

CS-GY 6083 B - Principles of Database Systems

Report for Project Part II

- Section: B
- Date: December 15, 2022
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Executive Summary

The goal of this project is to build a web-based user interface for the database schema designed in Part I, which models a library management system that provide three main services to the customer:

- An inventory for book rental
- A events management system for exhibitions and seminars
- A rooms management system for group study room reservation

In addition to the services mentioned above the library would also allow customers to signup and login to their account and manage access authorizations of different groups of users.

Tech Stack

- Server side: Django, Python, HTML
- Database: MySQL

- CSS: Bootstrap
- Deployment: Docker, Docker Compose

Given the tight deadline and short of stuff Junda decided to use the **Django** framework in the Python programming language to facilitate rapid prototyping of the application with tons of security features out of the box, and the **Bootstrap** framework to style the HTML pages. And **Docker compose** to orchestrate the deployment of the Django application and the MySQL instance.

Django is a full stack web framework that provides an ORM (Object Relational Mapper) to interact with the database, a templating engine to render the HTML pages, and a web server to serve the pages. The ORM is a layer that sits between the application and the database and provides a high level interface to interact with the database. The templating engine is a layer that sits between the application and the web server and provides a high level interface to render the HTML pages. The web server is a layer that sits between the application and the client and provides a high level interface to serve the pages. Django also comes with an admin page to conveniently manage database models out of the box and some useful security middlewares, please see [Security Features](#) for more details. Bootstrap provides a set of CSS classes to plug-and-play with the HTML pages.

