COMP208 Demo

Team 38
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Outline

1. Aim
2. Features
3. System Internals
4. Special Features
5. Website Demonstration

Aim

AI-based Business Intelligence Website

- Provide optimized pricing strategies for a higher profit or customized goal
- Provide customer persona analysis to locate optimal/potential customer group
- Provide concise and clear business metrics forecast

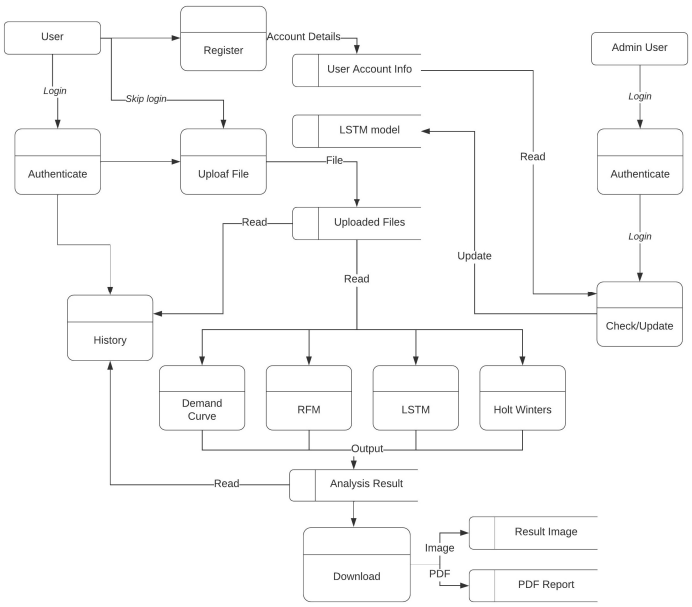
Features

AI-based Business Intelligence Website

- Data Entry: Register, Login, Choose Function Number, Upload File, Enter Prediction Days
- Data Modifications: Update LSTM Model, Enter Prediction Days
- Queries and Reports: Download PDF report, Analysis History
- User View: Guest, Registered User, Administrator

Features

Data Flow Diagram



System Internals

AI-based Business Intelligence Website

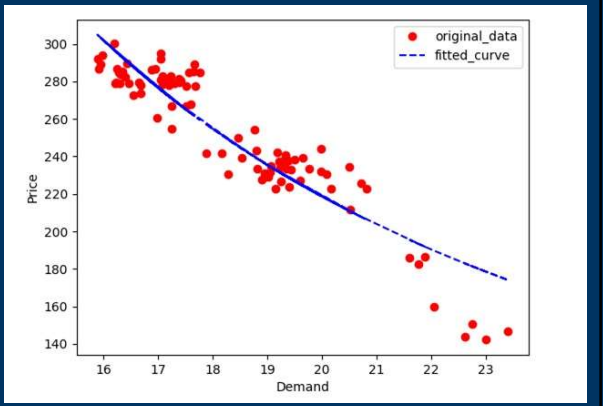
- **Web Front-end:** Vue.js, jQuery, Bootstrap, Echarts, Axios
- **Web Back-end:** Django REST framework, TensorFlow+Keras, statsmodels, scikit-learn, squarify, scipy
- **Database Maintain & Query:** SQLite3 Django Integration

Special Features 1

Demand Curve Fitting

Pseudocode

```
Objective(x, alpha, beta):
    return exp(alpha * log(x) + beta)
Main():
    x, y = read_csv()
    param, param_cov = curve_fit(Objective, x, y)
    optimal_alpha = param[0]
    optimal_beta = param[1]
    ans = exp(optimal_alpha * log(x) + optimal_beta)
    plot(original_data)
    plot(fitted_curve)
```



Special Features 2

RFM Prediction Algorithm

Pseudocode

```
RFM_level(input):
   switch case for certain intervals:
   assign corresponding RFM segment (customer group)
Main():
   data = read_csv()
   data.'TotalSales' = data.'Quantity' * data.'UnitPrice'
   SnapshotDate = data.'InvoiceDate'.max() + timedelta(days=1)
   data.groupby('CustomerID')
   data.aggregate({
        'InvoiceDate': lambda x: (SnapshotDate - x.max()).days,
        'InvoiceNo': 'count',
        'TotalSales': 'sum'}))
   data.rename(
        'InvoiceDate': 'Recency (R)',
        'InvoiceNo': 'Frequency (F)',
        'TotalSales': 'MonetaryValue (M)')
   For each 'R', 'M' and 'M' in data:
         assign 4 labels to 4 percentile groups
   data.add_column(RFM_score) = Column_Sum('R','F','M')
   data.add_column(RFM_level) = RFM_level(data.RFM_score)
   data.groupby(RFM_level)
   For each i in RFM_level:
         add {i: Count(i)} to RFM_map
   plot_treemap(RFM_map)
```

