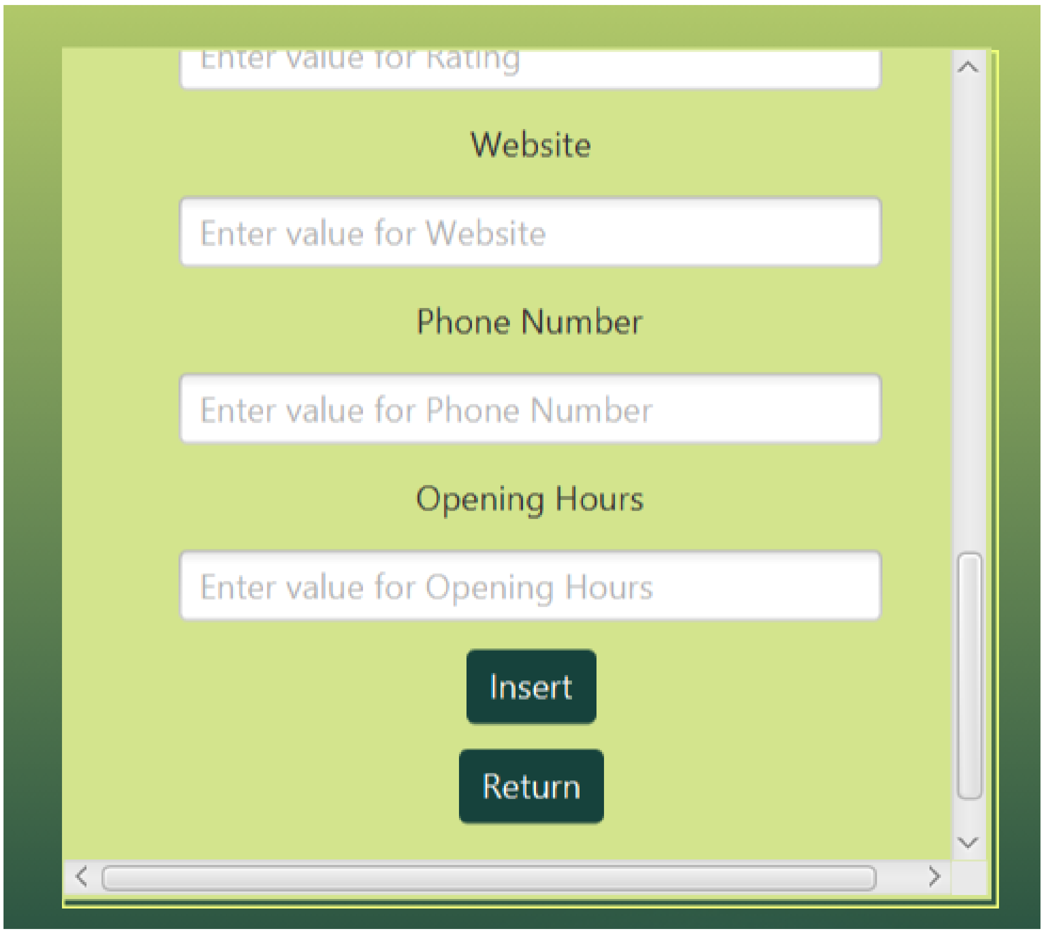
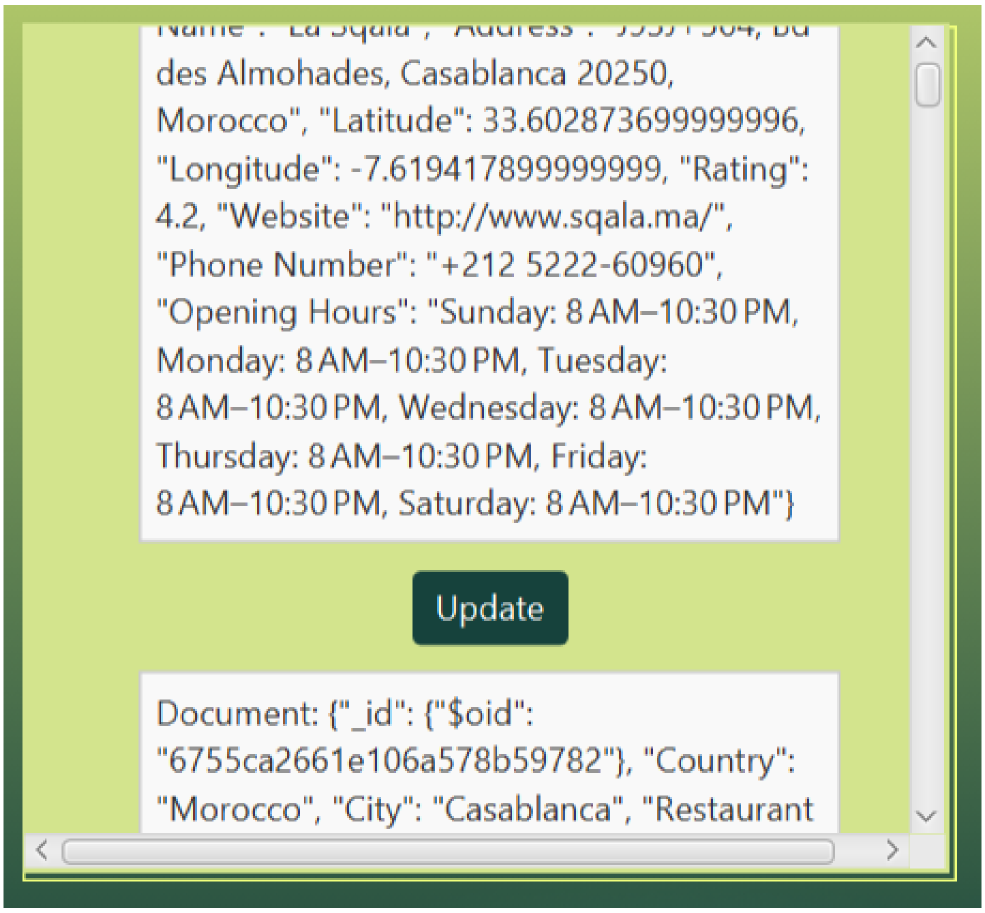