DDL File Content

```
-- SQLINES DEMO *** le SQL Developer Data Modeler 22.2.0.165.1149
-- SQLINES DEMO *** -11-05 15:10:28 EDT
-- SQLINES DEMO *** le Database 21c
-- SQLINES DEMO *** le Database 21c

-- SQLINES DEMO *** no DDL - MDSYS.SDO_GEOMETRY

-- SQLINES DEMO *** no DDL - XMLTYPE

-- SQLINES LICENSE FOR EVALUATION USE ONLY
CREATE TABLE author (
    auth_id INT NOT NULL COMMENT 'AUTHOR ID',
    fname VARCHAR(30) NOT NULL COMMENT 'First name',
    lname VARCHAR(30) NOT NULL COMMENT 'Last name',
    email VARCHAR(50) NOT NULL COMMENT 'Author''s email',
    street VARCHAR(30) NOT NULL COMMENT 'Street address',
    city VARCHAR(30) NOT NULL COMMENT 'Author''s city',
    state VARCHAR(2) NOT NULL COMMENT 'Author''s state code',
    zip INT NOT NULL COMMENT 'Author''s zip code'
);

/* Moved to CREATE TABLE
COMMENT ON COLUMN author.auth_id IS
    'AUTHOR ID'; */

/* Moved to CREATE TABLE
COMMENT ON COLUMN author.fname IS
    'First name'; */
```

```
/* Moved to CREATE TABLE
COMMENT ON COLUMN author.lname IS
    'Last name'; */

/* Moved to CREATE TABLE
COMMENT ON COLUMN author.email IS
    'Author''s email'; */

/* Moved to CREATE TABLE
COMMENT ON COLUMN author.street IS
    'Street address'; */

/* Moved to CREATE TABLE
COMMENT ON COLUMN author.city IS
    'Author''s city'; */

/* Moved to CREATE TABLE
COMMENT ON COLUMN author.state IS
    'Author''s state code'; */

/* Moved to CREATE TABLE
COMMENT ON COLUMN author.zip IS
    'Author''s zip code'; */

ALTER TABLE author ADD CONSTRAINT author_pk PRIMARY KEY ( auth_id );

-- SQLINES LICENSE FOR EVALUATION USE ONLY
CREATE TABLE author_seminar (
    inv_id  INT NOT NULL COMMENT 'Invitation ID',
    auth_id INT NOT NULL,
    e_id     INT NOT NULL
);

/* Moved to CREATE TABLE
COMMENT ON COLUMN author_seminar.inv_id IS
    'Invitation ID'; */

ALTER TABLE author_seminar
    ADD CONSTRAINT author_seminar_pk PRIMARY KEY ( inv_id,
                                                    auth_id,
                                                    e_id );

-- SQLINES LICENSE FOR EVALUATION USE ONLY
CREATE TABLE book (
    book_id  INT NOT NULL COMMENT 'Book ID',
    name      VARCHAR(50) NOT NULL COMMENT 'Book''s name',
    topic_id  SMALLINT NOT NULL
);

/* Moved to CREATE TABLE
COMMENT ON COLUMN book.book_id IS
    'Book ID'; */

/* Moved to CREATE TABLE
```

```
COMMENT ON COLUMN book.name IS
    'Book''s name'; */

ALTER TABLE book ADD CONSTRAINT book_pk PRIMARY KEY ( book_id );

-- SQLINES LICENSE FOR EVALUATION USE ONLY
CREATE TABLE book_author (
    auth_id INT NOT NULL,
    book_id INT NOT NULL
);

ALTER TABLE book_author ADD CONSTRAINT book_author_pk PRIMARY KEY (
book_id,
auth_id );

-- SQLINES LICENSE FOR EVALUATION USE ONLY
CREATE TABLE copy (
    copy_id BIGINT NOT NULL COMMENT 'Unique Copy ID for a book',
    status CHAR(1) NOT NULL COMMENT 'Status of copy - A for available, R
for on rent',
    book_id INT NOT NULL
);

/* Moved to CREATE TABLE
COMMENT ON COLUMN copy.copy_id IS
    'Unique Copy ID for a book'; */

/* Moved to CREATE TABLE
COMMENT ON COLUMN copy.status IS
    'Status of copy - A for available, R for on rent'; */

ALTER TABLE copy ADD CONSTRAINT copy_pk PRIMARY KEY ( copy_id );

-- SQLINES LICENSE FOR EVALUATION USE ONLY
CREATE TABLE customer (
    cust_id BIGINT NOT NULL COMMENT 'Customer ID',
    fname VARCHAR(30) NOT NULL COMMENT 'First name',
    lname VARCHAR(30) NOT NULL,
    phone VARCHAR(13) NOT NULL COMMENT 'Customer''s phone number',
    email VARCHAR(50) NOT NULL COMMENT 'Customer''s email',
    id_type CHAR(1) NOT NULL COMMENT 'Identification type - one of
passport (P), SSN (S) or driver's license (D)',
    id_number VARCHAR(15) NOT NULL COMMENT 'ID_NUMBER (can be
alphanumeric) from passport, SSN-driver's license.'
);

/* Moved to CREATE TABLE
COMMENT ON COLUMN customer.cust_id IS
    'Customer ID'; */

/* Moved to CREATE TABLE
COMMENT ON COLUMN customer.fname IS
    'First name'; */
```

```
/* Moved to CREATE TABLE
COMMENT ON COLUMN customer.phone IS
'Customer''s phone number'; */

/* Moved to CREATE TABLE
COMMENT ON COLUMN customer.email IS
'Customer''s email'; */

/* Moved to CREATE TABLE
COMMENT ON COLUMN customer.id_type IS
'Identification type – one of passport (P), SSN (S) or driver's
license (D)'; */

/* Moved to CREATE TABLE
COMMENT ON COLUMN customer.id_number IS