Special Features 3

Holt-winters Algorithm

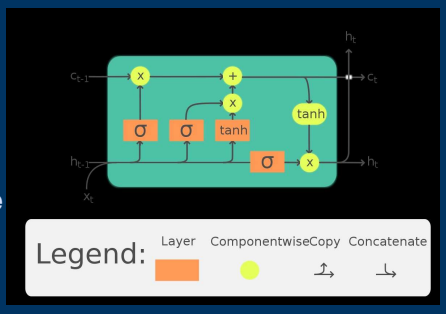
- Holt-Winters method is also known as triple exponential smoothing.
- It is a combination of 3 other much simpler components:
  - Simple Exponential Smoothing (SES)
  - Holt's Exponential Smoothing (HES)
  - Winter's Exponential Smoothing (WES)

- Holt-Winters can model three aspects of the time series: average, the trend over time, and seasonality (a cyclical repeating pattern).
- It allows users to smooth a time series and forecast selected areas with data.

Special Features 4

LSTM Model Algorithm

We predict a “future value” with “historical data” and assume it as “historical” for next round.
It means to predict & assume iteratively “towards the future”.



Pseudocode

Input: Upload Data, Future (int)

create an empty List named Prediction (List)
load pre-trained model
For k=1 to future do:
    predict next value with the last row of Uploaded Data
    add the predicted value to Prediction (List)
    append predicted value to the end of Upload Data

Output: Prediction (List)

Layer (type)	Output Shape	Param #
lstm_4 (LSTM)	(None, 1, 50)	10400
dropout_4 (Dropout)	(None, 1, 50)	0
lstm_5 (LSTM)	(None, 1, 60)	26640
dropout_5 (Dropout)	(None, 1, 60)	0
lstm_6 (LSTM)	(None, 1, 80)	45120
dropout_6 (Dropout)	(None, 1, 80)	0
lstm_7 (LSTM)	(None, 120)	96480
dropout_7 (Dropout)	(None, 120)	0
dense_1 (Dense)	(None, 1)	121

Total params: 178,761
Trainable params: 178,761
Non-trainable params: 0

Live Demo

AI-based Business Intelligence Website

Website: http://www.group-38.com
Video: https://stream.liv.ac.uk/archfsv5

User Manual

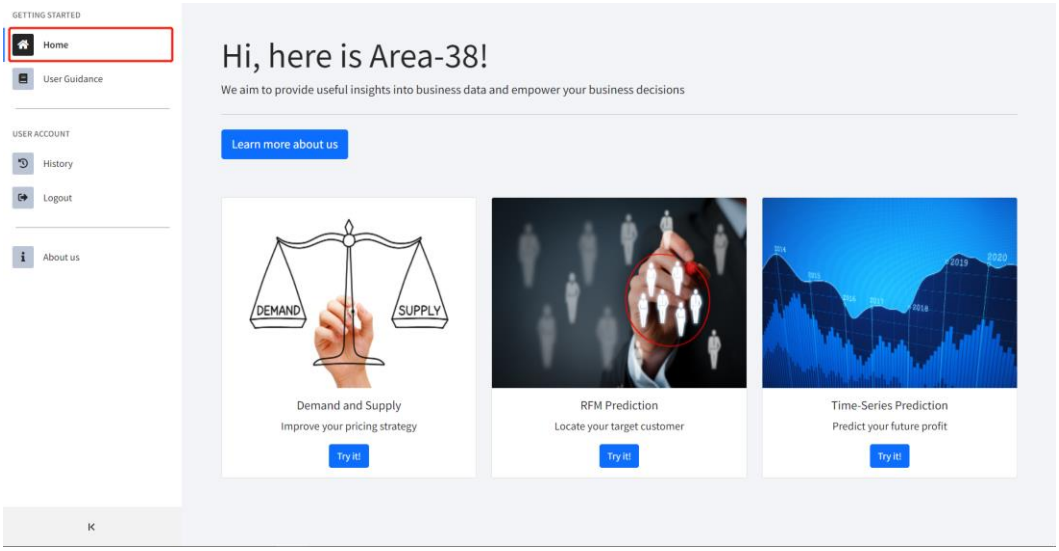
1. User Oriented View

Ⅰ. Common Users

When common users choose the 'Home' column, which is displayed on the top left of our website, you can see our dashboard of the Area-38 website. On the left of our website, there is an accordion menu which involves Home, User Guidance, login, History, Logout and About us columns. The followings are their descriptions of the above features.

