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topic

Design and implementation of a dynamic website for Euro-Mediterranean recipes and their biochemical characteristics

Presented by :

ANBIR Samah
BENZAID Douaa
OUMERACI Amar abdel aziz
RIAL Mohamed hachem

the jury composed of:

Otmanine Wahiba	Examinateur
Ishak Boushaki Saida	Encadreur

Table of contents

Page

Table of content 1

List of Figures 2

1 Introduction 3

2 Problem statement 4

3 Methodology 5

3.1 Use case Diagram 5

3.1.1 General Use Case Diagram..... 5

3.1.2 Recipe Management Use Case Diagram 6

3.2 SequenceDiagram 7

3.2.1Development of the Sequence Diagram 7

3.3 Class Diagram..... 10

3.3.1 Data Dictionary 10

3.3.2 Business Rules..... 12

3.3.3 Development of the Class Diagram 13

3.3.4 RelationalModel 14

4 Implementation and Results **15**

4.1 Working Tools 15

4.2 Application Interfaces 16

4.2.1 User Interface..... 16

4.2.2 Administrator Interface..... 26

5 Conclusion 24

6 Bibliographie 25

List of Figures

Page

Figure 01 : General use case diagram 6
Figure 02 : use case diagram of administrator 7
Figure 03 : sequencd diagram of user authentication with allergy data 8
Figure 04 : sequence diagram of the modify operation on the administration 8
Figure 05 : sequence diagram of add operation 9
Figure 06 : sequence diagram of delete operation 10
Figure 07 : Data dictionary of the system 11
Figure 08 : Class diagram of the system 13
Figure 09 : Home page 16
Figure 10 : Sections of the Euro-Mediterranean Countries 17
Figure 11 : Suggestions of recipes 17
Figure 12 : the Iconic Recipes from Algeria 18
Figure 13 :the iconic recipes from France 19
Figure 14 : step 1 create an account 20
Figure 15 : step 2 choose your preferences 20
Figure 16 : step 3 welcome to atLas 21
Figure 17: The result of a recipe 21
Figure 18: the home page the EuroMed atLas platform 22
Figure 19: the home page the morocco recipes 22
Figure 20 : Food is chemestry We decoded for you 23
Figure 21: the data base the phpmyadmin 23

1.Introduction

In recent years, the web has become an essential part of daily life..
In this era, it has become a way for us to search for information and use digital services. It is a dynamic, dedicated, and interactive space. Currently, smart platforms are being created in diverse fields such as education, shopping, health, culture, and even culinary arts education
One of its most notable benefits today is its contribution to the dissemination of diverse cultures and intangible heritage of different peoples. This is what led to its growing significance among internet users.

Our project also belongs to this dynamic field, as it aims to design and develop a dynamic web platform dedicated to searching for Mediterranean cooking recipes and exploring their biochemical properties, transforming them from traditional recipes into contemporary ones, by adding mixes so that anyone with any kind of allergy can eat dishes they have never tasted before, by accounting for the allergy score in the ingredient list of each recipe. It also aims to provide a variety of dishes from European cuisines, such as Italy, France, Spain, and Luxembourg, in addition to North African countries like Algeria, Tunisia, and Morocco.

The aim of this project is to raise awareness not only about Mediterranean cuisine, but also about health and dietary safety, and the risks linked to food allergies, with knowledge of each ingredient. It includes modernization and scientific precision through biochemical knowledge and food traditions.

2. Problem statement

In a world where nutrition has become a central focus in social and health issues, it highlights identity and elevates culinary heritage both locally and globally. Although there are various websites that revolve around recipes from different countries, few of them rely on a scientific approach that blends the components of a recipe with its biochemical properties and effects on health. As health issues increase, such as food allergies, the world now needs platforms that provide accurate and reliable information tailored to the needs of the users.

And, with this gap in interactive platforms that combine offering recipes with providing nutritional data, allergy warnings, and solutions in the digital field, the problem lies in : how to develop a comprehensive website. This site should not only display Mediterranean dishes but also add a scientific aspect, explaining the properties of ingredients, warning about allergy risks, and suggesting suitable alternatives?

And this forms a set of challenges: the need to organize data intelligently, to present complex scientific information in a clear and user-friendly way, while customizing the user experience, without neglecting scientific accuracy in managing health content. This project aims to address this issue by developing a web platform that combines cultural and scientific dimensions, educating users and offering solutions to allergy issues or reducing them, leveraging modern web technologies to provide a useful, safe, educational, and healthy experience suitable for all users.

3.Methodology

In this part of our report , we are going to present the tools used for the modeling and design of this project , using UML diagrams : use case , sequence , the data dictionary , managment rules , the class diagram and relational model .

3.1 Use Case Diagram :

A Use Case Diagram is a UML diagram that represents the interactions between a information system and its users called actors. It highlights the main functionalities of the system, called use cases, and describes what the system does without explaining how it is implemented. A use case is a collection of success or failure scenarios corresponding to a system function from the point of view of an actor. This diagram makes it possible to model the functional requirements of the system and represent the major functionalities needed by users.

the main objective of a use case diagram is to model the functional requirements of the system from the user's point of view .it used to clearly identify the different functionalities that the system must provide ,visualize the relationships between users(internal or external) and the use cases, a line between developers and designers and final users.and serve as a reference support for technical design, writing functional specifications, and functional testing. This diagram therefore represents a key step because it ensures that all the functionalities expected by users have been properly taken into account.

This diagram represents a key step because in help ensure that all functionalities expected by users are properly considered .(1)

3.1.1 General Use Case Diagram :

In this general use case diagram, we have two main actors: the user and the administrator, who interact within the Euromediterranean recipe management system. The user can consult general information on the main page, where they can access recipes from a selected country or choose a popular recipe. They can also perform a search using the filtering bar by entering the name of a recipe or a country they want to discover. In addition, the user can view recipes and their ingredients and create an account or log in to the system. The administrator must authenticate to access the administration area, where they can manage the content of the platform by administering recipes, ingredients, countries, molecular allergens, tissue allergens, superfamilies, scientific names, and parent names. The following figure (Figure 1) represents the general use case diagram of the system.

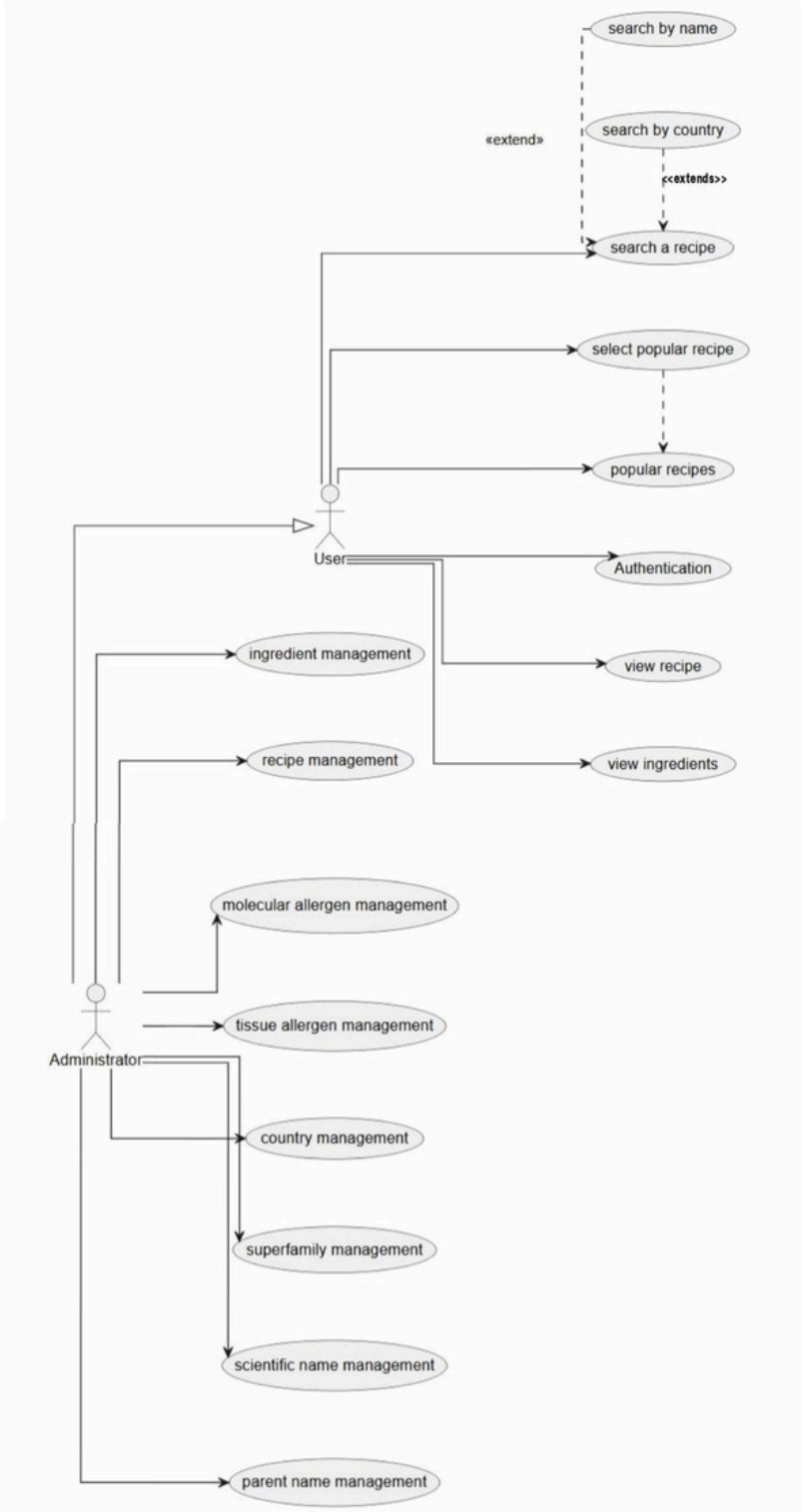


Figure 01 : general use case diagarm

3.1.2 Recipe Managment Use Case Diagram

In this use case diagram, the administrator is responsible for managing the main elements of the Euromediterranean recipe management system. The administrator can manage ingredients, recipes, allergens, countries, and classifications through different operations such as viewing, adding, updating, and deleting items. These operations follow the same principle for all entities in the system, which avoids repeating the same process for each management case and ensures a consistent logic at the interface and processing levels. Through this administration space, the administrator can efficiently organize and maintain the content of the platform. The following figure (Figure 2) represents the use case diagram of the administration management performed by the administrator actor in the Euromediterranean recipe management system.

