Library Management System

Laboratorio di Basi di Dati (A.A. 2023/2024)

Specifiche del progetto e documentation

Juan Barea Rojo

UNIVERSITÀ DEGLI STUDI DI MILANO

INDEX

Introduction

The goal of this project is to develop a comprehensive database application for managing a library system, distributed across multiple locations. This application is designed to provide essential functionalities for both registered library readers and the librarians responsible for managing the system. By using this application, readers will have the ability to view detailed information about the catalogs maintained by the library, which include various books, authors, and available copies. Additionally, readers can enter loan requests for a specific set of books directly through the application, streamlining the borrowing process. One of the key features of this system is its ability to handle loan requests efficiently.

Manuale utente

For the development and management of the database, I used phpPgAdmin, a popular tool for PostgreSQL database management. I chose phpPgAdmin because it was the tool used in our classes, providing familiarity and consistency in the learning process. However, during my attempt to export the database (SQL Dump), the software did not allow the operation. This posed a significant challenge as it hindered the ability to back up and share the database structure and data. To address this issue, I will include the SQL statements used to create the tables, as well as the code for the functions and triggers implemented in the database, ensuring that the entire setup can be recreated if necessary.

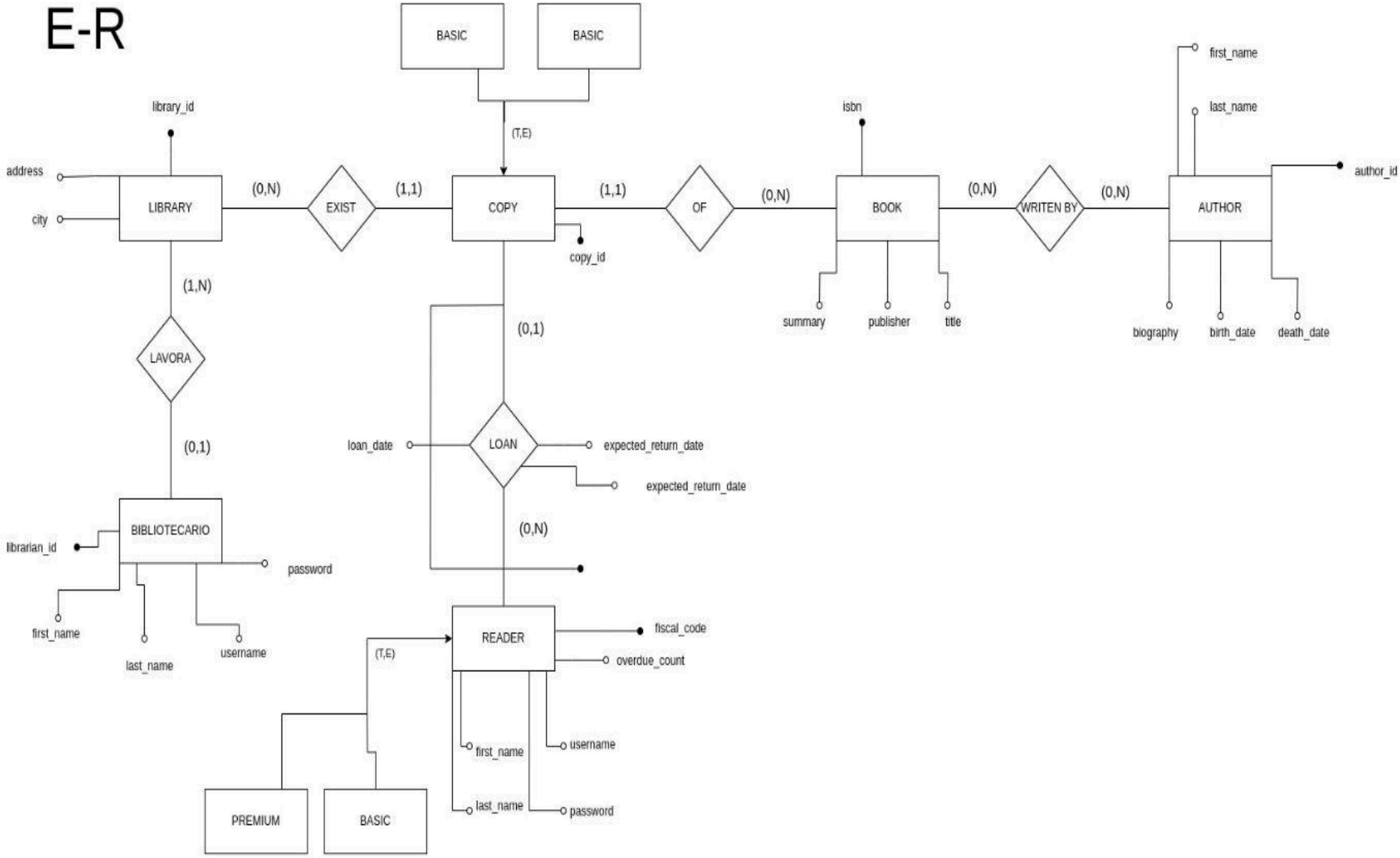
Furthermore, the deployment of the web interface is available at the following link, where all implemented functions can be tested.

https://studenti.di.unimi.it/juan.barearojo@studenti.unimi.it.

The following keys can be used to access the system

USERNAME	PASSWORD	ROLE
user	user	Lettore
reader	reader	Lettore
admin	admin	Bibliotecario

Schema concettuale (ER)



Schema logico (relazionale) della base di dati

LIBRARY	
PK	**library_id INT**
	city VARCHAR(100)
	address VARCHAR(255) NOT NULL

BOOK	
PK	**isbn VARCHAR(13)**
	title VARCHAR(255) NOT NULL
	summary TEXT
	publisher VARCHAR(255) NOT NULL

WRITTEN_BY	
PK	**author_id INT**
PK	**isbn VARCHAR(13)**
	FOREIGN KEY (isbn) REFERENCES BOOK(isbn)
	FOREIGN KEY (author_id) REFERENCES AUTHOR(author_id)

COPY	
PK	**library_id INT**
PK	**isbn VARCHAR(13)**
PK	**copy_id INT DEFAULT nextval('copy_copy_id_seq'::regclass)**
	status VARCHAR(10) DEFAULT "available"
	FOREIGN KEY (isbn) REFERENCES BOOK(isbn)
	FOREIGN KEY (library_id) REFERENCES LIBRARY(library_id)
	CHECK (status IN ('available', 'loaned'))

LOAN	
PK	**fiscal_code VARCHAR(20)**
PK	**copy_id INT**
PK	**loan_date DATE DEFAULT CURRENT_TIMESTAMP**
	expected_return_date DATE DEFAULT CURRENT_DATE + INTERV
	actual_return_date DATE
	FOREIGN KEY (copy_id) REFERENCES COPY(copy_id)
	FOREIGN KEY (fiscal_code) REFERENCES READER(fiscal_code)

AUTHOR	
PK	**author_id INT NOT NULL**
	first_name VARCHAR(100) NOT NULL
	last_name VARCHAR(100) NOT NULL
	birth_date DATE DEFAULT CURRENT_TIMESTAMP
	death_date DATE DEFAULT CURRENT_TIMESTAMP
	biography TEXT

READER	
PK	**fiscal_code VARCHAR(20)**
	first_name VARCHAR(100) NOT NULL
	last_name VARCHAR(100) NOT NULL
	services VARCHAR(10)
	overdue_count INT DEFAULT 0
	username VARCHAR(50) UNIQUE NOT NULL
	password VARCHAR(255) NOT NULL
	CHECK (services IN ('basic', 'premium'))

BIBLIOTECARIO	
PK	**library_id INT**
PK	**librarian_id INT**
	first_name VARCHAR(100) NOT NULL
	last_name VARCHAR(100) NOT NULL
	username VARCHAR(50) UNIQUE NOT NULL
	password VARCHAR(255) NOT NULL
	FOREIGN KEY (library_id) REFERENCES LIBRARY(library_id)

Explanation of the Schema logico

LIBRARY

The ***LIBRARY*** table represents the different library branches within the system. Each library is uniquely identified by ***library_id***. Additional attributes include:

- **city**: The city where the library is located.
- **address**: The address of the library.

BOOK

The ***BOOK*** table stores information about the books available in the library system. Each book is uniquely identified by ***isbn***. Additional attributes include:

- **title**: The title of the book.
- **summary:** A brief summary of the book.
- **publisher:** The publisher of the book.

WRITTEN_BY

The ***WRITTEN_BY*** table represents the relationship between books and their authors. It has two foreign keys:

- **author_id:** References AUTHOR(author_id).
- **isbn:** References BOOK(isbn).

COPY

The ***COPY*** table allows for multiple copies of the same book to exist within the library system, each identified by a unique ***copy_id***. Attributes include:

- **library_id:** References the LIBRARY where the copy is located.
- **isbn:** References the BOOK for which this is a copy.
- **copy_id:** Unique identifier for each copy, automatically incremented.
- **status:** Indicates whether the copy is 'available' or 'loaned'.

AUTHOR

The ***AUTHOR*** table stores information about the authors of the books. Each author is uniquely identified by ***author_id.*** Additional attributes include:

- **first_name**: The first name of the author.
- **last_name:** The last name of the author.
- **birth_date:** The birth date of the author.

- **death_date:** The death date of the author, if applicable.
- **biography:** A brief biography of the author.

LOAN

The ***LOAN*** table keeps track of the book loans in the system. The primary key consists of three values ***(fiscal_code, copy_id, and loan_date)*** to allow the same user to borrow the same copy on different dates. Attributes include:

- **fiscal_code:** References the READER who borrowed the book.
- **copy_id:** References the COPY that was borrowed.
- **loan_date:** The date when the book was borrowed.
- **expected_return_date:** The expected date by which the book should be returned.
- **actual_return_date:** The date when the book was actually returned.

READER

The ***READER*** table stores information about the library's registered readers. Each reader is uniquely identified by ***fiscal_code***. Additional attributes include:

- **first_name**: The first name of the reader.
- **last_name**: The last name of the reader.
- **services:** Indicates the type of services the reader is subscribed to ('basic' or 'premium').
- **overdue_count:** The number of overdue books the reader has had.
- **username:** The unique username of the reader.
- **password:** The password for the reader's account.

BIBLIOTECARIO

The ***BIBLIOTECARIO*** table stores information about the librarians. Each librarian is uniquely identified by ***librarian_id***. Additional attributes include:

- **library_id:** References the LIBRARY where the librarian works.
- **first_name:** The first name of the librarian.
- **last_name**: The last name of the librarian.
- **username:** The unique username of the librarian.
- **password:** The password for the librarian's account.

SQL used for the creation of the tables

```
-- Table LIBRARY
CREATE TABLE LIBRARY (
    library_id INT PRIMARY KEY,
    city VARCHAR(100),
    address VARCHAR(255) NOT NULL
);

-- Table BOOK
CREATE TABLE BOOK (
    isbn VARCHAR(13) PRIMARY KEY,
    title VARCHAR(255) NOT NULL,
    summary TEXT,
    publisher VARCHAR(255) NOT NULL
);

-- Table AUTHOR
CREATE TABLE AUTHOR (
    author_id INT PRIMARY KEY NOT NULL,
    first_name VARCHAR(100) NOT NULL,
    last_name VARCHAR(100) NOT NULL,
    birth_date DATE DEFAULT CURRENT_TIMESTAMP,
    death_date DATE DEFAULT CURRENT_TIMESTAMP,
    biography TEXT
);

-- Table WRITTEN_BY (Relationship between BOOK and AUTHOR)
CREATE TABLE WRITTEN_BY (
    isbn VARCHAR(13),
    author_id INT,
    PRIMARY KEY (isbn, author_id),
    FOREIGN KEY (isbn) REFERENCES BOOK(isbn) ON DELETE CASCADE,
      FOREIGN KEY (author_id) REFERENCES AUTHOR(author_id) ON DELETE
CASCADE
);

-- Table COPY
CREATE TABLE COPY (
                    copy_id       INT       PRIMARY       KEY       DEFAULT
nextval('copy_copy_id_seq'::regclass),
    isbn VARCHAR(13),
    library_id INT,
```

```
    status VARCHAR(10) DEFAULT "available",
    FOREIGN KEY (isbn) REFERENCES BOOK(isbn) ON DELETE CASCADE,
     FOREIGN KEY (library_id) REFERENCES LIBRARY(library_id) ON DELETE
CASCADE,
    CHECK (status IN ('available', 'loaned'))
);

-- Table READER
CREATE TABLE READER (
    fiscal_code VARCHAR(20) PRIMARY KEY,
    first_name VARCHAR(100) NOT NULL,
    last_name VARCHAR(100) NOT NULL,
    services VARCHAR(10),
    overdue_count INT DEFAULT 0,
    username VARCHAR(50) UNIQUE NOT NULL,
    password VARCHAR(255) NOT NULL,
    CHECK (services IN ('basic', 'premium'))
);

-- Table BIBLIOTECARIO (Librarian who works in a library)
CREATE TABLE BIBLIOTECARIO (
    librarian_id INT PRIMARY KEY,
    first_name VARCHAR(100) NOT NULL,
    last_name VARCHAR(100) NOT NULL,
    username VARCHAR(50) UNIQUE NOT NULL,
    password VARCHAR(255) NOT NULL,
    library_id INT,
     FOREIGN KEY (library_id) REFERENCES LIBRARY(library_id) ON DELETE
SET NULL
);

-- Table LOAN
CREATE TABLE LOAN (
    copy_id INT,
    fiscal_code VARCHAR(20),
    loan_date DATE DEFAULT CURRENT_TIMESTAMP,
    expected_return_date DATE DEFAULT CURRENT_DATE + INTERVAL '10 days',
    actual_return_date DATE,
    PRIMARY KEY(copy_id, fiscal_code,loan_date),
    FOREIGN KEY (copy_id) REFERENCES COPY(copy_id) ON DELETE CASCADE,
     FOREIGN KEY (fiscal_code) REFERENCES READER(fiscal_code) ON DELETE
CASCADE
);
```

Esauriente descrizione delle funzioni realizzate

check_loan_extension ()

```
-- Proroga della durata di un prestito.
CREATE OR REPLACE FUNCTION check_loan_extension()
RETURNS TRIGGER AS $$
BEGIN
      -- Verificar si el préstamo está vencido al momento de la
actualización usando la fecha original de devolución
   IF OLD.expected_return_date <= CURRENT_DATE THEN
         RAISE EXCEPTION 'Cannot extend the loan period for an overdue
loan.';
   END IF;

   -- Permitir la actualización si no está vencido
   RETURN NEW;
END;
$$ LANGUAGE plpgsql;

CREATE TRIGGER before_update_loan
BEFORE UPDATE ON loan
FOR EACH ROW
WHEN (OLD.expected_return_date <> NEW.expected_return_date)
EXECUTE FUNCTION check_loan_extension();
```

The function ***check_loan_extension*** and the trigger ***before_update_loan*** work together to manage the extension of loan durations. The ***check_loan_extension*** function verifies whether the original expected return date of a loan is past the current date. If the loan is overdue, it raises an exception with the message *'Cannot extend the loan period for an overdue loan,'* thereby preventing the extension. If the loan is not overdue, the function allows the update to proceed by returning the new row values.