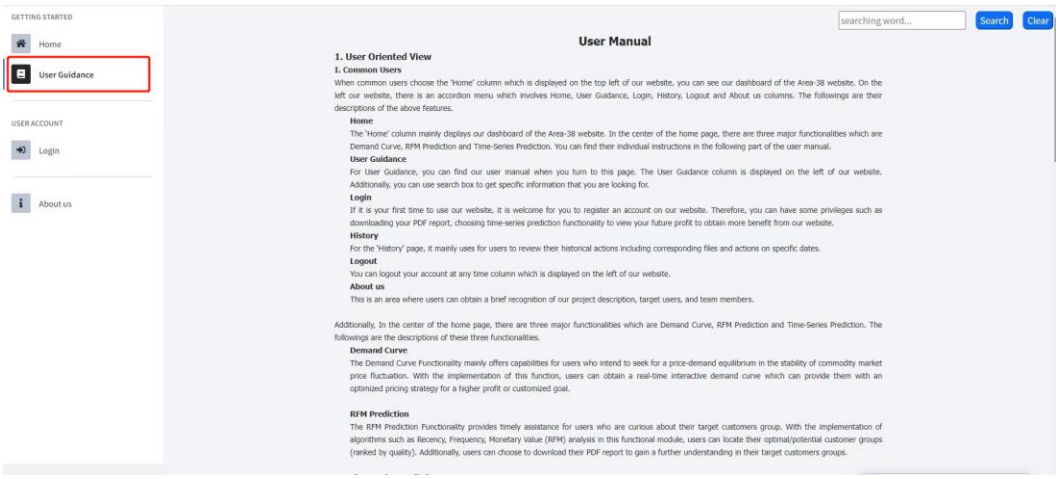
Home

The 'Home' column mainly displays our dashboard of the Area-38 website. In the centre of the home page, there are three major functionalities: Demand Curve, RFM Prediction, and Time-Series Prediction. You can find their individual instructions in the following part of the user manual.



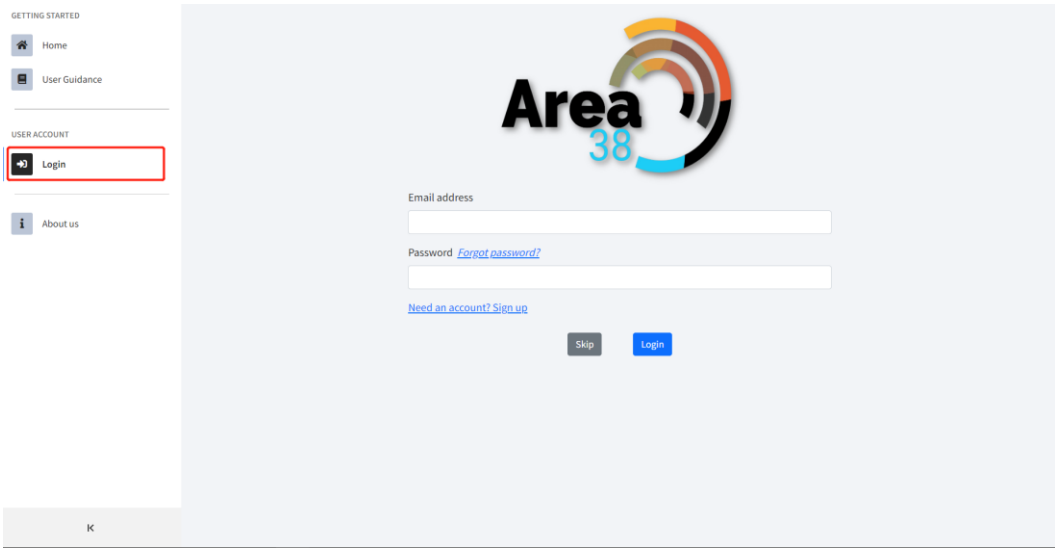
User Guidance

For User Guidance, you can find our user manual when you turn to this page. The User Guidance column is displayed on the left of our website. Additionally, you can use the search box to get the specific information you are looking for.



