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# Nutr.io - Multi-platform application for diabetics' nutritional choices

## Beta release

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# Abstract

The idea that every field of study can be digitalized in order to ease monotonous tasks is continuously growing in the modern world. Our project aims to tackle the field of Type 1 diabetes, given its growing prevalence in the world.

One of those monotonous tasks is the count and measurement of carbohydrates in meals used to administer the correspondent amount of insulin, along with their blood levels, to maintain a healthy lifestyle. A task that heavily relies on having access to food databases and realize of how many portions a meal has - usually by using a digital balance or doing estimations.

Eating in restaurants is the perfect example that showcases a gap in this field, that our project, Nutr.io, aims to fill. Most nutritional applications do not provide data for restaurants' meals, such as MyFitnessPal, nor does the user bring his digital balance from home - resulting in a faulty carbohydrate count and therefore the administration of an incorrect insulin dose.

The main goal of this project is to design a system that offers a way to facilitate difficult carbohydrate measurement situations, like in restaurants. To that end, a system that stores meals' nutritional information will be developed, where users can use and calibrate its data with their feedback.



# Contents





# Chapter 1

## Introduction

This document is related to the project's beta release, mentioning all the progress made to this milestone.

The report will also state the issues encountered during this time period, mentioning the decisions the group made to solve them. This might also include changes in the initial plan, that the group found relevant for the project's progress efficiency.

The diagrams and schemas developed for this project are shown when approaching the respective topic, however there is an appendix which contains additional information about the project, having references pointing to it when necessary.



## Chapter 2

# Project development

### 2.1 Roadmap

According to the proposed plan, the group managed to accomplish a more complete Android application that can make requests to the server and use its information to display lists, detailed views and calculate user's insulin values as store local cache such as user profiles and search history.

The HTTP server had also a great progress, having now most of its planned features working and properly tested. In order to make this possible, the database suffered some changes that will be detailed later in this report.

However, as it will be detailed in the next section, the group faced some issues that caused delays and made the web browser application development not possible by this date, mainly due to API withdrawals and data models changes.

#### TODO

This report's appendix displays two project schedules: the initial one [??], also present in the project's proposal, and the actual one [??], which was updated to match the actual progress made until now.

### 2.2 Issues encountered and updates

This section describes the issues found and the decisions made to overcome them during development.

#### 2.2.1 Relational database

The group had to redesign the database's models multiple times again, due to the previously mentioned API withdrawals and other encountered incoherences.

#### 2.2.2 HTTP server

After the progress report, the group continued developing the HTTP server and completing the endpoints that were previously lacking. However it was concluded that most APIs that were

being used by the server didn't provide accurate nutritional information about meals and ingredients, which would void the main objective of our platform.

As a result, the group had to drop some meal APIs and introduce generic and hardcoded meal information inside the database as a replace.

This information will be progressively tuned along with the users inputs when they, for example, associate a meal with a restaurant, leaving their values about meals' quantities and portions.

TODO - Falar dos dtos e models

### **2.2.3 Android client**

The Android application's development progressed normally but it had to be put on hold sometimes, because of HTTP server's endpoints' completion, in which the application depends strongly. A major dto and model restructure had also to be made inside the mobile application in order to meet with the current HTTP responses.

## **2.3 Roadmap updates**

Given that the previously mentioned issues, the group agrees that every mandatory requirement made in the initial draft and retified in the previous progress report can still be implemented until the project's final release, such as the web client application.

However the group will have to remove some optional features so the main ones can be delivered whole.

## Chapter 3

# Results

This chapter shows what has been achieved and developed to this date.

As previously written in the project's roadmap and in the last progress report, this project has already a HTTP server and an Android application that have most of the features that were planned by this date.

### 3.1 Relational database

As a result of multiples redesigns, here is the database's conceptual model.