The ***before_update_loan*** trigger is activated before any update on the loan table. It executes the ***check_loan_extension*** function only if there is a change in the expected return date. This trigger ensures that any attempt to change the return date of a loan triggers the function to check for overdue status. If the loan is overdue, the update is blocked; otherwise, it is permitted. This mechanism enforces that overdue loans cannot be extended, maintaining the integrity and discipline of loan management.

```
select * from loan
```

Enviar

copy_id	fiscal_code	loan_date	actual_return_date	expected_return_date
2	2	2024-06-24	2024-06-24	2014-07-14
1	2	2024-06-24	2024-06-24	2015-07-04
3	2	2024-06-24	2024-06-24	2024-07-04
15	FC000009J	2024-06-02	*NULL*	2024-06-24
45	1	2024-06-25	*NULL*	2024-07-05
29	1	2024-06-25	*NULL*	2024-07-05
4	2	2024-06-24	*NULL*	2024-07-05
40	FC000001E	2024-06-25	*NULL*	2024-07-05
59	FC000001E	2024-06-25	*NULL*	2024-07-05

The update in the loan ***copy_id*** = 15 and ***fiscal_code*** = FC000009J cannot be extended because it has passed the ***expected_return_date.***

Error de SQL:

```
ERROR:  Cannot extend the loan period for an overdue loan.
CONTEXT:  PL/pgSQL function check_loan_extension() line 5 at RAISE
```

En la setencia:
UPDATE loan SET expected_return_date = CURRENT_DATE + INTERVAL '10 days' WHERE fiscal_code = 'FC000009J' AND copy_id = 15 AND loan_date = '2024-06-02'

The update in the loan ***copy_id*** = 29 and ***fiscal_code*** = 1 can be extended because it has not passed the ***expected_return_date.***

```
SELECT * FROM "juan_barearojo"."loan";
```

Enviar

Acciones		copy_id	fiscal_code	loan_date	actual_return_date	expected_return_date
Editar	Eliminar	2	2	2024-06-24	2024-06-24	2014-07-14
Editar	Eliminar	1	2	2024-06-24	2024-06-24	2015-07-04
Editar	Eliminar	3	2	2024-06-24	2024-06-24	2024-07-04
Editar	Eliminar	15	FC000009J	2024-06-02	*NULL*	2024-06-24
Editar	Eliminar	45	1	2024-06-25	*NULL*	2024-07-05
Editar	Eliminar	4	2	2024-06-24	*NULL*	2024-07-05
Editar	Eliminar	40	FC000001E	2024-06-25	*NULL*	2024-07-05
Editar	Eliminar	59	FC000001E	2024-06-25	*NULL*	2024-07-05
Editar	Eliminar	29	1	2024-06-25	*NULL*	2024-07-07

statistiche_per_ogni_sede (integer)

```
CREATE OR REPLACE FUNCTION statistiche_per_ogni_sede(branch_id INTEGER)
RETURNS TABLE (
   total_copies BIGINT,
   total_isbns BIGINT,
   total_loans_in_progress BIGINT
) AS $$
BEGIN
   RETURN QUERY
   SELECT
       -- Número total de ejemplares gestionados por la sucursal
         (SELECT COUNT(*) FROM juan_barearojo.copy WHERE library_id =
branch_id) AS total_copies,

       -- Número total de códigos ISBN gestionados por la sucursal
          (SELECT COUNT(DISTINCT isbn) FROM juan_barearojo.copy WHERE
library_id = branch_id) AS total_isbns,

           -- Número total de préstamos en curso para los volúmenes
mantenidos por la sucursal
         (SELECT COUNT(*) FROM juan_barearojo.copy WHERE library_id =
branch_id AND status = 'loaned') AS total_loans_in_progress;
END;
$$ LANGUAGE plpgsql;
```

The ***statistiche_per_ogni_sede*** function is designed to return statistics for a specific library branch identified by branch_id. It returns a table with three columns: ***total_copies***, ***total_isbns***, and ***total_loans_in_progress***. The function executes a query that calculates the total number of copies managed by the branch, the total number of distinct ISBNs, and the total number of copies currently loaned out.

```
SELECT * FROM copy where status = 'loaned'
```

Enviar

copy_id	isbn	library_id	status
4	9780345535528	4	loaned
15	9781849700611	5	loaned
45	9781849706279	5	loaned
29	9781849703551	4	loaned
40	9781849705517	5	loaned
59	9781111111111	5	loaned

6 fila(s)

```
SELECT * FROM juan_barearojo.statistiche_per_ogni_sede(3)
```

Enviar

total_copies	total_isbns	total_loans_in_progress
45	31	0

```
SELECT * FROM juan_barearojo.statistiche_per_ogni_sede(5)
```

Enviar

total_copies	total_isbns	total_loans_in_progress
33	30	4

```
SELECT * FROM juan_barearojo.statistiche_per_ogni_sede(4)
```

Enviar

total_copies	total_isbns	total_loans_in_progress
34	31	2

ritardi_per_ogni_sede (integer)

```
--Ritardi per ogni sede.
CREATE OR REPLACE FUNCTION ritardi_per_ogni_sede(branch_id INTEGER)
RETURNS TABLE (
   copy_id INTEGER,
   isbn VARCHAR(13),
   title VARCHAR(255),
   reader_fiscal_code VARCHAR(20),
   reader_name VARCHAR(200),
   expected_return_date DATE,
   actual_return_date DATE
) AS $$
BEGIN
   RETURN QUERY
   SELECT
       c.copy_id,
       c.isbn,
       b.title,
       r.fiscal_code AS reader_fiscal_code,
        CAST(CONCAT(r.first_name, ' ', r.last_name) AS VARCHAR(200)) AS
reader_name,
       l.expected_return_date,
       l.actual_return_date
   FROM
       juan_barearojo.loan l
   JOIN
       juan_barearojo.copy c ON l.copy_id = c.copy_id
   JOIN
       juan_barearojo.book b ON c.isbn = b.isbn
   JOIN
       juan_barearojo.reader r ON l.fiscal_code = r.fiscal_code
   WHERE
       c.library_id = branch_id
       AND l.actual_return_date IS NULL
       AND l.expected_return_date < CURRENT_DATE;
END;
$$ LANGUAGE plpgsql;
```

The ***ritardi_per_ogni_sede*** function is designed to return information about overdue loans for a specific library branch identified by branch_id. It returns a table with columns including ***copy_id, isbn, title, reader_fiscal_code, reader_name, expected_return_date,*** and ***actual_return_date***. The function executes a query that joins the loan, copy, book, and reader tables to gather all necessary information about overdue loans. It selects the relevant columns and filters results to include only loans from the specified branch, loans that have not been returned yet, and loans that are overdue.

The only loan that is on '*ritardo*' is the one with ***fiscal_code*** = FC000009J, ***copy_id*** = 15 and ***loan_date*** = 2024-06-02

```
SELECT * FROM "juan_barearojo"."loan";
```

Enviar

Acciones		copy_id	fiscal_code	loan_date	actual_return_date	expected_return_date
Editar	Eliminar	2	2	2024-06-24	2024-06-24	2014-07-14
Editar	Eliminar	1	2	2024-06-24	2024-06-24	2015-07-04
Editar	Eliminar	3	2	2024-06-24	2024-06-24	2024-07-04
Editar	Eliminar	15	FC000009J	2024-06-02	*NULL*	2024-06-24
Editar	Eliminar	45	1	2024-06-25	*NULL*	2024-07-05
Editar	Eliminar	4	2	2024-06-24	*NULL*	2024-07-05
Editar	Eliminar	40	FC000001E	2024-06-25	*NULL*	2024-07-05
Editar	Eliminar	59	FC000001E	2024-06-25	*NULL*	2024-07-05
Editar	Eliminar	29	1	2024-06-25	*NULL*	2024-07-07

```
SELECT * FROM juan_barearojo.ritardi_per_ogni_sede(5)
```

Enviar

copy_id	isbn	title	reader_fiscal_code	reader_name	expected_return_date	actual_return_date
15	9781849700611	Horus Rising	FC000009J	Jaghatai Khan	2024-06-24	*NULL*

update_copy_status ()

```
-- Update status after loaning
CREATE OR REPLACE FUNCTION update_copy_status()
RETURNS TRIGGER AS $$
BEGIN
   -- Actualizar el estado del ejemplar a 'loaned'
   UPDATE copy
   SET status = 'loaned'
   WHERE copy_id = NEW.copy_id;

   -- Permitir la inserción en la tabla loan
   RETURN NEW;
END;
$$ LANGUAGE plpgsql;

-- Crear el trigger
CREATE TRIGGER after_insert_loan
AFTER INSERT ON loan
FOR EACH ROW
EXECUTE FUNCTION update_copy_status();
```

The ***update_copy_status*** function is designed to update the status of a book copy to '*loaned*' whenever a new loan is inserted into the loan table. The function executes an update on the ***copy*** table, setting the status to '*loaned*' for the corresponding ***copy_id*** of the newly inserted loan. After performing this update, the function allows the insertion of the new loan record by returning NEW. This function is triggered by the ***after_insert_loan*** trigger, which activates after each row insertion into the loan table, ensuring that the status of the borrowed book is appropriately updated to reflect its loaned state.

```
SELECT * FROM "juan_barearojo"."copy";
```

Enviar

Acciones		copy_id	isbn	library_id	status
Editar	Eliminar	5	9780345535528	5	available
Editar	Eliminar	6	9780060850524	1	available
Editar	Eliminar	7	9780060850524	2	available
Editar	Eliminar	8	9780060850524	3	available
Editar	Eliminar	9	9780060850524	4	available
Editar	Eliminar	10	9780060850524	5	available
Editar	Eliminar	11	9781849700611	1	available
Editar	Eliminar	12	9781849700611	2	available
Editar	Eliminar	13	9781849700611	3	available
Editar	Eliminar	14	9781849700611	4	available
Editar	Eliminar	16	9781849701021	1	available

AFTER ->**INSERT INTO loan (copy_id, fiscal_code) VALUES (5, 2);**

```
SELECT * FROM copy where copy_id = 5
```

Enviar

copy_id	isbn	library_id	status
5	9780345535528	5	loaned

update_copy_status_to_available

```
-- Update status after returning copy
CREATE OR REPLACE FUNCTION update_copy_status_to_available()
RETURNS TRIGGER AS $$
BEGIN
   -- Actualizar el estado del ejemplar a 'available'
   UPDATE copy
   SET status = 'available'
   WHERE copy_id = NEW.copy_id;

   -- Permitir la actualización en la tabla loan
   RETURN NEW;
END;
$$ LANGUAGE plpgsql;

CREATE TRIGGER after_update_loan_return
AFTER UPDATE ON loan
FOR EACH ROW
WHEN (OLD.actual_return_date IS NULL AND NEW.actual_return_date IS NOT
NULL)
EXECUTE FUNCTION update_copy_status_to_available();
```

The ***update_copy_status_to_available*** function updates the status of a book copy to '*available*' when a loan record is updated to indicate that the book has been returned. This function updates the copy table, setting the status to '*available*' for the ***copy_id*** of the returned book. The function is triggered by the ***after_update_loan_return*** trigger, which activates after an update on the loan table for each row where the ***actual_return_date*** changes from NULL to a non-null value, ensuring that the status of the book is correctly updated to reflect its availability.

```
SELECT * FROM loan
```

Enviar

copy_id	fiscal_code	loan_date	actual_return_date	expected_return_date
2	2	2024-06-24	2024-06-24	2014-07-14
1	2	2024-06-24	2024-06-24	2015-07-04
3	2	2024-06-24	2024-06-24	2024-07-04
15	FC000009J	2024-06-02	*NULL*	2024-06-24
45	1	2024-06-25	*NULL*	2024-07-05
4	2	2024-06-24	*NULL*	2024-07-05
40	FC000001E	2024-06-25	*NULL*	2024-07-05
59	FC000001E	2024-06-25	*NULL*	2024-07-05
29	1	2024-06-25	*NULL*	2024-07-07
5	2	2024-06-25	*NULL*	2024-07-05

AFTER -> **UPDATE loan SET actual_return_date = CURRENT_TIMESTAMP WHERE copy_id = 5 AND loan_date = '2024-06-25'**

```
select * from copy where copy_id = 5
```

Enviar

copy_id	isbn	library_id	status
5	9780345535528	5	available

```
select * from loan where copy_id = 5
```

Enviar

copy_id	fiscal_code	loan_date	actual_return_date	expected_return_date
5	2	2024-06-25	2024-06-25	2024-07-05

update_overdue_count()

```
-- Ritardi nelle restituzioni.
CREATE OR REPLACE FUNCTION update_overdue_count()
RETURNS TRIGGER AS $$
BEGIN
   -- Verificar si la devolución es tarde
   IF NEW.actual_return_date > NEW.expected_return_date THEN
       -- Incrementar el contador de retrasos del lector
       UPDATE reader
       SET overdue_count = overdue_count + 1
        WHERE fiscal_code = (SELECT fiscal_code FROM loan WHERE copy_id
= NEW.copy_id);
   END IF;

   -- Permitir la actualización de la fila
   RETURN NEW;
END;
$$ LANGUAGE plpgsql;

CREATE TRIGGER after_update_loan
AFTER UPDATE ON loan
FOR EACH ROW
EXECUTE FUNCTION update_overdue_count();
```

The ***update_overdue_count*** function increments the overdue count for a reader if a book is returned late. When a loan record is updated with an ***actual_return_date*** that is later than the ***expected_return_date***, the function increases the ***overdue_count*** in the reader table for the corresponding reader. This function is triggered by the ***after_update_loan*** trigger, which activates after each row update on the loan table, ensuring that any late returns are correctly reflected in the reader's overdue count.