Figure 40: Fields of insert

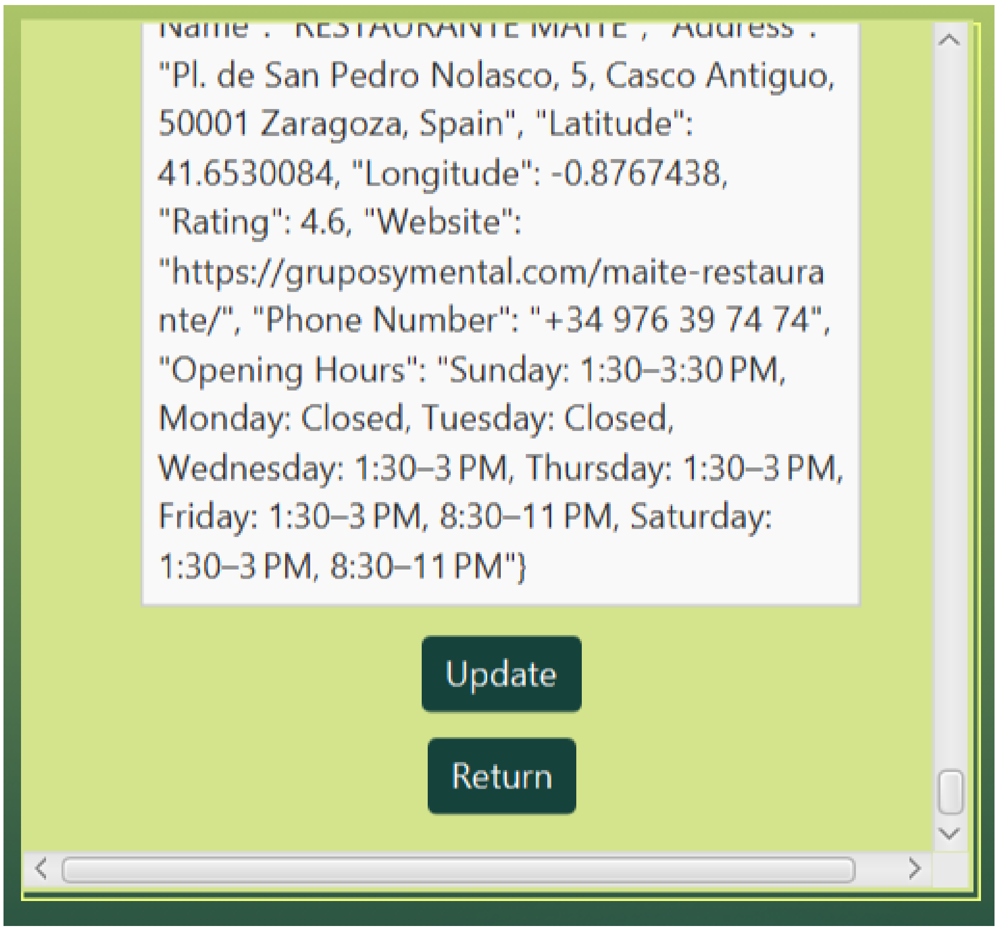
When the admin returns to choose the **Update** action, the system will display the existing records from the selected collection (e.g., the **restaurants collection**). The admin can search for a specific record they want to update by providing criteria.