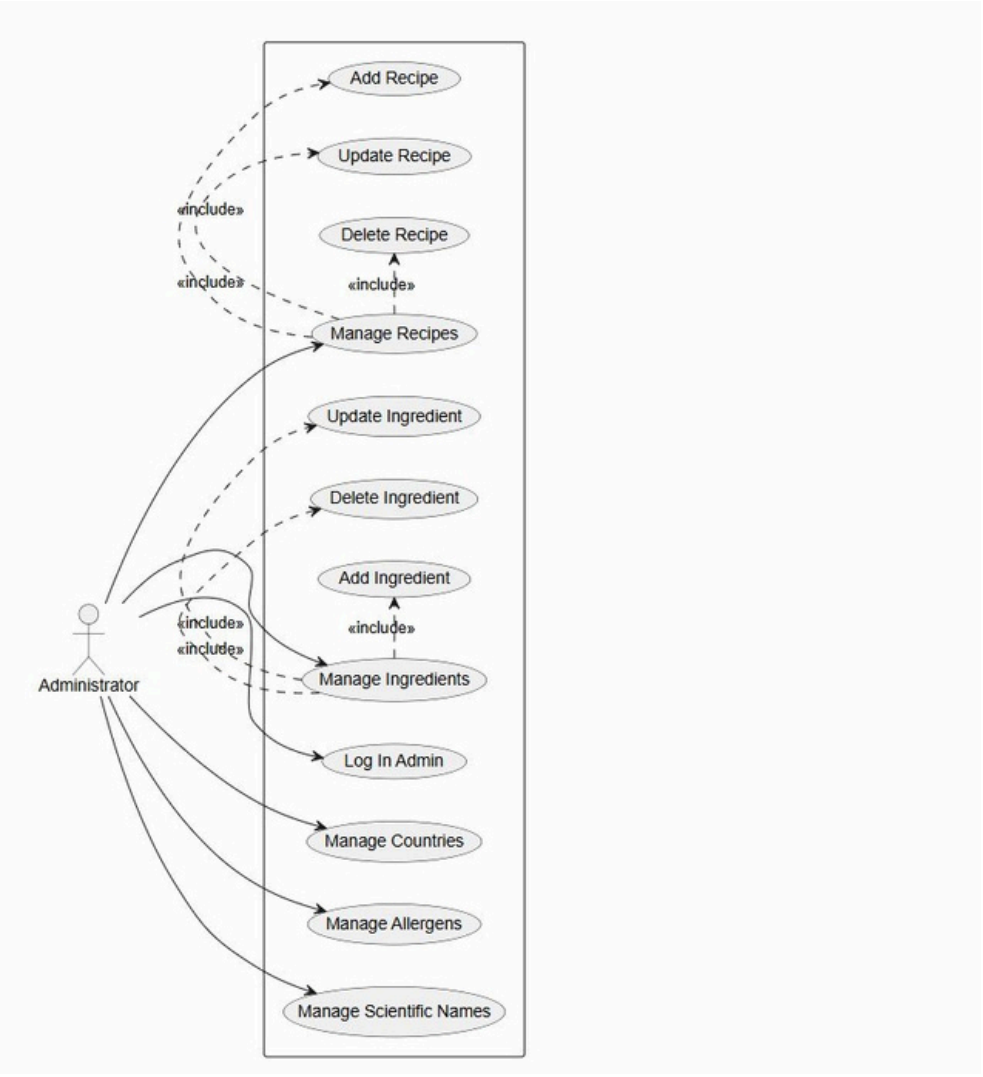


Figure 02 : Use Case Diagram of Administrator

3.2 Sequence Diagram

A sequence diagram is a behavioral UML diagram that shows how objects and actors interact with each other through messages in a specific order over time. It describes the sequence of interactions between the elements of a system to realize a use case. (2)

3.2.1 The development of a sequence diagram:

The following figure (Figure 3) represents the sequence diagram of user authentication with allergy data on a web interface. The user clicks on "Login" to access the login page, enters their email and password, and starts the authentication process. The authentication controller verifies the credentials with the database. If the credentials are correct, the system retrieves the user's food allergy data and displays the user dashboard with the allergy information. Otherwise, an error message indicating that the email or password is incorrect is displayed. The activation bars make it possible to visualize the activity periods of each actor and component of the system.

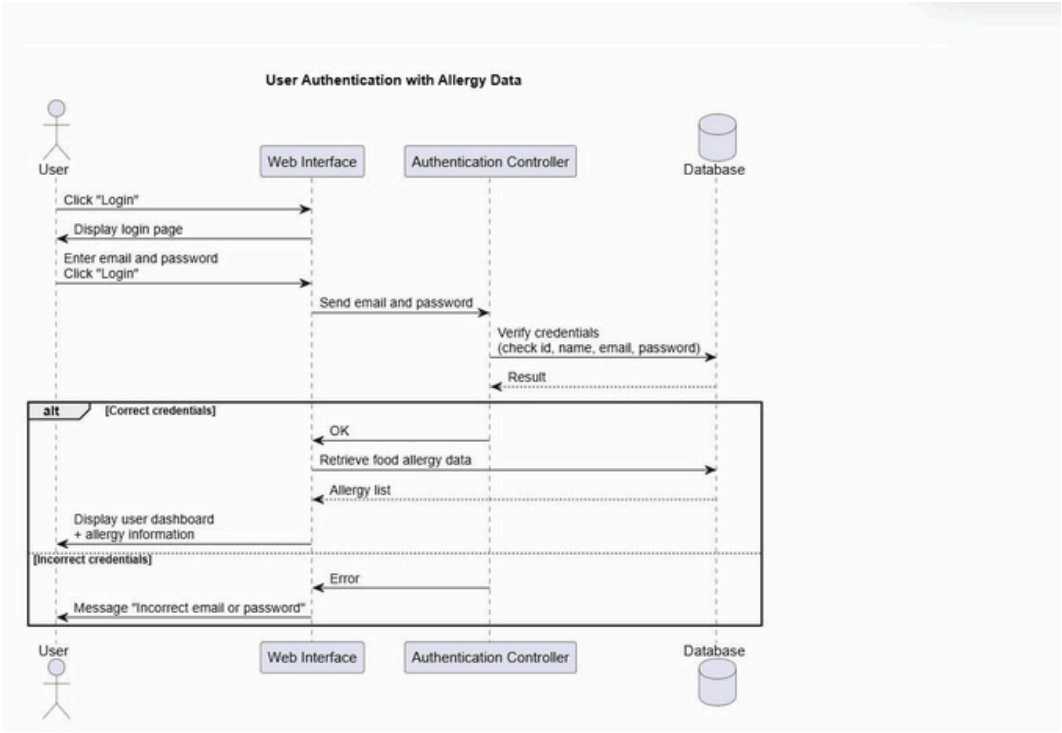


Figure 03 : sequence diagram of user authentication with allergy data

The following figure (Figure 4) represents the sequence diagram of the modify operation on the administration web interface. The administrator enters the username and password and clicks on “Login” to access the system. The authentication controller verifies the credentials with the database. After successful authentication, the administrator chooses the “Modify” option. The system displays the list of elements and the modification form. The administrator enters the new information and clicks on “Validate”. The management controller sends the modification request to the database in order to update the selected entity or attribute. If the modification is successful, a confirmation message indicating that the modification is completed is displayed. Otherwise, an error message is shown. The activation bars make it possible to visualize the activity periods of each actor and component of the system.

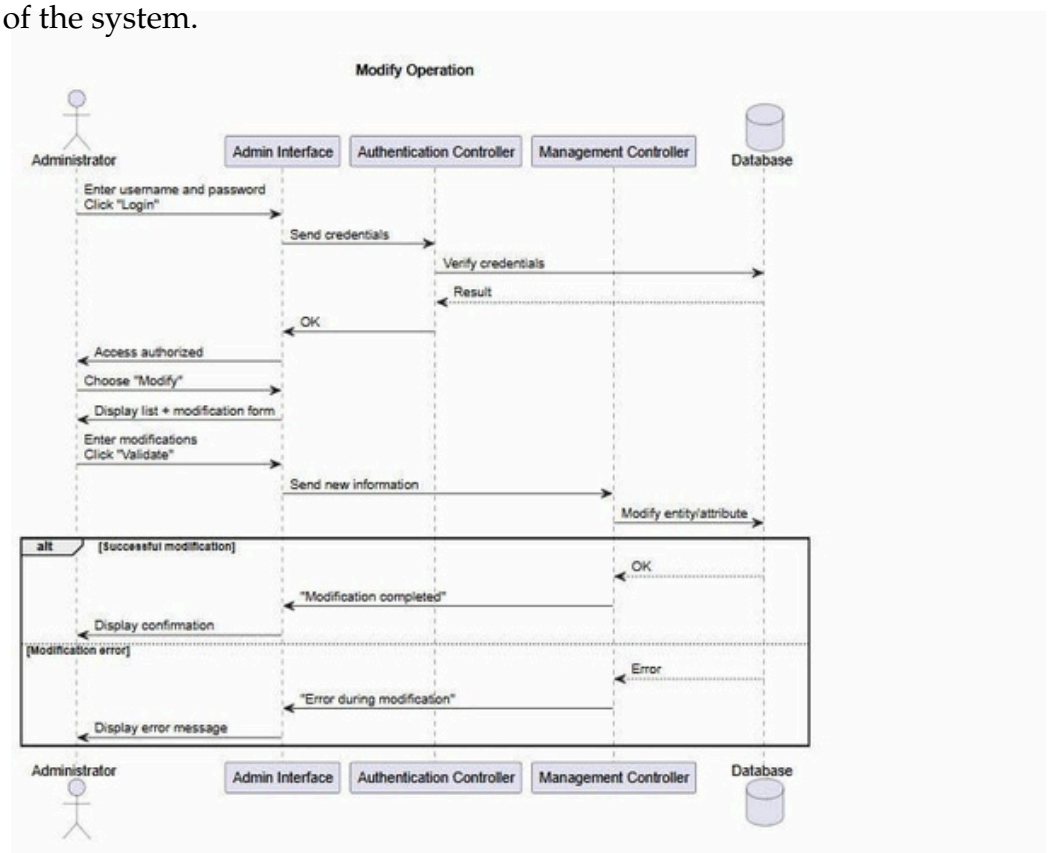


Figure 04 : sequence diagram of the modify operation on the administration

The following figure (Figure 05) represents a sequence diagram describing the process of adding an entity or an attribute in the system by an administrator. The administrator begins by entering the username and password for authentication. The authentication controller verifies the credentials in the database and returns an access granted message. After successful authentication, the administrator chooses the "Add" option. The interface then displays the add form, where the administrator fills in the required information and validates the form. The add information is then sent to the management controller, which proceeds with adding the entity or attribute to the database. The system then returns the result of the operation: a confirmation message indicating that the addition was completed successfully, or an error message if an error occurs during the addition process.