Acciones		copy_id	fiscal_code	loan_date	actual_return_date	expected_return_date
Editar	Eliminar	2	2	2024-06-24	2024-06-24	2014-07-14
Editar	Eliminar	1	2	2024-06-24	2024-06-24	2015-07-04
Editar	Eliminar	3	2	2024-06-24	2024-06-24	2024-07-04
Editar	Eliminar	15	FC000009J	2024-06-02	*NULL*	2024-06-24
Editar	Eliminar	45	1	2024-06-25	*NULL*	2024-07-05
Editar	Eliminar	4	2	2024-06-24	*NULL*	2024-07-05
Editar	Eliminar	40	FC000001E	2024-06-25	*NULL*	2024-07-05
Editar	Eliminar	59	FC000001E	2024-06-25	*NULL*	2024-07-05
Editar	Eliminar	29	1	2024-06-25	*NULL*	2024-07-07
Editar	Eliminar	5	2	2024-06-25	2024-06-25	2024-07-05
Editar	Eliminar	43	FC000001E	2024-06-03	*NULL*	2024-06-13
Editar	Eliminar	23	4	2024-05-02	*NULL*	2024-05-13
Editar	Eliminar	20	FC000003R	2024-04-02	*NULL*	2024-05-02

```
select * from reader where fiscal_code = '4'
```

Enviar

fiscal_code	first_name	last_name	services	overdue_count	username	password
4	reader	Premium	premium	0	readerPremium	readerPremium

AFTER -> **UPDATE loan SET actual_return_date = CURRENT_TIMESTAMP WHERE copy_id =23 AND loan_date = '2024-05-02'**

```
SELECT * FROM READER WHERE fiscal_code='4'
```

Enviar

fiscal_code	first_name	last_name	services	overdue_count	username	password
4	reader	Premium	premium	1	readerPremium	readerPremium

check_max_loans(fiscal_code_given TEXT)

```
CREATE OR REPLACE FUNCTION check_max_loans(fiscal_code_given TEXT)
RETURNS VOID AS $$
DECLARE
   loan_count INTEGER;
   max_loans INTEGER;
BEGIN
   -- Obtener el número actual de préstamos del lector
   SELECT COUNT(*)
   INTO loan_count
   FROM loan
     WHERE fiscal_code = fiscal_code_given AND actual_return_date IS
NULL;

    -- Determinar el máximo de préstamos permitidos según la categoría
del lector
        IF (SELECT services FROM reader WHERE fiscal_code =
fiscal_code_given) = 'basic' THEN
       max_loans := 3;
   ELSE
       max_loans := 5;
   END IF;

    -- Verificar si el lector ha alcanzado el número máximo de préstamos
permitidos
   IF loan_count >= max_loans THEN
         RAISE EXCEPTION 'The reader has reached the maximum number of
loans.';
   END IF;
END;
$$ LANGUAGE plpgsql;
```

The ***check_max_loans*** function ensures that a reader has not exceeded their maximum allowed loans before issuing a new one. It takes a reader's ***fiscal_code_given*** as input, retrieves the current number of active loans for that reader, and determines the maximum loans allowed based on their service category (basic or premium). If the reader's current loan count meets or exceeds the maximum allowed (3 for basic, 5 for premium), the function raises an exception with the message '*The reader has reached the maximum number of loans*,' thus preventing the issuance of additional loans.

```
select * from loan where fiscal_code = '2'
```

Enviar

copy_id	fiscal_code	loan_date	actual_return_date	expected_return_date
2	2	2024-06-24	2024-06-24	2014-07-14
1	2	2024-06-24	2024-06-24	2015-07-04
3	2	2024-06-24	2024-06-24	2024-07-04
4	2	2024-06-24	*NULL*	2024-07-05
5	2	2024-06-25	2024-06-25	2024-07-05
64	2	2024-06-25	*NULL*	2024-07-05
119	2	2024-06-25	*NULL*	2024-07-05

7 fila(s)

```
select * from reader where fiscal_code ='2'
```

Enviar

fiscal_code	first_name	last_name	services	overdue_count	username	password
2	prueba2	prueba2	basic	0	prueba2	prueba2

Error de SQL:

```
ERROR:  The reader has reached the maximum number of loans.
CONTEXT:  PL/pgSQL function check_max_loans(text) line 21 at RAISE
SQL statement "SELECT check_max_loans(NEW.fiscal_code)"
PL/pgSQL function check_loan_conditions() line 4 at PERFORM
```

En la setencia:

```
INSERT INTO "juan_barearojo"."loan" ("copy_id","fiscal_code","loan_date","actual_return_date","expected_return_date")
                        VALUES ('117','2',CURRENT_TIMESTAMP,NULL,(CURRENT_DATE + '10 days'::interval))
```

The loan table shows that the reader with fiscal_code '2' currently has multiple active loans (indicated by NULL in the actual_return_date column). The reader table shows that this reader has a 'basic' service, which typically allows a maximum of 3 concurrent loans.The attempted insertion of a new loan fails because the reader already has 3 or more active loans, violating the maximum allowed loans condition for 'basic' service readers.

check_overdue_count(fiscal_code_given TEXT)

```
CREATE OR REPLACE FUNCTION check_overdue_count(fiscal_code_given TEXT)
RETURNS VOID AS $$
BEGIN
    -- Chequear el overdue_count del lector que intenta tomar prestado
un libro
       IF  (SELECT  overdue_count  FROM  reader  WHERE  fiscal_code  =
fiscal_code_given) >= 5 THEN
         -- Si el lector tiene 5 o más préstamos vencidos, lanzar una
excepción
        RAISE EXCEPTION 'Cannot lend to a reader with 5 or more overdue
returns.';
   END IF;
END;
$$ LANGUAGE plpgsql;
```

The ***check_overdue_count*** function prevents a reader with five or more overdue loans from borrowing additional books. It takes a ***fiscal_code_given*** as input, checks the ***overdue_count*** of the reader from the reader table, and raises an exception with the message '*Cannot lend to a reader with 5 or more overdue returns*' if the count is five or more.

```
select * from reader where fiscal_code ='FC000009J'
```

Enviar

fiscal_code	first_name	last_name	services	overdue_count	username	password
FC000009J	Jaghatai	Khan	premium	8	jaghatai	white scar

Error de SQL:

```
ERROR:  Cannot lend to a reader with 5 or more overdue returns.
CONTEXT:  PL/pgSQL function check_overdue_count(text) line 6 at RAISE
SQL statement "SELECT check_overdue_count(NEW.fiscal_code)"
PL/pgSQL function check_loan_conditions() line 7 at PERFORM
```

En la setencia:

```
INSERT INTO "juan_barearojo"."loan" ("copy_id","fiscal_code","loan_date","actual_return_date","expected_return_date")
                        VALUES ('76','FC000009J',CURRENT_TIMESTAMP,NULL,(CURRENT_DATE + '10 days'::interval))
```

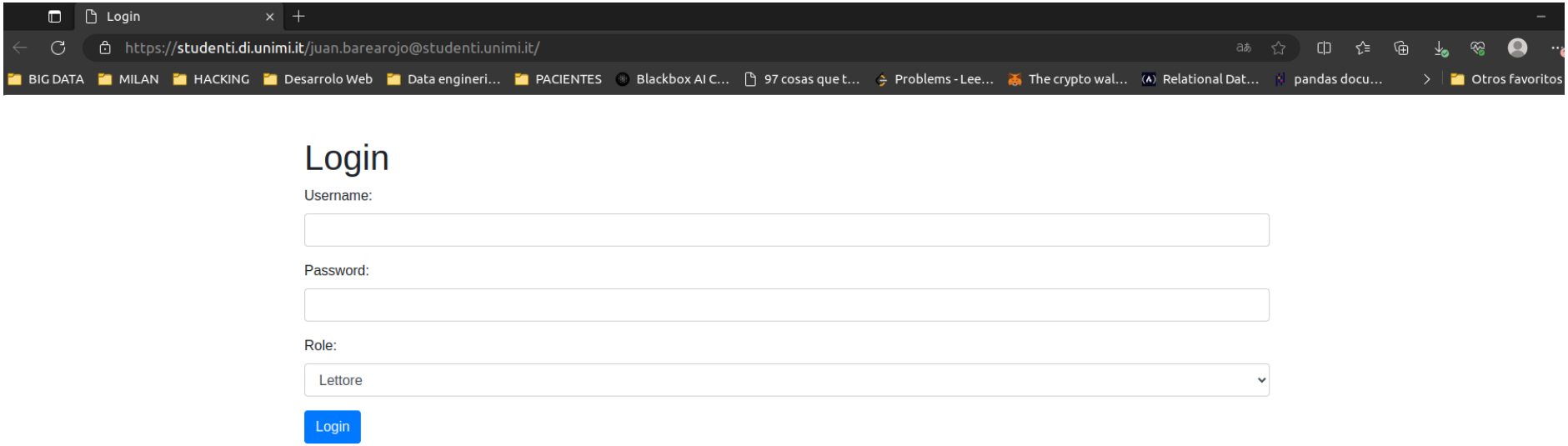
check_loan_conditions()

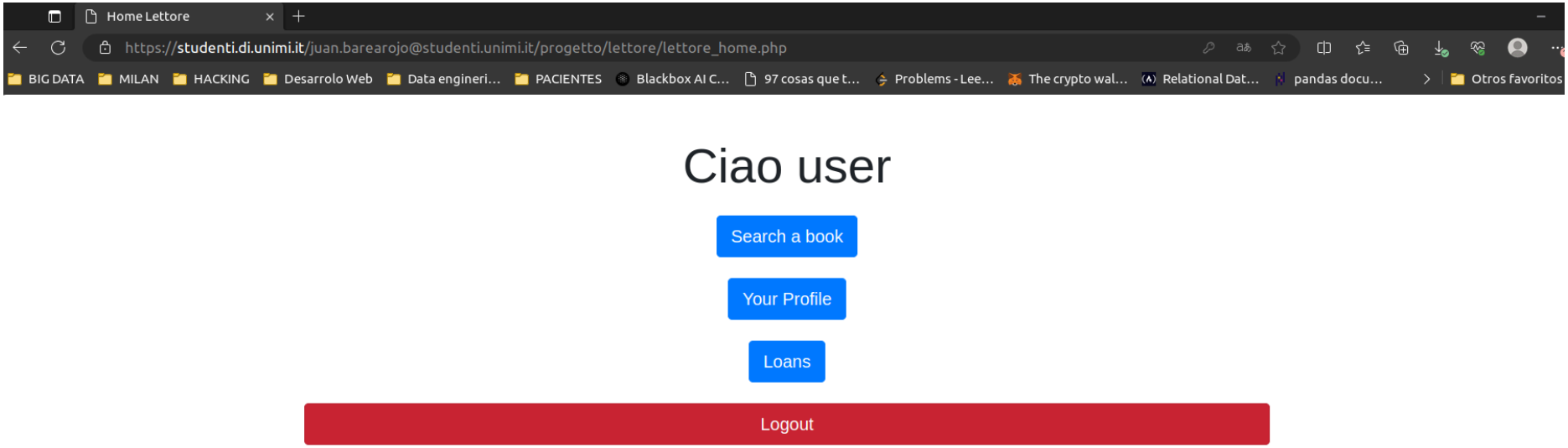
```
CREATE OR REPLACE FUNCTION check_loan_conditions()
RETURNS TRIGGER AS $$
BEGIN
   -- Llamar a la sub-función para chequear el máximo de préstamos
   PERFORM check_max_loans(NEW.fiscal_code);

    -- Llamar a la sub-función para chequear el número de préstamos
vencidos
   PERFORM check_overdue_count(NEW.fiscal_code);

   -- Si ambos chequeos pasan, permitir la inserción
   RETURN NEW;
END;
$$ LANGUAGE plpgsql;


CREATE TRIGGER before_insert_loan
BEFORE INSERT ON loan
FOR EACH ROW
EXECUTE FUNCTION check_loan_conditions();
```

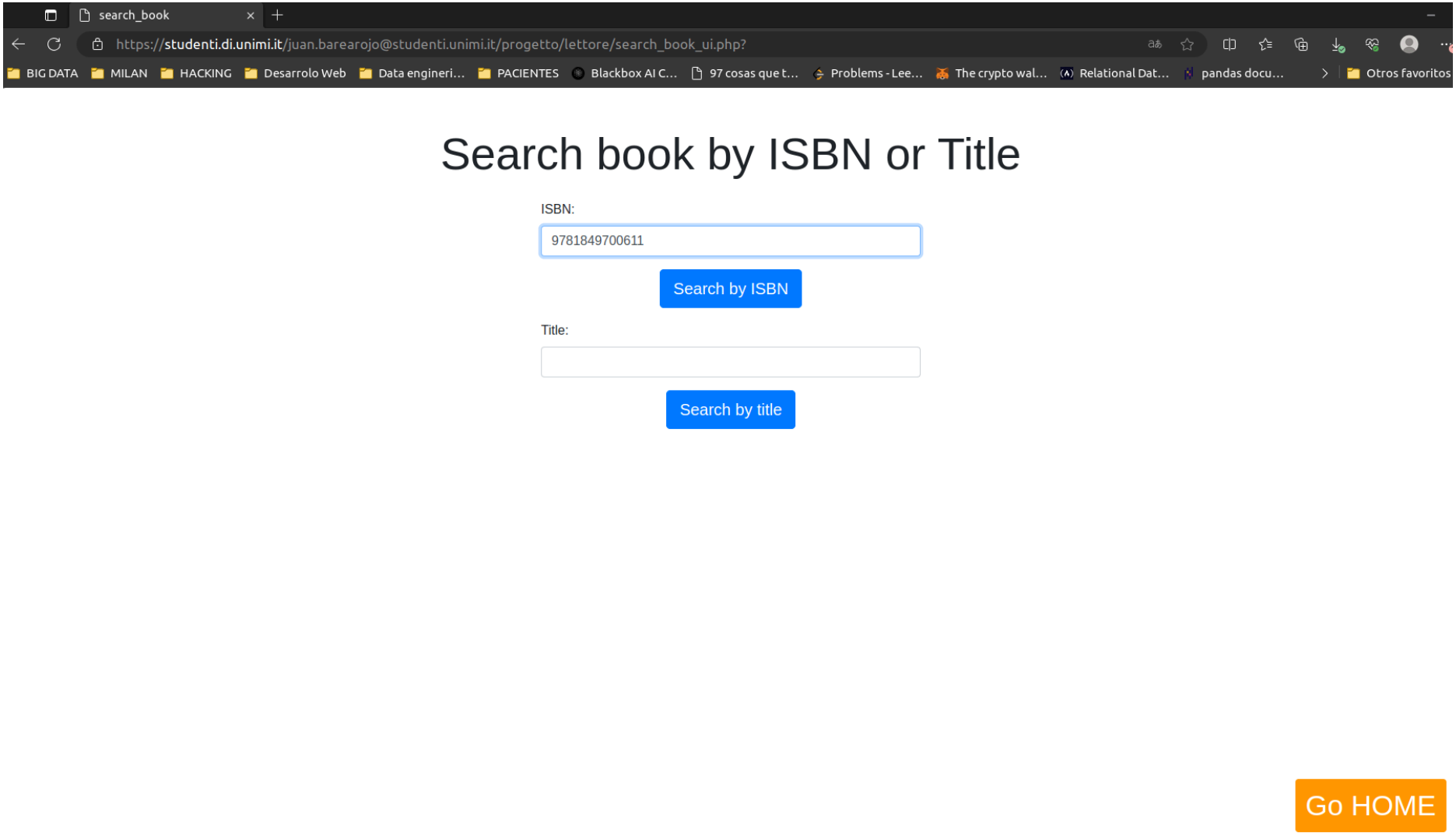
The ***check_loan_conditions*** function is designed to ensure that certain conditions are met before a new loan is inserted into the loan table. This function first calls ***check_max_loans***, which verifies if the reader has reached their maximum allowed number of loans. It then calls ***check_overdue_count*** to check if the reader has five or more overdue loans. If either of these conditions fails, an exception is raised, preventing the insertion of the new loan.

