华东师范大学数据科学与工程学院实验报告

课程名称：当代数据管理系统	**年级：**2018	**上机实践成绩：**
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上机实践名称：在线书店 bookstore		**上机实践日期：**2021/1
上机实践编号：	**组号：**	**上机实践时间：**

一、实验目的

实现一个提供网上购书功能的网站后端。

二、实验任务

网站支持书商在上面开商店，购买者可能通过网站购买。
买家和卖家都可以注册自己的账号。
一个卖家可以开一个或多个网上商店， 买家可以为自己的账户充值，在任意商店购买图书。
支持下单->付款->发货->收货，流程。
其中包括：
1)用户权限接口，如注册、登录、登出、注销
2)买家用户接口，如充值、下单、付款
3)卖家用户接口，如创建店铺、填加书籍信息及描述、增加库存
4)发货 -> 收货
5)搜索图书。用户可以通过关键字搜索，参数化的搜索方式； 如搜索范围包括，题目，标签，目录，内容；全站搜索或是当前店铺搜索
6)订单状态，订单查询和取消定单
用户可以查自己的历史订单，用户也可以取消订单。

任务分工：

基础功能：陈郅睿、曾国龙、俞泽恺

搜索功能、报告、演讲：俞泽恺

收货发货、取消订单：陈郅睿

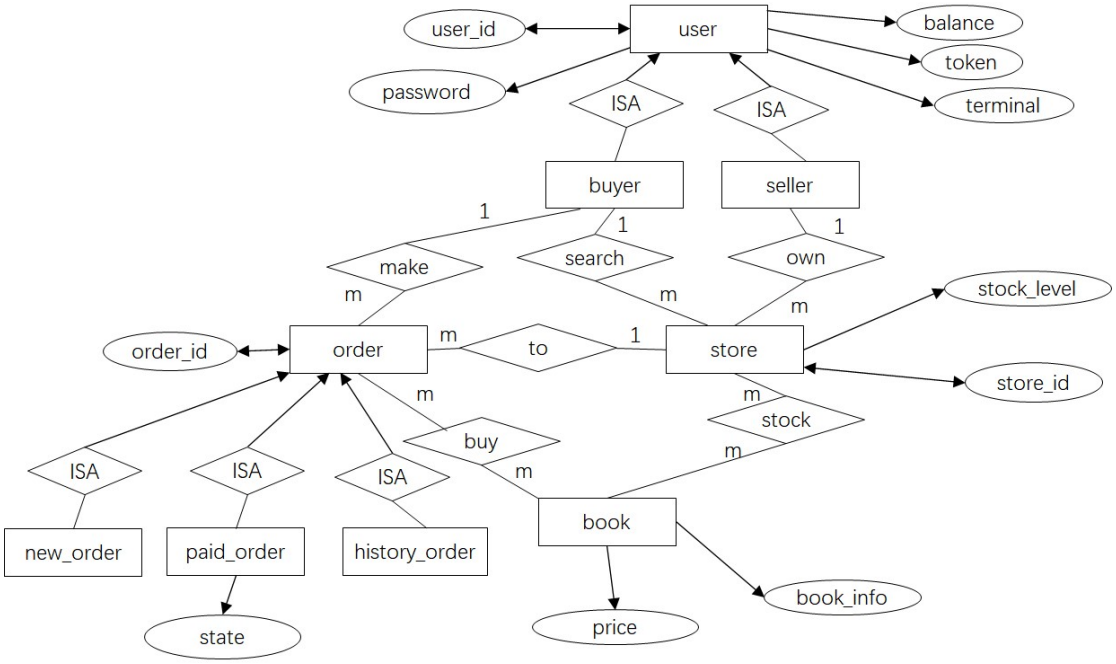
测试：曾国龙

三、使用环境

Python3

四、实验过程

ER 图：



ER 图的实体类主要有：用户 订单 商店 书本

用户包括买家和卖家，拥有自己的 id password 等信息

卖家拥有自己的商店，有自己的库存

商店中存放书本，书本有自己的 price 等信息

买家可以下订单，为了实现所需功能，可以将订单分为三类（新订单、已付款订单和历史订单），其中，新订单是用户下单后生成的，已付款订单是付款后生成的，记录商品的状态（待发货和发货中），而历史订单是由新订单或者已付款订单生成的

对应关系：一个用户可以下多个订单，一个订单只能由一个用户生成；一个订单只能访问一家商店，一家商店可以有多个订单；一个订单可以买多本书，一本书也可以出现在不同订单中（同一本书可以有很多库存）；一家商店可以存多本书，一本书也可以出现在不同商店；一个商家可以拥有多个商店，一个商店只能被一个人拥有

数据库设计（共 9 张表）：

users

user_id	password	balance	token	terminal
[PK] text	text	integer	text	text

user_store

user_id	store_id
[PK] text	[PK] text

store

store_id	book_id	book_info	stock_level
[PK] text	[PK] text	text	integer

new_order/history_order（schema 相同）

order_id	user_id	store_id
[PK] text	text	text

paid_order

order_id	user_id	store_id	state
[PK] text	text	text	text

new_order_detail/paid_order_detail/history_order_detail（schema 相同）

order_id	book_id	count	price
[PK] text	[PK] text	integer	integer

订单拆分成三个表原因：

买家对于看中的书可以进行下单，订单存在 new_order/new_order_detail 中，此时还未进行付款

付款后，订单信息会转存到 paid_order/paid_order_detail 中（new_order 中信息删除），此时多了一个 state 位，用于记录发货信息，初始化为“未发货”。商家在买家付款后便可对其进行发货处理

发货后，买家收到货物，订单信息会转存到 history_order/history_order_detail（paid_order 中信息删除）中，以供用户查询历史订单

被取消的订单也加入到 history_order/history_order_detail 中以供查询

由于历史订单表相对尚未完成的订单的表来说可能较大，因此将其分开可以减少修改订单状态、查询的性能开销。

索引：对每个表中搜索时最常用到的键（id 等）建立了 B 树索引。

基础功能部分：
与 github 项目代码类似，将 sqlite 实现换成了 postgresql 实现
注册功能：
传入用户名和密码，插入数据库。若用户名已存在则无法插入。

```
def register(self, user_id: str, password: str):
    try:
        terminal = "terminal_{}".format(str(time.time()))
        token = jwt_encode(user_id, terminal)
        self.conn.execute(
            "INSERT into users(user_id, password, balance, token, terminal) "
            "VALUES (%s, %s, %s, %s, %s);",
            (user_id, password, 0, token, terminal), )
        #self.conn.commit()
    except pg.Error:
        return error.error_exist_user_id(user_id)
    return 200, "ok"
```

