



# **IPB Digital Library**

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Master in Informatics

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Bragança

2023-2024



# Abstract

The abstract in english.

**Keywords:** The keywords

# Resumo

O summary in Portuguese .

**Key words :** words key .

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# Chapter 1

## Introduction

In today's digital age, transformation permeates every aspect of life, including the way we interact and access books. Libraries, as guardians of knowledge, are adapting to keep up with this change. This project focuses on developing a website for a library, with the aim of facilitating and making access to knowledge more efficient.

Users can search for specific titles, see what books are available, and even create private virtual shelves to organize the books they want to read in the future. Additionally, users can request books to be picked up from the library.

The IPB Digital Library serves as a digital catalog, allowing users to explore the library's collection efficiently and conveniently. We are committed to continually improving our website to meet our users' needs and promote a love of reading. Thank you for your understanding and support.

With advanced search functionality, users can easily find the books they are looking for, saving time and effort. Additionally, they can create private virtual bookshelves for better organization of their favorite books and can order books easily and conveniently.

This library website is a step towards a more informed and sustainable future. While we are proud of what we have achieved so far, we recognize that there is still room for improvement and expansion. We are committed to continuing to develop and improve our website to better meet the needs of our users and promote literature. Thanks.

## Chapter 2



# Problems and Goals

## Problems

The libraries traditional , in fact , face several challenges in the digital age. The need for space physical space , maintaining books , limiting opening hours and the difficulty of finding books specific they are some of the problems common . In addition addition , the users they can to have difficulty in access the library due to distance or The others restrictions .

Our library website he was developed to solve these problems . Although you users no can to read you books directly on the website, they have the ability to search and view which books they are available at library . That eliminates the need for space physical and maintains you books in perfect conditions . The website is available 24 hours a day day , 7 days per week , allowing to the users access to the library resources at any time moment and in any place .

You users they can to look for easily books specific through the search functionality advanced . In addition of that , they they can request books for pick up at library , eliminating the need to travel physically until there . Each user he can create your own private virtual bookshelf , allowing them organize you books according to your preferences .

library website is a step-in direction to a future more informed and sustainable. We are committed in continue to develop and improve our website to meet better to the needs of our users and promote a love of reading . Thank you for your understanding and support .

## Goals

The IPB Digital Library was developed with the aim of facilitating access to the knowledge, improve The research efficiency , promote the organization personnel , facilitate book lending , promote sustainability and be available 24/7. By digitizing the library's book collection , we aim to make knowledge more accessible to everyone , regardless of their location geographic . With search functionality advanced , the users they can meet easily you looking books , saving time and effort . By creating shelves virtual private , the users they can organize you your books favorites according to your preferences . You users they can request books for pick up at library easily and conveniently , eliminating the need to travel physically until there . By reducing the need for transportation physical and maintain you books in perfect conditions , we are contributing to a future more sustainable . The website is available 24 hours a day day , 7 days per week , allowing to the users access to the library resources at any time moment and in any place . These objectives reflect our commitment in promote literature and access to the knowledge , to at the same time that we use technology to overcome the limitations of libraries traditional . We look forward to seeing how the IPB Digital Library will continue the evolve and serve our user community.

## **Chapter 3**

# Backgroud

The IPB has already has an identical system.

## Chapter 4

# Requirements

Chapter 4 has as goal introduce technologies and programming languages used during of this work . In addition Furthermore , it addresses the applications already developed that will serve as guidance for developing our library website .

## Technologies/Software

### Python

Python is a high - level, versatile and powerful programming language that allows work quickly and integrate systems more effective [ 3]. Its syntax clear and legible makes Python easy to learn for new programmers [ 3]. In addition Furthermore , Python is used in lots of areas , including web development , data science , machine learning , automation , among others [3] . Python can be easily installed in Windows, macOS , or Linux platforms from the official Python website (python.org). The installation process is simple and includes options for installing the library pattern, test suite, launcher, and pip as well [ 4]. You you can use pip to download multi - packs indexes such as the Python Package Index [4].

### FastAPI

FastAPI is a modern, high- performance framework for building APIs with Python, based in type tips default [ 1][2]. It offers performance very high, comparable to NodeJS and Go, thanks to Starlette and Pydantic [ 1][2]. It is one of the fastest available [ 1]. In addition to being quick to execute , FastAPI It's also quick to code . He

allows increases significant at development speed , reducing the number of errors induced for the developer [1]. FastAPI is intuitive, offering great support to the editor, with conclusion in all you place, reducing the time spent at debugging [1]. FastAPI is designed to be easy to use and learn, minimizing time spent at reading the documentation [1]. He too minimizes code duplication, obtaining multiple features of each parameter declaration [1].

## **MongoDB**

document database that offers the scalability and flexibility you need . want with the query and indexing you need [ 5]. It stores data in documents flexible similar to JSON, which means fields can vary from document to document and the data structure can be changed to the overtime [5]. In addition Additionally , MongoDB is intuitive for users. developers learn and use, while at the same time as providing all capabilities necessary to meet to the requirements more complexes in any scale [ 5]. Ad hoc queries , indexing and aggregation real time provide ways powerful ways to access and analyze your data [5]. As a distributed database in your core , MongoDB offers high availability , horizontal scalability and distribution geographical integrated and easy to use [5]. In summary, MongoDB is a powerful tool for data management, providing high performance, ease of use and a series of features that facilitate development [ 6 ].