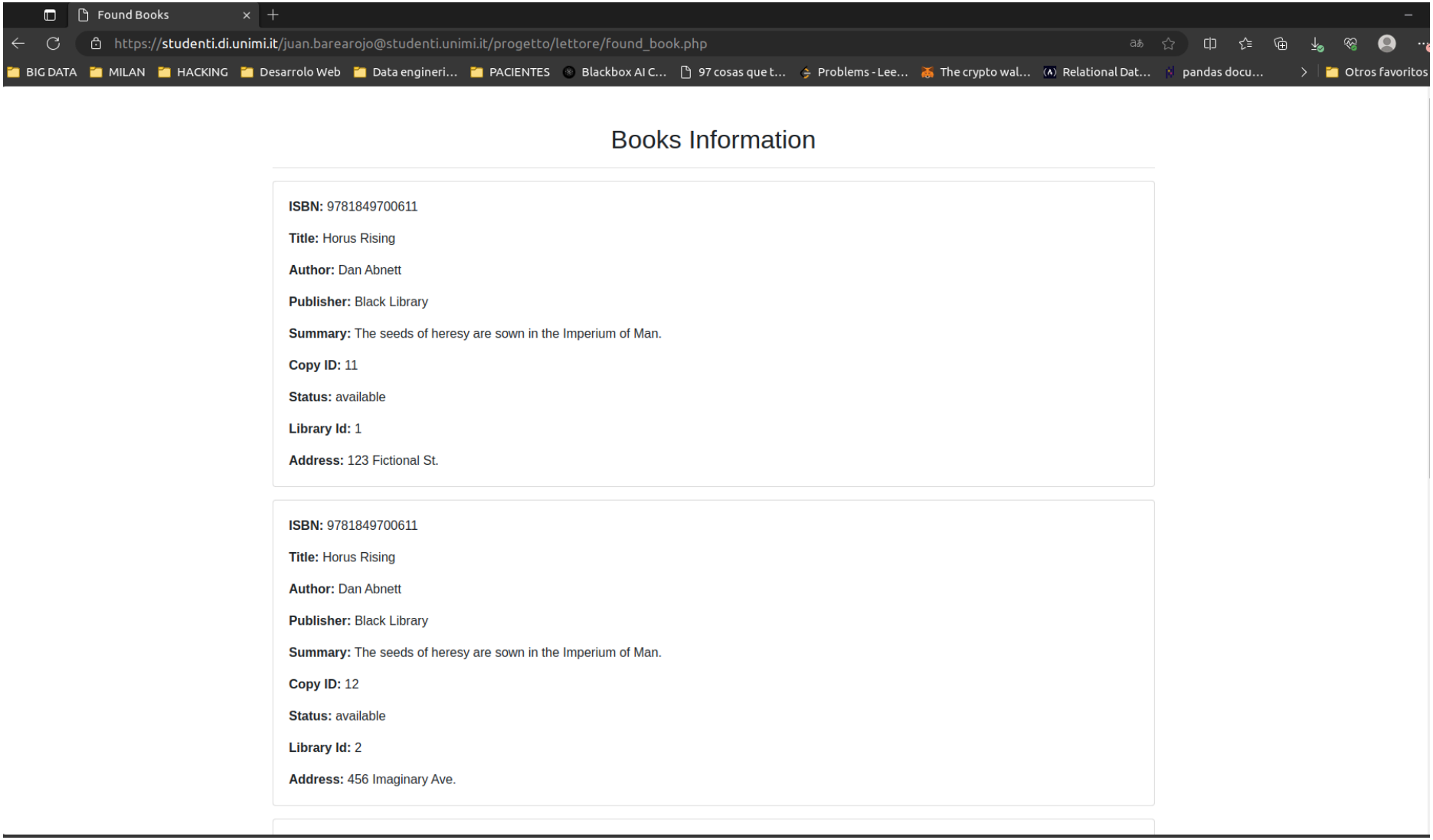
The ***before_insert_loan*** trigger is set to execute the c***heck_loan_condition***s function before each row insertion into the loan table. This ensures that every new loan is subject to these checks, maintaining adherence to the library's borrowing policies. By enforcing these conditions, the system helps manage loan limits and overdue returns effectively, promoting responsible borrowing behavior among readers.

