

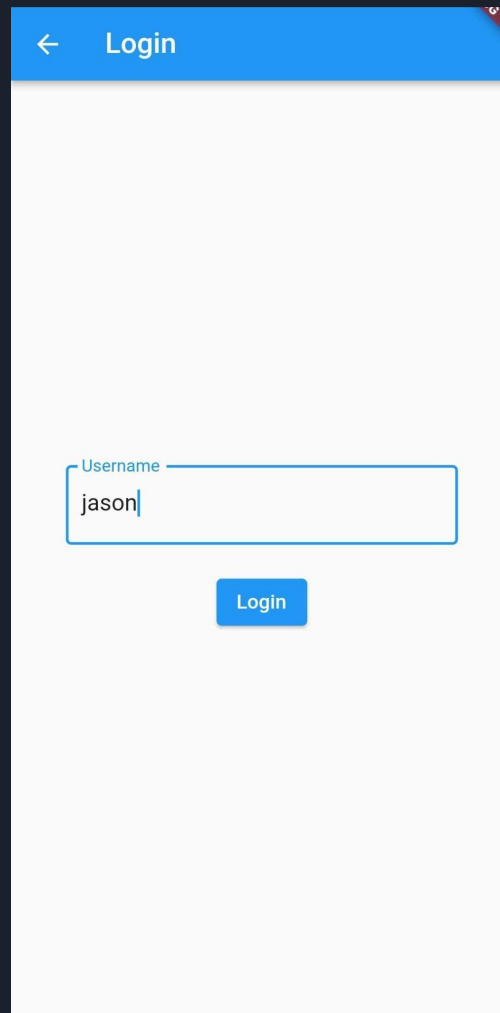
居家電量分析系統 結案報告

00957009 鄧暉宣

00957050 張銀軒

前端APP

使用者登入介面



A mobile application login screen mockup. The screen has a white background with a blue header bar at the top. The header bar contains a back arrow icon and the text "Login". Below the header, there is a large white rectangular area. In the center of this area, there is a text input field with a blue border. The input field has a placeholder label "Username" and the text "jason" entered. Below the input field, there is a blue button with the text "Login".

← Login

Username

jason

Login

前端APP

插座、類別總覽

Power ...		
^	bedroom	32.07 kWh
	lava lamp	32.07 kWh
^	kitchen	0.00 kWh
	oven	0.00 kWh
	microwave	0.00 kWh
	dishwasher	0.00 kWh
^	living room	0.00 kWh
	tv	0.00 kWh
^	study	0.00 kWh
	acer laptop	0.00 kWh
^	Uncategorized	0.00 kWh
Sockets		Stats

前端APP

插座、類別增刪操作

Power ...

^	Uncategorized	127.00 kWh
	lava lamp	127.00 kWh

Add Power Socket Category

Power Socket Category Name

Cancel Add

Power ...

^	Uncategorized	127.00 kWh
	lava lamp	127.00 kWh

Add Power Socket

Power Socket Name

Power Socket Category Name

Cancel Add

Power ...

^	Uncategorized	127.00 kWh
	lava lamp	127.00 kWh

Add Power Socket

Power Socket Name

Power Socket Category Name

Cancel Add

Power ...

^	Uncategorized	127.00 kWh
	lava lamp	127.00 kWh

Delete All Power Socket Category





Are you sure?

Cancel Delete

前端APP

總電量/電費 時間區間查詢

Power ...