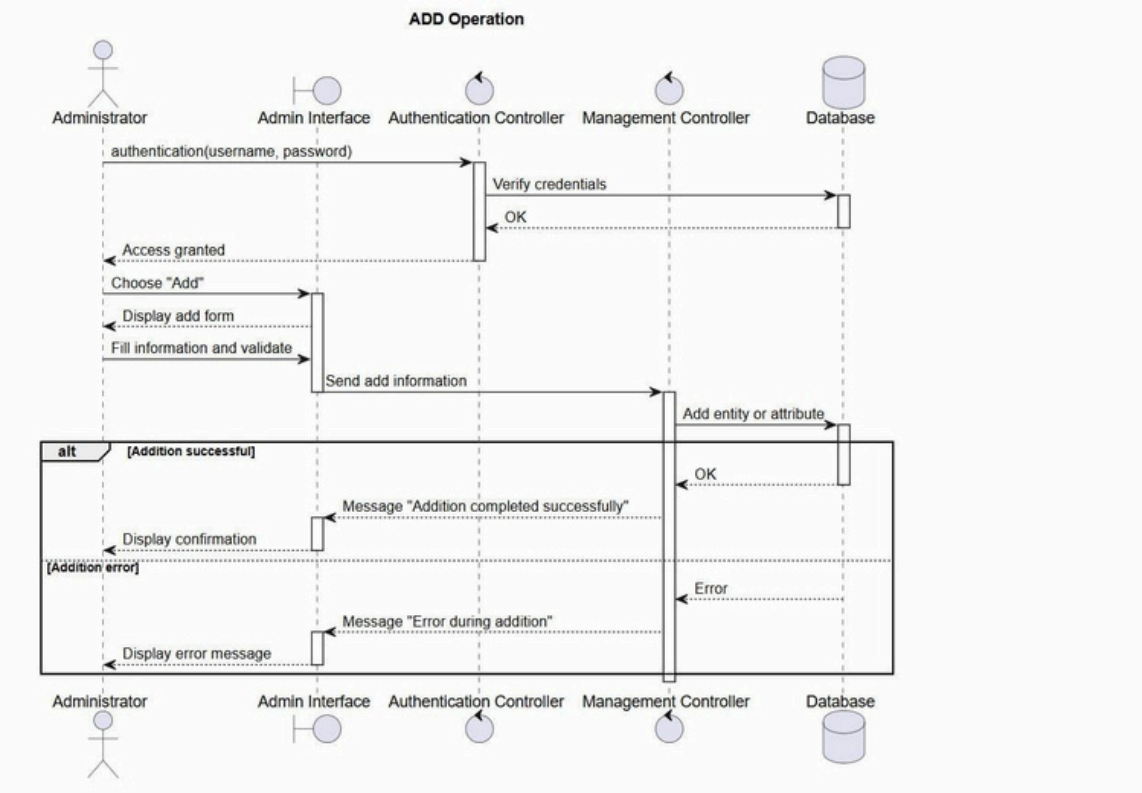


Figure 05 : sequence diagram of add operation

The following figure (Figure 06) represents a sequence diagram describing the process of deleting an entity or an attribute in the system by an administrator. After clicking on "Admin Login", the interface displays the login page where the administrator enters the username and password, then clicks on "Login". The information is then sent to the authentication controller, which verifies the credentials in the database and returns the authentication result. Once access is granted, the administrator chooses the "Delete" option. The interface then displays the list of available elements, from which the administrator selects the element to delete and confirms the operation. The delete request is transmitted to the management controller, which proceeds with deleting the entity or attribute from the database. The system then returns the result of the operation: a confirmation message if the deletion is successfully completed, or an error message if the deletion fails.

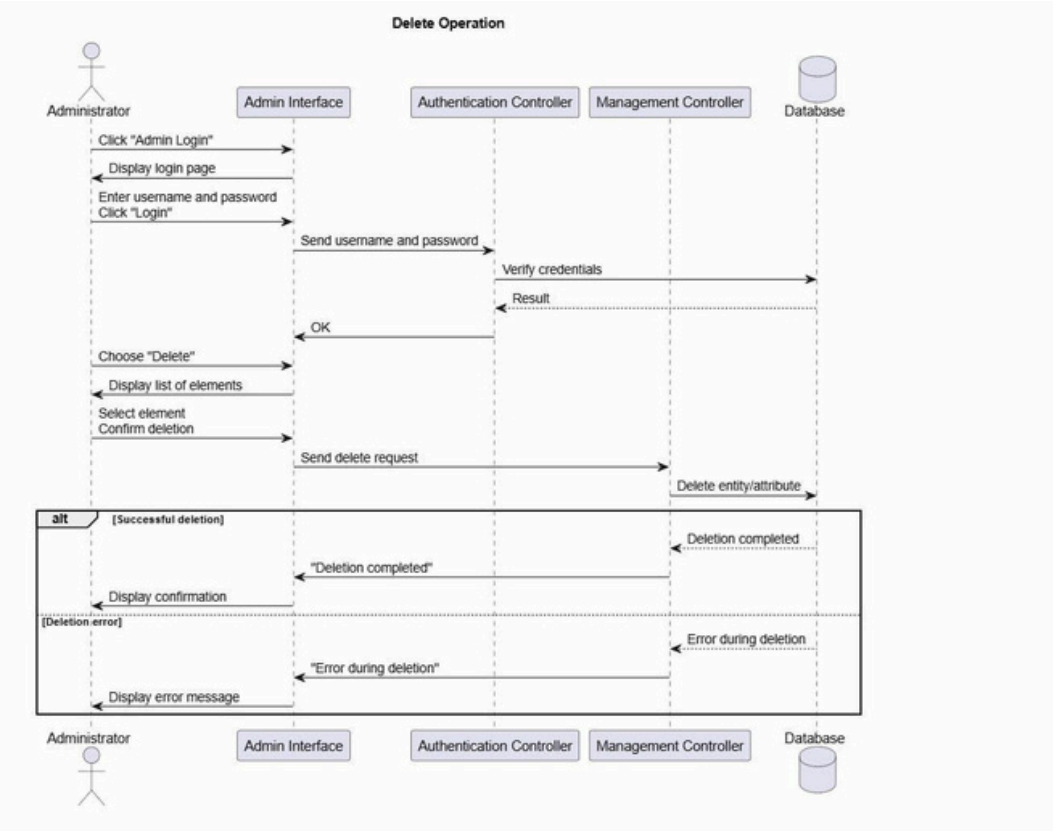


Figure 06 : sequence diagram of delete operation

3.3 Classes Diagram

in this part we are focusing on modeling the data of the Euro-Mediterranean recipe management system. we will see in this part :

- the data dictionary .
- the management rules .
- the UML class diagram .
- the relational model .

All these elements helps to organize the information ,prepare the database design of the system effectively , maintain data consistency . (1)

3.3.1 Data dictionary

A data dictionary is a set of metadata or reference data required for the design of a relational database. It plays a fundamental role by providing a detailed description of the data, thus facilitating its understanding, management, and reuse throughout the database management system (DBMS). Each data item must be specified by indicating:

- Its designation: the exact name of the data.
- Its size: the maximum number of characters.
- Its attributes: the characteristics or properties of the data.
- Its type: for example, numeric (N), alphabetic (A), alphanumeric (AN), date (D), or boolean (B).
- An observation: if additional details are required.(3)

Category	Attributes and Designation	Data Type	Size
Recipe	***idR*** : Unique recipe identifier	N	3
	nameR : Recipe name	A	30
	scoreR : Recipe score	N	5.3
Ingredient	***idI*** : Ingredient identifier	N	4
	scoreI : Ingredient score	A	65535
	nameI : Ingredient name	A	30
	powerI : Ingredient potency	AN	5
	severityI : Ingredient severity	AN	5
	prevalenceI : Ingredient prevalence	AN	5
	allergenicityI : Ingredient allergenicity	A	65535
	hypoTraitI : Hypoallergenic treatment of the ingredient	A	65535
	recommendationI : Recommendation of the favons	B	1
Tissue	***idAT*** : Unique allergenic tissue identifier	N	3
Allergenic Tissue	***nameSAT*** : Allergenic tissue name	A	30
Molecular Allergen	***idAM*** : Molecular allergen identifier	N	3
	nameAM : Molecular allergen name	A	30
	idUniprot : UniProt identifier	AN	12
Super Family	***idSF*** : Super family identifier	N	3
	nameSF : Super family name	A	30
Parent Name	***idNP*** : Parent name identifier	N	3
	nameNP : Parent name	A	30
Country	***idP*** : Country identifier	N	3
	nameP : Country name	A	15
Scientific Name	***idSN*** : Unique scientific name identifier	N	3
	nameScientific : Scientific name	A	30

Figure 07 : Data Dictionary of the System

3.3.2 Management Rules

We will define the management rules and the relationships between the entities of our system as follows:
Recipe

RG1: Each recipe has a unique identifier (idR).
RG2: A recipe has a name (nameR) and a score (scoreR).
RG3: Each recipe belongs to only one country.
RG4: A recipe contains several ingredients.

Country

RG1: Each country has a unique identifier (idP).
RG2: A country has a name (nameP).
RG3: One country can have several recipes.

Ingredient

RG1: Each ingredient has a unique identifier (idI).
RG2: An ingredient has a score (scoreI) and biochemical properties (pre, pui, sev, allergenicity, traitHypo).
RG3: An ingredient shows if it is recommended by FAO/OMS (recomFAO/OMS).
RG4: One ingredient can belong to one or more recipes.
RG5: One ingredient can contain one or several molecular allergens.