## **JavaScript**

JavaScript is a high - level, dynamic and interpreted programming language, known mainly per your function as scripting language for web pages [ 11][12]. He was created by Brendan Eich in 1995 and since then evolved into one of the programming languages more popular in the world [ 11]. The strength of JavaScript lies in your ability to enable content creation dynamic and interactive website [11][12]. It allows the developers manipulate web page elements and respond to user actions in real time, such as mouse clicks, keystrokes , and form changes [ 11 ][12] . In addition,

Furthermore, JavaScript is the only language that combines HTML, CSS and JavaScript, making it unique in your ability to create user interfaces rich and interactive [ 11][12]. In addition Furthermore , JavaScript is not limited to the browser . With the advent of Node.js, JavaScript can now be used to develop server - side applications, allowing developers use one only language to develop complete web applications [ 11].

## **React**

ReactJS, too known as React.js or simply React, it's a code JavaScript library open to building user interfaces based in components [9]. It is maintained by Meta (formerly Facebook) and a developer community individual and company [ 9]. ReactJS allows you build user interfaces from parts individual called components. Each component in ReactJS is a modular and reusable entity, which makes the code more organized and easier to maintain [ 9]. In addition, Furthermore, ReactJS follows the programming paradigm declarative, which means that the developers design views for each state of an application and React updates and renders you components when data changes [ 9]. One of the main advantages of ReactJS is that it only renders again the parts of the page that changed, avoiding rendering unnecessary use of unchanged DOM elements [ 9]. That improvement significantly the efficiency and performance of web applications. ReactJS too can be used to develop page applications unique, furniture or rendered on the server with frameworks like Next.js [ 9]. How ReactJS is just Concerned with user interface and component rendering for the DOM, react applications often times depend on libraries for routing and other client- side functionalities [ 9].

## **Bootstrap**

Bootstrap is a Popular HTML, CSS, and JavaScript library for developing responsive websites and applications web [14][15]. He was developed by the Twitter team and is now maintained per developers in all over the world [ 14][15]. Bootstrap

offers one variety of components reusable materials that help you developers creating user interfaces consistent and attractive quickly and efficiently [14][15]. These components include buttons, forms, navigation, windows modals, tooltips, carousels and much more [14][15]. In addition, Furthermore, Bootstrap includes a responsive grid system that allows to the developers create flexible and adaptable layouts for a variety of screen sizes [14][15]. This is especially useful in the modern era , where Websites need to be accessible and functional in one variety of devices , from desktops to smartphones [14],[15]. Bootstrap too includes one series of JavaScript plugins that add functionalities interactive to the components [ 14],[15]. These plugins allow to the developers to add behaviors dynamic to your websites without have to write very JavaScript code [14],[15].

## **User Stories**

User Stories are one fundamental part of development agile software [17],[18]. They are descriptions informal and general descriptions of a software feature , written from the end user 's perspective [17],[18]. The purpose of a User Story is to articulate how one task specific he can offer a certain value to the client [ 17],[18]. User Stories are expressed in simple language and no technique, which helps to give context to the development team and their initiatives [ 17],[18]. After reading a User Story, the team knows why they are developing what is developing and what value does it creates [ 17],[18]. User Stories are one of the main components of a program agile . They provide one structure user - centric for work daily, which drives collaboration, creativity and a product better in general [ 17],[18].

n	Type	Identifier	Name	Module	Priority (1 - high to 5 - low)	User	Story	User Story
01	ASP	ASP1	Create bookshelf	Managment	1	Student	I want to be able to add books.	As a Student I want to be able to add books.
02	SSP	SSP2	Add book to a bookshelf	Managment	3	Student	I want to be able to organise the added books.	As a Student I want to be able to organise the added books.
03	ASP	ASP3	Edit book	Edition	2	Admin	I want to be able to change a books data.	As a Admin I want to be able to change a books data.
04	SSP	SSP4	Add book to wanted books list	Edition	5	Student	I want to be able to add a book so I can have a list of books I want to reserv.	As a Student I want to be able to add a book so I can have a list of books I want to reserv.
05	ASP	ASP5	Remove book	Edition	3	Admin	I want to be able to delete a book.	As a Admin I want to be able to delete a book.
06	SSP	SSP6	Borrowed	Visualization	5	Student		As a Student
07	SSP	SSP7	View bookshelf	Visualization	3	Student	I want to be able to view all my books in one bookcase.	As a Student I want to be able to view all my books in one bookcase.
08	SSP	SSP8	View all books from all bookshelf	Visualization	1	Student	I want to be able to view all books from all bookcases monitoring if i think that something is wrong.	As a Student I want to be able to view all books from all bookcases monitoring if i think that something is wrong.
09	SSP	SSP9	Login	Managment	5	User	I want to be able to Login.	As a User I want to be able to Login.
10	SSP	SSP10	Register	Managment	3	Student	I want to be able to Register.	As a Student I want to be able to Register.
11	SSP	SSP11	Update Profile	Managment	2	User	I want to be able to update my profile monitoring if I think that something is wrong.	As a User I want to be able to update my profile monitoring if I think that something is wrong.
12	SSP	SSP12	Change Password	Managment	5	User	I want to be able to change my password.	As a User I want to be able to change my password.
13	SSP	SSP13	See the details of a book	User Interface	3	Student	I want to be able to see the details of a book.	As a Student I want to be able to see the details of a book.
14	SSP	SSP14	Mark book as returned	Managment	4	Admin	I want to be able to mark book as returned.	As a Admin I want to be able to mark book as returned.
15	SSP	SSP15	Log out	User Interface	4	User	I want to be able to logout.	As a User I want to be able to logout.
16	SSP	SSP16	Send comment	Managment	3	Student	I want to be able to send comment	As a Student I want to be able to send comment

Figure 1- User stories.