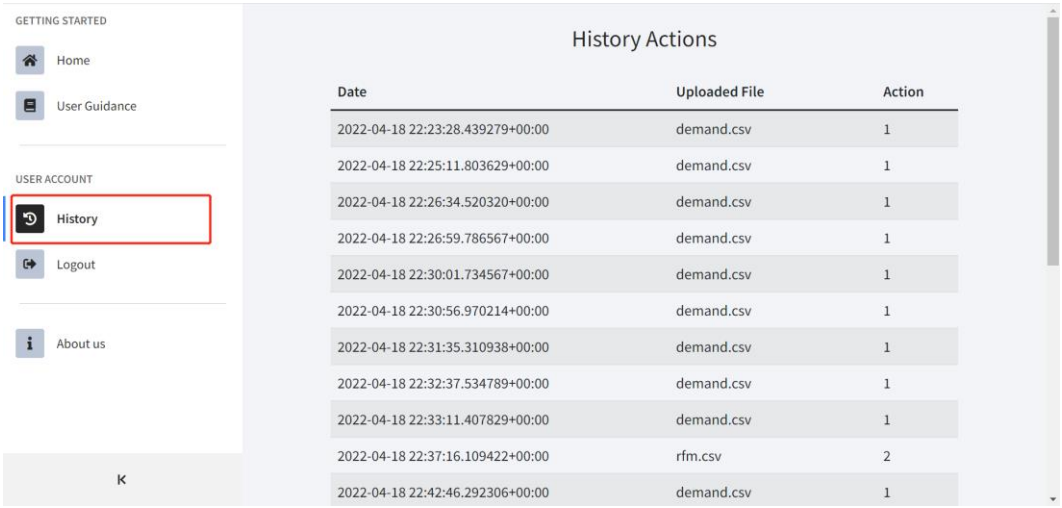
Login

If it is your first time using our website, you are welcome to register an account on our website. Therefore, you can have privileges such as downloading your PDF report and choosing time-series prediction functionality to view your future profit to obtain more benefits from our website.



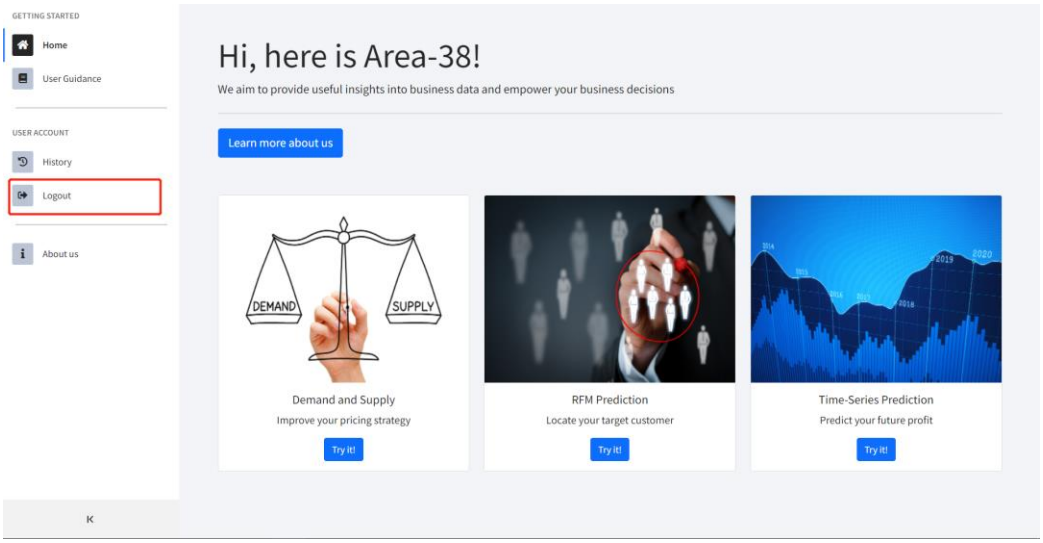
History

The 'History' page allows users to review their historical actions, including corresponding files and activities on specific dates.