Molecular Allergen

RG1: Each molecular allergen has a unique identifier (idAM).
RG2: A molecular allergen has a name (nameAM) and a UniProt identifier (idUniProt).
RG3: A molecular allergen belongs to one super family, one parent name, and one or more allergenic tissues.
RG4: A molecular allergen can exist in several ingredients.

Allergenic Tissue

RG1: Each allergenic tissue has a unique identifier (idAT).
RG2: Each allergenic tissue has a scientific name (scientificNameAT).
RG3: One allergenic tissue can contain several molecular allergens.

Super Family

RG1: Each super family has a unique identifier (idSF).
RG2: A super family has a name (nameSF).
RG3: One super family can contain several molecular allergens.

Parent Name

RG1: Each parent name has a unique identifier (idNP).
RG2: A parent name has a name (nameNP).
RG3: One parent name can be linked to several molecular allergens.

Scientific Name

RG1: Each scientific name has a unique identifier (idSN).
RG2: A scientific name has a value (scientificName).
RG3: One scientific name can be linked to several allergenic tissues.

3.3.3 Class Diagram

A class diagram is a structural diagram in UML language used to represent the static structure of a system. It models the classes, their attributes, methods (operations), and the relationships between classes such as associations, aggregations, compositions, and generalizations. Each class represents an entity of the system, while the relationships show the links and interactions between these entities. The class diagram is considered as the basis of object-oriented modeling because it transforms business concepts into computer objects. Its main objective is to provide a general and clear view of the system structure before the implementation phase. It also helps to define the entities of the application domain and their characteristics, identify the responsibilities of each class and the relationships between them, serve as a reference for object-oriented code implementation, help in database design by transforming the model into a relational model, and ensure the coherence, maintainability, and evolution of the system. The following figure (Figure 08) presents the class diagram of our system.

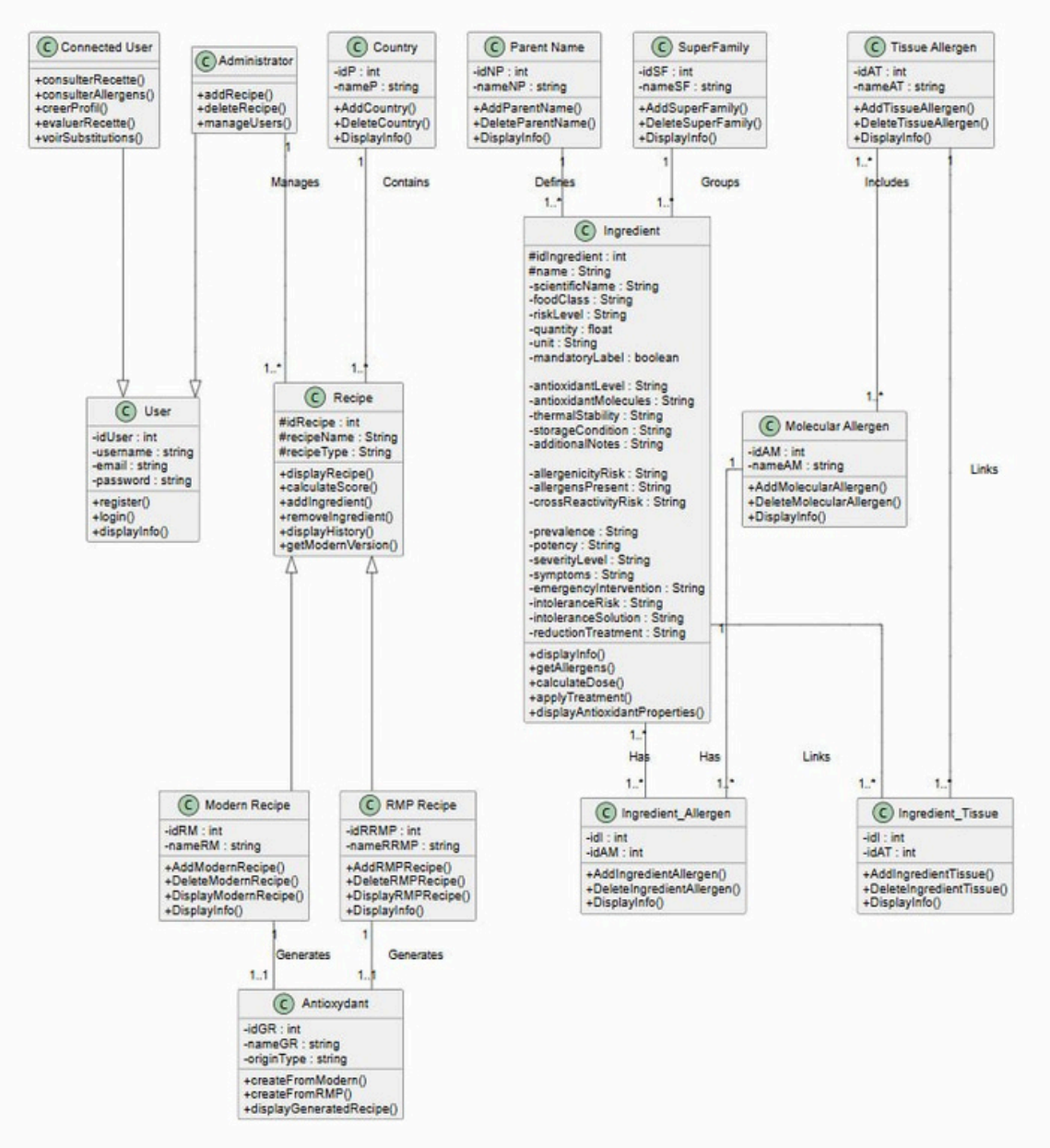


Figure 08 : Class Diagram of the system

3.3.4 Relational Model

Before creating the relational model, it is important to understand the transformation rules that allow the transition from the conceptual model represented by the UML class diagram to a relational database structure. These transformation rules make it possible to convert classes, attributes, and associations into tables, columns, primary keys, and foreign keys. Respecting these rules is essential to ensure the consistency, integrity, and normalization of the relational schema. During this transformation process, several principles were applied such as converting classes into relational tables, transforming attributes into columns, implementing primary and foreign keys, managing cardinalities and associations, creating associative tables for many-to-many (N:N) relationships, and applying integrity constraints and normalization rules to obtain a well-structured database schema.
The following textual relations describe the relational model generated from the UML class diagram of our system:

PAYS(idP, nomP)

RECETTE(idR, nomR, scoreR, #idP)

INGREDIENT(idI, scoreI, pre, pui, sev, allergenicity, traitHypo, recomFAO_OMS)

RECETTE_INGREDIENT(#idR, #idI)

ALLERGENEMOLECULAIRE(idAM, nomAM, idUniProt, #idSF, #idNP)

INGREDIENT_ALLERGENE(#idI, #idAM)

NOMDUPARENT(idNP, nomNP)

SUPERFAMILLE(idSF, nomSF)

TISSUALLERGENIQUE(idAT, scientificNameAT)

ALLERGENE_TISSU(#idAT, #idAM)

SCIENTIFIQUENAME(idSN, scientificName)

INGREDIENT_SCIENTIFIQUENAME(#idI, #idSN)

The adopted methodology is based on a progressive modeling approach of the system. Several UML diagrams were used during the design process, including the use case diagram to identify the system functionalities, the sequence diagram to represent dynamic interactions, and the class diagram to organize the system entities. In addition.

In addition ,a data dictionary and management rules were added to ensure the functional consistency of the system. Finally, the transformation from the object-oriented model to the relational model established the basis of a structured and reliable database

4. Implementation and Results

In this part of our report ,we will present what we use of tools to design and modeling our project and the results from our application

4.1 Working Tools

for this point of our project the goal of this tools is to development and modeling

- To create the UML diagrams :use case diagram, class diagram and sequence diagram we use the power designer to generate the diagrams .
- the development of the application was mainly done using visual studio code .
- Frontend we used :HTML5 ,CSS3, and java script (4).
- the backend using PHP.
- the databse was in MySQL through XAMPP and the phpMyadmininterface .
- the rapport was written usig Microsoft Word .

4.2 Application Interfaces

We will present the different interfaces of our project :

4.2.1 User Interface

The following figures represent the user interfaces of the application. In this interface, the user can navigate easily between the different functionalities of the system and access the main features in a simple and intuitive way.

As described in the general use case diagram shown in Figure 1, the user can access the main page to view general information about the system. From there, they can explore popular recipes from the available countries in our application or select a specific country to view its most popular recipes. The user can also search for a recipe by typing a letter, and the system will display all recipes that contain that letter. In addition, the user can filter recipes by choosing a country to discover its related recipes. The following two figures illustrate the beginning of the main page, where the user can click on the “Discover Now” button to view the popular recipes of each available country.
The following figure (Figure 09) shows the home page, which includes an image, a filtering bar, and a button that redirects the user to the popular recipes section.