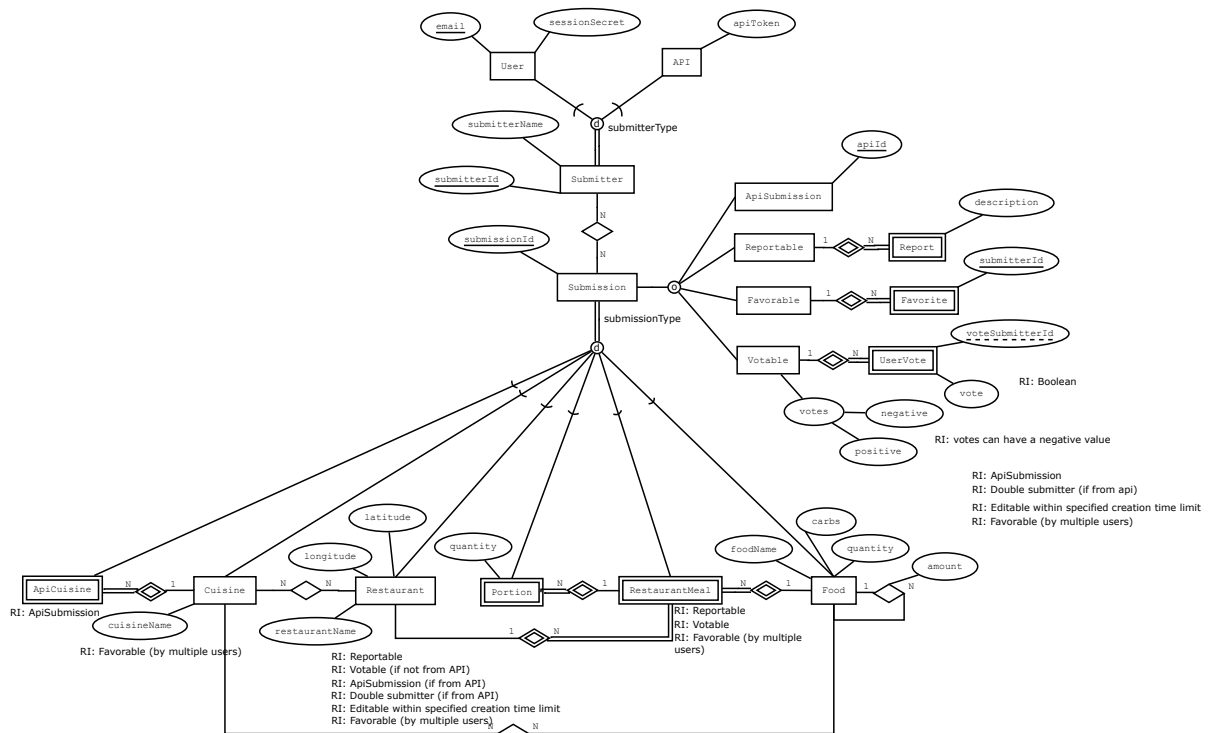


Figure 3.1: Database conceptual model

The database's relational model is present inside this report's appendix [??].

In the relational model there are tables which are not specified in the conceptual model. These are a product from associations between entities which will simplify queries' complexity.

Now the submission can fall into 4 categories: ApiSubmission, Reportable, Favorable and Votable, in order to distinguish between submissions that are from the user or from APIs and to separate which ones can be reportable, favorable and votable by the user.

The cuisine entity has now an associated entity called ApiCuisine, to save cuisine information provided by the Here API.

Meals and ingredients were now condensed into one entity called food - now each meal can have meals inside it that can also be considered ingredients in other contexts.

Therefore each meal possesses nutritional information, which is essential to the user especially to the insulin calculations. That information is composed by 'carbs' - meal's carbohydrates; and quantity - meal's quantity.

## **3.2 HTTP server**

TODO

Some endpoints were changed [??] in order to meet with the current server requirements.

## **3.3 Geolocation**

Given how all clients rely on obtaining nearby restaurants, there was a need to implement a geolocation function in the project's design.

Initial research showcased two possible solutions: Haversine distances and cartesian distances, where the latter returns a highly imprecise distances. As such, Haversine was selected.

The next step was to choose which system filters nearby restaurants: database or HTTP server. After some discussion, the group decided that database was the best option for two reasons:

- Given the large amount of existing restaurants, sending such data from the database to the HTTP server so that it could filter it would occupy too much memory;
- PostgreSQL already supplies extensions that add support for location queries, namely PostGIS.

## **3.4 Android application**

As mentioned in the progress report, the group managed to implement in the mobile application a fragment that displays a map with a list of restaurants nearby the user.

The user can also search for restaurants, meals and cuisines providing the associated name or identifier.

The core feature of the application was also finished during this time period - the insulin calculator. This feature calculates how many insulin doses should be injected in order to maintain the blood glucose levels stabilized according to the user's planned glucose objective for that period of the day.

The blood glucose objective is set inside the user's profile, by creating multiples insulin profiles, each one has a limited time period to give the user freedom to map its own insulin routine throughout the day.