检查用户 token：
根据用户名取出并比对。

```
def check_token(self, user_id: str, token: str) -> (int, str):
    cursor = self.conn.execute("SELECT token from users where user_id=%s", (user_id,))
    row = self.conn.fetchone()
    if row is None:
        return error.error_authorization_fail()
    db_token = row['token']
    if not self.__check_token(user_id, db_token, token):
        return error.error_authorization_fail()
    return 200, "ok"
```

检查密码：
根据用户名取出并比对。

```
def check_password(self, user_id: str, password: str) -> (int, str):
    self.conn.execute("SELECT password from users where user_id=%s", (user_id,))
    row = self.conn.fetchone()
    if row is None:
        return error.error_authorization_fail()

    if password != row['password']:
        return error.error_authorization_fail()

    return 200, "ok"
```

登陆功能：
检查用户名和密码是否匹配，更新用户 token，返回 token。

```
def login(self, user_id: str, password: str, terminal: str) -> (int, str, str):
    token = ""
    try:
        code, message = self.check_password(user_id, password)
        if code != 200:
            return code, message, ""

        token = jwt_encode(user_id, terminal)
        cursor = self.conn.execute(
            "UPDATE users set token= %s , terminal = %s where user_id = %s",
            (token, terminal, user_id), )
        """if cursor.rowcount == 0:
            return error.error_authorization_fail() + ("", )"""
        # self.conn.commit()
    except pg.Error as e:
        print(e)
        return 528, "{}".format(str(e)), ""
    except BaseException as e:
        print(e)
        return 530, "{}".format(str(e)), ""
    return 200, "ok", token
```

登出功能：

检查用户名和 token 是否匹配，更新 token。

```
def logout(self, user_id: str, token: str) -> bool:
    try:
        code, message = self.check_token(user_id, token)
        if code != 200:
            return code, message

        terminal = "terminal_{}".format(str(time.time()))
        dummy_token = jwt_encode(user_id, terminal)

        cursor = self.conn.execute(
            "UPDATE users SET token = %s, terminal = %s WHERE user_id=%s",
            (dummy_token, terminal, user_id), )
        """if cursor.rowcount == 0:
            return error.error_authorization_fail()

        self.conn.commit()"""
    except pg.Error as e:
        return 528, "{}".format(str(e))
    except BaseException as e:
        return 530, "{}".format(str(e))
    return 200, "ok"
```

注销用户功能：

检查用户名和密码是否匹配。删除用户信息。

```
def unregister(self, user_id: str, password: str) -> (int, str):
    try:
        code, message = self.check_password(user_id, password)
        if code != 200:
            return code, message

        cursor = self.conn.execute("DELETE from users where user_id=%s", (user_id,))
        """if self.conn.rowcount == 1:
            self.conn.commit()
        else:
            return error.error_authorization_fail()"""
    except pg.Error as e:
        return 528, "{}".format(str(e))
    except BaseException as e:
        return 530, "{}".format(str(e))
    return 200, "ok"
```

修改密码：

检查用户名和密码是否匹配。更新用户信息。

```
def change_password(self, user_id: str, old_password: str, new_password: str) -> bool:
    try:
        code, message = self.check_password(user_id, old_password)
        if code != 200:
            return code, message

        terminal = "terminal_{}".format(str(time.time()))
        token = jwt_encode(user_id, terminal)
        cursor = self.conn.execute(
            "UPDATE users set password = %s, token= %s , terminal = %s where user_id = %s",
            (new_password, token, terminal, user_id), )
        """if cursor.rowcount == 0:
            return error.error_authorization_fail()

        self.conn.commit()"""
    except pg.Error as e:
        return 528, "{}".format(str(e))
    except BaseException as e:
        return 530, "{}".format(str(e))
    return 200, "ok"
```

创建新订单：

检查参数是否合法，修改库存，创建订单。

```
def new_order(self, user_id: str, store_id: str, id_and_count: [(str, int)]) -> (int, str, str):
    order_id = ""
    try:
        #检查 id 是否存在
```

```
        if not self.user_id_exist(user_id):
            return error.error_non_exist_user_id(user_id) + (order_id, )
        if not self.store_id_exist(store_id):
            return error.error_non_exist_store_id(store_id) + (order_id, )
        uid = "{}_{}_{}".format(user_id, store_id, str(uuid.uuid1()))

        for book_id, count in id_and_count:
            cursor = self.conn.execute(
                "SELECT book_id, stock_level, book_info FROM store "
                "WHERE store_id = %s AND book_id = %s;",
                (store_id, book_id))
            row = self.conn.fetchone()
            #检查商店和书是否存在
            if row is None:
                return error.error_non_exist_book_id(book_id) + (order_id, )

            stock_level = row['stock_level']
            book_info = row['book_info']
            book_info_json = json.loads(book_info)
            price = book_info_json.get("price")
            #检查库存是否充足
            if stock_level < count:
                return error.error_stock_level_low(book_id) + (order_id,)
            #更改库存数量
            cursor = self.conn.execute(
                "UPDATE store set stock_level = stock_level - %s "
                "WHERE store_id = %s and book_id = %s and stock_level >= %s; ",
                (count, store_id, book_id, count))
            """if cursor.rowcount == 0:
                return error.error_stock_level_low(book_id) + (order_id, )"""

            self.conn.execute(
                    "INSERT INTO new_order_detail(order_id, book_id, count, price) "
                    "VALUES(%s, %s, %s, %s);",
                    (uid, book_id, count, price))

        self.conn.execute(
            "INSERT INTO new_order(order_id, store_id, user_id) "
            "VALUES(%s, %s, %s);",
            (uid, store_id, user_id))
        #self.conn.commit()
        order_id = uid
    except pg.Error as e:
        logging.info("528, {}".format(str(e)))
        return 528, "{}".format(str(e)), ""
    except BaseException as e:
        logging.info("530, {}".format(str(e)))
```

```
            return 530, "{}".format(str(e)), ""

        return 200, "ok", order_id
```