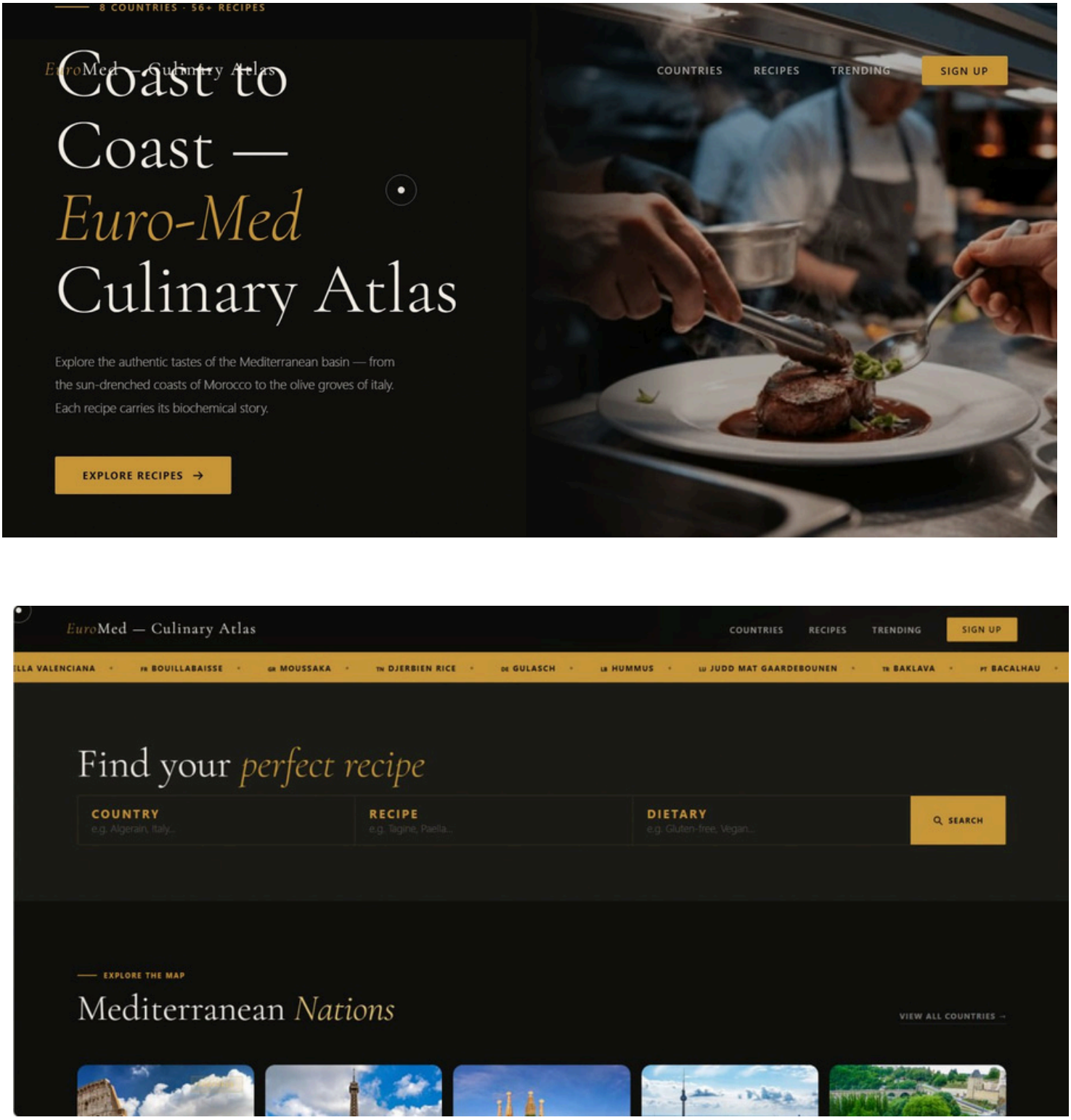


Figure 09 :Home pages

The following figure (Figure 10) represents the sections of the Euro-Mediterranean countries : Italy , France , Spain , Germany , Luxembourg ... from Europe and Algeria ,Morocco , Tunisiafrom North African.



Figure 10: Sections of the Euro-Mediterranean Countries

the following figures (Figure 11) represents a suggestions of few recipes

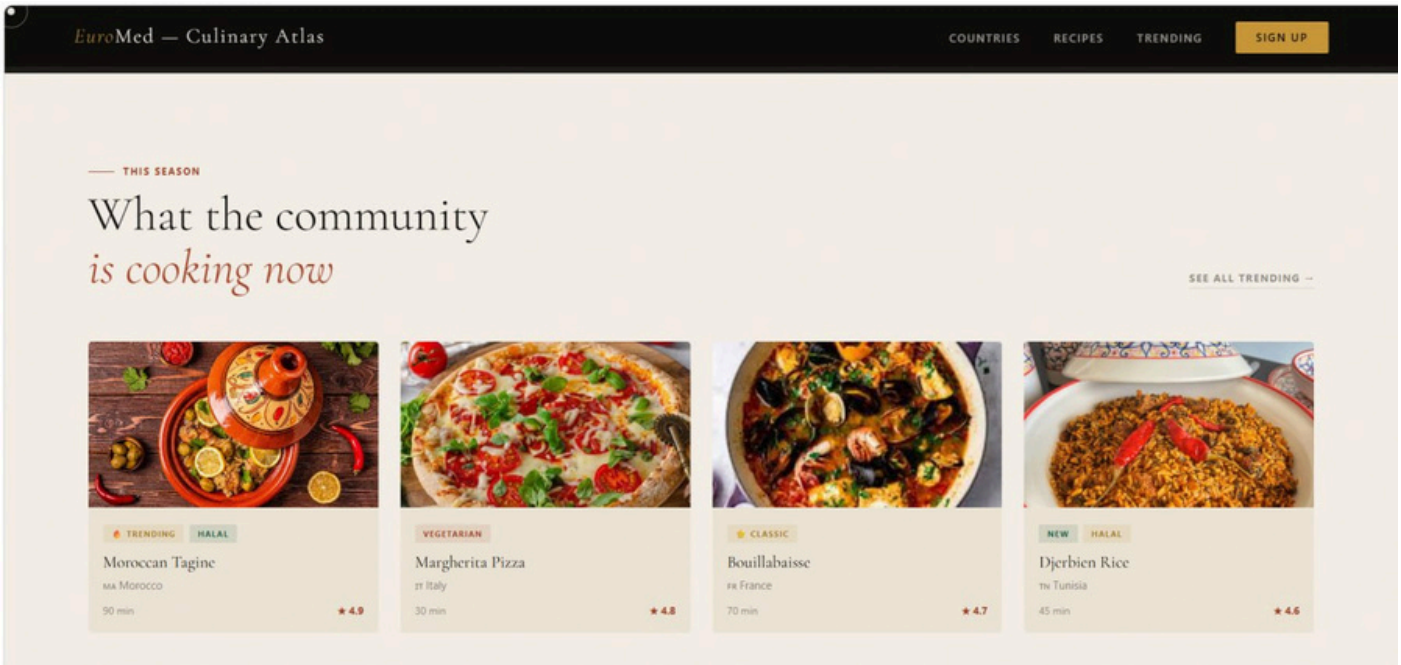


Figure 11: Suggestions of recipes

the following figures (Figure12)represents the 50 Iconic Recipes of all the 8 countries, we can find all the recipes or searth by countrie Specifically algeria .