Once the admin selects the record to update, the relevant fields will be populated with the current data. The admin can then modify the values in these fields as needed. After making the necessary changes, the admin can click **Update** to save the changes to the database, ensuring that the record is updated with the new information.



des Almohades, Casablanca 20250, Morocco", "Latitude": 33.602873699999996, "Longitude": -7.619417899999999, "Rating": 4.2, "Website": "http://www.sqala.ma/", "Phone Number": "+212 5222-60960", "Opening Hours": "Sunday: 8 AM–10:30 PM, Monday: 8 AM–10:30 PM, Tuesday: 8 AM–10:30 PM, Wednesday: 8 AM–10:30 PM, Thursday: 8 AM–10:30 PM, Friday: 8 AM–10:30 PM, Saturday: 8 AM–10:30 PM"}

Document: {"_id": {"$oid": "6755ca2661e106a578b59782"}, "Country": "Morocco", "City": "Casablanca", "Restaurant

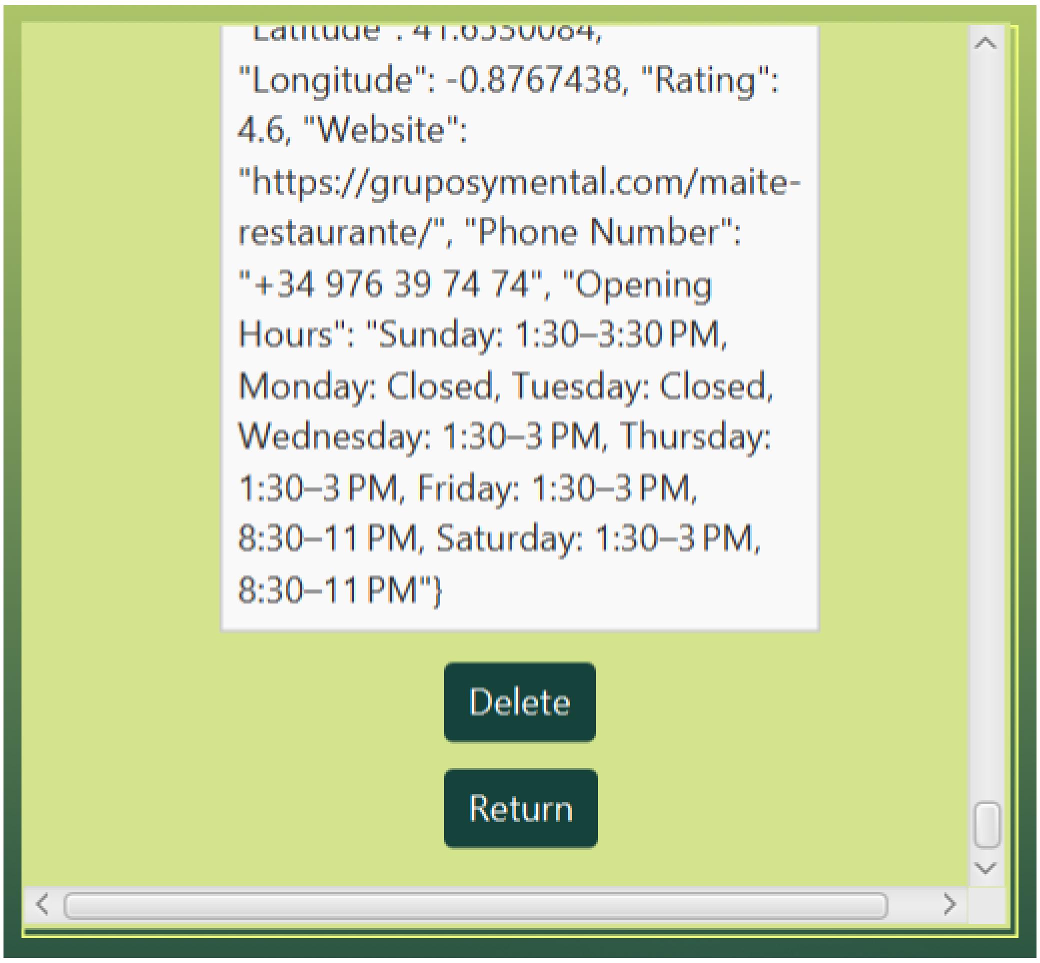


"Pl. de San Pedro Nolasco, 5, Casco Antiguo, 50001 Zaragoza, Spain", "Latitude": 41.6530084, "Longitude": -0.8767438, "Rating": 4.6, "Website": "https://gruposymental.com/maite-restaurante/", "Phone Number": "+34 976 39 74 74", "Opening Hours": "Sunday: 1:30–3:30 PM, Monday: Closed, Tuesday: Closed, Wednesday: 1:30–3 PM, Thursday: 1:30–3 PM, Friday: 1:30–3 PM, 8:30–11 PM, Saturday: 1:30–3 PM, 8:30–11 PM"}

Figure 41: Fields of update

For the **Delete** action, the admin will be presented with a list of records from the selected collection (e.g., the **restaurants collection**). Beneath each record, there will be a **Delete** button.