支付某个订单的钱款：
检查参数是否合法，修改买方卖方信息，修改订单状态信息。

```
def payment(self, user_id: str, password: str, order_id: str) -> (int, str):
        conn = self.conn
        try:
            #检查订单是否存在
            cursor = conn.execute("SELECT order_id, user_id, store_id FROM new_order WHERE
order_id = %s", (order_id,))
            row = conn.fetchone()
            if row is None:
                return error.error_invalid_order_id(order_id)

            order_id = row['order_id']
            buyer_id = row['user_id']
            store_id = row['store_id']
            #检查买家信息
            if buyer_id != user_id:
                return error.error_authorization_fail()
            #核对账户密码
            cursor = conn.execute("SELECT balance, password FROM users WHERE user_id = %s;",
(buyer_id,))
            row = conn.fetchone()
            if row is None:
                return error.error_non_exist_user_id(buyer_id)
            balance = row['balance']
            if password != row['password']:
                return error.error_authorization_fail()

            #核对店铺信息
            cursor = conn.execute("SELECT store_id, user_id FROM user_store WHERE store_id
= %s;", (store_id,))
            row = conn.fetchone()
            if row is None:
                return error.error_non_exist_store_id(store_id)

            seller_id = row['user_id']

            if not self.user_id_exist(seller_id):
                return error.error_non_exist_user_id(seller_id)

            conn.execute("SELECT book_id, count, price FROM new_order_detail WHERE order_id
= %s;", (order_id,))
            cursor=conn.fetchall()
```

```
        total_price = 0
        bookids=[]
        counts=[]
        prices=[]
        for row in cursor:
            bookids.append(row['book_id'])
            counts.append(row['count'])
            prices.append(row['price'])
            count = row['count']
            price = row['price']
            total_price = total_price + price * count

        if balance < total_price:
            return error.error_not_sufficient_funds(order_id)
        #买家扣除相应钱款
        cursor = conn.execute("UPDATE users set balance = balance - %s"
                              "WHERE user_id = %s AND balance >= %s",
                              (total_price, buyer_id, total_price))
        """if cursor.rowcount == 0:
            return error.error_not_sufficient_funds(order_id)"""
        #卖家增加相应钱款
        cursor = conn.execute("UPDATE users set balance = balance + %s"
                              "WHERE user_id = %s",
                              (total_price, seller_id))

        """if cursor.rowcount == 0:
            return error.error_non_exist_user_id(buyer_id)"""
        #删除订单信息
        cursor = conn.execute("DELETE FROM new_order WHERE order_id = %s", (order_id, ))
        """if cursor.rowcount == 0:
            return error.error_invalid_order_id(order_id)"""

        cursor = conn.execute("DELETE FROM new_order_detail where order_id = %s",
(order_id, ))
        """if cursor.rowcount == 0:
            return error.error_invalid_order_id(order_id)"""

        #增加状态信息
        cursor = conn.execute(
            "INSERT INTO paid_order(order_id,user_id,store_id,state) "
            "VALUES(%s, %s, %s, '待发货');",
            (order_id, user_id, store_id))

        for i in range(len(bookids)):
            cursor=conn.execute(
                "INSERT INTO paid_order_detail(order_id,book_id,count,price) "
                "VALUES(%s, %s, %s, %s);",
```

```
                    (order_id,bookids[i],counts[i],prices[i]))
            #conn.commit()

        except pg.Error as e:
            return 528, "{}".format(str(e))

        except BaseException as e:
            return 530, "{}".format(str(e))

        return 200, "ok"
```

给买方增加资金：

```
def add_funds(self, user_id, password, add_value) -> (int, str):
    try:

        cursor = self.conn.execute("SELECT password    from users where user_id=%s",
(user_id,))
        row = self.conn.fetchone()
        if row is None:
            return error.error_authorization_fail()
        #核对密码信息
        if row['password'] != password:
            return error.error_authorization_fail()
        #充值
        cursor = self.conn.execute(
            "UPDATE users SET balance = balance + %s WHERE user_id = %s",
            (add_value, user_id))
        """if cursor.rowcount == 0:
            return error.error_non_exist_user_id(user_id)

        self.conn.commit()"""
    except pg.Error as e:
        return 528, "{}".format(str(e))
    except BaseException as e:
        return 530, "{}".format(str(e))

    return 200, "ok"
```

卖方添加书：

```
#添加书的信息。从 user_store\store\users 中查询 id 是否存在。书的信息不能已经存在。
#向 store 中插入书的信息，包括卖家 id、书 id、书信息（结构体）、库存数量。
def add_book(self, user_id: str, store_id: str, book_id: str, book_json_str: str, stock_level: int):
    try:
        if not self.user_id_exist(user_id):
            return error.error_non_exist_user_id(user_id)
        if not self.store_id_exist(store_id):
```

```
                return error.error_non_exist_store_id(store_id)
            if self.book_id_exist(store_id, book_id):
                return error.error_exist_book_id(book_id)

            self.conn.execute("INSERT into store(store_id, book_id, book_info, stock_level)"
                              "VALUES (%s, %s, %s, %s)", (store_id, book_id, book_json_str,
stock_level))
            #self.conn.commit()
        except pg.Error as e:
            return 528, "{}".format(str(e))
        except BaseException as e:
            return 530, "{}".format(str(e))
        return 200, "ok"
```

增加库存：

```
#增加书的库存水平。用户、店铺、书必须存在。将指定店铺中指定书籍的库存容量增加
add_stock_level 个。
def add_stock_level(self, user_id: str, store_id: str, book_id: str, add_stock_level: int):
    try:
        if not self.user_id_exist(user_id):
            return error.error_non_exist_user_id(user_id)
        if not self.store_id_exist(store_id):
            return error.error_non_exist_store_id(store_id)
        if not self.book_id_exist(store_id, book_id):
            return error.error_non_exist_book_id(book_id)

        self.conn.execute("UPDATE store SET stock_level = stock_level + %s "
                          "WHERE store_id = %s AND book_id = %s", (add_stock_level,
store_id, book_id))
        #self.conn.commit()
    except pg.Error as e:
        return 528, "{}".format(str(e))
    except BaseException as e:
        return 530, "{}".format(str(e))
    return 200, "ok"
```