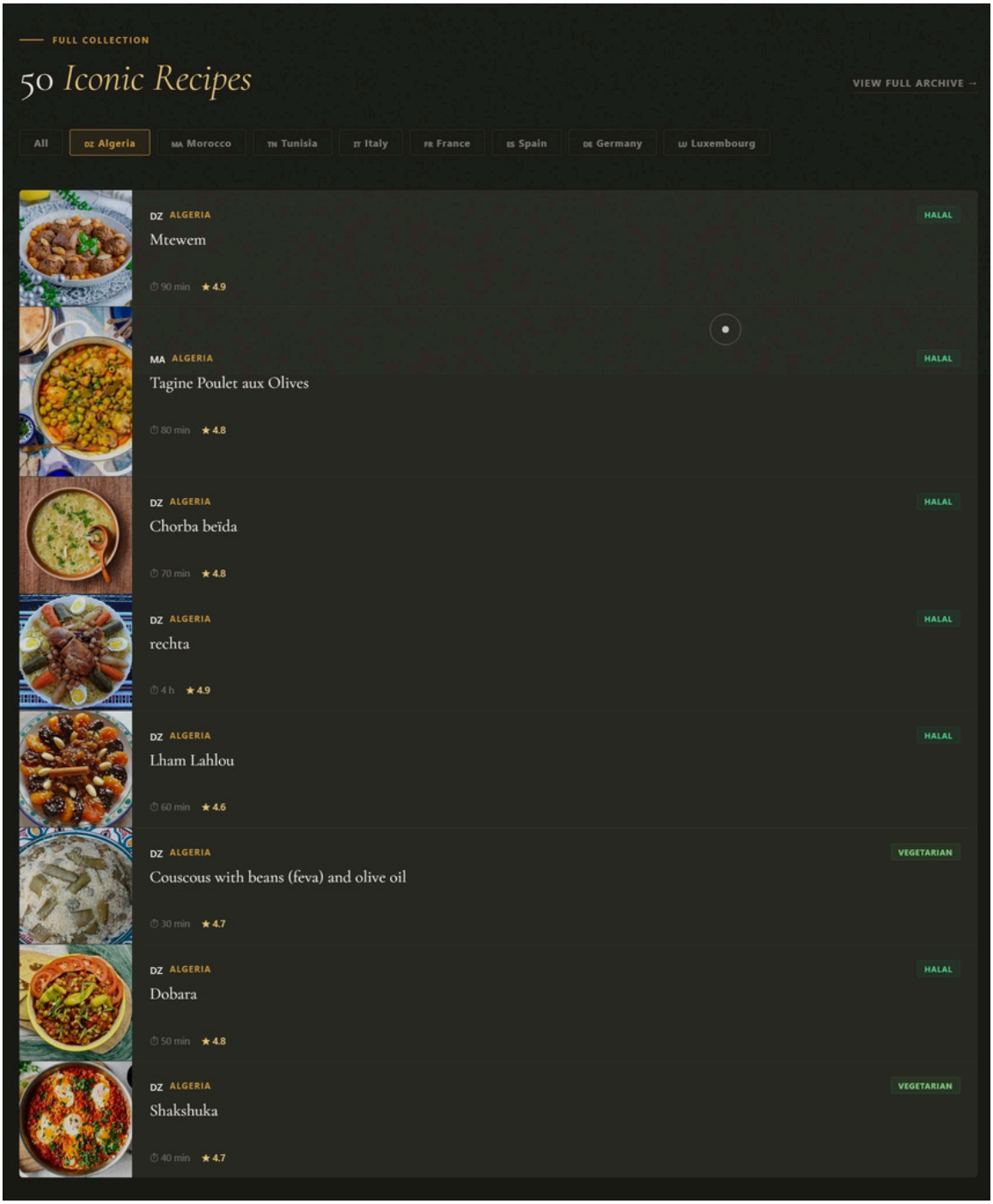


Figure 12 : the Iconic Recipes from algeria

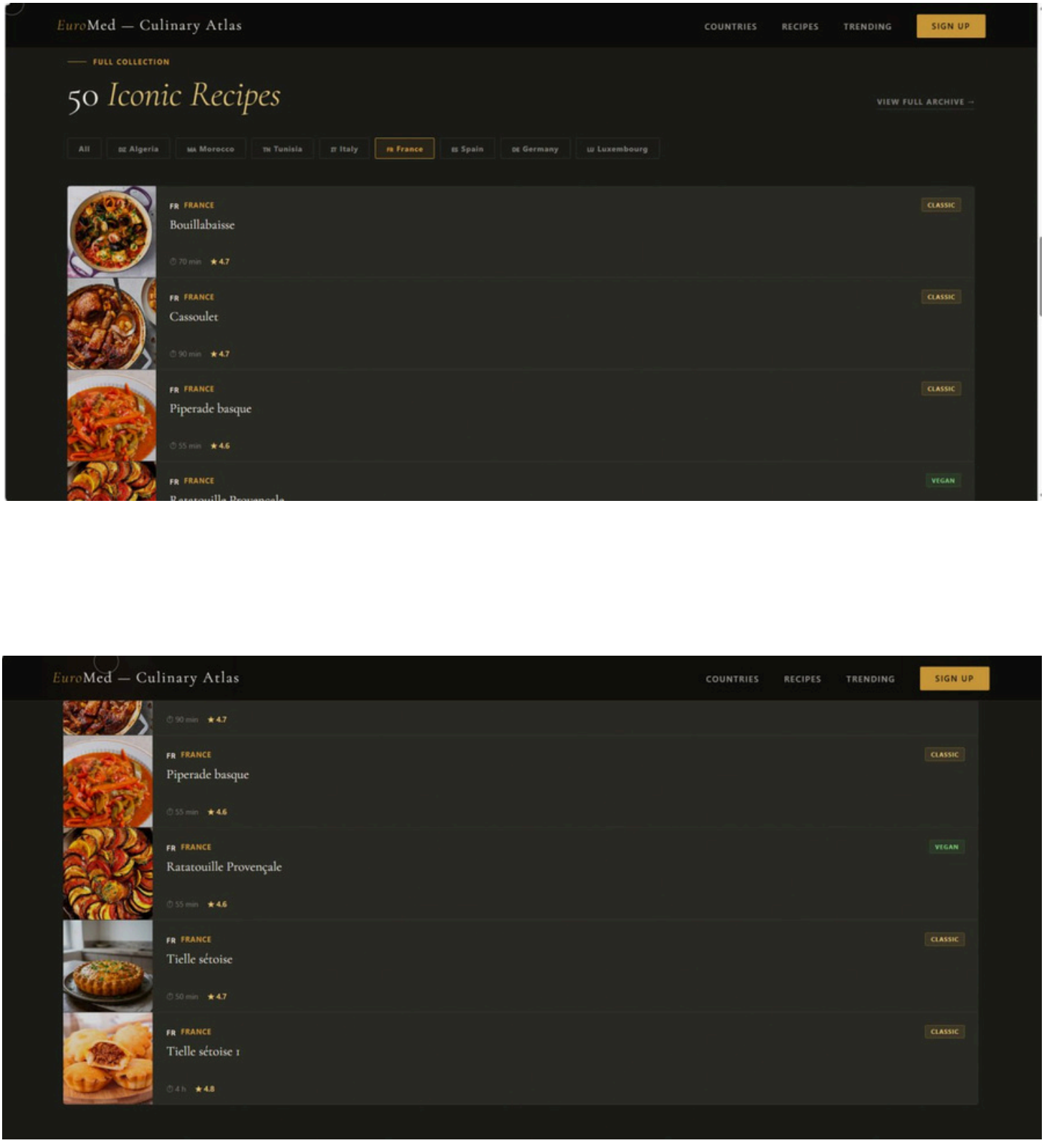


Figure 13 : the iconic recipes from France

the next three pages is how to log and create a profile in our application (figure 13 , 14 , 15)