## **System Description**

The IPB Digital Library, designed to the students and staff at the IPB school, is a robust digital platform that aims to facilitate access and interaction with the library resources. After a simple and secure registration process, users they can log in to the website. This authentication process ensures that each user you have one experience personalized and secure at platform. Once authenticated, the users have the ability to search books available at library. This research can be done per book 's name or category , allowing to the users meet easily what they are looking for . In addition of that, they can to view details of these books, such as the author, year of publication, synopsis and much more . The system also offers the functionality to create bookshelves virtual private . These bookshelves allow to the users organize you your books favorites according to your preferences . Is important note that each book only can be added to a shelf of each time, ensuring that the organization it is maintained. In addition, the users he has the option to request books. They can indicate which books wish request and the system will process the order . If the book is not returned until the deadline , the system will score automatically the book as late . That helps to maintain the order and efficiency at management of library books.

Finally, the system also allows the users send comments. This functionality provides one platform for feedback and discussion, allowing to the users share your opinions and experiences.

## **Use cases.**

You use cases they are a powerful tool used at business analysis to define your requirements functionalities of a system or software [27]. A use case describe as a user interacts with a system to achieve goals specific [24],[25]. It outlines the flow of user inputs , establishing success and failure paths to achieving goals. That allows product

teams understand better than a system do , as he works and why they occur errors [24]. You use cases they are often employees in software development environments to simplify concepts complicated, but they can also be important at project management for collecting requirements and defining the scope of a project [ 25]. They are used in domains of product management, product development and product testing [ 25]. Your product managers document use cases focused on the user, while you developers document uses cases focused on the product [ 25]. You use cases user - focused they are mainly concerned about the user and their goals . These are then passed to the developers to guide decision making during the product development process [ 25 ] . You use cases they are designed to reveal system demands early in the process [ 25]. They focus us system users, in instead of his own system [ 25]. A use case must be understandable to everyone stakeholders, not just developers and testers, as they are mainly prosing narrative [ 25].