创建店铺：

```
#创建店铺。用户 id 不能不存在，店铺 id 不能已经存在。向 user_store 中插入（店铺，用
户）对
def create_store(self, user_id: str, store_id: str) -> (int, str):
    try:
        if not self.user_id_exist(user_id):
            return error.error_non_exist_user_id(user_id)
        if self.store_id_exist(store_id):
            return error.error_exist_store_id(store_id)
        self.conn.execute("INSERT into user_store(store_id, user_id)"
                          "VALUES (%s, %s)", (store_id, user_id))
```

```
        #self.conn.commit()
    except pg.Error as e:
        return 528, "{}".format(str(e))
    except BaseException as e:
        return 530, "{}".format(str(e))
    return 200, "ok"
```

扩展功能：

①收货和发货功能实现：
为卖家提供一个发货接口，对于已经付款的订单（存在 paid_order 中），确认信息之后进行发货，改变 paid_id 状态位（“待发货”——“发货中”）
函数实现：

```
def send_item(self, user_id: str, order_id: str) -> (int, str):
    try:
        if not self.user_id_exist(user_id):
            return error.error_non_exist_user_id(user_id)
        #检查发货人信息
        cursor = self.conn.execute("SELECT store_id,state FROM paid_order WHERE order_id =
%s", (order_id,))
        row = self.conn.fetchone()
        if row is None:
            return error.error_invalid_order_id(order_id)
        store_id = row['store_id']
        state=row['state']
        cursor = self.conn.execute("SELECT user_id FROM user_store WHERE store_id = %s",
(store_id,))
        row = self.conn.fetchone()
        seller_id = row['user_id']
        if seller_id != user_id:
            return error.error_authorization_fail()
        if state=='发货中':
            return error.error_repeatsend()
        self.conn.execute("UPDATE paid_order SET state = %s "
                          "WHERE order_id = %s ", ('发货中',order_id))

    except pg.Error as e:
        return 528, "{}".format(str(e))
    except BaseException as e:
        return 530, "{}".format(str(e))
    return 200, "ok"
```

检查完用户和订单信息之后，还要检查 state 位，如果该货物已经在发货中则报错

为买家提供一个收货接口，收货之后，该订单变为历史订单，存入 history_order/history_order_detail（paid_order 中信息删除）中
函数实现：

```
def receive_item(self, user_id: str, order_id: str) -> (int, str):
    try:
        if not self.user_id_exist(user_id):
            return error.error_non_exist_user_id(user_id)

        # 检查收货人信息
        cursor = self.conn.execute("SELECT user_id,store_id,state FROM paid_order WHERE order_id = %s", (order_id,))
        row = self.conn.fetchone()
        if row is None:
            return error.error_invalid_order_id(order_id)

        buyer_id = row['user_id']
        state = row['state']
        store_id = row['store_id']
        if buyer_id != user_id:
            return error.error_authorization_fail()

        if state == '待发货':
            return error.error_receive_fail()

        # 收货完成，该订单记录为历史订单
        cursor = self.conn.execute(
            "INSERT INTO history_order(order_id,user_id,store_id) "
            "VALUES(%s, %s, %s);",
            (order_id, user_id, store_id))

        self.conn.execute("SELECT book_id, count, price FROM paid_order_detail WHERE order_id = %s;", (order_id,))
        cursor = self.conn.fetchall()
        total_price = 0
        bookids = []
        counts = []
        prices = []
        for row in cursor:
            bookids.append(row['book_id'])
            counts.append(row['count'])
            prices.append(row['price'])

        for i in range(len(bookids)):
            cursor = self.conn.execute(
```

```
                    "INSERT INTO history_order_detail(order_id,book_id,count,price) "
                    "VALUES(%s, %s, %s, %s);",
                    (order_id, bookids[i], counts[i], prices[i]))

        # 删除订单信息
        cursor = self.conn.execute("DELETE FROM paid_order WHERE order_id = %s", (order_id,))
        cursor = self.conn.execute("DELETE FROM paid_order_detail where order_id = %s",
(order_id,))

        # self.conn.commit()
    except pg.Error as e:
        return 528, "{}".format(str(e))
    except BaseException as e:
        return 530, "{}".format(str(e))
    return 200, "ok"
```

②订单查询实现：

由于订单可能出现在三个表中（new_order、paid_order、history_order）所以首先执行三个 sql 语句查询订单当前进度（位于哪个表中），并从对应的 xxx_order_detail 中提取订单详细信息，最后加上一个状态位返回给用户（未付款、待发货、发货中、已完成四种）

函数实现：

```
# 查询历史订单
def query(self, user_id: str, order_id: str) -> (int, str, str):
    conn = self.conn
    try:
        # 检查订单进度（未付款、已付款、已交付）
        cursor = conn.execute("SELECT user_id, store_id FROM new_order WHERE order_id
= %s",
                              (order_id,))
        row_new = conn.fetchone()
        cursor = conn.execute("SELECT user_id, store_id,state FROM paid_order WHERE order_id
= %s",
                              (order_id,))
        row_paid = conn.fetchone()
        cursor = conn.execute("SELECT user_id, store_id FROM history_order WHERE order_id
= %s",
                              (order_id,))
        row_history = conn.fetchone()

        if row_new is None and row_paid is None and row_history is None:
            return error.error_invalid_order_id(order_id)
        elif row_new is not None:
            print('new')
            buyer_id = row_new['user_id']
            store_id = row_new['store_id']
            if buyer_id != user_id:
```

```
                return error.error_authorization_fail()

            conn.execute("SELECT book_id, count FROM new_order_detail WHERE order_id
= %s;", (order_id,))
            cursor = conn.fetchall()

            books = []
            for row in cursor:
                dict = {}
                dict["id"] = row['book_id']
                dict["count"] = row['count']
                books.append(dict)
            json_text = {}
            json_text["user_id"] = buyer_id
            json_text["store_id"] = store_id
            json_text["books"] = books
            json_text["order_state"] = "unpaid"
            return 200, "ok", str(json_text)
        elif row_paid is not None:
            print('paid')
            buyer_id = row_paid['user_id']
            store_id = row_paid['store_id']
            state = row_paid['state']
            if buyer_id != user_id:
                return error.error_authorization_fail()

            conn.execute("SELECT book_id, count FROM paid_order_detail WHERE order_id
= %s;", (order_id,))
            cursor = conn.fetchall()

            books = []
            for row in cursor:
                dict = {}
                dict["id"] = row['book_id']
                dict["count"] = row['count']
                books.append(dict)
            json_text = {}
            json_text["user_id"] = buyer_id
            json_text["store_id"] = store_id
            json_text["books"] = books
            json_text["order_state"] = state
            return 200, "ok", str(json_text)
        elif row_history is not None:
            print('his')
            buyer_id = row_history['user_id']
            store_id = row_history['store_id']
            if buyer_id != user_id:
```

```
                return error.error_authorization_fail()

            conn.execute("SELECT book_id, count FROM history_order_detail WHERE order_id
= %s;", (order_id,))
            cursor = conn.fetchall()

            books = []
            for row in cursor:
                dict = {}
                dict["id"] = row['book_id']
                dict["count"] = row['count']
                print(dict)
                books.append(dict)
            json_text = {}
            json_text["user_id"] = buyer_id
            json_text["store_id"] = store_id
            json_text["books"] = books
            json_text["order_state"] = "finished"
            print(json_text)
            return 200, "ok", str(json_text)

    except pg.Error as e:
        return 528, "{}".format(str(e))

    except BaseException as e:
        return 530, "{}".format(str(e))
```