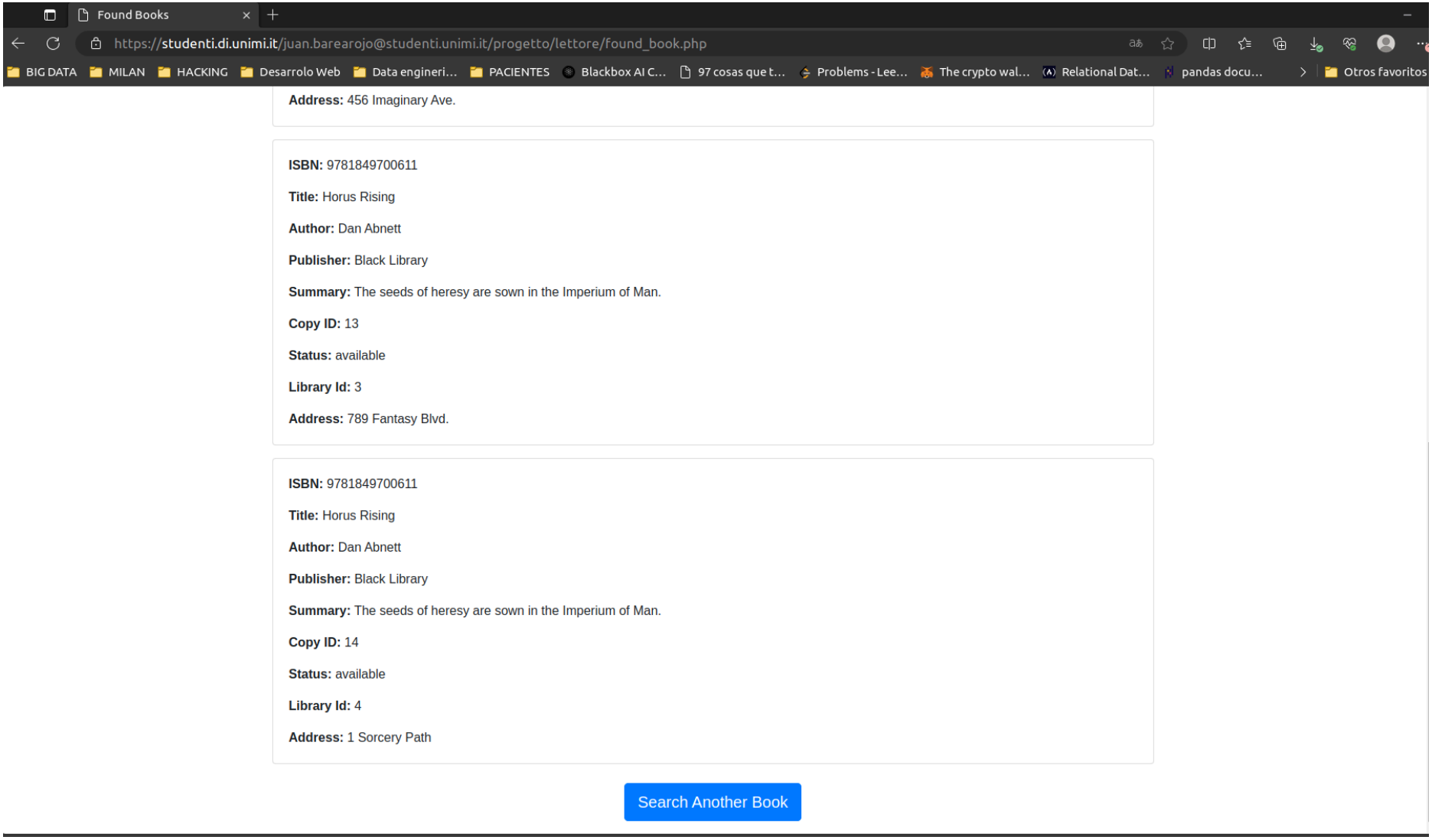
Prove di funzionamento LETTORE

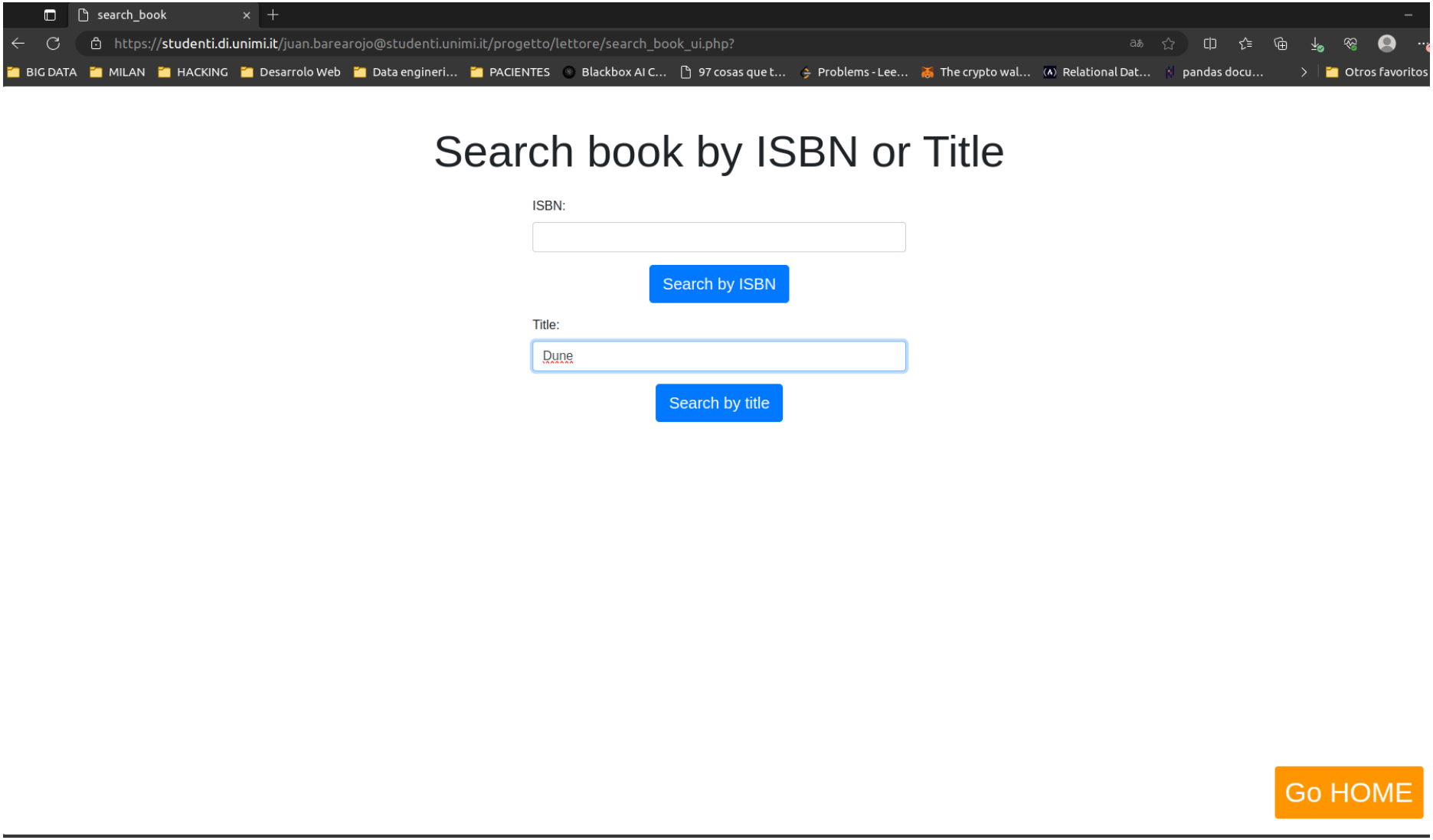


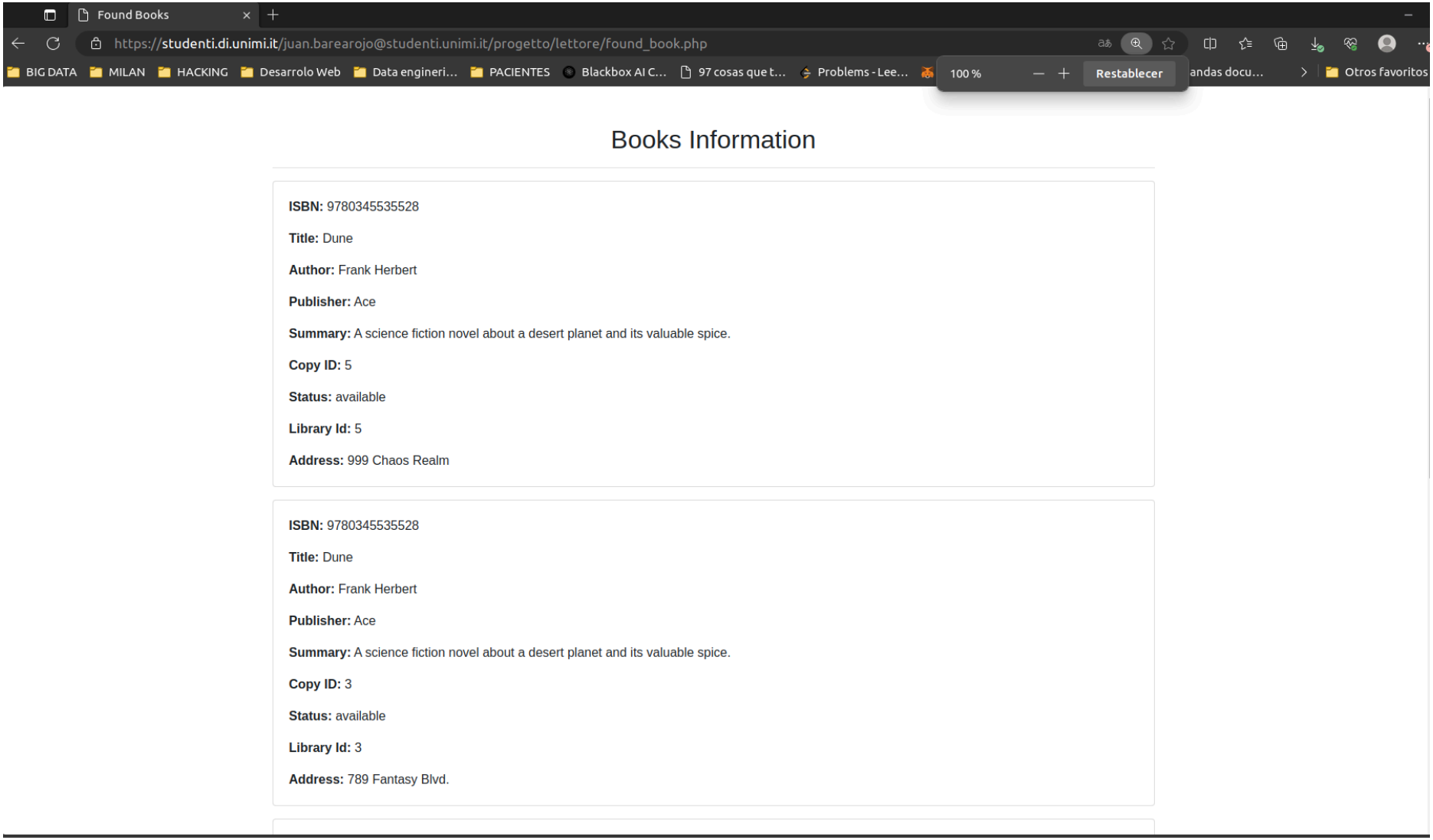

Home Lettore
https://studenti.di.unimi.it/juan.barearojo@studenti.unimi.it/progetto/lettore/lettore_home.php
BIG DATA
MILAN
HACKING
Desarrolo Web
Data engineri...
PACIENTES
Blackbox AI C...
97 cosas que t...
Problems - Lee...
The crypto wal...
Relational Dat...
pandas docu...
Otros favoritos
Ciao user
Search a book
Your Profile
Loans
Logout

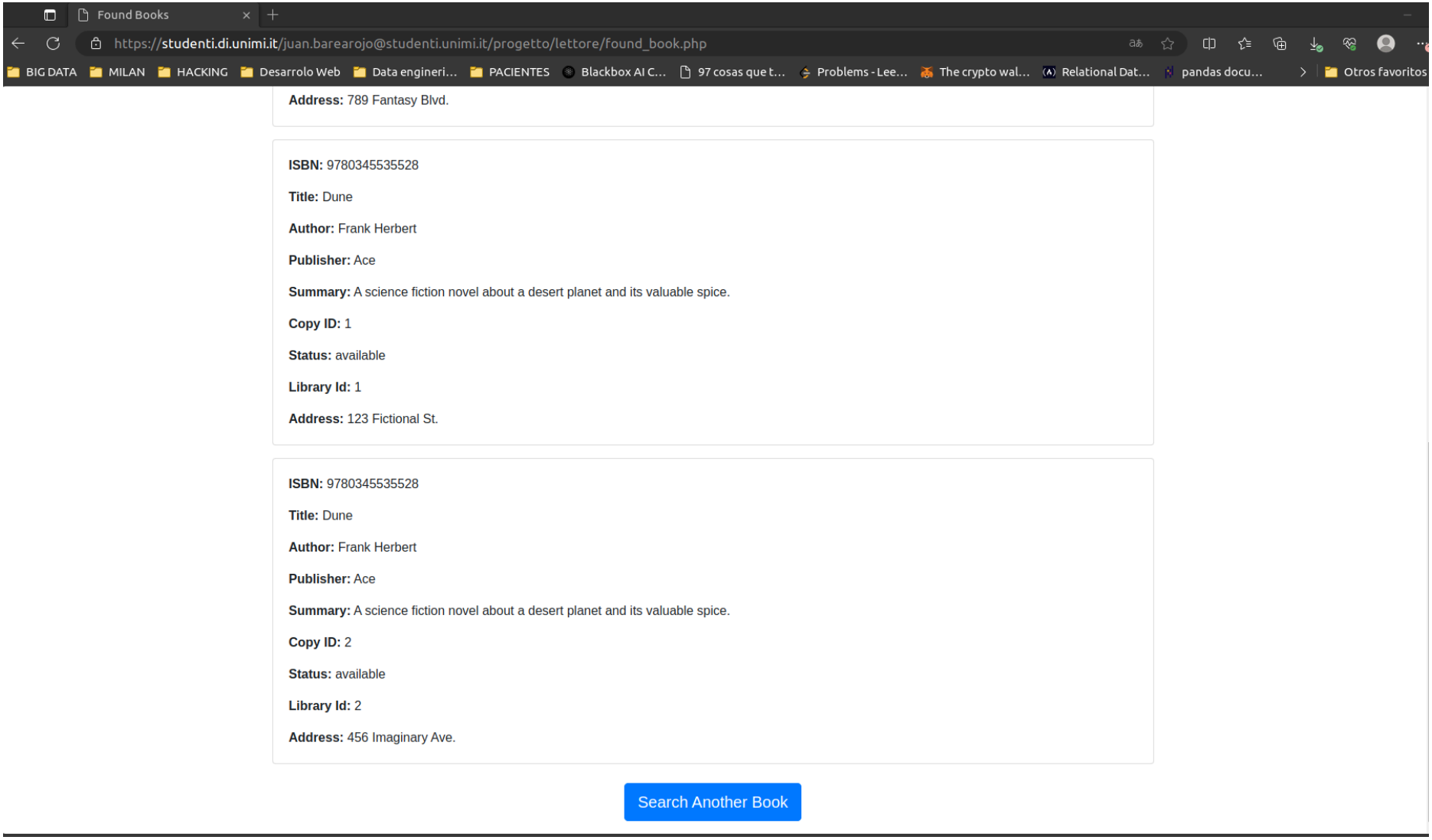

search_book
https://studenti.di.unimi.it/juan.barearojo@studenti.unimi.it/progetto/lettore/search_book_ui.php?
BIG DATA
MILAN
HACKING
Desarrolo Web
Data engineri...
PACIENTES
Blackbox AI C...
97 cosas que t...
Problems - Lee...
The crypto wal...
Relational Dat...
pandas docu...
Otros favoritos
Search book by ISBN or Title
ISBN:
9781849700611
Search by ISBN
Title:
Search by title
Go HOME

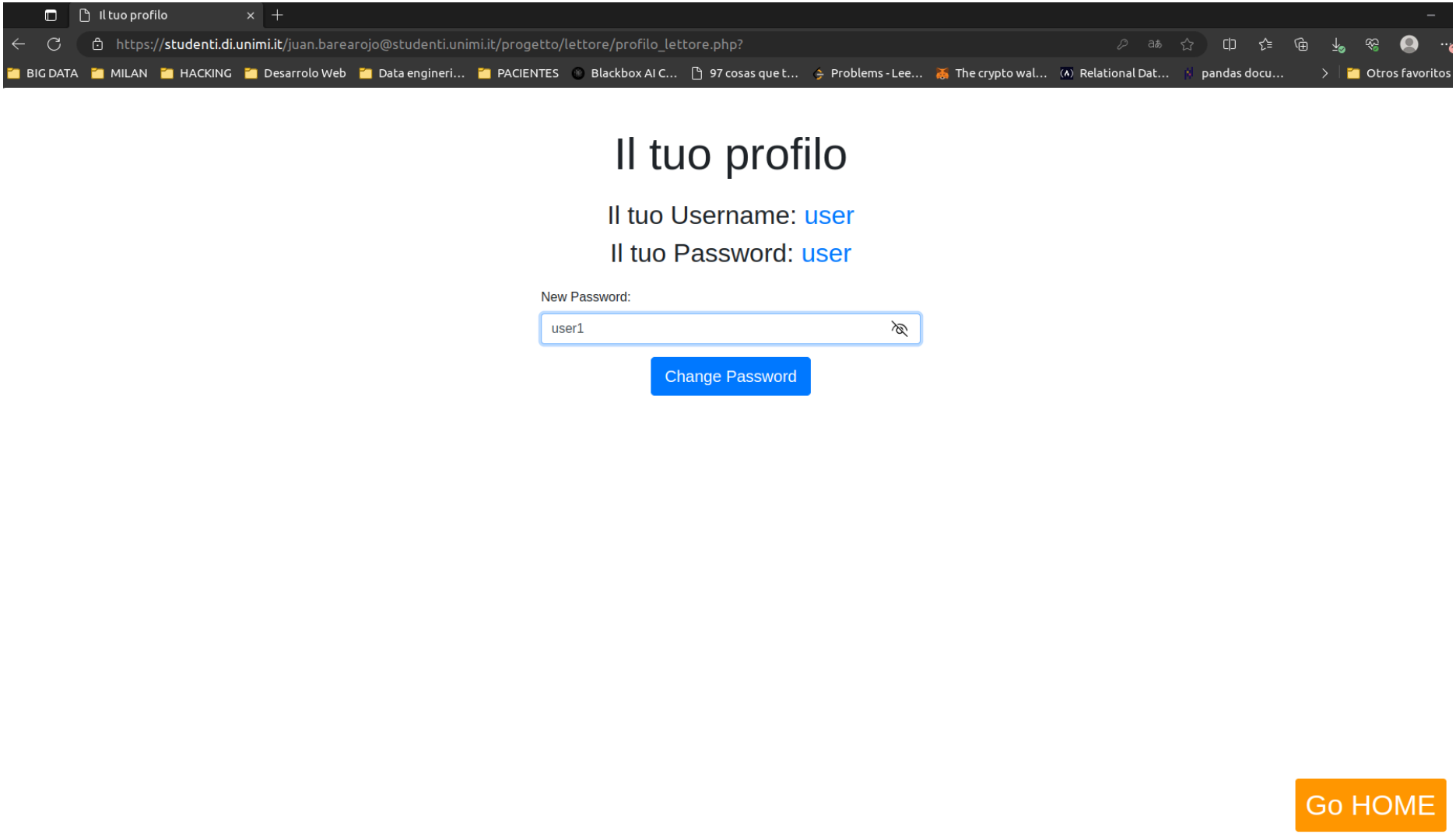

Found Books
https://studenti.di.unimi.it/juan.barearojo@studenti.unimi.it/progetto/lettore/found_book.php
BIG DATA
MILAN
HACKING
Desarrolo Web
Data engineri...
PACIENTES
Blackbox AI C...
97 cosas que t...
Problems - Lee...
The crypto wal...
Relational Dat...
pandas docu...
Otros favoritos
Books Information
ISBN: 9781849700611
Title: Horus Rising
Author: Dan Abnett
Publisher: Black Library
Summary: The seeds of heresy are sown in the Imperium of Man.
Copy ID: 11
Status: available
Library Id: 1
Address: 123 Fictional St.
ISBN: 9781849700611
Title: Horus Rising
Author: Dan Abnett
Publisher: Black Library
Summary: The seeds of heresy are sown in the Imperium of Man.
Copy ID: 12
Status: available
Library Id: 2
Address: 456 Imaginary Ave.