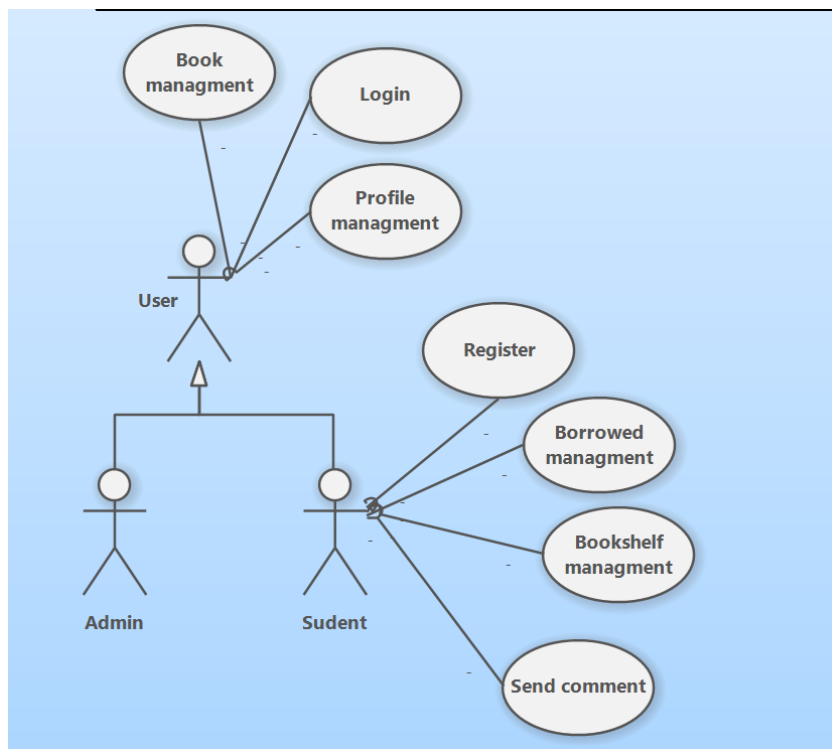


Figure 2 - Use case nível 0

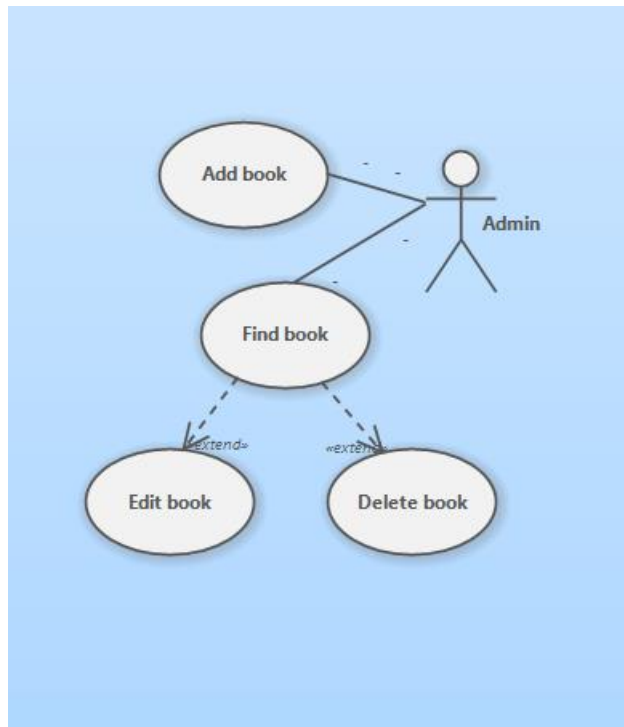


Figure 3 - Gerir book, admin

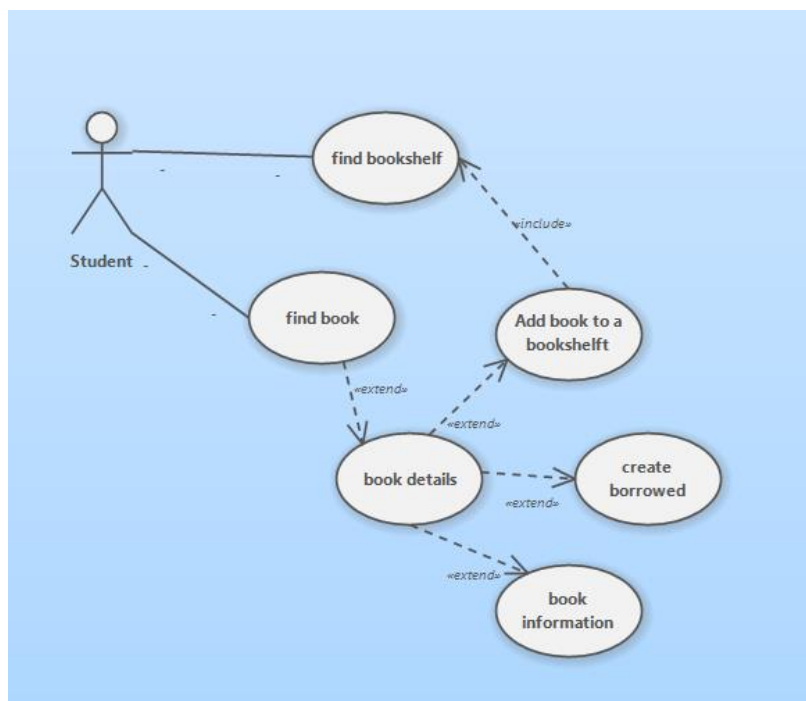


Figure 4 - Gerir book, student

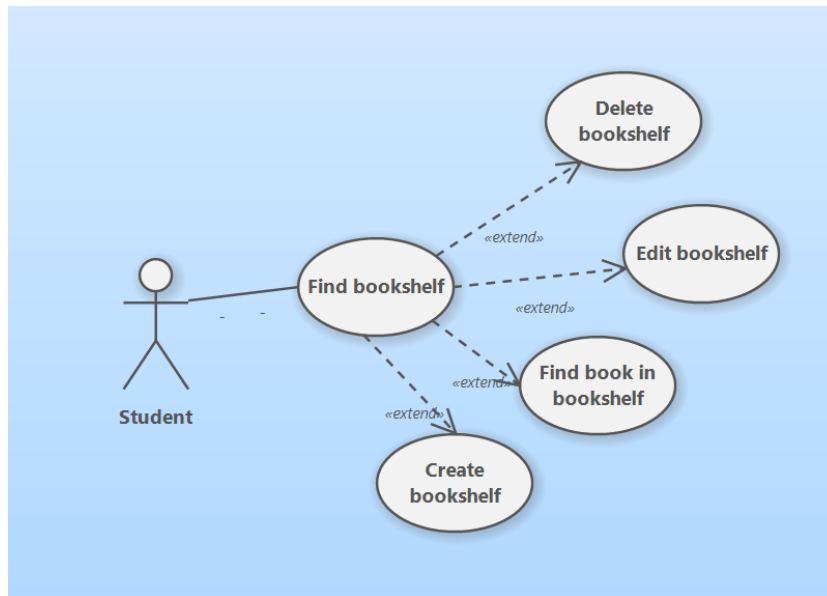


Figure 5 - Gerir bookshelf

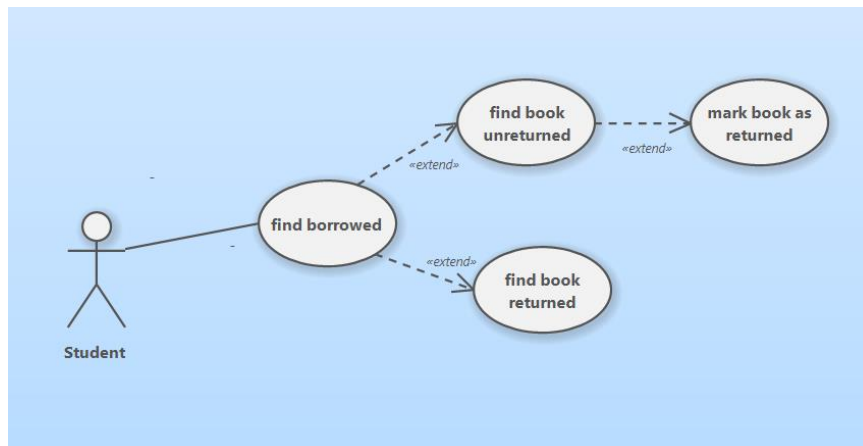


Figure 6 - Gerir borrowed.