③取消订单实现：

做出以下规定——只有未付款或者是已付款但未发货的用户才能取消订单，付款后已发货的用户无法取消订单。如果已经付款，则会退回相应钱款数目。取消后的订单存放在 history_order 中供用户查询。

```
def cancel(self, user_id: str, order_id: str) -> (int, str):
    conn = self.conn
    try:

        cursor = conn.execute("SELECT user_id, store_id FROM new_order WHERE order_id
= %s",
                              (order_id,))
        row_new = conn.fetchone()
        cursor = conn.execute("SELECT user_id, store_id,state FROM paid_order WHERE order_id
= %s",
                              (order_id,))
        row_paid = conn.fetchone()
        if row_new is None and row_paid is None:
            return error.error_invalid_order_id(order_id)
        elif row_new is not None:
            buyer_id = row_new['user_id']
```

```
                store_id = row_new['store_id']
                cursor = conn.execute("SELECT store_id, user_id FROM user_store WHERE store_id
= %s;", (store_id,))
                row = conn.fetchone()
                seller_id = row['user_id']

                if not self.user_id_exist(seller_id):
                    return error.error_non_exist_user_id(seller_id)
                if buyer_id != user_id:
                    return error.error_authorization_fail()

                # 订单未付款，接受取消操作，该订单写入历史订单
                cursor = self.conn.execute(
                    "INSERT INTO history_order(order_id,user_id,store_id) "
                    "VALUES(%s, %s, %s);",
                    (order_id, user_id, store_id))

                self.conn.execute("SELECT book_id, count, price FROM new_order_detail WHERE
order_id = %s;",
                                  (order_id,))
                cursor = self.conn.fetchall()

                bookids = []
                counts = []
                prices = []

                for row in cursor:
                    bookids.append(row['book_id'])
                    counts.append(row['count'])
                    prices.append(row['price'])


                for i in range(len(bookids)):
                    cursor = self.conn.execute(
                        "INSERT INTO history_order_detail(order_id,book_id,count,price) "
                        "VALUES(%s, %s, %s, %s);",
                        (order_id, bookids[i], counts[i], prices[i]))


                # 删除订单信息
                cursor = self.conn.execute("DELETE FROM new_order WHERE order_id = %s",
(order_id,))
                cursor = self.conn.execute("DELETE FROM new_order_detail where order_id = %s",
(order_id,))

                return 200, "ok"
            elif row_paid is not None:
```

```
            buyer_id = row_paid['user_id']
            store_id = row_paid['store_id']
            state = row_paid['state']
            cursor = conn.execute("SELECT store_id, user_id FROM user_store WHERE store_id
= %s;", (store_id,))
            row = conn.fetchone()
            seller_id = row['user_id']

            if not self.user_id_exist(seller_id):
                return error.error_non_exist_user_id(seller_id)
            if buyer_id != user_id:
                return error.error_authorization_fail()
            if state == "发货中":
                return error.error_cancel()
            # 订单未发货，接受取消操作，该订单写入历史订单，退款
            cursor = self.conn.execute(
                "INSERT INTO history_order(order_id,user_id,store_id) "
                "VALUES(%s, %s, %s);",
                (order_id, user_id, store_id))

            self.conn.execute("SELECT book_id, count, price FROM paid_order_detail WHERE
order_id = %s;",
                                  (order_id,))
            cursor = self.conn.fetchall()
            total_price = 0
            bookids = []
            counts = []
            prices = []

            for row in cursor:
                bookids.append(row['book_id'])
                counts.append(row['count'])
                prices.append(row['price'])
                count = row['count']
                price = row['price']
                total_price = total_price + price * count

            for i in range(len(bookids)):
                cursor = self.conn.execute(
                    "INSERT INTO history_order_detail(order_id,book_id,count,price) "
                    "VALUES(%s, %s, %s, %s);",
                    (order_id, bookids[i], counts[i], prices[i]))
            # 买家增加相应钱款
            cursor = conn.execute("UPDATE users set balance = balance + %s"
                                  "WHERE user_id = %s AND balance >= %s",
                                  (total_price, buyer_id, total_price))
```

```
            # 卖家减少相应钱款
            cursor = conn.execute("UPDATE users set balance = balance - %s"
                                  "WHERE user_id = %s",
                                  (total_price, seller_id))

            # 删除订单信息
            cursor = self.conn.execute("DELETE FROM paid_order WHERE order_id = %s",
(order_id,))
            cursor = self.conn.execute("DELETE FROM paid_order_detail where order_id = %s",
(order_id,))

            return 200, "ok"


    except pg.Error as e:
        return 528, "{}".format(str(e))

    except BaseException as e:
        return 530, "{}".format(str(e))
```

④搜索功能：

参数化的搜索。可搜索的参数和 store 及 book_info 中参数一致，每个检索条件以列表形式传入（也可不传入），返回匹配满足条件的所有结果。对 tags，要求结果满足包含传入参数的所有元素。对其他参数，要求结果满足包含传入参数中的至少一个。这样可以实现限制条件较丰富的查询。