'ID_NUMBER (can be alphanumeric) from passport, SSN–driver's
license.'; */

ALTER TABLE customer ADD CONSTRAINT customer_pk PRIMARY KEY ( cust_id );

-- SQLINES LICENSE FOR EVALUATION USE ONLY
CREATE TABLE customer_exhibition (
    reg_id INT NOT NULL COMMENT 'Registration ID or invitation ID
depending on whether the customer is an author participating in seminar or
in exhibition.',
    cust_id BIGINT NOT NULL,
    e_id     DOUBLE NOT NULL
);

/* Moved to CREATE TABLE
COMMENT ON COLUMN customer_exhibition.reg_id IS
'Registration ID or invitation ID depending on whether the customer is
an author participating in seminar or in exhibition.'; */

ALTER TABLE customer_exhibition
    ADD CONSTRAINT customer_exhibition_pk PRIMARY KEY ( reg_id,
                                                       cust_id,
                                                       e_id );

-- SQLINES LICENSE FOR EVALUATION USE ONLY
CREATE TABLE customer_room (
    day_booked DATETIME NOT NULL COMMENT 'Day the room is booked',
    timeslot   TINYINT NOT NULL COMMENT 'Timeslot the room is booked – one
of four, with ''1'' for 8–10AM, ''2'' for 11am–1pm, ''3'' for 1–3pm and
''4'' for 4–6pm.',
    cust_id    BIGINT NOT NULL,
    room_id    SMALLINT NOT NULL
);

/* Moved to CREATE TABLE
COMMENT ON COLUMN customer_room.day_booked IS
'Day the room is booked'; */
```

```
/* Moved to CREATE TABLE
COMMENT ON COLUMN customer_room.timeslot IS
    'Timeslot the room is booked – one of four, with ''1'' for 8-10AM,
    ''2'' for 11am-1pm, ''3'' for 1-3pm and ''4'' for 4-6pm.' */

ALTER TABLE customer_room ADD CONSTRAINT customer_room_pk PRIMARY KEY (
    room_id,
    cust_id );

-- SQLINES LICENSE FOR EVALUATION USE ONLY

CREATE TABLE event (
    e_id      INT NOT NULL COMMENT 'Unique Event ID',
    name      VARCHAR(30) NOT NULL COMMENT 'Event''s name',
    type      VARCHAR(10) NOT NULL COMMENT 'Event type – can either be
Seminar or Exhibition',
    start_time DATETIME NOT NULL COMMENT 'Start datetime',
    stop_time  DATETIME NOT NULL COMMENT 'Stop datetime',
    topic_id   SMALLINT
);

ALTER TABLE event
    ADD CONSTRAINT ch_inh_event CHECK ( type IN ( 'Exhibition', 'Seminar' )
) );

/* Moved to CREATE TABLE
COMMENT ON COLUMN event.e_id IS
    'Unique Event ID'; */

/* Moved to CREATE TABLE
COMMENT ON COLUMN event.name IS
    'Event''s name'; */

/* Moved to CREATE TABLE
COMMENT ON COLUMN event.type IS
    'Event type – can either be Seminar or Exhibition'; */

/* Moved to CREATE TABLE
COMMENT ON COLUMN event.start_time IS
    'Start datetime'; */

/* Moved to CREATE TABLE
COMMENT ON COLUMN event.stop_time IS
    'Stop datetime'; */

ALTER TABLE event ADD CONSTRAINT event_pk PRIMARY KEY ( e_id );

-- SQLINES LICENSE FOR EVALUATION USE ONLY

CREATE TABLE exhibition (
    e_id      INT NOT NULL COMMENT 'Unique Event ID',
    expenses  DECIMAL(8, 2) NOT NULL COMMENT 'Exhibition expenses'
);

/* Moved to CREATE TABLE
```

```
COMMENT ON COLUMN exhibition.e_id IS
    'Unique Event ID'; */

/* Moved to CREATE TABLE
COMMENT ON COLUMN exhibition.expenses IS
    'Exhibition expenses'; */

ALTER TABLE exhibition ADD CONSTRAINT exhibition_pk PRIMARY KEY ( e_id );

-- SQLINES LICENSE FOR EVALUATION USE ONLY
CREATE TABLE invoice (
    invoice_id BIGINT NOT NULL COMMENT 'Invoice ID',
    inv_date DATETIME NOT NULL COMMENT 'Date the invoice is generated',
    inv_amt DECIMAL(8, 2) NOT NULL COMMENT 'Invoice amount (calculated
based on formula).',
    rent_id INT NOT NULL
);

/* Moved to CREATE TABLE
COMMENT ON COLUMN invoice.invoice_id IS
    'Invoice ID'; */

/* Moved to CREATE TABLE
COMMENT ON COLUMN invoice.inv_date IS
    'Date the invoice is generated'; */

/* Moved to CREATE TABLE
COMMENT ON COLUMN invoice.inv_amt IS
    'Invoice amount (calculated based on formula).'; */

-- SQLINES LICENSE FOR EVALUATION USE ONLY
CREATE UNIQUE INDEX invoice_idx ON
    invoice (
        rent_id
        ASC );
;

ALTER TABLE invoice ADD CONSTRAINT invoice_pk PRIMARY KEY ( invoice_id );

-- SQLINES LICENSE FOR EVALUATION USE ONLY
CREATE TABLE payment (
    pay_id BIGINT NOT NULL COMMENT 'Unique Payment ID for paying a
part (or full) of that invoice',
    pay_date DATETIME NOT NULL COMMENT 'Date payment is done',
    pay_method CHAR(2) NOT NULL COMMENT 'Payment method - ''P'' for