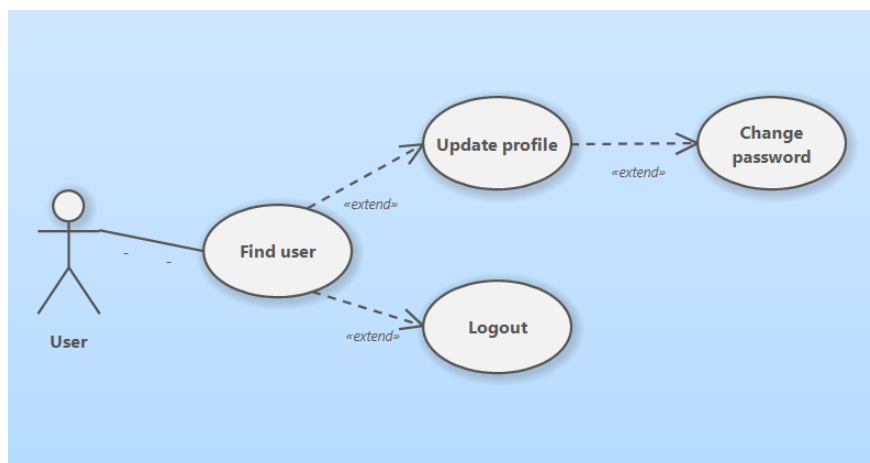


Figure 7 - Gerir account, user.

## Database Schema

The Database was defined based on the functionalities of the application and showed in a table schema for better understatement, as showed in figure 4.1.

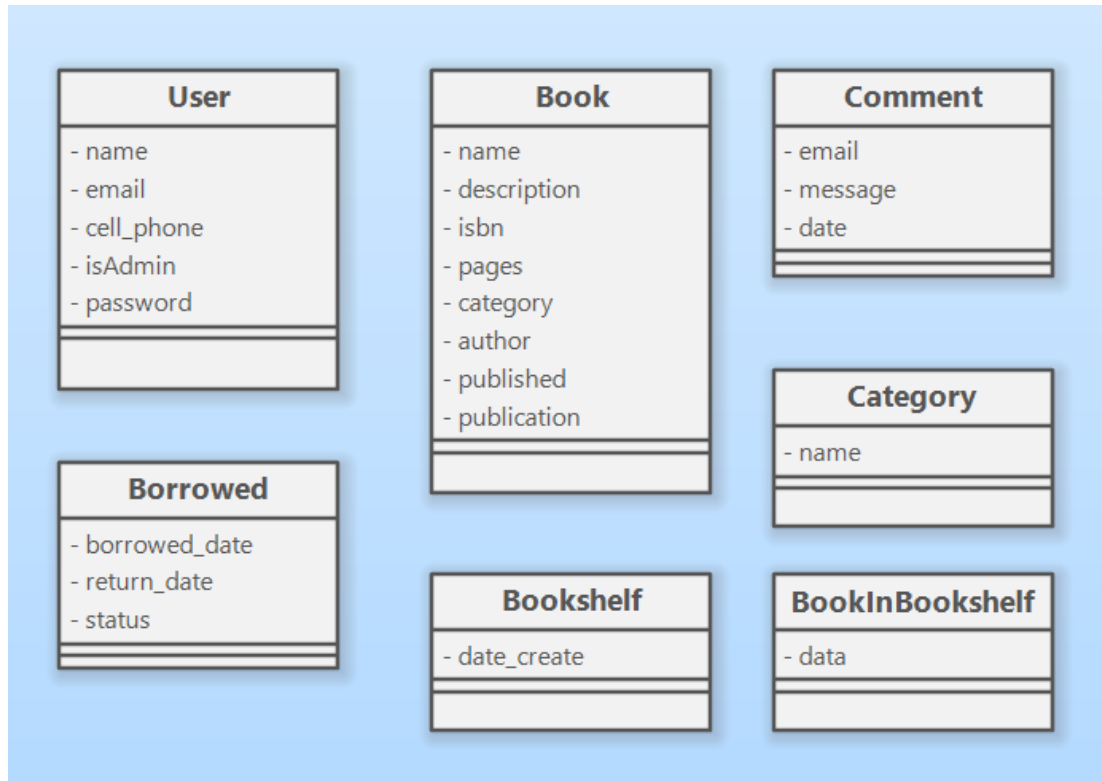


Figure 8 - Database Schema

## Mockups

When creating the mockup for our project , we chose for a clean and simple design , using the IPB color and icon . We believe that this approach not only reflects The IPB's visual identity, but also facilitates usability and understanding of the project by the users.

Clean , simple design helps features stand out more important parts of our project , avoiding distractions unnecessary . The IPB color was used to add a touch of familiarity and consistency to the project, while the IPB icon serves as a reminder

constant association of the project with the institution .