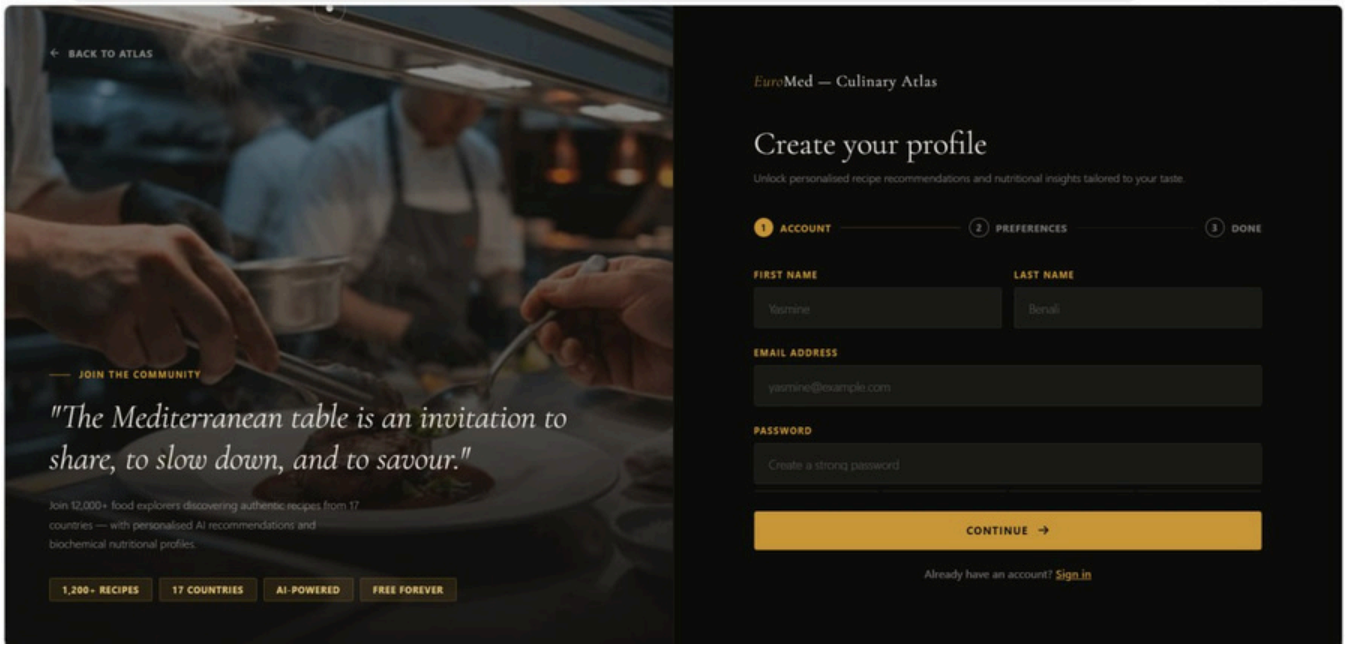


Figure 14 : step 1 create an account

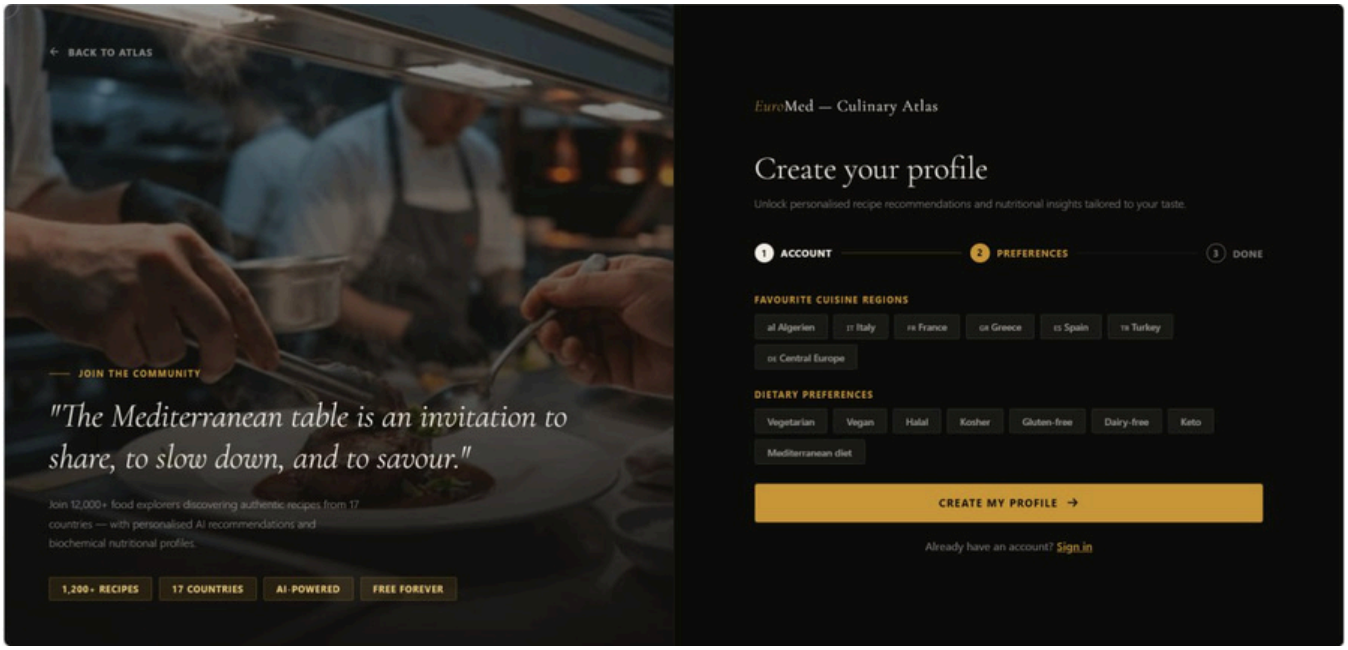


Figure 15 : step 2 choose your preferences

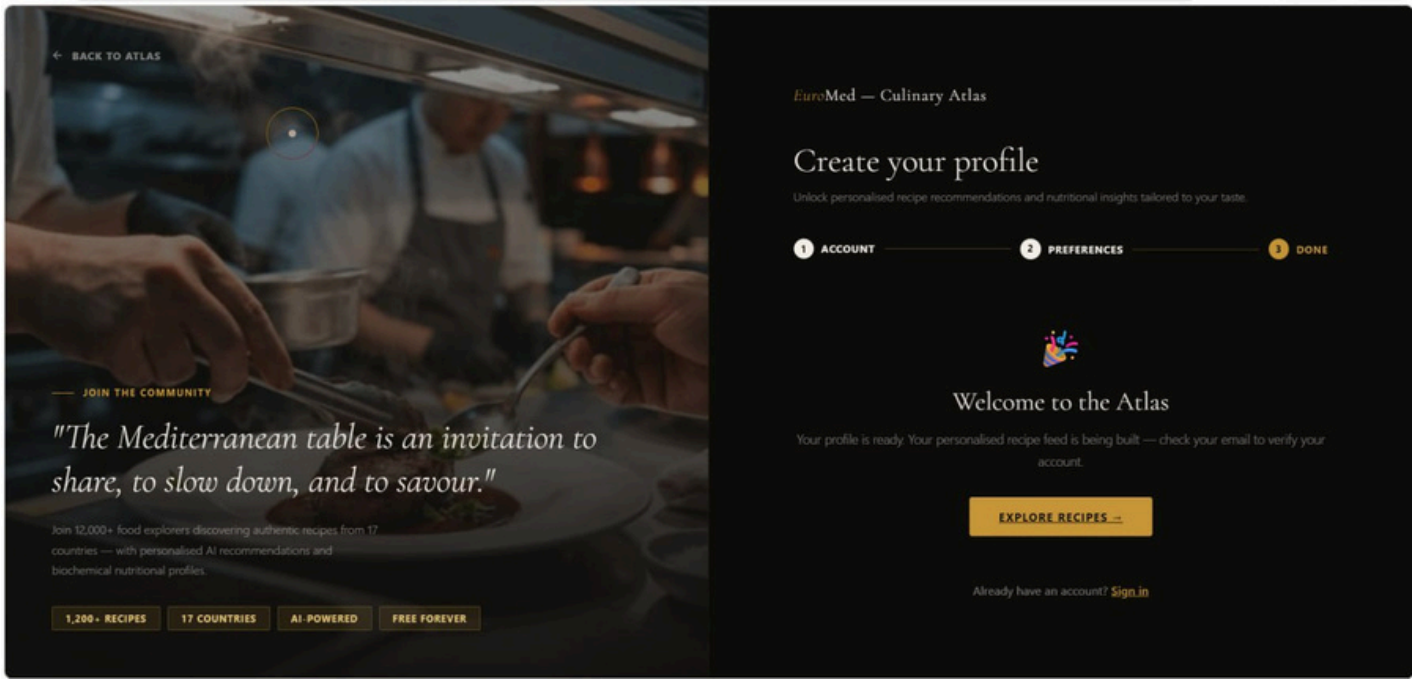


Figure 16: step 3 done and welcome to AtLas

Figure 17 represents the information related to a selected recipe, including the preparation steps, the biochemical profile of the ingredients, their classifications, and the allergen profile.

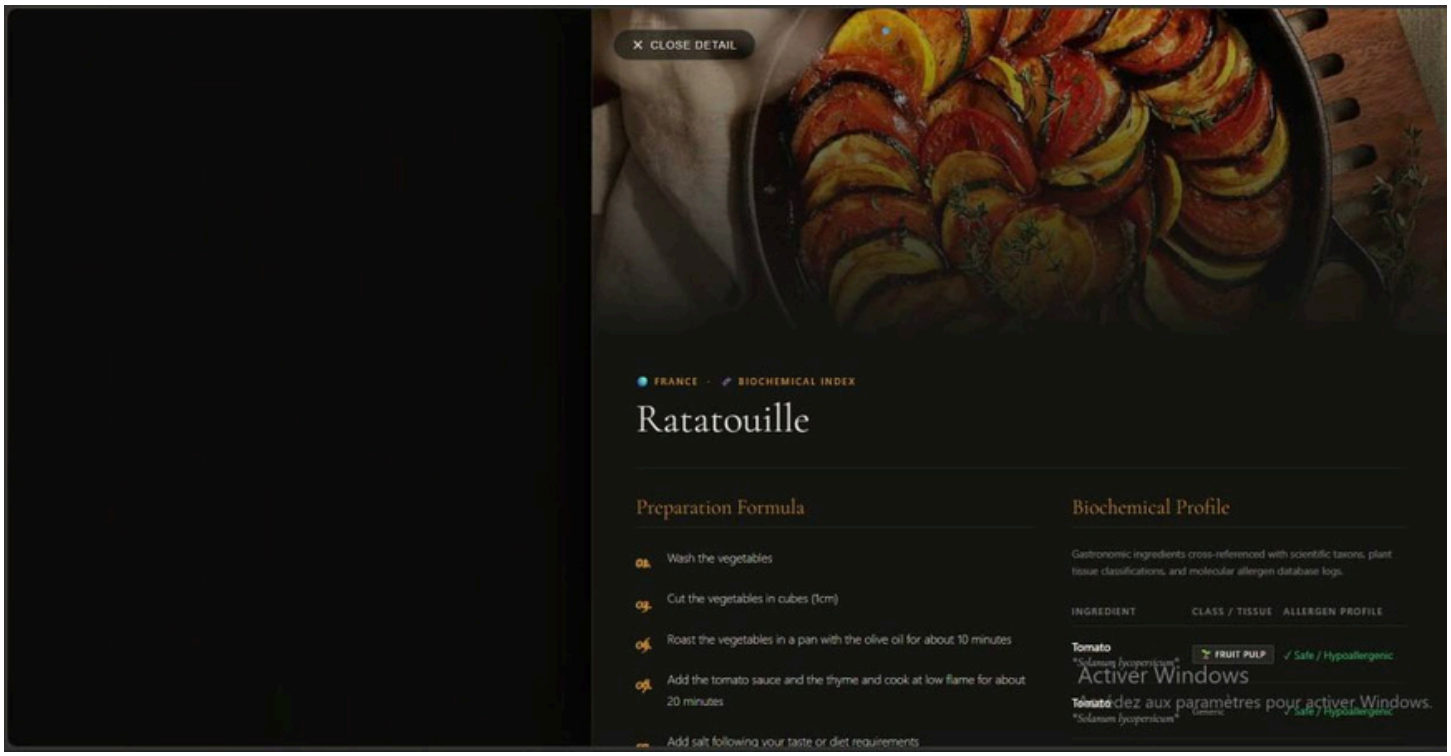


Figure 17: The result of a recipe

Figure 15 represente the Home page of the EuroMed Culinary Atlas platform showing the main navigation interface, country selection, and access to biochemical and allergen-related recipe information.