PayPal, ''CC'' for credit card, ''CA'' for cash and ''DC'' for debit
card.',
    fname VARCHAR(30) NOT NULL COMMENT 'Cardholder''s first name',
    lname VARCHAR(30) NOT NULL COMMENT 'Cardholder''s last name',
    pay_amt DECIMAL(8, 2) NOT NULL COMMENT 'Payment amount',
    invoice_id BIGINT NOT NULL
);

/* Moved to CREATE TABLE
COMMENT ON COLUMN payment.pay_id IS
```

```
'Unique Payment ID for paying a part (or full) of that invoice'; */

/* Moved to CREATE TABLE
COMMENT ON COLUMN payment.pay_date IS
'Date payment is done'; */

/* Moved to CREATE TABLE
COMMENT ON COLUMN payment.pay_method IS
'Payment method - ''P'' for PayPal, ''CC'' for credit card, ''CA'' for
cash and ''DC'' for debit card.'; */

/* Moved to CREATE TABLE
COMMENT ON COLUMN payment.fname IS
'Cardholder''s first name'; */

/* Moved to CREATE TABLE
COMMENT ON COLUMN payment.lname IS
'Cardholder''s last name'; */

/* Moved to CREATE TABLE
COMMENT ON COLUMN payment.pay_amt IS
'Payment amount'; */

ALTER TABLE payment ADD CONSTRAINT payment_pk PRIMARY KEY ( pay_id );

-- SQLINES LICENSE FOR EVALUATION USE ONLY
CREATE TABLE rental (
    rent_id      INT NOT NULL COMMENT 'Unique rental service ID for each
time a copy is borrowed',
    r_status     CHAR(1) NOT NULL COMMENT 'Rental status - ''B'' for
borrowed, ''R'' for returned, ''L'' for late',
    borrow_date   DATETIME NOT NULL COMMENT 'Date borrowed',
    exp_return   DATETIME NOT NULL COMMENT 'Date the rental is expected
to return',
    actual_return DATETIME NOT NULL COMMENT 'Date the rental is actually
returned',
    copy_id       BIGINT
);

/* Moved to CREATE TABLE
COMMENT ON COLUMN rental.rent_id IS
'Unique rental service ID for each time a copy is borrowed'; */

/* Moved to CREATE TABLE
COMMENT ON COLUMN rental.r_status IS
'Rental status - ''B'' for borrowed, ''R'' for returned, ''L'' for
late'; */

/* Moved to CREATE TABLE
COMMENT ON COLUMN rental.borrow_date IS
'Date borrowed'; */

/* Moved to CREATE TABLE
COMMENT ON COLUMN rental.exp_return IS
```

```
'Date the rental is expected to return'; /*

/* Moved to CREATE TABLE
COMMENT ON COLUMN rental.actual_return IS
'Date the rental is actually returned'; */

-- SQLINES LICENSE FOR EVALUATION USE ONLY
CREATE UNIQUE INDEX rental_idx ON
rental (
    rent_id
ASC );

ALTER TABLE rental ADD CONSTRAINT rental_pk PRIMARY KEY ( rent_id );

-- SQLINES LICENSE FOR EVALUATION USE ONLY
CREATE TABLE room (
    room_id      SMALLINT NOT NULL COMMENT 'Unique ID for each room',
    room_capacity TINYINT NOT NULL COMMENT 'Max capacity for each room'
);

/* Moved to CREATE TABLE
COMMENT ON COLUMN room.room_id IS
'Unique ID for each room'; */

/* Moved to CREATE TABLE
COMMENT ON COLUMN room.room_capacity IS
'Max capacity for each room'; */

ALTER TABLE room ADD CONSTRAINT room_pk PRIMARY KEY ( room_id );

-- SQLINES LICENSE FOR EVALUATION USE ONLY
CREATE TABLE seminar (
    e_id INT NOT NULL COMMENT 'Unique Event ID'
);

/* Moved to CREATE TABLE
COMMENT ON COLUMN seminar.e_id IS
'Unique Event ID'; */

ALTER TABLE seminar ADD CONSTRAINT seminar_pk PRIMARY KEY ( e_id );

-- SQLINES LICENSE FOR EVALUATION USE ONLY
CREATE TABLE sponsor (
    sponsor_id INT NOT NULL COMMENT 'Unique Sponsor ID',
    fname      VARCHAR(30) NOT NULL COMMENT 'Sponsor First name if
individual. Org name if org.',
    lname      VARCHAR(30) COMMENT 'Sponsor''s last name (optional)',
    type       CHAR(1) NOT NULL COMMENT 'Sponsor type. I for individual,
and O for organisation.'
);

/* Moved to CREATE TABLE
COMMENT ON COLUMN sponsor.sponsor_id IS
'Unique Sponsor ID'; */
```

```
/* Moved to CREATE TABLE
COMMENT ON COLUMN sponsor.fname IS
    'Sponsor First name if individual. Org name if org.'; */

/* Moved to CREATE TABLE
COMMENT ON COLUMN sponsor.lname IS
    'Sponsor''s last name (optional)'; */

/* Moved to CREATE TABLE
COMMENT ON COLUMN sponsor.type IS
    'Sponsor type. I for individual, and O for organisation.'; */

ALTER TABLE sponsor ADD CONSTRAINT sponsor_pk PRIMARY KEY ( sponsor_id );

-- SQLINES LICENSE FOR EVALUATION USE ONLY
CREATE TABLE sponsor_seminar (
    amt_supp DECIMAL(8, 2) NOT NULL COMMENT 'Amount each sponsor
supports for each seminar',
    sponsor_id INT NOT NULL,
    e_id INT NOT NULL
);

/* Moved to CREATE TABLE
COMMENT ON COLUMN sponsor_seminar.amt_supp IS
    'Amount each sponsor supports for each seminar'; */