To develop the mockup, we used Figma, a collaborative interface design tool [ 17]. Figma allows designers to work together in real time, making the design process more efficient and integrated [ 17]. In addition Additionally, Figma supports prototyping realistic , allowing us test The experience interactive and get more feedback early in the design process [17]. To access to the mockup - [Mockup Link](#)

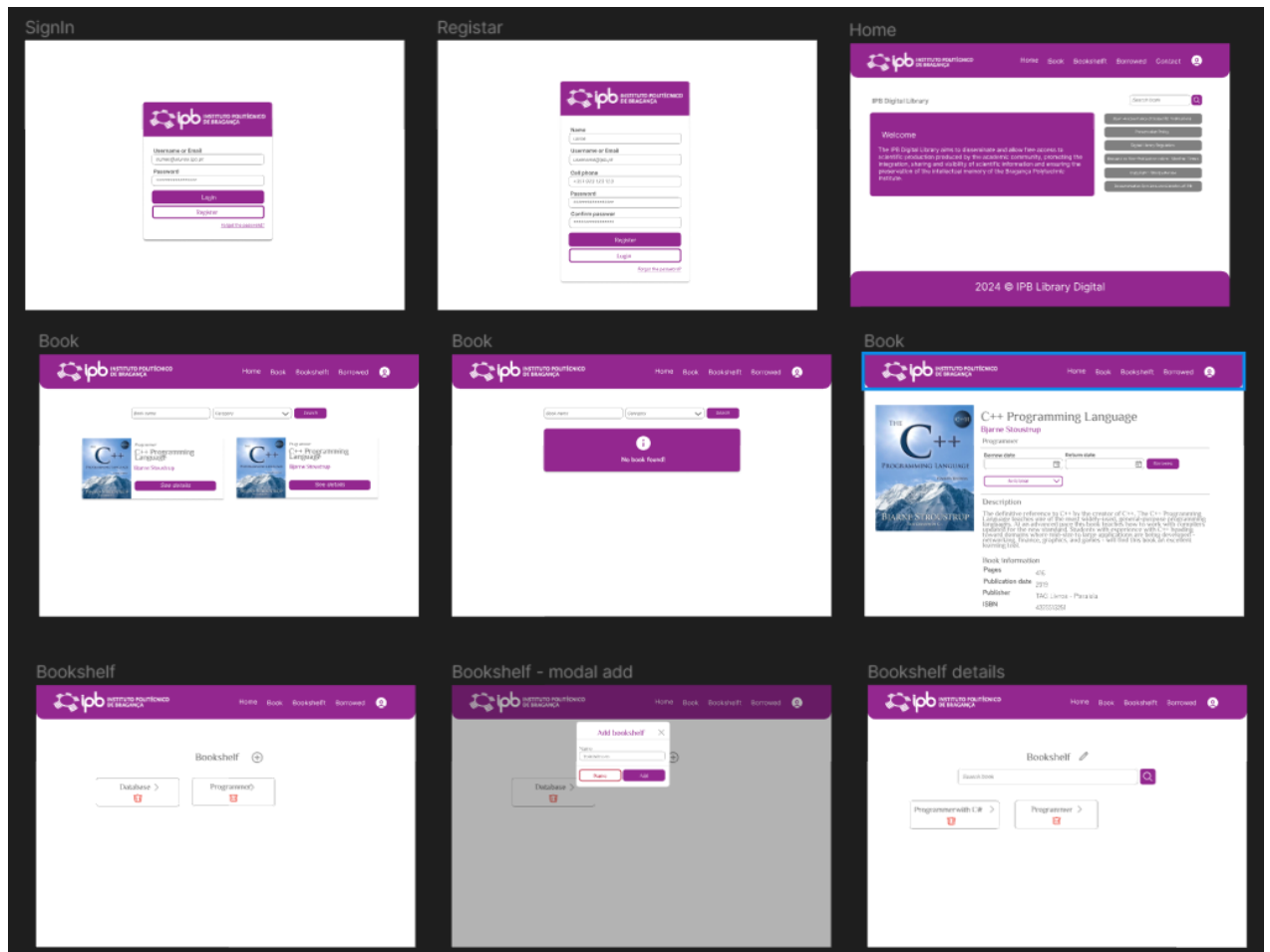


Figure 9 – Mockup

# Chapter 5

## Prototype Development

### Back-End Development

The back-End development was divided into the Database, the API, authentication, and test.

#### Database

The Database was built using MongoDB. The figure 4.1 in the previous chapter the database is composed by 4 collections being them: User, News, Volunteering and Map.

#### API and relation with Database

project API , it was implemented several endpoints and was used you four main HTTP methods : GET, POST, DELETE and PUT [20]:

- GET: This method is used to retrieve data from the server<sup>12</sup>. It is a method read - only , which means it cannot he has risk of changing or corrupt the data [20],[21].
- POST: The POST method is used to send data to the server to create a new resource . It is used to send data to the server and create a new resource [20],[21].
- DELETE: This method is used to remove a resource existing on the server [ 20],[21].
- PUT: The PUT method is used to update a resource existing on the server or create a new resource if it no exist [20],[21].