When the admin clicks on the **Delete** button for a specific record, the system will prompt for confirmation to ensure that the deletion is intentional. Once confirmed, the selected data will be removed from the database, ensuring that only the desired records are deleted. This provides the admin with full control over the data while also preventing accidental deletions.



"Latitude": 41.6530084, "Longitude": -0.8767438, "Rating": 4.6, "Website": "https://gruposymental.com/maite-restaurante/", "Phone Number": "+34 976 39 74 74", "Opening Hours": "Sunday: 1:30–3:30 PM, Monday: Closed, Tuesday: Closed, Wednesday: 1:30–3 PM, Thursday: 1:30–3 PM, Friday: 1:30–3 PM, 8:30–11 PM, Saturday: 1:30–3 PM, 8:30–11 PM"}

Figure 42: Fields of delet

With all of these features, the admin can efficiently **manage the data**, performing actions such as **inserting**, **updating**, **deleting**, and **selecting** records. This ensures that the data in the app is always up to date and well-maintained for the users.

At any point, the admin can **logout**, which will return them to the login page, ensuring secure access to the admin functionalities. They can also return to the **main page** of the app, allowing them to navigate through other features and functionalities of the app as needed. This structure provides a comprehensive and user-friendly way for admins to manage and control the app's data while maintaining ease of access and security.

Chapter 4: Application Improvements

In this chapter, we will explore potential improvements to our application, focusing on enhancing its functionality, performance, and user experience. These enhancements aim to optimize the application's efficiency, incorporate additional features, and address any identified limitations, ensuring it meets the evolving needs of users and stakeholders.

1. Automated Data Source via APIs

One of the key improvements we aim to implement for the future of our application is the automated update of data sources via APIs. Currently, data updates are handled manually or at fixed intervals, which can lead to delays in data freshness. By integrating automated API , we envision a significant enhancement to the application’s efficiency and the accuracy of the information provided to users.

This Automating will allow the application to continuously synchronize with external data sources, ensuring that the information displayed to users is always up-to-date. This will not only save time and reduce the manual effort involved in maintaining data accuracy, but it will also enable real-time updates that respond to external events, such as changes in our services data.

2. Front-End Translation in Multiple Languages

As part of our ongoing efforts to enhance user experience and broaden the accessibility of our application, support for multiple languages on the front-end will be an important future improvement. Currently, the application may only support a single language (english), limiting its reach to a broader, global audience. By implementing multi-language support, we aim to serve diverse users from the whole world and make the application more inclusive.

multilingual capabilities will allow users to interact with the application in their preferred language, improving their experience and engagement. This feature will involve translating the user interface (UI) components, messages, labels, and other text elements across various languages.

3. Making the Desktop Application Available in Web Mode and Hosting Both Versions:

A significant improvement that we are considering for the future of our application is the ability to run the desktop application in web mode. This change would enable users to access the application through a web browser, in addition to using the desktop version. This dual-platform approach increases accessibility and offers several key benefits, while also providing flexibility for different user preferences and use cases.

As part of our future improvements, we also plan to host both the desktop and web versions of the application. This will provide significant value for the efforts we’ve invested in enhancing the application, ensuring that users have access to the best possible experience across multiple platforms.

Conclusion

This project highlights the growing importance of Big Data in modern applications, particularly in tourism and urban planning. In today's data-driven world, the ability to collect, process, and analyze vast amounts of information is crucial for enhancing user experiences and decision-making processes. By utilizing Big Data technologies, our Smart City Guide application demonstrates how data can be leveraged to offer personalized and relevant information to users.

If fully realized, this project could significantly benefit the tourism sector in the three host countries of the 2030 FIFA World Cup. It has the potential to streamline access to information, improve navigation in unfamiliar cities, and foster a deeper appreciation of local culture and amenities.

Our experience working on this project has been incredibly rewarding. It provided us with the opportunity to delve into the realm of Smart City applications and Big Data technologies, allowing us to expand not only our technical expertise but also our collaborative and problem-solving skills. Throughout this journey, we had the privilege of working as a team, exchanging ideas, and learning from one another, which played a crucial role in delivering a functional and innovative application tailored to enhance tourism experiences.

Overall, we are very satisfied with the progress and outcomes of this project. It has been an enriching experience that allowed us to apply theoretical knowledge to solve real-world challenges. We look forward to the potential future impact of our work and are excited about the prospects it holds for practical implementation.

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