ALTER TABLE sponsor_seminar ADD CONSTRAINT sponsor_seminar_pk PRIMARY KEY
( sponsor_id,

e_id );

-- SQLINES LICENSE FOR EVALUATION USE ONLY
CREATE TABLE topic (
    topic_id SMALLINT NOT NULL COMMENT 'Topic ID',
    name VARCHAR(30) NOT NULL COMMENT 'Topic name',
    description VARCHAR(100) NOT NULL COMMENT 'Topic description'
);

/* Moved to CREATE TABLE
COMMENT ON COLUMN topic.topic_id IS
    'Topic ID'; */

/* Moved to CREATE TABLE
COMMENT ON COLUMN topic.name IS
    'Topic name'; */

/* Moved to CREATE TABLE
COMMENT ON COLUMN topic.description IS
    'Topic description'; */

ALTER TABLE topic ADD CONSTRAINT topic_pk PRIMARY KEY ( topic_id );

ALTER TABLE author_seminar
```

```
ADD CONSTRAINT author_seminar_author_fk FOREIGN KEY ( auth_id )
    REFERENCES author ( auth_id );

ALTER TABLE author_seminar
    ADD CONSTRAINT author_seminar_seminar_fk FOREIGN KEY ( e_id )
        REFERENCES seminar ( e_id );

ALTER TABLE book_author
    ADD CONSTRAINT book_author_author_fk FOREIGN KEY ( auth_id )
        REFERENCES author ( auth_id );

ALTER TABLE book_author
    ADD CONSTRAINT book_author_book_fk FOREIGN KEY ( book_id )
        REFERENCES book ( book_id );

ALTER TABLE book
    ADD CONSTRAINT book_topic_fk FOREIGN KEY ( topic_id )
        REFERENCES topic ( topic_id );

ALTER TABLE copy
    ADD CONSTRAINT copy_book_fk FOREIGN KEY ( book_id )
        REFERENCES book ( book_id );

ALTER TABLE customer_exhibition
    ADD CONSTRAINT customer_fk FOREIGN KEY ( cust_id )
        REFERENCES customer ( cust_id );

ALTER TABLE customer_room
    ADD CONSTRAINT customer_room_customer_fk FOREIGN KEY ( cust_id )
        REFERENCES customer ( cust_id );

ALTER TABLE customer_room
    ADD CONSTRAINT customer_room_room_fk FOREIGN KEY ( room_id )
        REFERENCES room ( room_id );

ALTER TABLE event
    ADD CONSTRAINT event_topic_fk FOREIGN KEY ( topic_id )
        REFERENCES topic ( topic_id );

ALTER TABLE exhibition
    ADD CONSTRAINT exhibition_event_fk FOREIGN KEY ( e_id )
        REFERENCES event ( e_id );

ALTER TABLE invoice
    ADD CONSTRAINT invoice_rental_fk FOREIGN KEY ( rent_id )
        REFERENCES rental ( rent_id );

ALTER TABLE payment
    ADD CONSTRAINT payment_invoice_fk FOREIGN KEY ( invoice_id )
        REFERENCES invoice ( invoice_id );

ALTER TABLE rental
    ADD CONSTRAINT rental_copy_fk FOREIGN KEY ( copy_id )
        REFERENCES copy ( copy_id );
```

```
ALTER TABLE seminar
    ADD CONSTRAINT seminar_event_fk FOREIGN KEY ( e_id )
        REFERENCES event ( e_id );

ALTER TABLE sponsor_seminar
    ADD CONSTRAINT sponsor_seminar_seminar_fk FOREIGN KEY ( e_id )
        REFERENCES seminar ( e_id );

ALTER TABLE sponsor_seminar
    ADD CONSTRAINT sponsor_seminar_sponsor_fk FOREIGN KEY ( sponsor_id )
        REFERENCES sponsor ( sponsor_id );

-- SQLINES LICENSE FOR EVALUATION USE ONLY
DROP TRIGGER IF EXISTS arc_fkarc_4_seminar;

DELIMITER //

CREATE TRIGGER arc_fkarc_4_seminar BEFORE
    INSERT OR UPDATE OF e_id ON seminar
    FOR EACH ROW
    DECLARE d VARCHAR(10);
BEGIN
    -- SQLINES LICENSE FOR EVALUATION USE ONLY
    SELECT
        a.type
    INTO d
    FROM
        event a
    WHERE
        a.e_id = :new.e_id;

    IF ( d IS NULL OR d <> 'Seminar' ) THEN
        raise_application_error(-20223, 'FK SEMINAR_EVENT_FK in Table
SEMINAR violates Arc constraint on Table EVENT – discriminator column TYPE
doesn''t have value ''Seminar'''');
    END IF;

    DECLARE EXIT HANDLER FOR not found BEGIN
        NULL;
    END;
    DECLARE EXIT HANDLER FOR SQLEXCEPTION BEGIN
        RESIGNAL;
    END;
END;
/

-- SQLINES LICENSE FOR EVALUATION USE ONLY
DROP TRIGGER IF EXISTS arc_fkarc_4_exhibition;

DELIMITER //

CREATE TRIGGER arc_fkarc_4_exhibition BEFORE
```

```
INSERT OR UPDATE OF e_id ON exhibition
FOR EACH ROW
DECLARE d VARCHAR(10);
BEGIN
-- SQLINES LICENSE FOR EVALUATION USE ONLY
SELECT
    a.type
  INTO d
  FROM
    event a
  WHERE
    a.e_id = :new.e_id;

IF ( d IS NULL OR d <> 'Exhibition' ) THEN
    raise_application_error(-20223, 'FK EXHIBITION_EVENT_FK in Table
EXHIBITION violates Arc constraint on Table EVENT – discriminator column
TYPE doesn''t have value ''Exhibition'''
    );
END IF;

DECLARE EXIT HANDLER FOR not found BEGIN
    NULL;
END;
DECLARE EXIT HANDLER FOR SQLEXCEPTION BEGIN
    RESIGNAL;
END;
END;
/
```