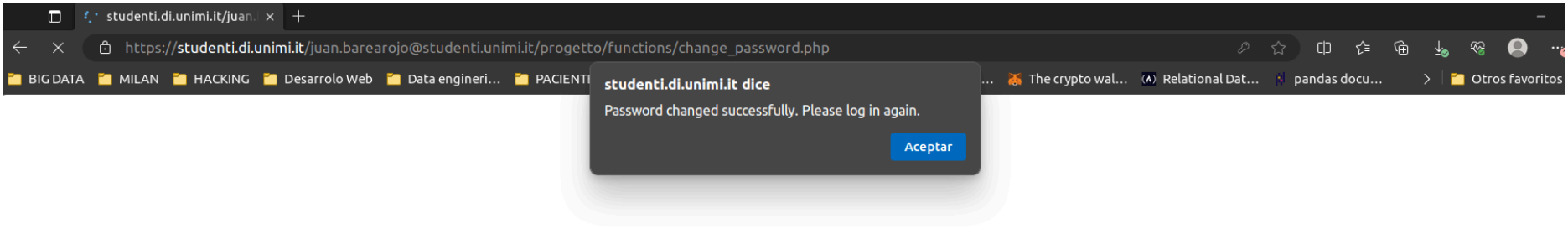

Found Books
https://studenti.di.unimi.it/juan.barearojo@studenti.unimi.it/progetto/lettore/found_book.php
BIG DATA
MILAN
HACKING
Desarrolo Web
Data engineri...
PACIENTES
Blackbox AI C...
97 cosas que t...
Problems - Lee...
The crypto wal...
Relational Dat...
pandas docu...
Otros favoritos
Address: 456 Imaginary Ave.
ISBN: 9781849700611
Title: Horus Rising
Author: Dan Abnett
Publisher: Black Library
Summary: The seeds of heresy are sown in the Imperium of Man.
Copy ID: 13
Status: available
Library Id: 3
Address: 789 Fantasy Blvd.
ISBN: 9781849700611
Title: Horus Rising
Author: Dan Abnett
Publisher: Black Library
Summary: The seeds of heresy are sown in the Imperium of Man.
Copy ID: 14
Status: available
Library Id: 4
Address: 1 Sorcery Path
Search Another Book

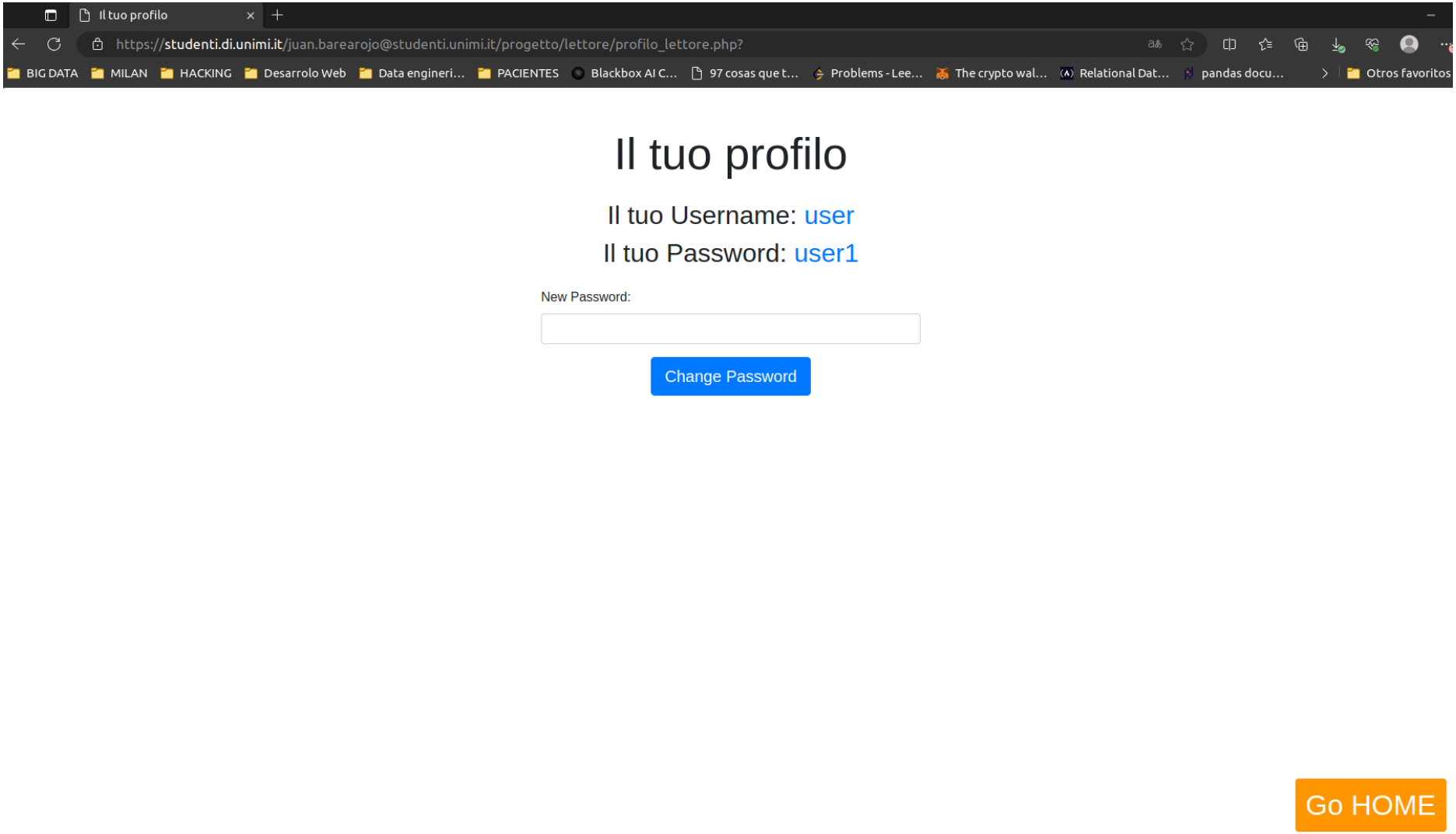

search_book
https://studenti.di.unimi.it/juan.barearojo@studenti.unimi.it/progetto/lettore/search_book_ui.php?
BIG DATA
MILAN
HACKING
Desarrolo Web
Data engineri...
PACIENTES
Blackbox AI C...
97 cosas que t...
Problems - Lee...
The crypto wal...
Relational Dat...
pandas docu...
Otros favoritos
Search book by ISBN or Title
ISBN:
Search by ISBN
Title:
Dune
Search by title
Go HOME

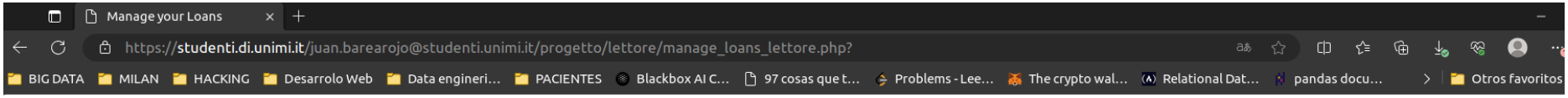

Found Books
https://studenti.di.unimi.it/juan.barearojo@studenti.unimi.it/progetto/lettore/found_book.php
BIG DATA
MILAN
HACKING
Desarrolo Web
Data engineri...
PACIENTES
Blackbox AI C...
97 cosas que t...
Problems - Lee...
100 %
Restablecer
Otros favoritos
Books Information
ISBN: 9780345535528
Title: Dune
Author: Frank Herbert
Publisher: Ace
Summary: A science fiction novel about a desert planet and its valuable spice.
Copy ID: 5
Status: available
Library Id: 5
Address: 999 Chaos Realm
ISBN: 9780345535528
Title: Dune
Author: Frank Herbert
Publisher: Ace
Summary: A science fiction novel about a desert planet and its valuable spice.
Copy ID: 3
Status: available
Library Id: 3
Address: 789 Fantasy Blvd.


Found Books
https://studenti.di.unimi.it/juan.barearojo@studenti.unimi.it/progetto/lettore/found_book.php
BIG DATA
MILAN
HACKING
Desarrolo Web
Data engineri...
PACIENTES
Blackbox AI C...
97 cosas que t...
Problems - Lee...
The crypto wal...
Relational Dat...
pandas docu...
Otros favoritos
Address: 789 Fantasy Blvd.
ISBN: 9780345535528
Title: Dune
Author: Frank Herbert
Publisher: Ace
Summary: A science fiction novel about a desert planet and its valuable spice.
Copy ID: 1
Status: available
Library Id: 1
Address: 123 Fictional St.
ISBN: 9780345535528
Title: Dune
Author: Frank Herbert
Publisher: Ace
Summary: A science fiction novel about a desert planet and its valuable spice.
Copy ID: 2
Status: available
Library Id: 2
Address: 456 Imaginary Ave.
Search Another Book


Il tuo profilo
https://studenti.di.unimi.it/juan.barearojo@studenti.unimi.it/progetto/lettore/profilo_lettore.php?
BIG DATA
MILAN
HACKING
Desarrolo Web
Data engineri...
PACIENTES
Blackbox AI C...
97 cosas que t...
Problems - Lee...
The crypto wal...
Relational Dat...
pandas docu...
Otros favoritos
Il tuo profilo
Il tuo Username: user
Il tuo Password: user
New Password:
user1
Change Password
Go HOME


studenti.di.unimi.it/juan.
https://studenti.di.unimi.it/juan.barearojo@studenti.unimi.it/progetto/functions/change_password.php
BIG DATA
MILAN
HACKING
Desarrolo Web
Data engineri...
PACIENTI
The crypto wal...
Relational Dat...
pandas docu...
Otros favoritos
studenti.di.unimi.it dice
Password changed successfully. Please log in again.
Aceptar


Il tuo profilo
https://studenti.di.unimi.it/juan.barearojo@studenti.unimi.it/progetto/lettore/profilo_lettore.php?
BIG DATA
MILAN
HACKING
Desarrolo Web
Data engineri...
PACIENTES
Blackbox AI C...
97 cosas que t...
Problems - Lee...
The crypto wal...
Relational Dat...
pandas docu...
Otros favoritos
Il tuo profilo
Il tuo Username: user
Il tuo Password: user1
New Password:
Change Password
Go HOME

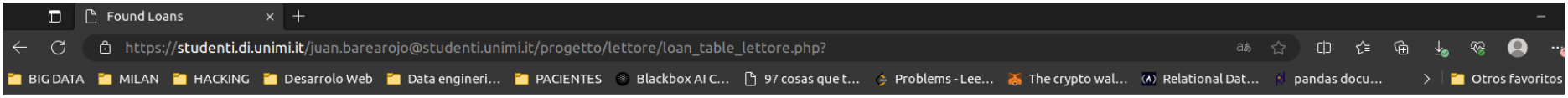


Manage your Loans

All your loans

Ask for a loan

Go HOME

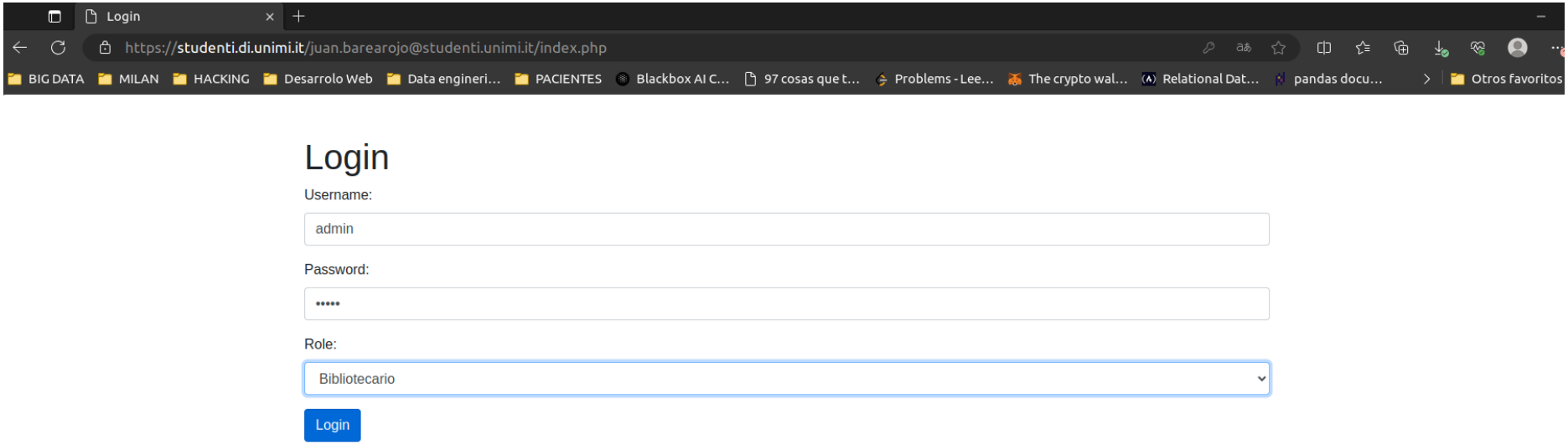


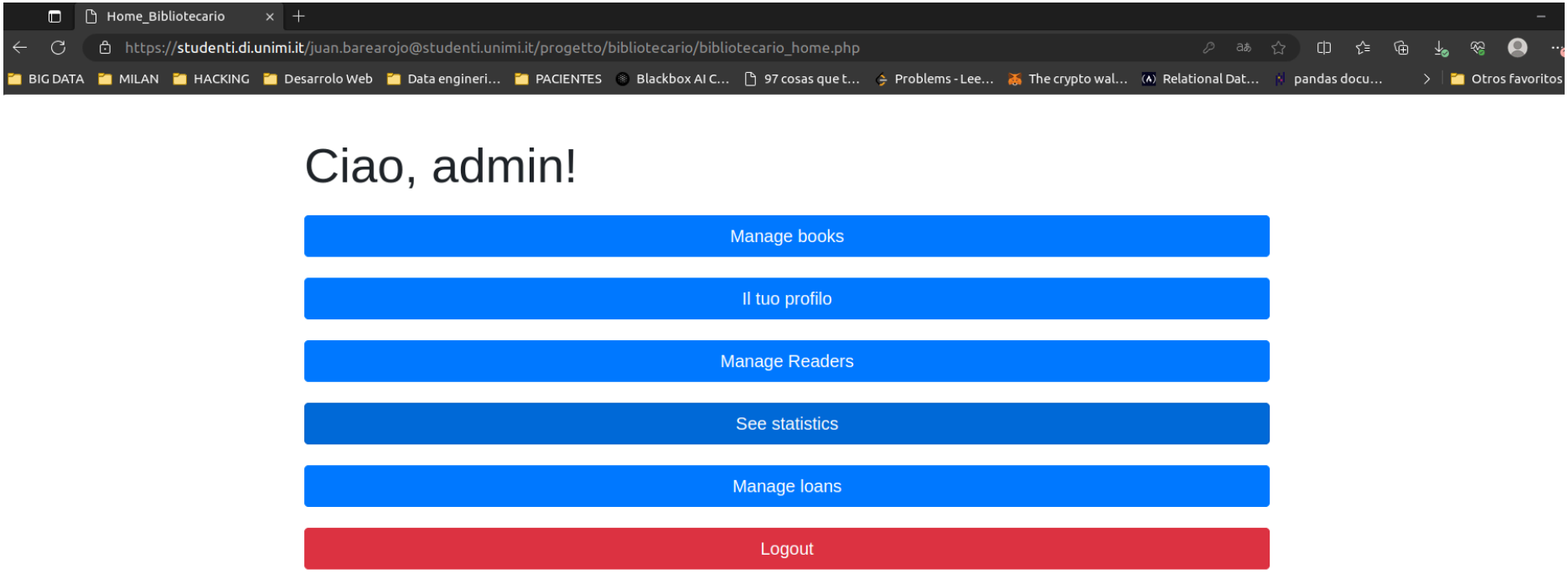
Loans Information

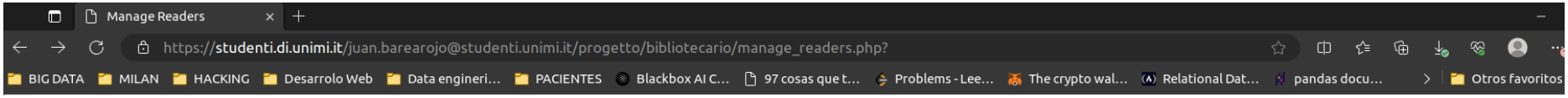
Copy ID	Fiscal Code	Loan Date	Actual Return Date	Expected Return Date
45	1	2024-06-25		2024-07-05
29	1	2024-06-25		2024-07-07