These methods they are essential to allow CRUD (Create, Read, Update, Delete) operations in its API, allowing to the users interact effectively with the data [20],[21],[22],[23]

**FastAPI** 0.1.0 OAS 3.1  
/openapi.json

**default** ^

POST	/user/	Insert User	▼
GET	/user/	Get User	▼
PUT	/user/	Update User	▼
POST	/book/	Insert Book	▼
GET	/book/	Get Book	▼
PUT	/book/	Update Book	▼
DELETE	/book/	Delete Book	▼
GET	/category/	Get All Categories	▼
POST	/category/	Insert Category	▼
POST	/bookshelf/	Insert Bookshelf	▼
GET	/bookshelf/	Get Bookshelf	▼
PUT	/bookshelf/	Update Bookshelf Name	▼
DELETE	/bookshelf/	Delete Bookshelf	▼
POST	/borrowed/	Insert Borrowed	▼
GET	/borrowed/	Get Book Is Borrowed	▼
PUT	/borrowed/	Update Borrowed	▼
POST	/book-in-bookshelf/	Insert Book In Bookshelf	▼
GET	/book-in-bookshelf/	Get Book In Bookshelf	▼
PUT	/book-in-bookshelf/	Update Book In Bookshelf	▼
DELETE	/book-in-bookshelf/	Delete Book In Bookshelf	▼
POST	/comment/	Insert Comment	▼

Figure 10- FastAPI endpoints

## Connecting to the database

To connect to the database, it was using pymongo , a Python library to interact with MongoDB. The pymongo allows the Python developers use MongoDB as a data storage



system in a efficient and intuitive . Connection to the database is established through MongoClient , a pymongo class . The connection string passed to MongoClient specifies that the database is stored locally , at the address ' mongodb ://localhost:27017/'. That means that the MongoDB server is running at same machine where the Python code is being executed . Therefore , all data read and write operations are carried out locally , which can to result in a performance more fast and secure .

```
from pymongo import MongoClient, DESCENDING
from bson import ObjectId

client = MongoClient('mongodb://localhost:27017')
db = client['ipb_db']
user_collection = db['user']
DESCENDING = DESCENDING
book_collection = db['book']
category_collection = db['category']
bookshelf_collection = db['bookshelf']
book_in_bookshelf_collection = db['book_in_bookshelf']
borrowed_collection = db['borrowed']
comment_collection = db['comment']
```

Figure 11- Access database.

## Encrypting the password

In any information system , data security is of utmost importance . One of the main ways to guarantee that Security is through password encryption. He was used the library *passlib* to encrypt passwords . This library allows transform the original password into one version encrypted , known as hash. A password encryption is important per several reasons. First, it protects the user 's sensitive data . Even if an attacker get access to the database, it no it will be able to discover the original password from the hash. Second, *passlib* also provides one function to check whether the password inserted for the user matches to the stored hash. This is done without the

need to decrypt the hash, contributing to the security and efficiency of the system .

```
from passlib.context import CryptContext

pwd_context = CryptContext(schemes=["bcrypt"], deprecated="auto")

3 usages new *
def hash_password(password: str) -> str:
    return pwd_context.hash(password)

3 usages new *
def verify_password(plain_password: str, hashed_password: str) -> bool:
    return pwd_context.verify(plain_password, hashed_password)
```

Figure 12- Encryption method.

## Folder Structure

A Folder structure is a crucial aspect of any programming project. She serves as the backbone of the project and plays a vital role in organization of files and directories. A good folder structure planned and organized he can make project development more

efficient and manageable.