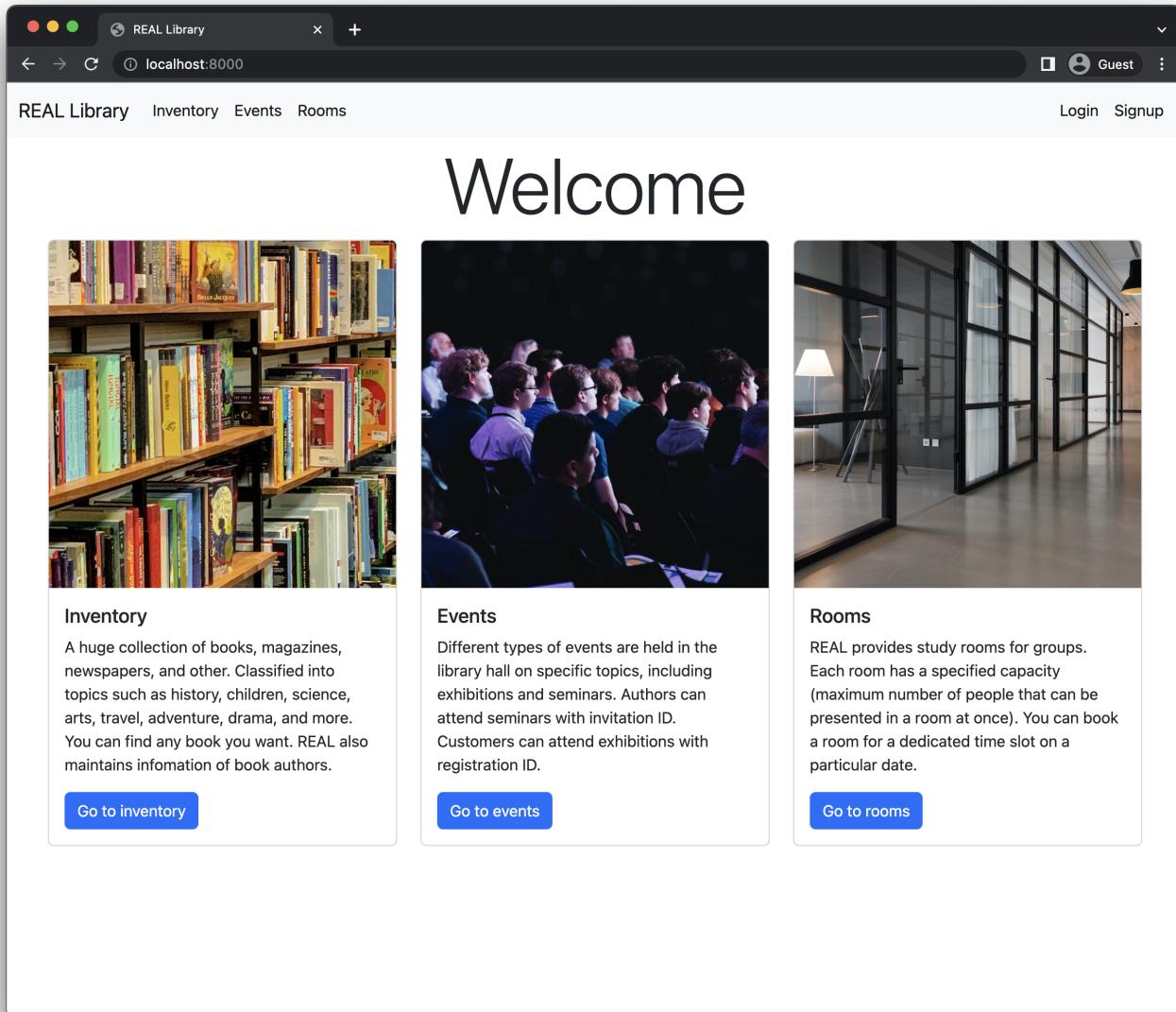
| | |
|---------------------------------|---|
| -- SQLINES DEMO *** EGMENT | 0 |
| -- SQLINES DEMO *** | 0 |
| -- SQLINES DEMO *** ED VIEW | 0 |
| -- SQLINES DEMO *** ED VIEW LOG | 0 |
| -- SQLINES DEMO *** | 0 |
| -- SQLINES DEMO *** | 0 |
| -- SQLINES DEMO *** | 0 |
| -- | |
| -- SQLINES DEMO *** | 0 |
| -- SQLINES DEMO *** | 0 |
| -- | |
| -- SQLINES DEMO *** | 0 |
| -- | |
| -- SQLINES DEMO *** | 0 |
| -- SQLINES DEMO *** A | 0 |
| -- SQLINES DEMO *** T | 0 |
| -- | |
| -- SQLINES DEMO *** | 0 |
| -- SQLINES DEMO *** | 0 |