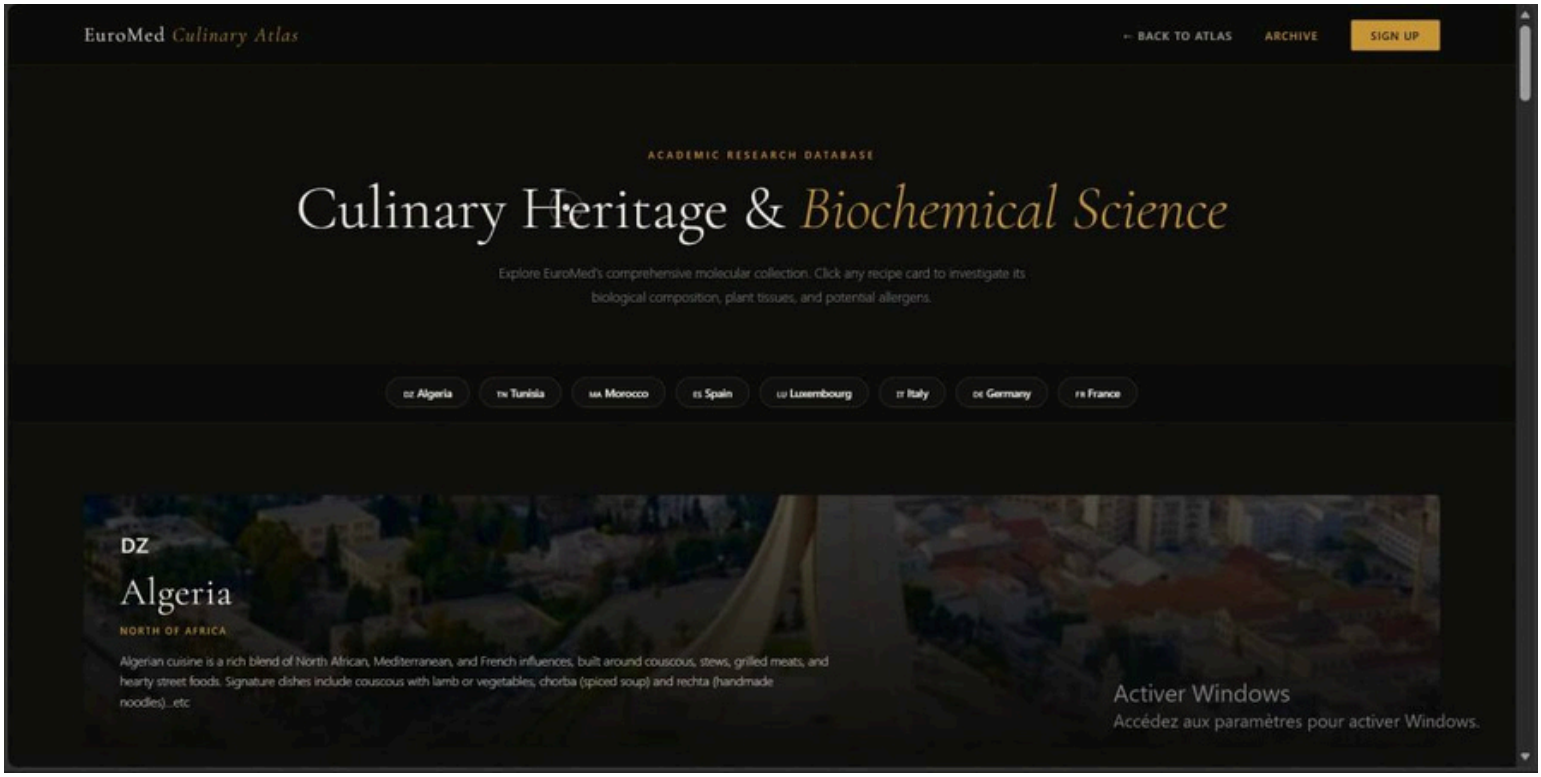


Figure 18: the home page the EuroMed atLas platform

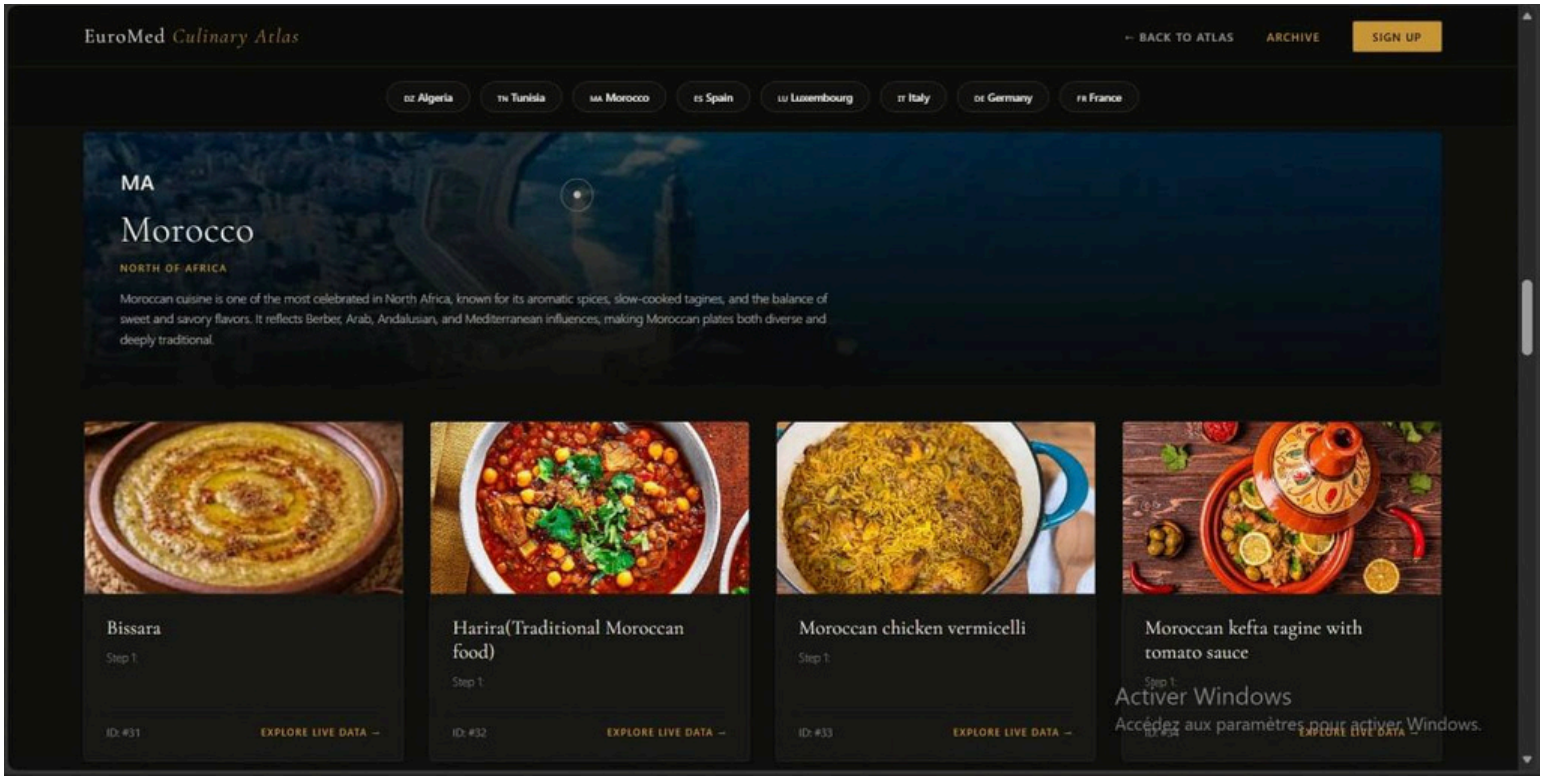


Figure 19: the home page the morocco recipes

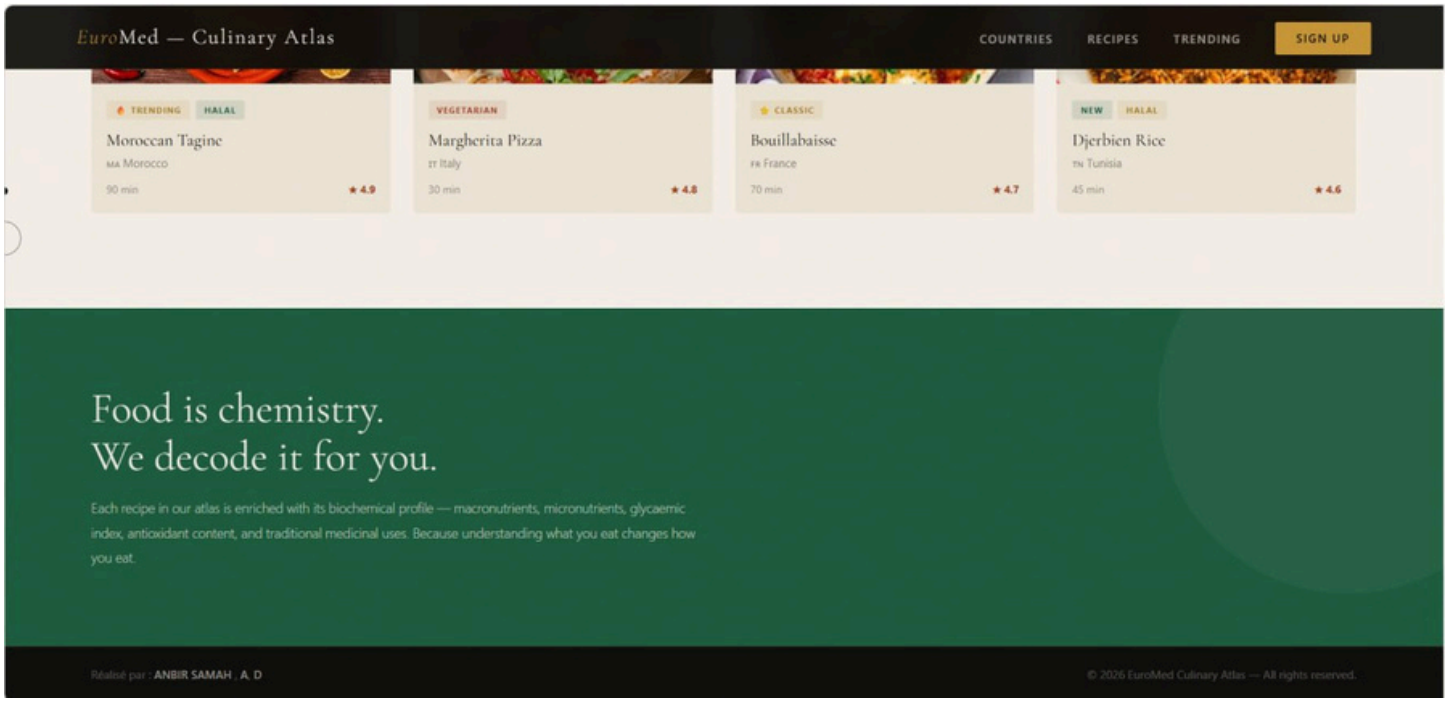


Figure 20 : Food is chemestry We decoded for you

	Table	Action	Rows	Type	Collation	Size	Overhead
☐	administrator	Browse Structure Search Insert Empty Drop	0	InnoDB	utf8mb4_general_ci	32.0 KiB	-
☐	allergenictissue	Browse Structure Search Insert Empty Drop	14	InnoDB	utf8mb4_general_ci	16.0 KiB	-
☐	antioxidant	Browse Structure Search Insert Empty Drop	0	InnoDB	utf8mb4_general_ci	48.0 KiB	-
☐	country	Browse Structure Search Insert Empty Drop	8	InnoDB	utf8mb4_general_ci	16.0 KiB	-
☐	ingredient	Browse Structure Search Insert Empty Drop	198	InnoDB	utf8mb4_general_ci	96.0 KiB	-
☐	ingredient_allergen	Browse Structure Search Insert Empty Drop	18	InnoDB	utf8mb4_general_ci	32.0 KiB	-
☐	ingredient_tissue	Browse Structure Search Insert Empty Drop	35	InnoDB	utf8mb4_general_ci	32.0 KiB	-
☐	modernrecipe	Browse Structure Search Insert Empty Drop	0	InnoDB	utf8mb4_general_ci	32.0 KiB	-
☐	molecularallergen	Browse Structure Search Insert Empty Drop	15	InnoDB	utf8mb4_general_ci	16.0 KiB	-
☐	parentname	Browse Structure Search Insert Empty Drop	14	InnoDB	utf8mb4_general_ci	16.0 KiB	-
☐	recipe	Browse Structure Search Insert Empty Drop	34	InnoDB	utf8mb4_general_ci	112.0 KiB	-
☐	rmprecipe	Browse Structure Search Insert Empty Drop	0	InnoDB	utf8mb4_general_ci	32.0 KiB	-
☐	scientificname	Browse Structure Search Insert Empty Drop	30	InnoDB	utf8mb4_general_ci	16.0 KiB	-
☐	superfamily	Browse Structure Search Insert Empty Drop	14	InnoDB	utf8mb4_general_ci	16.0 KiB	-
☐	userr	Browse Structure Search Insert Empty Drop	0	InnoDB	utf8mb4_general_ci	32.0 KiB	-
	15 tables	Sum	380	InnoDB	utf8mb4_general_ci	544.0 KiB	0 B

Figure 21: the data base the phpmyadmin

5. Conclusion

This project helped us improve our skills in computer science, especially in requirements analysis, data modeling, designing a dynamic web application, and organizing a relational database. It also allowed us to learn how to structure a project in a clear and step-by-step way, while keeping consistency between all stages of design and development.

On the content side, this work also helped us to better understand Euro-Mediterranean recipes, their cultural diversity, and the biochemical properties of ingredients as well as their allergenic effects. This combination between computer science and culinary knowledge allowed us to see the project from both a technical and informative point of view.

For our future improvements, we plan to add several enhancements in order to improve the performance of our dynamic web application and make the user experience better. It will be important to secure the system, especially by adding protection against common attacks such as SQL injection and unauthorized access. We also want to add new features like user management, usage statistics, and advanced search options to make the website more powerful.

Bibliographie

To better understand and successfully develop this dynamic web project about Euro-Mediterranean recipes and their biochemical properties, we relied on several complementary references. Each source helped us in a specific part of the project, such as software design, web development, database modeling, allergen information, and the culinary diversity of Mediterranean countries. The list of references used is as follows:

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