This is due to the fact that user's insulin sensitivity factor varies along the day, so the user has the ability to specify its own values in order to the calculator

TODO - add fragments





## **Chapter 4**

# **Appendices**

This chapter displays all the appendices referenced in this report.

Appendix A - Initial plan



Figure 1: Initial plan accorded in the project's proposal

Appendix B - Actual plan

Nutri.io Project Schedule  
Instituto Superior de Engenharia de Lisboa

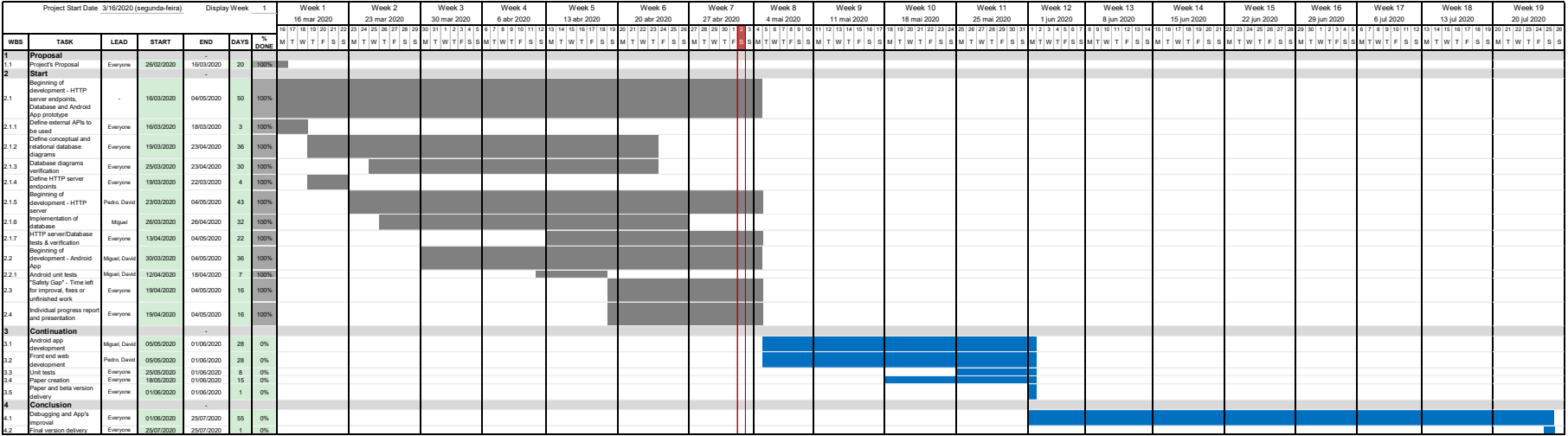


Figure 2: Actual plan with the progress updated as of today

## Appendix C - Database relational model

- **Submitter**

- Attributes: submitterId, submitterName, submitterType
- Primary Key(s): submitterId
- Foreign Key(s): -
- Not null: submitterName, submitterType

- **User**

- Attributes: submitterId, email, sessionSecret
- Primary Key(s): submitterId, email
- Foreign Key(s): submitterId references Submitter(submitterId)
- Not null: sessionSecret

- **API**

- Attributes: submitterId, apiToken
- Primary Key(s): submitterId
- Foreign Key(s): submitterId references Submitter(submitterId)
- Not null: apiToken

- **Submission**

- Attributes: submissionId, submissionType
- Primary Key(s): submissionId
- Not null: submissionType

- **ApiSubmission**

- Attributes: submissionId, apId, submissionType
- Primary Key(s): submissionId, apId
- Foreign Key(s): submissionId references Submission(submissionId)
- Not null: submissionType

- **SubmissionSubmitter**

- Attributes: submissionId, submitterId, submissionDate
- Primary Key(s): submissionId, submitterId
- Foreign Key(s):
  - \* submissionId references Submission(submissionId)
  - \* submitterId references Submitter(submitterId)
- Not null: submitterId

- **SubmissionContract**

- Attributes: submissionId, submissionContract
- Primary Key(s): submissionId, submissionContract

- **Report**

- Attributes: submitterId, submissionId, description
- Primary Key(s): submitterId, submissionId
- Foreign Key(s):
  - \* submissionId references Submission(submissionId)
  - \* submitterId references Submitter(submitterId)
- Not null: description