總電量

0.00 kWh

總電費

0.00 NT

起始時間

2010-01-01 00:00:00


結束時間


2030-01-01 00:00:00

現在時間

test

查詢


Sockets


Stats

後端

後端提供的api功能, 所有API都能分辨用戶

- 註冊/登入
- 插座、類別的CURD
- 查詢 單一插座/單一類別/全部 在給定時間區間的 電費/電量
- 查詢的時間包含未來則會給出預測的電費/電量



後端-資料庫



MongoDB[®]

Atlas

```
_id: ObjectId('6471193fc9ea84e855209b20')
user: "64711640c9ea84e855209b06"
category: "music"
name: "speaker"
▶ power: Array
  __v: 0
```

```
_id: ObjectId('6474859ba8d3a812b13daa40')
user: "646f04774794b70649920476"
category: "bedroom"
name: "lava lamp"
▶ power: Array
  ▶ 0: Object
  ▶ 1: Object
  ▶ 2: Object
  ▶ 3: Object
    start_time: 1685447173
    end_time: 1685447179
    consumption: 0
  ▶ 4: Object
  ▶ 5: Object
  ▶ 6: Object
```

```
_id: ObjectId('646f04774794b70649920476')
name: "Bob"
▼ category: Array
  0: "outdoor"
  1: "basement"
▼ power_socket: Array
  0: ObjectId('6474859ba8d3a812b13daa40')
  1: ObjectId('647485baa8d3a812b13daa44')
  2: ObjectId('647485c7a8d3a812b13daa48')
  3: ObjectId('647485dca8d3a812b13daa4c')
  4: ObjectId('6474860ca8d3a812b13daa50')
  5: ObjectId('64748639a8d3a812b13daa58')
  6: ObjectId('6474d3139162db6563c29385')
  7: ObjectId('6475e78323c391d123870abb')
  8: ObjectId('6475e7c323c391d123870b00')
  9: ObjectId('6475edb6d83292c1741a469c')
  __v: 0
```

```
_id: ObjectId('6473e8ca3a5f2aa90813e84c')
name: "Amber"
▶ category: Array
▶ power_socket: Array
  __v: 0
```



AI預測

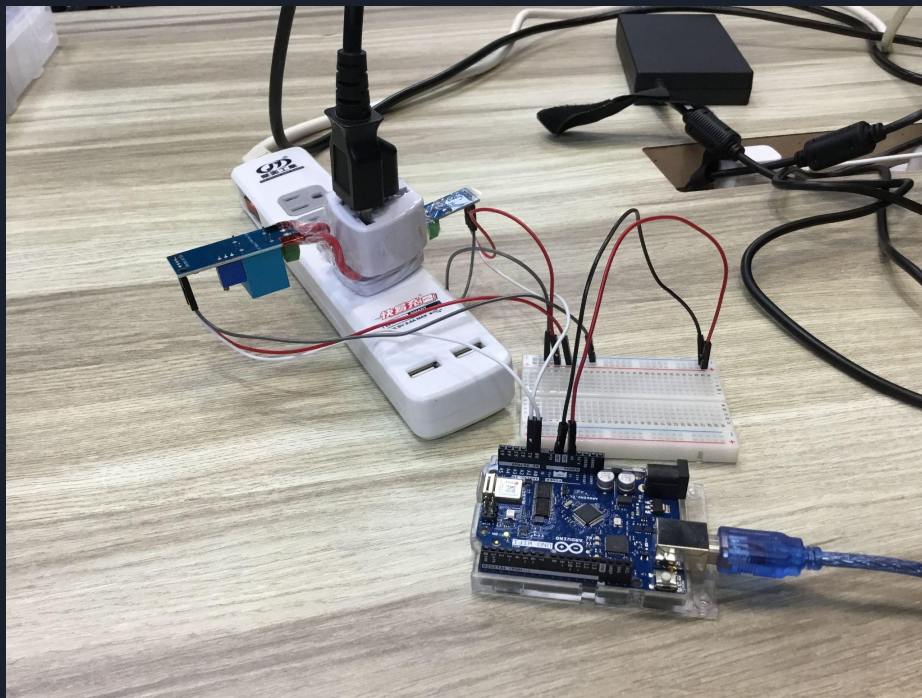
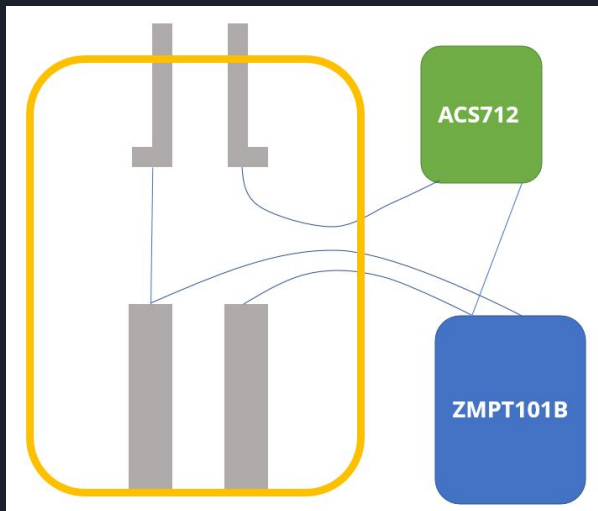
輸入：