要全站搜索，只需不传入 store 参数。要搜索某一个或某几个店铺中的内容，只需要传入对应的 store 列表。

例如，传入参数 target_store_id=[‘store1’,’store2’],target_title=[‘book1’,’book2’],target_tags=[‘tags1’,’tags2,’tags3’],则查询的对象为 store1 和 store2 中书标题为 book1 或 book2、且书的 tags 包含全部三者的条目。如果全部参数都为空，就等同于返回所有书的信息（通过修改代码来限制返回结果的数量是容易的）。

```
def
search_by_arguments(self,target_store_id:list=None,target_id:list=None,target_title:list=None,tar
get_tags:list=None,

target_author:list=None,target_publisher:list=None,target_original_title:list=None,target_translat
or:list=None,

target_pub_year:list=None,target_pages:list=None,target_price:list=None,target_binding:list=Non
e,

target_isbn:list=None,target_author_intro:list=None,target_book_intro:list=None,target_content:li
st=None,
                                target_stock_level:int=None
                                ):
```

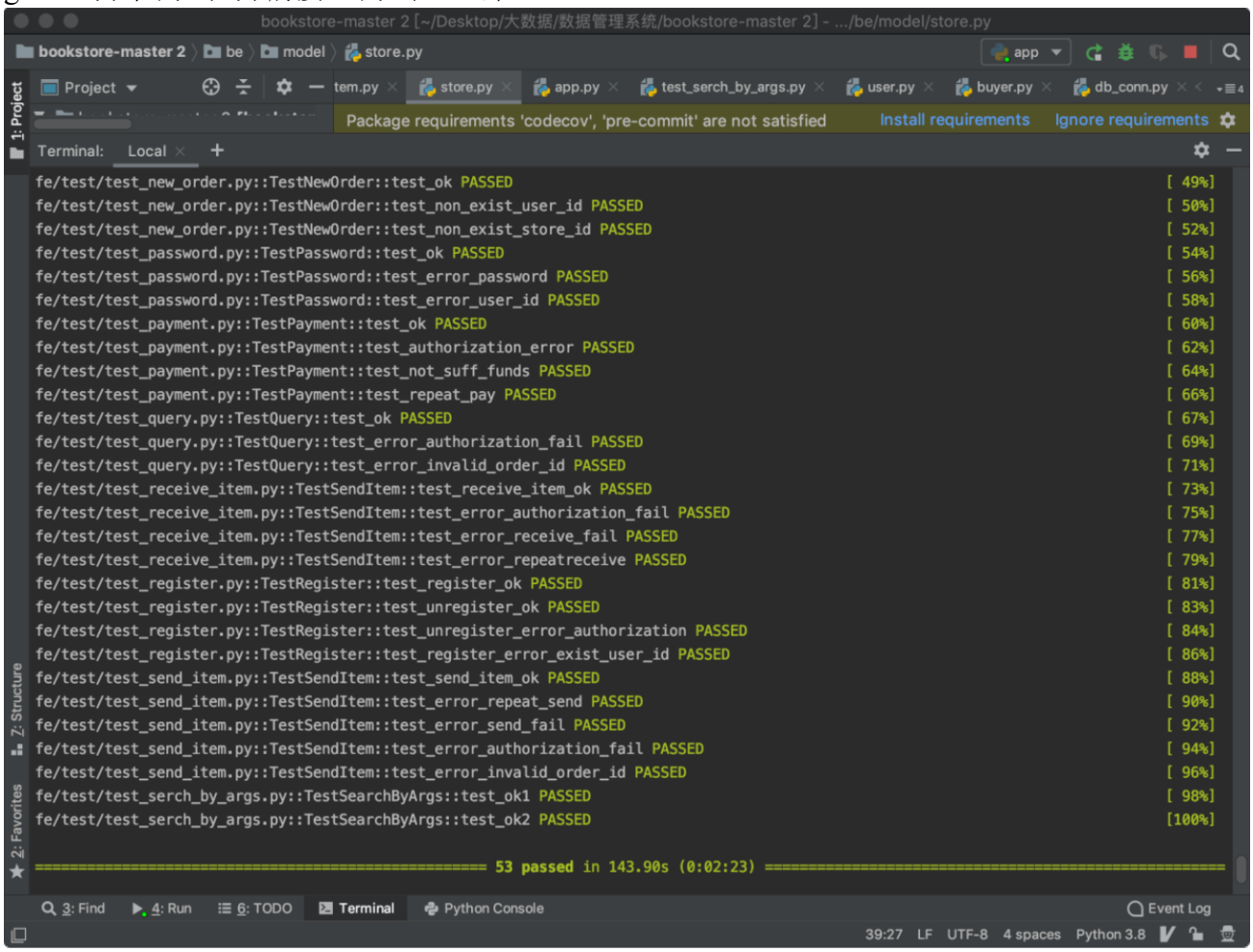
```
        if target_store_id == None or target_store_id==[]:#全站搜索
            self.conn.execute("""
                select * from store
                """)
        else:#指定店铺
            if len(target_store_id)==1:
                self.conn.execute("""
                            select * from store where store_id=%s
                            """, (target_store_id[0],))
            else:
                cond='store_id='+'\''+target_store_id[0]+'\''
                for x in target_store_id[1:]:
                    cond+=' or store_id='+'\''+x+'\''
                print(cond)
                self.conn.execute("""
                            select * from store where {}
                            """.format(cond,))
        ans = self.conn.fetchall()
        ret = []
        for entry in ans:
                flag = 1
                store_id = entry['store_id']
                stock_level = entry['stock_level']
                book_info = entry['book_info']
                book_info = json.loads(book_info)
                tags = book_info['tags']
                pictures = book_info['pictures']
                id = book_info['id']
                title = book_info['title']
                author = book_info['author']
                publisher = book_info['publisher']
                original_title = book_info['original_title']
                translator = book_info['translator']
                pub_year = book_info['pub_year']
                pages = book_info['pages']
                price = book_info['price']
                binding = book_info['binding']
                isbn = book_info['isbn']
                author_intro = book_info['author_intro']
                book_intro = book_info['book_intro']
                content = book_info['content']
                if target_id!=None and target_id!=[] and not any(item in id for item in target_id):#id 任意满足

                    continue
                if target_tags != None and target_tags !=[] and not all(item in tags for item in target_tags):#tag 要全部满足
```