List of Tables

Listed below are tables generated by the Django ORM:

```
mysql> show tables;
+-----+
| Tables_in_reallibrary |
+-----+
| auth_group
| auth_group_permissions
| auth_permission
| auth_user
| auth_user_groups
| auth_user_user_permissions
| django_admin_log
| django_content_type
| django_migrations
| django_session
| events_exhibition
| events_exhibitionuser
| events_seminar
| events_seminarauthor
| events_seminarsponsor
| events_sponsor
| home_customer
| inventory_author
| inventory_book
| inventory_bookauthor
| inventory_copy
| inventory_invoice
| inventory_payment
| inventory_rental
| inventory_topic
| rooms_room
| rooms_roomcustomer
+-----+
27 rows in set (0.00 sec)
```

Screenshots

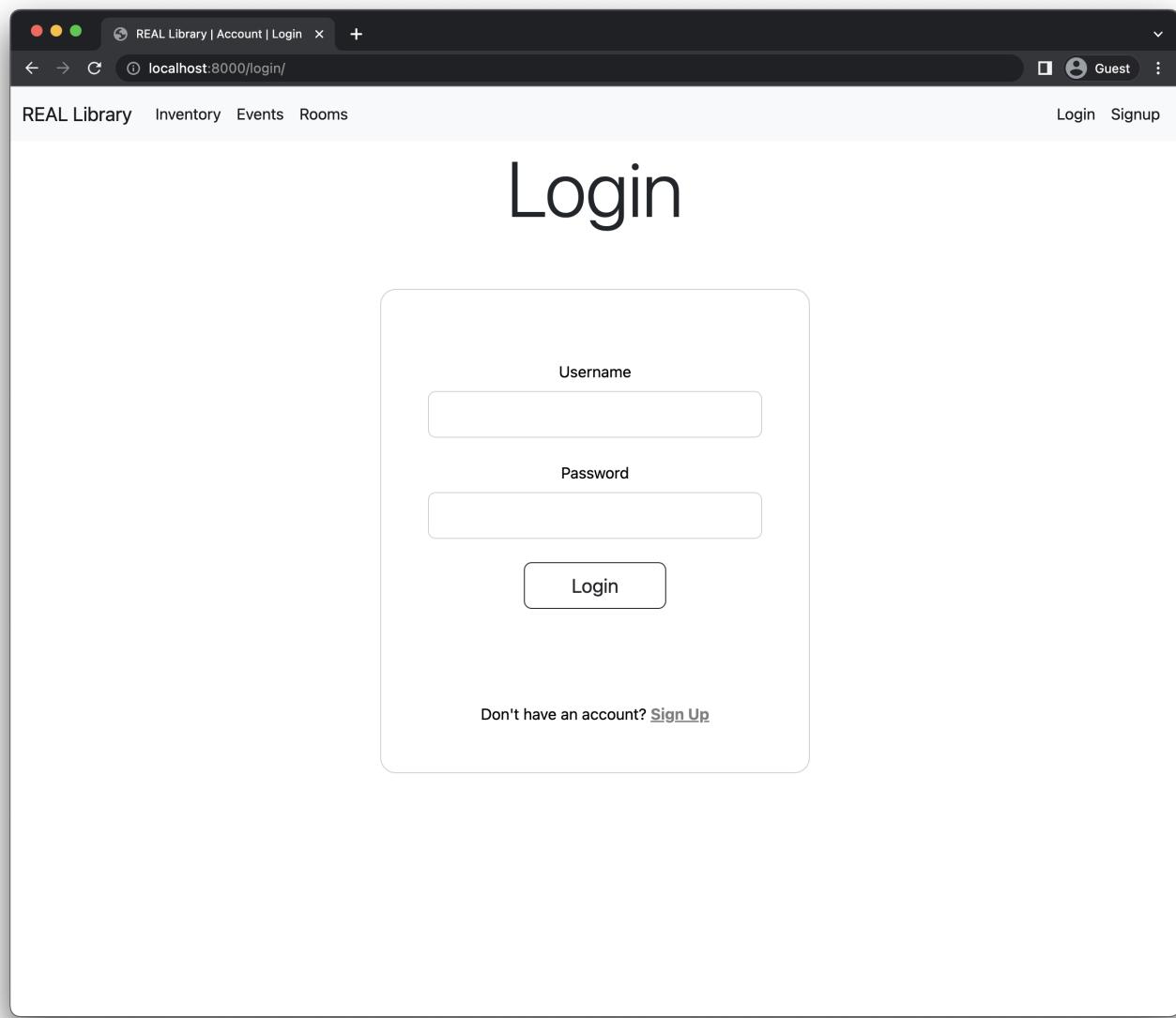


The screenshot shows the homepage of the REAL Library website. At the top, there is a navigation bar with links for "REAL Library", "Inventory", "Events", and "Rooms". On the right side of the navigation bar are "Login" and "Signup" buttons, along with a "Guest" link and a user icon. The main title "Welcome" is displayed prominently in large, bold letters. Below the title are three cards, each containing an image and a section header with a brief description and a blue "Go to [category]" button.

Inventory
A huge collection of books, magazines, newspapers, and other. Classified into topics such as history, children, science, arts, travel, adventure, drama, and more. You can find any book you want. REAL also maintains information of book authors.

Events
Different types of events are held in the library hall on specific topics, including exhibitions and seminars. Authors can attend seminars with invitation ID. Customers can attend exhibitions with registration ID.

Rooms
REAL provides study rooms for groups. Each room has a specified capacity (maximum number of people that can be present in a room at once). You can book a room for a dedicated time slot on a particular date.



The screenshot shows a web browser window with the following details:

- Title Bar:** REAL Library | Account | Signup
- Address Bar:** localhost:8000/signup/
- Header:** REAL Library, Inventory, Events, Rooms, Login, Signup, Guest
- Main Content:** A large, rounded rectangular form titled "Signup".
- Fields:**
 - Username: An input field with a blue border.
 - Password: An input field.
 - Password confirmation: An input field.
 - Phone: An input field.
 - Identity type: A dropdown menu with the placeholder "-----".
 - Identity number: An input field.
- Buttons:**
 - A large, rounded rectangular button labeled "sign up".
- Text at the bottom:** Already have an account? [Login](#)

The screenshot shows a web browser window for the "REAL Library | Inventory" site at localhost:8000/inventory/. The page has a header with "REAL Library" and navigation links for "Inventory", "Events", and "Rooms". On the right, there are "Login" and "Signup" buttons. A "Guest" icon is also present. The main content is titled "Inventory" and displays a grid of 16 book cards arranged in four rows and four columns. Each card contains the book title, its genre, and a small snippet of text. The genres visible include Horror, History, Mystery, Detective, Science, ML, Arts, and Physics. The titles include "Hide And Do Not Seek", "History Grade 1", "Murder Mayhem: A Story", "Hardy Boys 1", "Sherlock Holmes 1", "5G commications Part 1", "Intro to ML 1", "Science Part 1", "Painting Volume 1", "Mechanics Vol 1", "Pattern Recognition and Machine Learning", "The Silent Patient", "The Midnight Library", "One of Us is Lying", "5G System Design", "2AM Thoughts", "The Physics of Everyday Things", "Art - Monet: A Collection", "A Feynman Guide To Physics", "Guns, Germs And Steel", and "Principles of Big Little Lies", "They All Had A Secret", and "The Reichenbach". A sidebar on the left lists "Topics", "Books" (which is selected), and "Authors". The URL in the address bar is localhost:8000/inventory/books/11/.

| | | | |
|--|-----------------------------------|--|----------------------------------|
| Hide And Do Not Seek Horror | History Grade 1 History | Murder Mayhem: A Story Murder | Hardy Boys 1 Mystery |
| Sherlock Holmes 1 Detective | 5G commications Part 1 5G | Intro to ML 1 ML | Science Part 1 Science |
| Painting Volume 1 Arts | Mechanics Vol 1 Physics | Pattern Recognition and Machine Learning ML | The Silent Patient Murder |
| The Midnight Library Mystery | One of Us is Lying Detective | 5G System Design 5G | 2AM Thoughts Horror |
| The Physics of Everyday Things Science | Art - Monet: A Collection Arts | A Feynman Guide To Physics Physics | Guns, Germs And Steel History |
| Principles of Big Little Lies They All Had A Secret | Big Little Lies | They All Had A Secret | The Reichenbach |