Go HOME

Prove di funzionamento BIBLIOTECARIO




Home_Bibliotecario
https://studenti.di.unimi.it/juan.barearojo@studenti.unimi.it/progetto/bibliotecario/bibliotecario_home.php
BIG DATA
MILAN
HACKING
Desarrolo Web
Data engineri...
PACIENTES
Blackbox AI C...
97 cosas que t...
Problems - Lee...
The crypto wal...
Relational Dat...
pandas docu...
Otros favoritos
Ciao, admin!
Manage books
Il tuo profilo
Manage Readers
See statistics
Manage loans
Logout



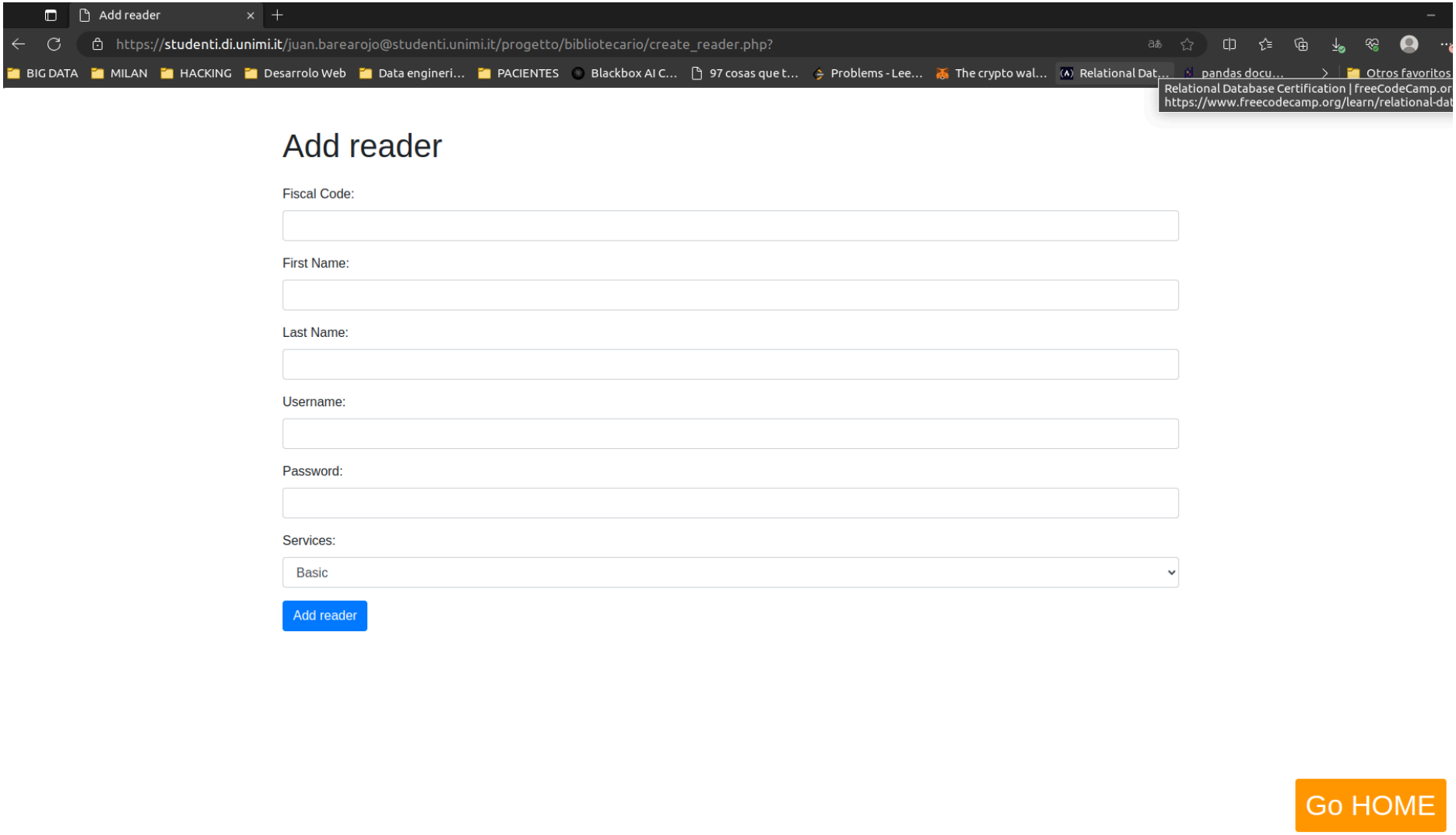
Manage Readers

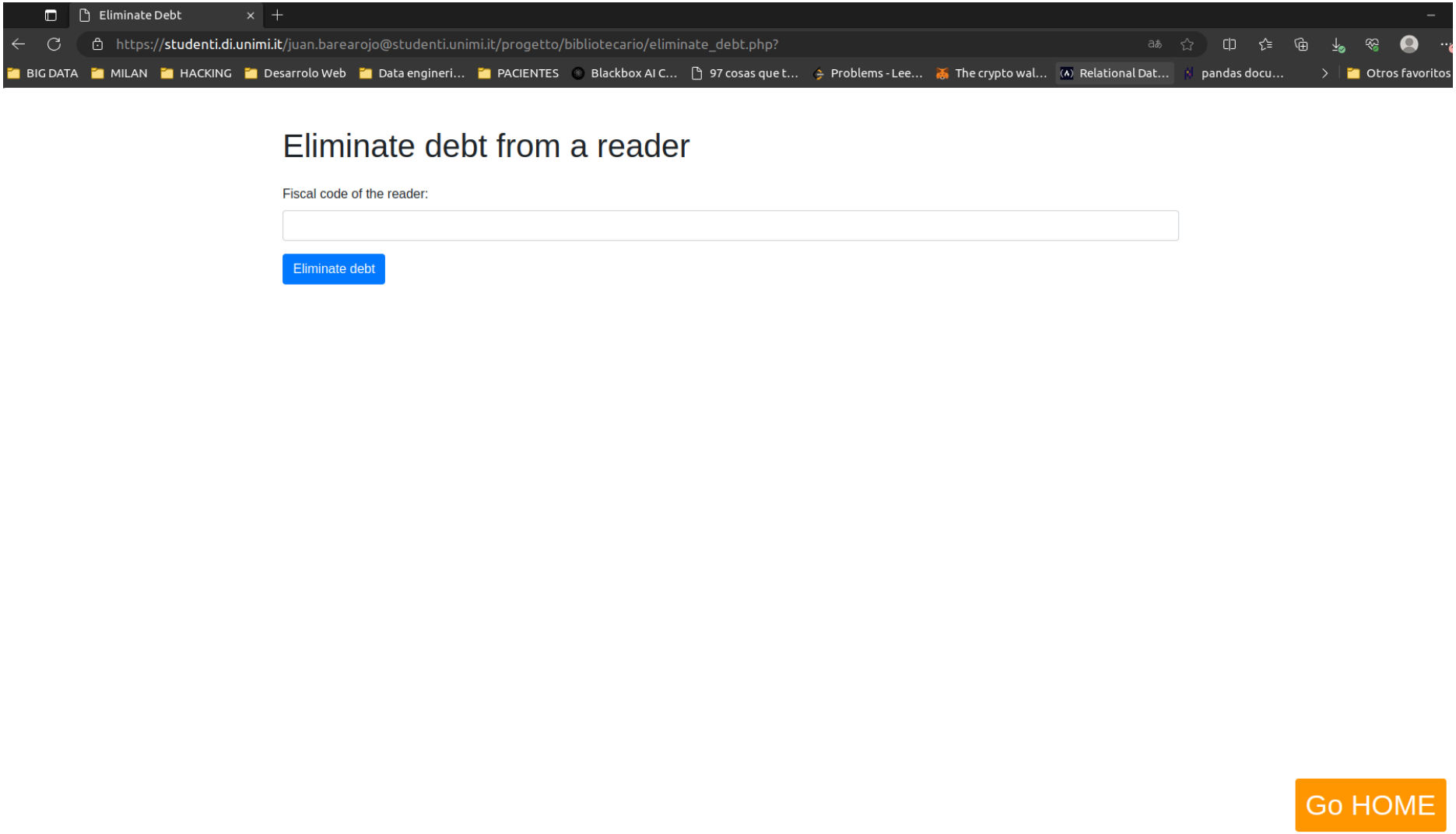
Create a reader account

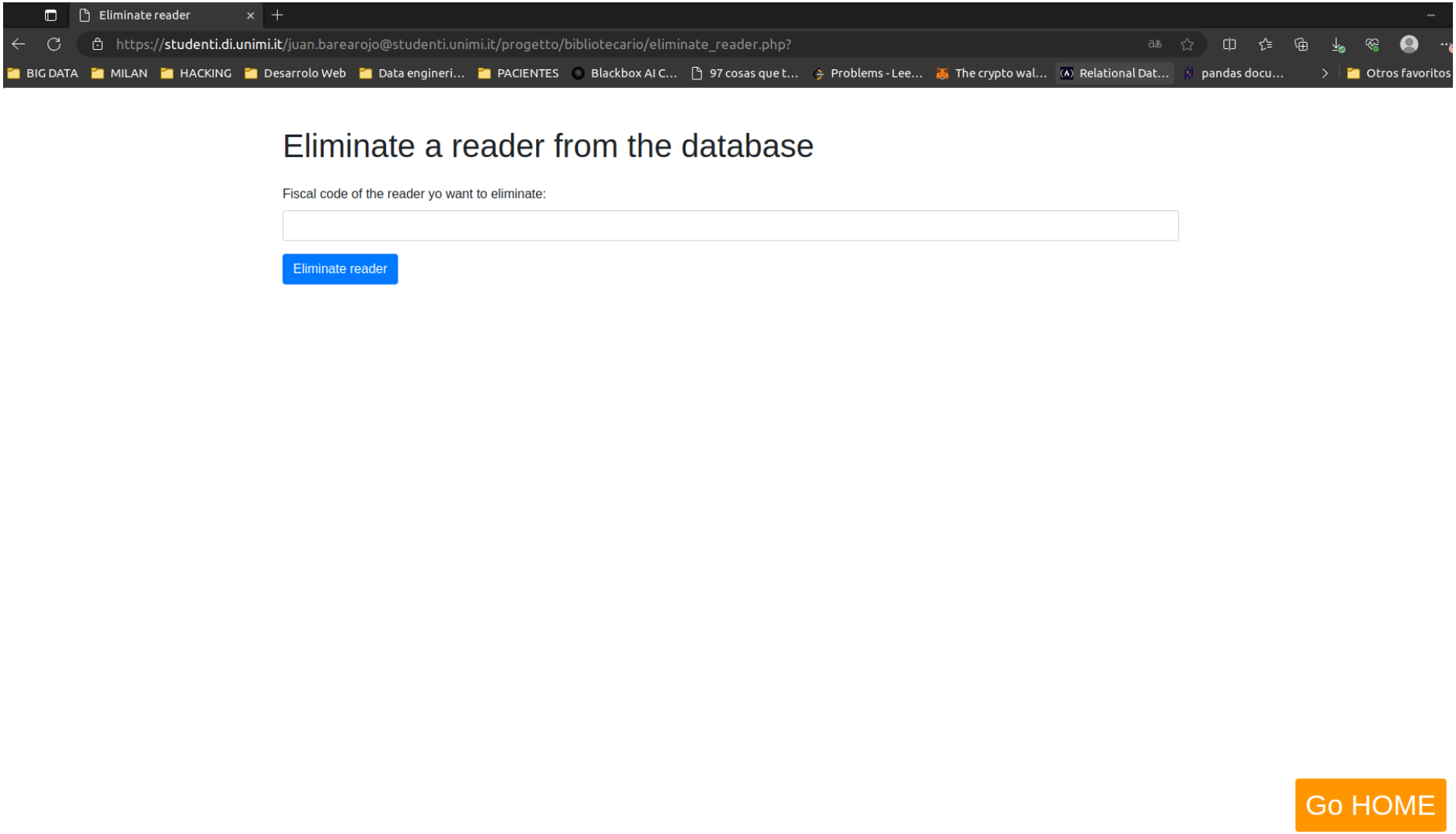
Eliminate reader debt

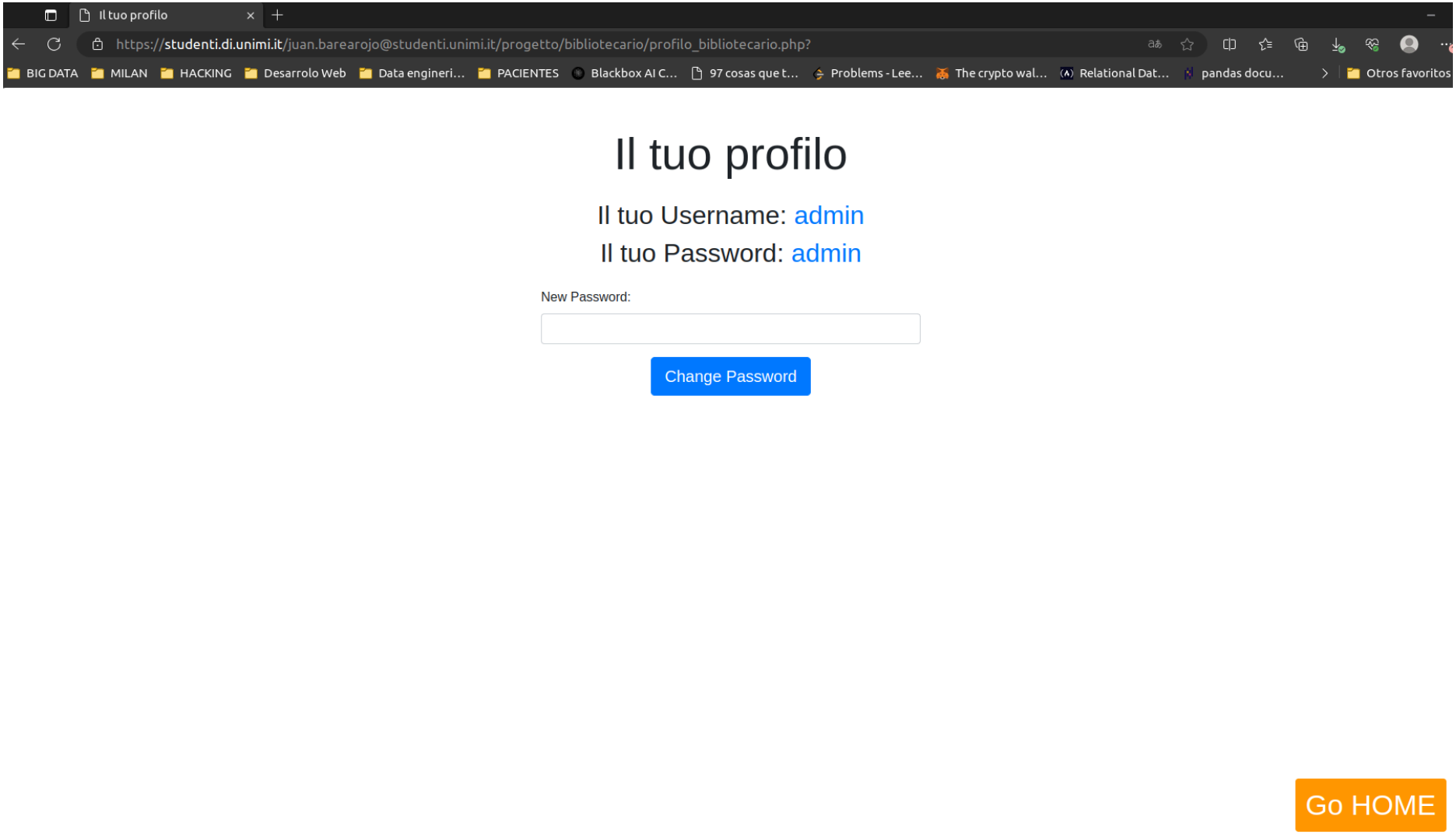
Eliminate reader from system

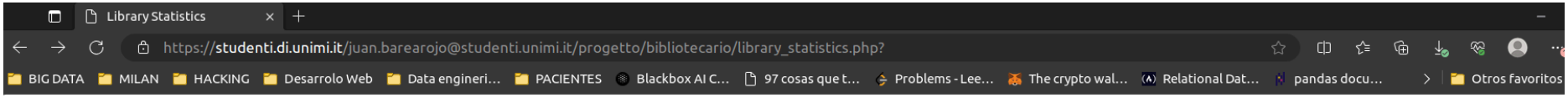
Go HOME


Add reader
https://studenti.di.unimi.it/juan.barearojo@studenti.unimi.it/progetto/bibliotecario/create_reader.php?
BIG DATA
MILAN
HACKING
Desarrolo Web
Data engineri...
PACIENTES
Blackbox AI C...
97 cosas que t...
Problems - Lee...
The crypto wal...
Relational Dat...
pandas docu...
Otros favoritos
Relational Database Certification | freeCodeCamp.or
https://www.freecodecamp.org/learn/relational-dat
Add reader
Fiscal Code:
First Name:
Last Name:
Username:
Password:
Services:
Basic
Add reader
Go HOME


Eliminate Debt
https://studenti.di.unimi.it/juan.barearojo@studenti.unimi.it/progetto/bibliotecario/eliminate_debt.php?
BIG DATA
MILAN
HACKING
Desarrolo Web
Data engineri...
PACIENTES
Blackbox AI C...
97 cosas que t...
Problems - Lee...
The crypto wal...
Relational Dat...
pandas docu...
Otros favoritos
Eliminate debt from a reader
Fiscal code of the reader:
Eliminate debt
Go HOME


Eliminate reader
https://studenti.di.unimi.it/juan.barearojo@studenti.unimi.it/progetto/bibliotecario/eliminate_reader.php?
BIG DATA
MILAN
HACKING
Desarrolo Web
Data engineri...
PACIENTES
Blackbox AI C...
97 cosas que t...
Problems - Lee...
The crypto wal...
Relational Dat...
pandas docu...
Otros favoritos
Eliminate a reader from the database
Fiscal code of the reader yo want to eliminate:
Eliminate reader
Go HOME


Il tuo profilo
https://studenti.di.unimi.it/juan.barearojo@studenti.unimi.it/progetto/bibliotecario/profilo_bibliotecario.php?
BIG DATA
MILAN
HACKING
Desarrolo Web