- 以分鐘為單位的歷史電量資料
- 欲預測的時間長度

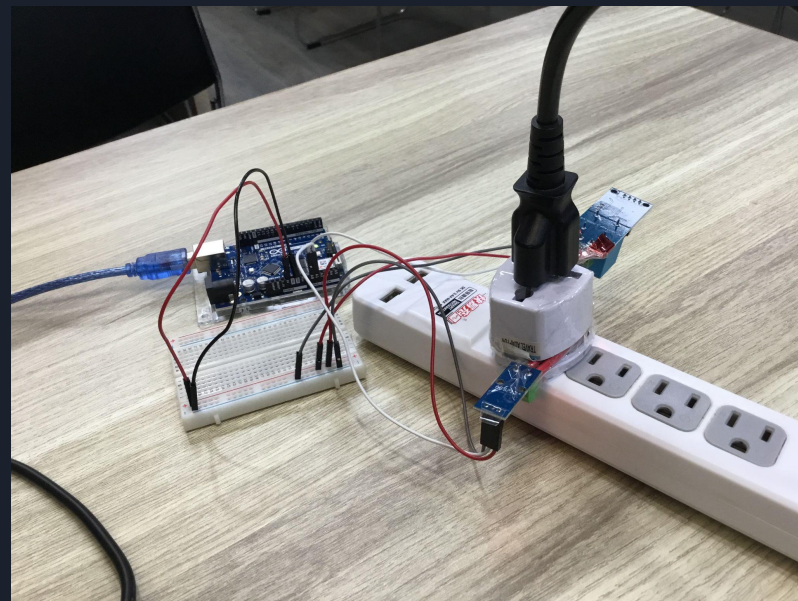
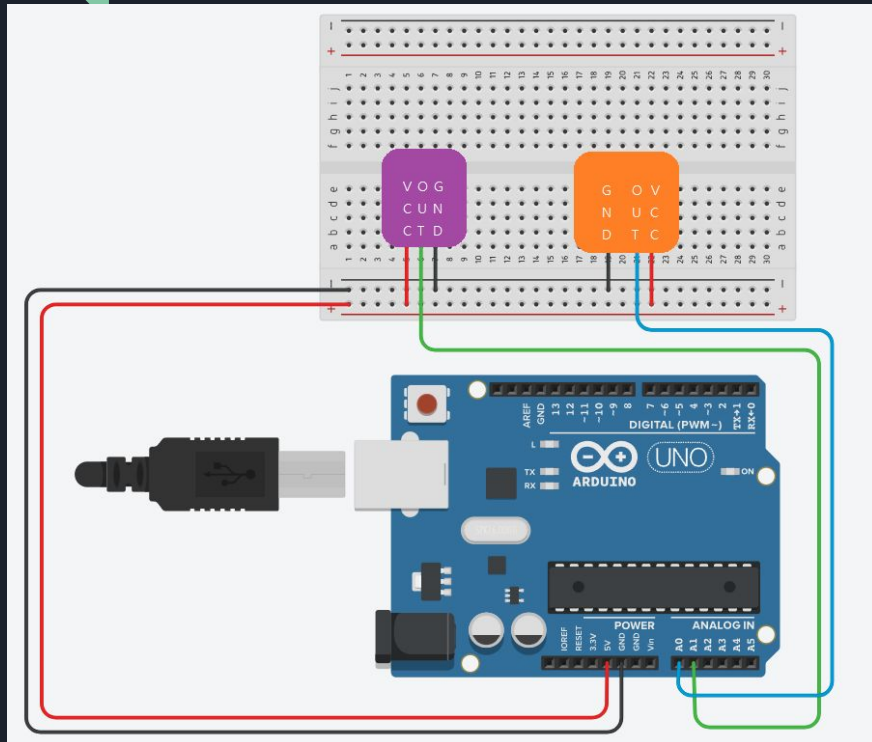
輸出：預測的總電量