- **Vote**

- Attributes: submissionId, voteSubmitterId, vote
- Primary Key(s): voteSubmitterId, submissionId
- Foreign Key(s):
  - \* submissionId references Submission(submissionId)
  - \* voteSubmitterId references Submitter(submitterId)
- Not null: vote

- **Restaurant**

- Attributes: submissionId, restaurantName, latitude, longitude
- Primary Key(s): submissionId
- Foreign Key(s): submissionId references Submission(submissionId)
- Not null: restaurantName

- **Cuisine**

- Attributes: cuisineName
- Primary Key(s): cuisineName

- **Meal**

- Attributes: submissionId, mealName
- Primary Key(s): submissionId
- Foreign Key(s): submissionId references Submission(submissionId)
- Not null: mealName

- **Portion**

- Attributes: submissionId, quantity
- Primary Key(s): submissionId
- Foreign Key(s): submissionId references Submission(submissionId)
- Not null: quantity

- **Ingredient**

- Attributes: submissionId, ingredientName
- Primary Key(s): submissionId
- Foreign Key(s): submissionId references Submission(submissionId)
- Not null: ingredientName

- **MealIngredient**

- Attributes: mealSubmissionId, ingredientSubmissionId
- Primary Key(s): mealSubmissionId, ingredientSubmissionId
- Foreign Key(s):
  - \* mealSubmissionId references Meal(submissionId)
  - \* ingredientSubmissionId references Ingredient(submissionId)

- **RestaurantMealPortion**

- Attributes: mealSubmissionId, portionSubmissionId, restaurantSubmissionId
- Primary Key(s): mealSubmissionId, portionSubmissionId
- Foreign Key(s):
  - \* mealSubmissionId references Meal(submissionId)
  - \* portionSubmissionId references Portion(submissionId)
  - \* restaurantSubmissionId references Restaurant(submissionId)

- **RestaurantCuisine**

- Attributes: restaurantSubmissionId, cuisineName
- Primary Key(s): restaurantSubmissionId, cuisineName
- Foreign Key(s):
  - \* restaurantSubmissionId references Restaurant(submissionId)
  - \* cuisineName references Cuisine(cuisineName)

- **MealCuisine**

- Attributes: mealSubmissionId, cuisineName
- Primary Key(s): mealSubmissionId, cuisineName
- Foreign Key(s):
  - \* mealSubmissionId references Meal(submissionId)
  - \* cuisineName references Cuisine(cuisineName)



## Appendix D - Endpoints' table

Method	Path	Query String	Body parameters	Description
GET	restaurant	int lat, int lon, int skip, int count, String name		Search for restaurants and their cuisines, based on location or named search
GET	restaurant/:id			Restaurant's name and cuisines
GET	restaurant/:id/meal	int skip, int count		Restaurant's meals with votes
GET	cuisines	int skip, int count		List possible cuisines
GET	ingredients	int skip, int count		Get all possible meal ingredients
GET	meal/:id			Meal's portions and ingredients
GET	report/:id			GET user's report on a submission
GET	vote/:id			GET user's vote on a submission
POST	restaurant		String name, float lat, float lon, String[] cuisines	Create a new restaurant from location
POST	meal		String name, MealIngredient[], amount, carbs, image, unit	Create a new restaurant meal, allowing for multiple ingredients (optional), first portion submission (optional)
POST	restaurant/:restaurantMeal/meal/:mealId		Object portion	Associates existing meal with existing or api restaurant
POST	restaurant/:id/meal/:mealId/portion		Object portion	Creates a restaurant's meal portion
POST	report/:id		String reason	Create a report on a restaurant's meal
POST	vote/:id		boolean isPrimitive	Create a vote on a restaurant's meal
PUT	restaurant/:id		Object portion	Updates a restaurant
PUT	meal/:mealId		String name, Object portion, int[] ingredients, String[] cuisines	Update a restaurant's meal
PUT	restaurant/:id/meal/:mealId/portion		Object portion	Creates a restaurant's meal portion
PUT	vote/:id		boolean isPositive	Update a vote on a restaurant's meal
DELETE	meal/:id			Delete user created meal
DELETE	restaurant/:id			Delete user created restaurant, if it wasn't used by the community yet
DELETE	restaurant/:id/meal/:mealId			Delete user created restaurant meal, if it wasn't used by the community yet
DELETE	restaurant/:id/meal/:mealId/portion			Delete user's restaurant's meal portion
DELETE	vote/:id			Delete user's restaurant meal vote