Data engineri...
PACIENTES
Blackbox AI C...
97 cosas que t...
Problems - Lee...
The crypto wal...
Relational Dat...
pandas docu...
Otros favoritos
Il tuo profilo
Il tuo Username: admin
Il tuo Password: admin
New Password:
Change Password
Go HOME



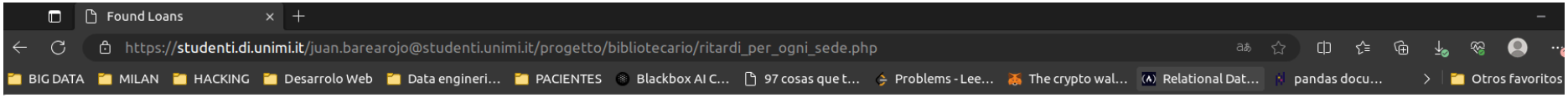
Get Library Statistics

Library ID:

5

Statistiche per sede | Ritardi per sede

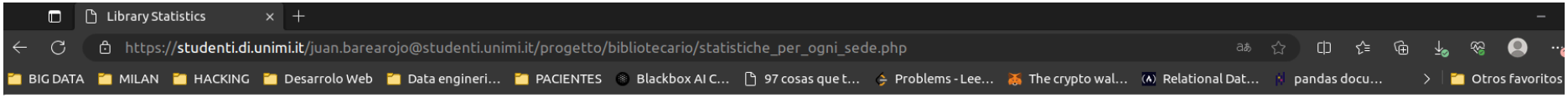
Go HOME



Loans Information

Copy ID	ISBN	Title	Reader Fiscal Code	Reader Name	Expected Return Date	Actual Return Date
15	9781849700611	Horus Rising	FC000009J	Jaghatai Khan	2024-06-24	
20	9781849701021	False Gods	FC000003R	Roboute Guilliman	2024-05-02	

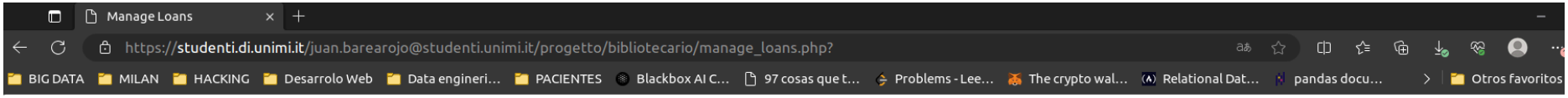
Go HOME



Library Statistics

Total Copies	Total ISBNs	Total Loans in Progress
33	30	6

Go HOME



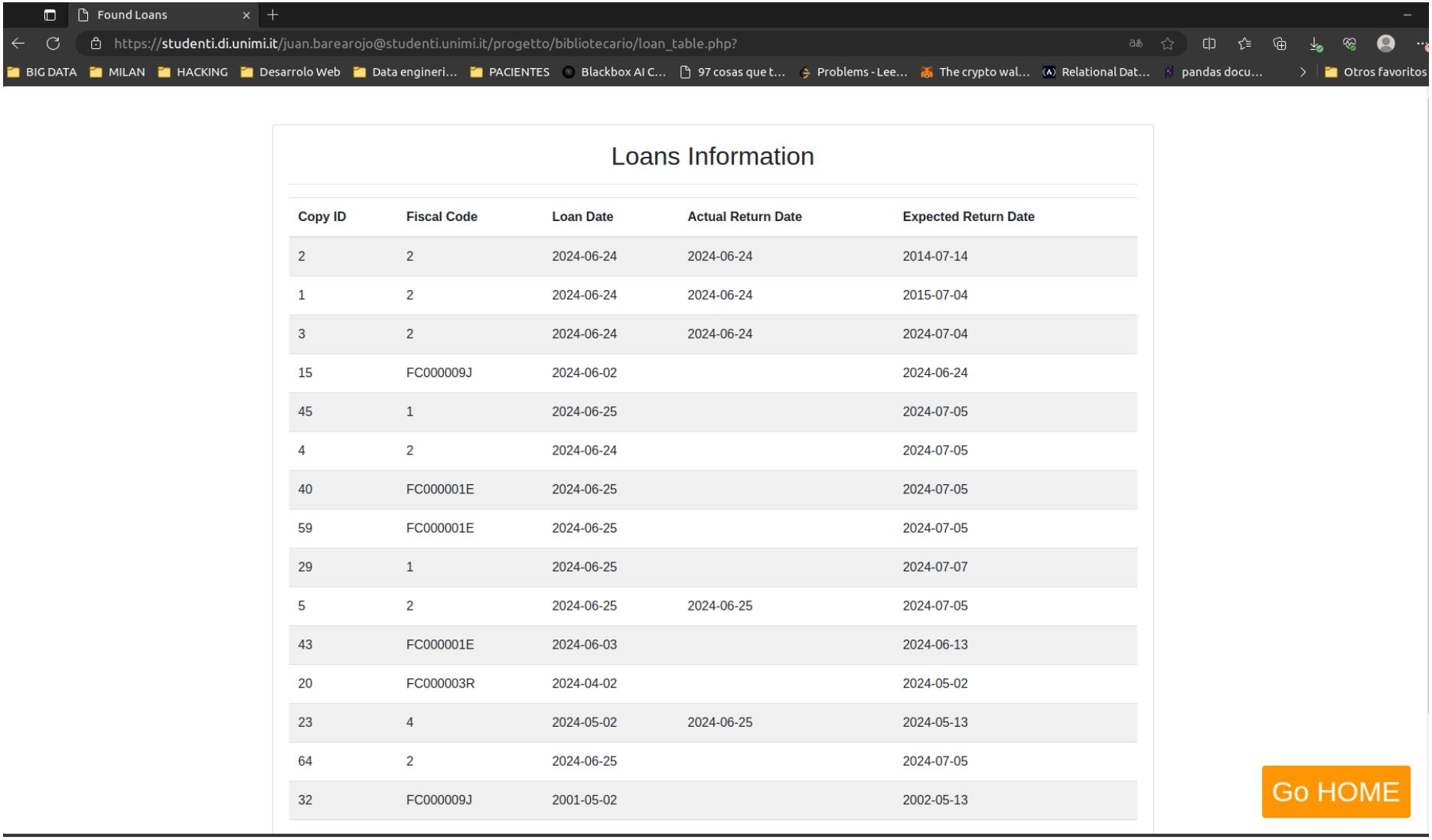
Manage Loans

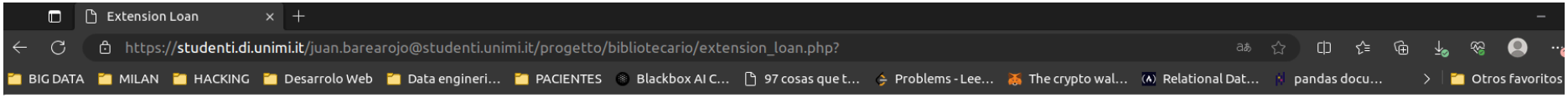
All loans

Extension of Loan

Return a copy

Go HOME


Found Loans
https://studenti.di.unimi.it/juan.barearojo@studenti.unimi.it/progetto/bibliotecario/loan_table.php?
BIG DATA
MILAN
HACKING
Desarrolo Web
Data engineri...
PACIENTES
Blackbox AI C...
97 cosas que t...
Problems - Lee...
The crypto wal...
Relational Dat...
pandas docu...
Otros favoritos
Loans Information
Copy ID | Fiscal Code | Loan Date | Actual Return Date | Expected Return Date
2 | 2 | 2024-06-24 | 2024-06-24 | 2014-07-14
1 | 2 | 2024-06-24 | 2024-06-24 | 2015-07-04
3 | 2 | 2024-06-24 | 2024-06-24 | 2024-07-04
15 | FC000009J | 2024-06-02 | | 2024-06-24
45 | 1 | 2024-06-25 | | 2024-07-05
4 | 2 | 2024-06-24 | | 2024-07-05
40 | FC000001E | 2024-06-25 | | 2024-07-05
59 | FC000001E | 2024-06-25 | | 2024-07-05
29 | 1 | 2024-06-25 | | 2024-07-07
5 | 2 | 2024-06-25 | 2024-06-25 | 2024-07-05
43 | FC000001E | 2024-06-03 | | 2024-06-13
20 | FC000003R | 2024-04-02 | | 2024-05-02
23 | 4 | 2024-05-02 | 2024-06-25 | 2024-05-13
64 | 2 | 2024-06-25 | | 2024-07-05
32 | FC000009J | 2001-05-02 | | 2002-05-13
Go HOME



Extension loan reader

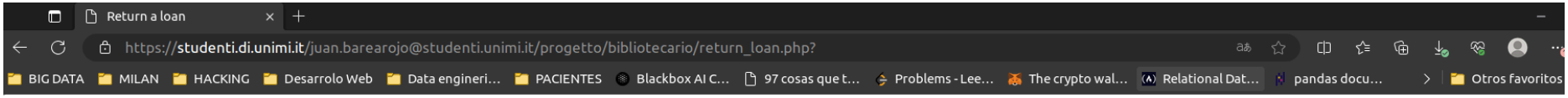
Fiscal code of the reader:

Copy ID:

Start Date:

Extension loan

Go HOME



Return a loan

Copy of id of the book you want to return:

Date where the loan was taken:

Return book

Go HOME