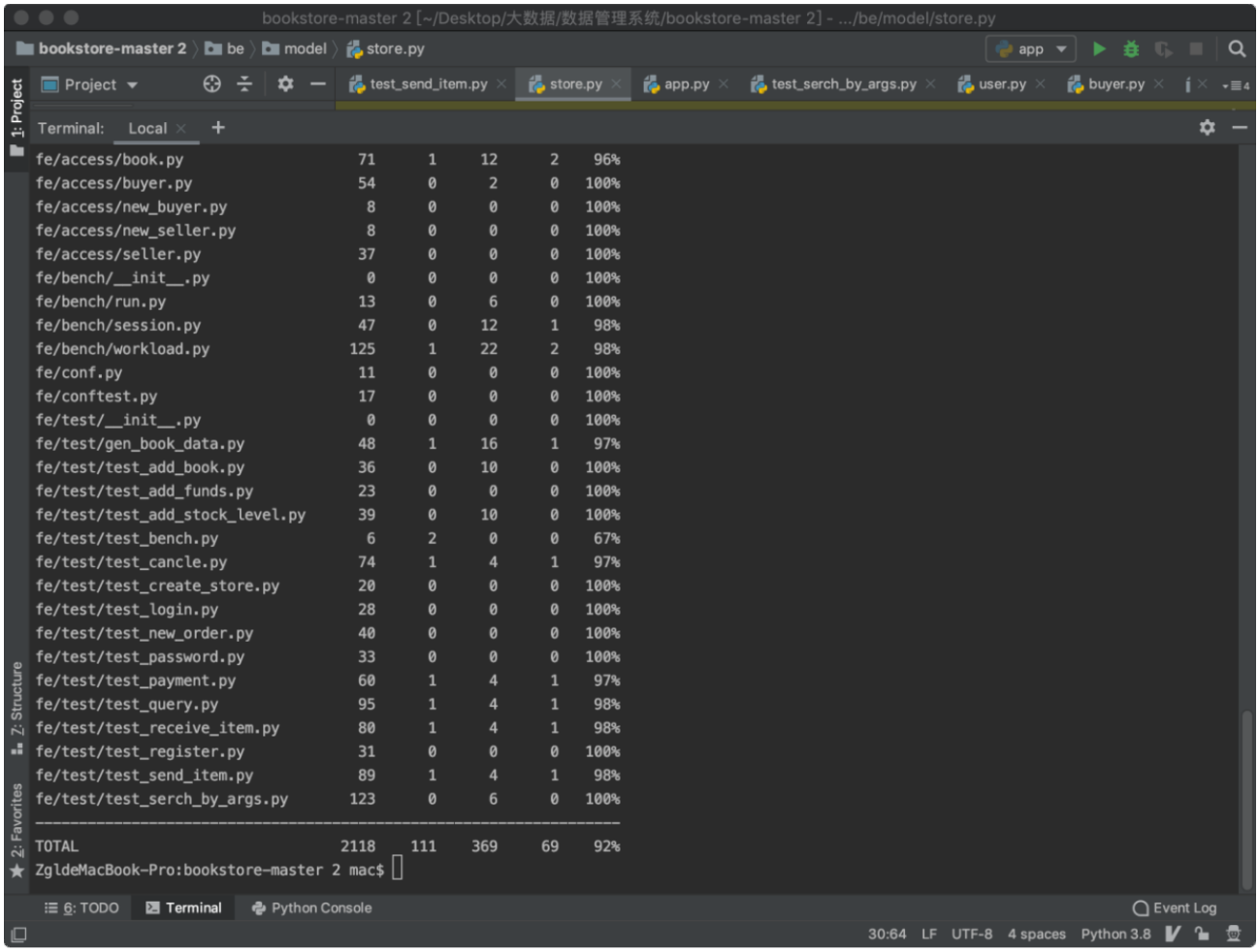
```
                flag = 0
                continue
            if target_title!=None and target_title!=[] and not any(item in title for item in target_title):

                continue
            if target_author!=None and target_author!=[] and not any(i in author for i in
target_author):

                continue
            if target_publisher!=None and target_publisher!=[] and not any(i in publisher for i in
target_publisher):

                continue
            if target_original_title!=None and target_original_title!=[] and not any(i in original_title
for i in target_original_title):

                continue
            if target_translator!=None and target_translator!=[] and not any(i in translator for i in
target_translator):

                continue
            if target_pub_year!=None and target_pub_year!=[] and not any(i in pub_year for i in
target_pub_year):

                continue
            if target_pages!=None and target_pages!=[] and not any(i in pages for i in target_pages):

                continue
            if target_price!=None and target_price!=[] and not any(i in price for i in target_price):

                continue
            if target_binding!=None and target_binding!=[] and not any(i in binding for i in
target_binding):

                continue
            if target_isbn!=None and target_isbn!=[] and not any(i in isbn for i in target_isbn):

                continue
            if target_author_intro!=None and target_author_intro!=[] and not any(i in author_intro
for i in target_author_intro):

                continue
            if target_book_intro!=None and target_book_intro!=[] and not any(i in book_intro for i in
target_book_intro):

                continue
            if target_content!=None and target_content!=[] and not any(i in content for i in
```

```
target_content):

                continue
            if target_stock_level!=None and target_stock_level!=[] and target_stock_level >
stock_level:

                continue
            if flag==1:
                ret.append(dict(entry))

        return 200, ret
```