使用LSTM作為預測模型

硬體&Arduino



硬體&Arduino





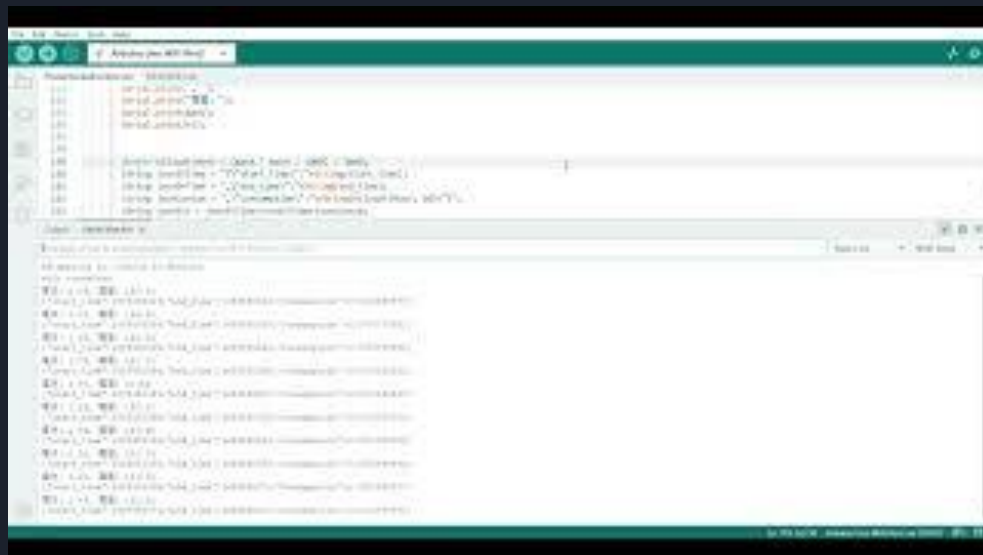
硬體&Arduino

程式碼架構

1. 每隔一段時間讀取感測器數值(電壓 & 電流), 並進行處理
2. 換算成x度電
3. 把資料post到後端



demo



```
1 // Keypad library
2 #include <Keypad.h>
3
4 // Keypad pin constants
5 #define ROWS 4
6 #define COLUMNS 4
7
8 // Keypad array
9 char keys[ROWS][COLUMNS] = {
10   {'1','2','3','A'},
11   {'4','5','6','B'},
12   {'7','8','9','C'},
13   {'*','0','#','D'}
14 };
15
16 // Keypad object
17 Keypad keypad = Keypad(ROWS, COLUMNS, keys);
18
19 // Serial port
20 #define SERIAL_PORT Serial
21 #define SERIAL_BAUD 9600
22
23 // Main function
24 void setup() {
25   SERIAL_PORT.begin(SERIAL_BAUD);
26   SERIAL_PORT.println("Keypad demo");
27 }
28
29 // Loop function
30 void loop() {
31   char key = keypad.getKey();
32   if (key) {
33     SERIAL_PORT.print(key);
34     SERIAL_PORT.println();
35   }
36 }
```



未來展望

1. 電線粗細調整(感測器與電線的粗細需要相同尺寸)
2. 感測器連接方式
3. 處理電費計算方式(夏季電費)
4. 修正電壓數值



Github

<https://github.com/IoTPowerConsumptionAnalysisTeam>