REAL Library | Events

localhost:8000/events/

REAL Library Inventory Events Rooms

Login Signup

Events

Exhibitions

Seminars

Sponsors

| | | | |
|---|---|--|--|
| Spooktober Exhibition Horror starts at June 30, 2015, 7 p.m. | Homicide Cases Showcase Murder starts at March 31, 2015, 7 p.m. | Halloweana Collection Horror starts at Feb. 28, 2015, 7 p.m. | Police Training Exhibition Murder starts at Dec. 31, 2014, 7 p.m. |
| Detective Training Exhibition Murder starts at Dec. 31, 2015, 7 p.m. | Scottish Enlightenment Gallery History starts at Dec. 31, 2016, 7 p.m. | Stephen King Horror Wonderla Horror starts at Dec. 31, 2017, 7 p.m. | Yet Another Spooky Exhibition Horror starts at March 11, 2015, 7 p.m. |
| LA Crime Showcase Murder starts at Jan. 20, 2016, 7 p.m. | Crime In NYC Before WW2 Murder starts at Oct. 31, 2018, 7 p.m. | Books From The Qing Empire History starts at Oct. 31, 2011, 7 p.m. | Horror Novel Book Signing Horror starts at Dec. 31, 2018, 7 p.m. |

localhost:8000/events/exhibitions/28/

The screenshot shows a web application titled "REAL Library | Rooms" at the URL "localhost:8000/rooms/". The page has a header with navigation links for "REAL Library", "Inventory", "Events", "Rooms", "Login", and "Signup". The main content area is titled "Rooms" and displays a grid of room information in three rows. Each room entry consists of a title, location, and ID.

| 5 People | 5 People | 5 People |
|------------------|------------------|------------------|
| Dibner 4th floor | Dibner 4th floor | Dibner 3rd floor |
| ID: 110 | ID: 111 | ID: 112 |

| 4 People | 4 People | 4 People |
|-----------------|-----------------|-----------------|
| Bobst 5rd floor | Bobst 3rd floor | Bobst 3rd floor |
| ID: 113 | ID: 114 | ID: 115 |

| 3 People | 3 People | 3 People | 3 People |
|-----------------|-----------------|------------------|------------------|
| Bobst 6th floor | Bobst 6th floor | Dibner 3rd floor | Dibner 3rd floor |
| ID: 116 | ID: 117 | ID: 118 | ID: 119 |

Security Features

CSRF Protection

Cross-site request forgery (CSRF) is a type of attack that occurs when a malicious web site, email, blog, instant message, or program causes a user's web browser to perform an unwanted action on a trusted site when the user is authenticated. CSRF attacks specifically target state-changing requests, not theft of data, since the attacker has no way to see the response to the forged request.

Django provides a CSRF protection mechanism that is enabled by default. It works by checking that the request contains a valid CSRF token, which is a randomly generated value that is tied to the user's session. The token is included in the page as a hidden field, and is also set as a cookie. When the user submits a form, the token is checked against the value in the cookie. If they match, the request is accepted. If they don't match, the request is rejected.

dj login.html home/templates/home/login.html

```
11   <div class="container py-5 h-100">
12     <div class="row d-flex justify-content-center align-items-center h-100">
13       <div class="col-12 col-md-8 col-lg-6 col-xl-5">
14         <div class="card bg-white text-black" style="border-radius: 1rem">
15           <div class="card-body p-5 text-center">
16             <form method="POST">
17               {% csrf_token %}
18               <div class="mb-md-5 mt-md-4 pb-5">
```

SQL Injection Protection

SQL injection is a code injection technique, used to attack data-driven applications, in which malicious SQL statements are inserted into an entry field for execution (e.g. to dump the database contents to the attacker). SQL injection must exploit a security vulnerability in an application's software, for example, when user input is either incorrectly filtered for string literal escape characters embedded in SQL statements or user input is not strongly typed and unexpectedly executed. SQL injection is mostly known as an attack vector for websites but can be used to attack any type of SQL database.

Django's querysets are protected from SQL injection since their queries are constructed using query parameterization. This means that the query parameters are not embedded in the query string, but are passed as separate arguments to the database backend and escaped by the underlying database driver. This prevents the database backend from having to parse the query string, which is vulnerable to SQL injection attacks.

Clickjacking Protection

Clickjacking is a type of malicious exploit of a website where malicious code is injected into a legitimate web page to trick the user into clicking on a button or link that they would not otherwise click. The malicious code is invisible to the user and is rendered on top of the legitimate web page. The malicious code is executed when the user clicks on the button or link.

Django contains clickjacking protection in the form of the X-Frame-Options middleware which in a supporting browser will prevent a page from being loaded in a frame or iframe unless the page comes from the same origin as the parent page. This is done by setting the X-Frame-Options header to DENY. This is the default setting for the middleware.

SSL/HTTPS

HTTPS is a protocol for secure communication over a computer network, and is widely used on the Internet. HTTPS is an extension of the Hypertext Transfer Protocol (HTTP). In HTTPS, the communication protocol is encrypted using Transport Layer Security (TLS), or, formerly, its predecessor, Secure Sockets Layer (SSL). The protocol is therefore also often referred to as HTTP over TLS, or HTTP over SSL. With a few configuration steps Django can enable HTTPS for your site.

Lesson Learned

I learned a great deal of Django, MySQL, Bootstrap, and Docker in the process of doing this project. I learned how to model many-to-many relationships in Django with the `models.ManyToManyField()` and adding additional fields to the through model. And model inheritance with an abstract parent model. And how to filter model objects in Django views.

I also bumped into a few issues with Docker compose, Django constantly failed to connect to MySQL server at first, after two days of research I found out that the problem was that the MySQL server was not ready when Django tried to connect to it. I solved this by adding a `healthcheck` option to the `db` service and a `depends_on` option to the `web` service in the `docker-compose.yml` file and specified that `web` not start until `db` service is healthy. So the Django app will not start until the MySQL server is ready for connection.

Finally I learned to style the template pages with Bootstrap, which is a very powerful and popular CSS framework that could be used in a plug-and-play fashion.

Business Analysis with Project Data

Extra Features

- We added indexes to the Rental and Invoice tables to speed up the queries.
- We also orchestrated the app and database with Docker Compose.