Pytest：

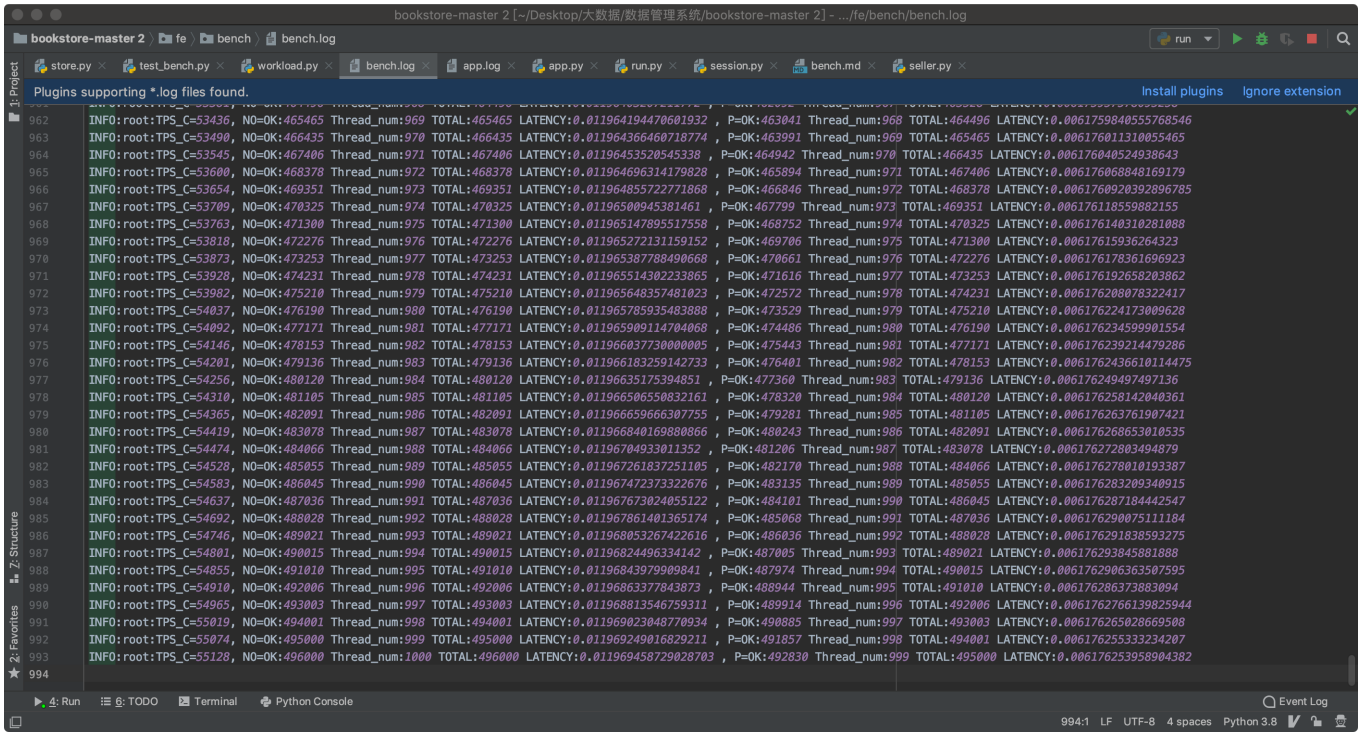
github 自带测试+自编接口测试，全部通过





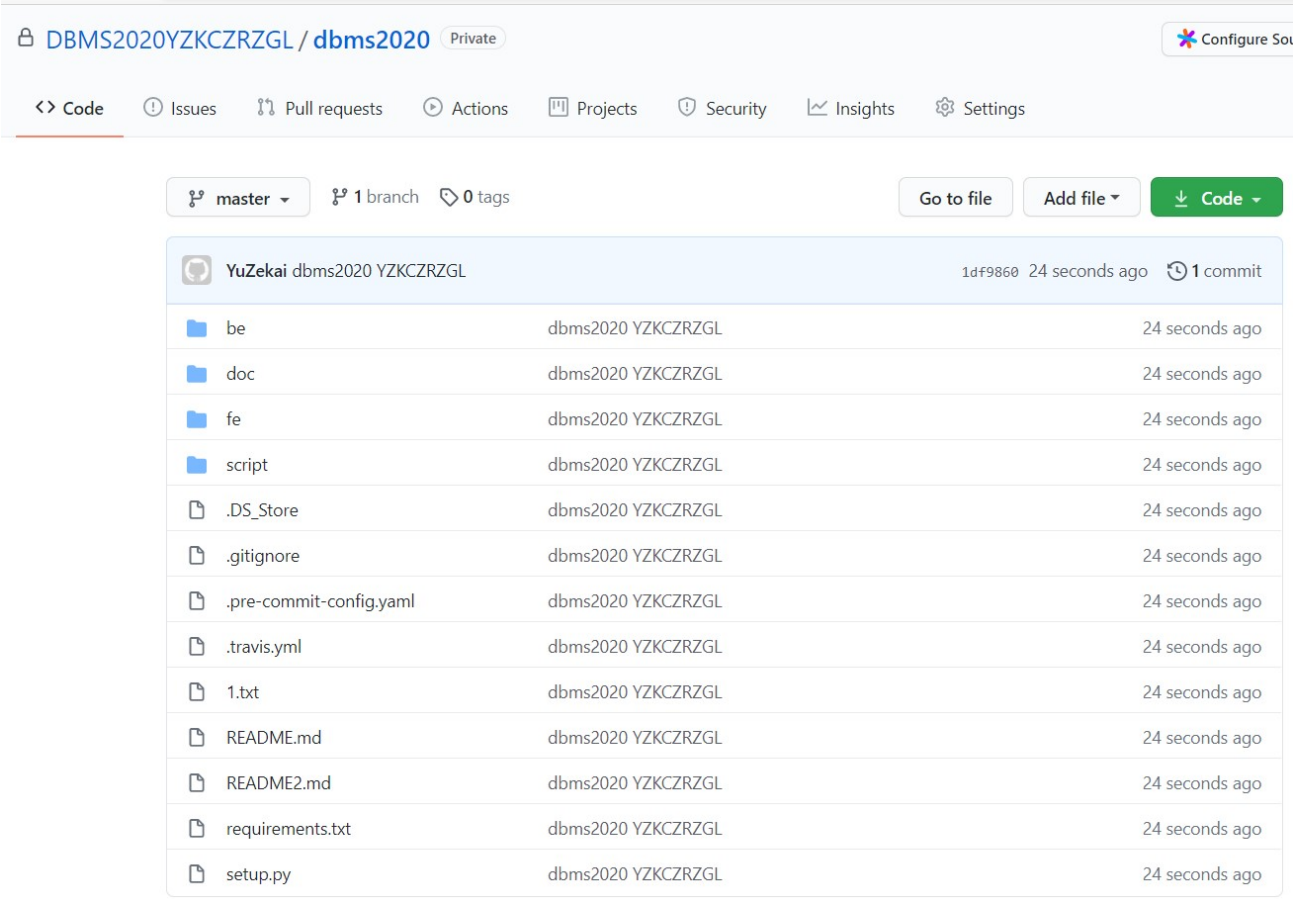
覆盖率 92%

性能测试 吞吐量、延时等：
每秒五万三千-五万五千笔左右下单、付款操作



其他：

创建了 github 组织并提交了项目代码



五、总结

本次项目使我们更好地了解了关系型数据库的设计和使用，也进一步熟悉了 flask 架构和 pytest 代码测试等。由于时间和水平有限，项目还有很多可以改进的空间，例如使用 ORM、优化表的设计、实现更多功能等等，如有机会将继续改进。