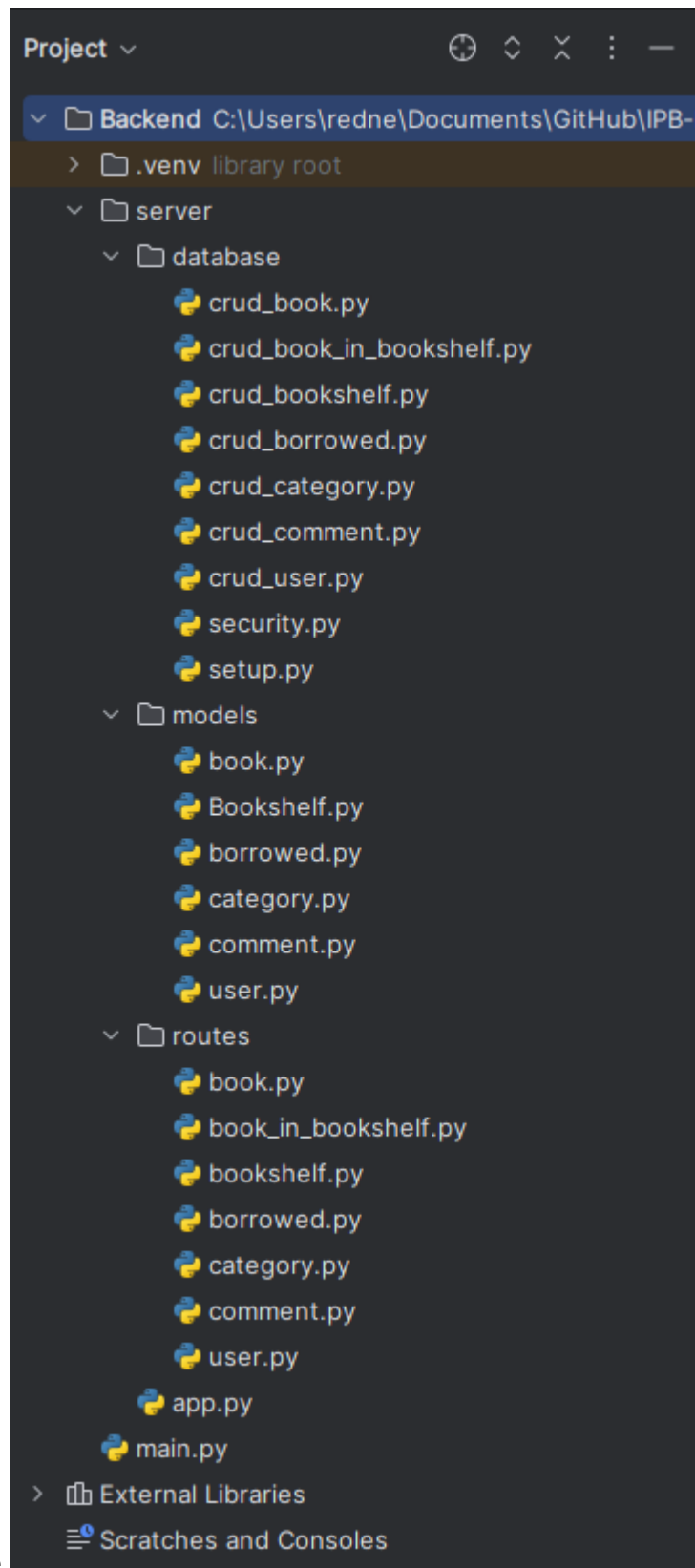


Figure 13- Structured from Pasta Pytho

# Front-End Development

Front-end development is a crucial part of any web project. Using HTML, CSS, and Bootstrap, it is possible to create clean and organized web interfaces. The interface is an essential part of a book management system.

The use of HTML, CSS, and Bootstrap allows for the creation of a clean and organized interface. Bootstrap facilitates the implementation of a responsive design that adapts well to different screen sizes.

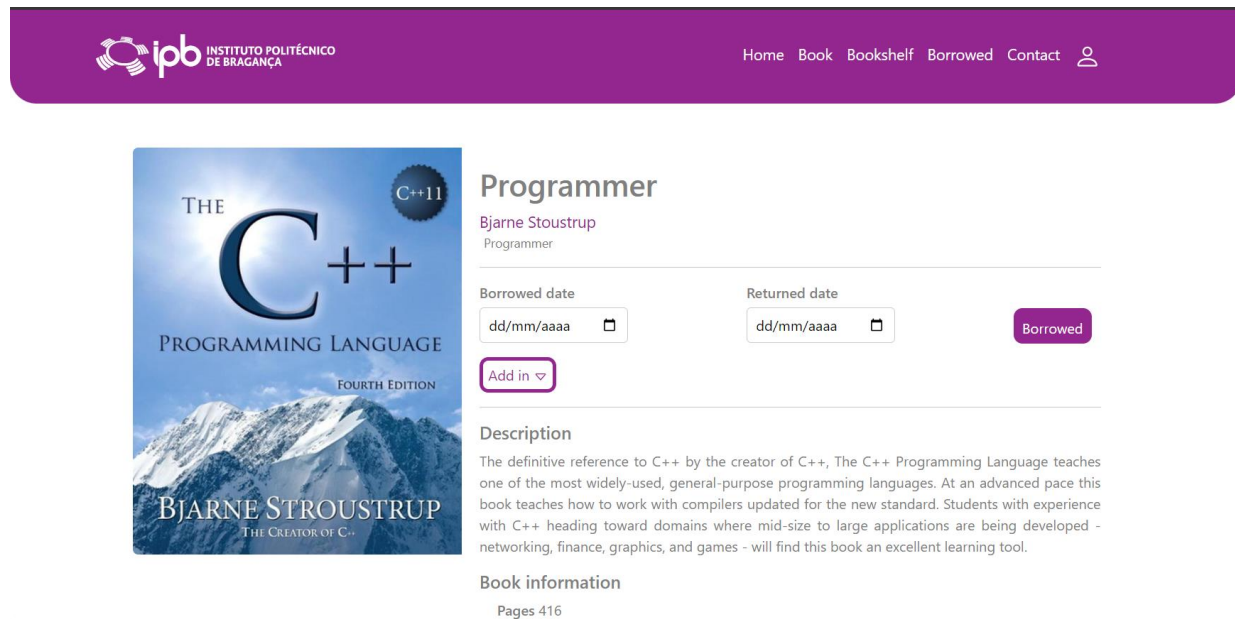


Figure 14 - Website image

# Chapter 6

## Conclusions

The IPB Digital Library represents a milestone significant at promoting reading and access to information. You users they can easily to view you books available at library, request books and create bookshelves virtual private, providing one experience personalized and enriching.

This website is not only a tool to facilitate access to the books , but also a space where you book lovers they can interact and share their passions literary . By creating shelves virtual private , the users they can organize you your books favorites and share yours recommendations with others.

Despite already terms Reached many of our goals initials , we recognize that we still there is room for improvement and expansion . We are committed in continue to develop and improve our website to better to meet to the needs of our users and contribute to the promotion of literature .

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