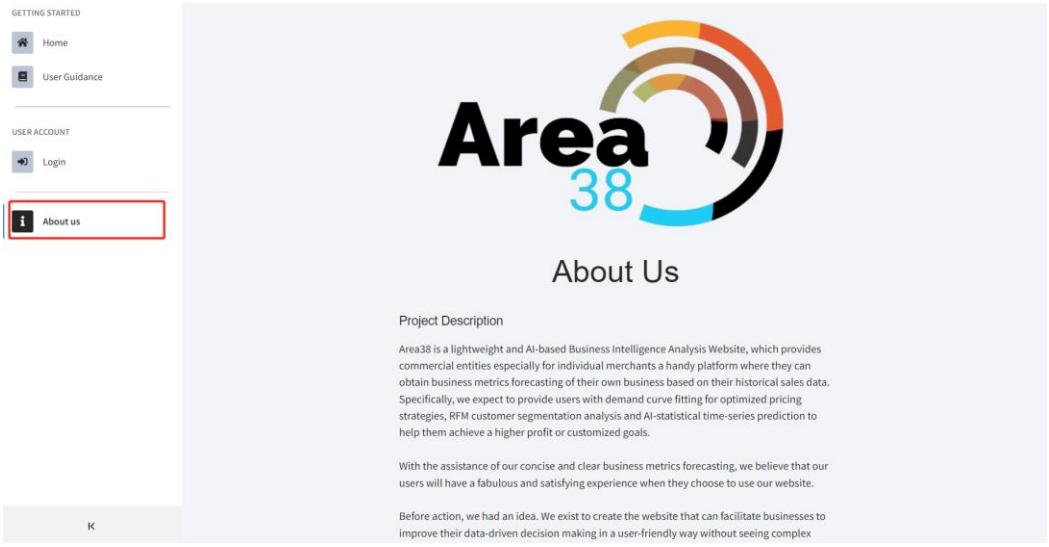
Logout

You can log out of your account by pressing the button displayed on the left of our website.



About us

This is an area where users can briefly recognise our project description, target users, and team members.



Additionally, there are three major functionalities in the centre of the home page: Demand Curve, RFM Prediction, and Time-Series Prediction. The followings are the descriptions of these three functionalities.

Demand Curve

The Demand Curve Functionality mainly offers capabilities for users who intend to seek a price-demand equilibrium in the stability of commodity market price fluctuation. With the implementation of this function, users can obtain a real-time interactive demand curve which can provide them with an optimised pricing strategy for a higher profit or customised goal.

RFM Prediction

The RFM Prediction Functionality provides timely assistance for users who are curious about their target customers group. With the implementation of Recency, Frequency, Monetary Value (RFM) model in this functional module, users can locate their optimal/potential customer groups (ranked by quality). Additionally, users can choose to

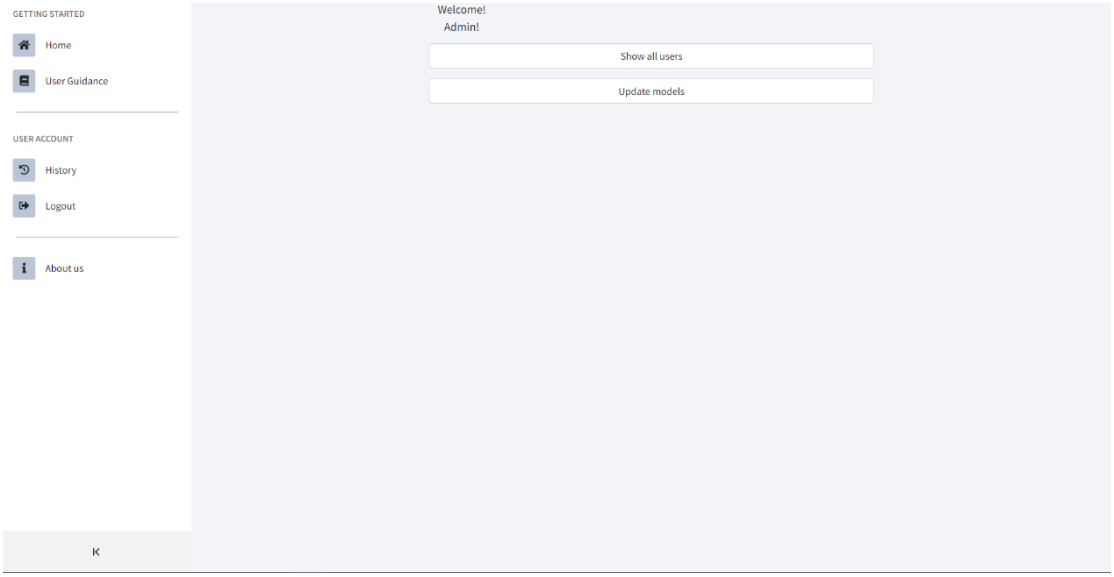
download their PDF report to gain a further understanding of their target customer groups.

Time-Series Prediction

The Time-Series Prediction Functionality offers users an opportunity to have a quick glance at their prospective future profit. With algorithms such as AI model (LSTM) and traditional statistical model (Holt-Winters) in this functional module, users can obtain a line chart which shows future short-term finer (user input 20 days) prediction (LSTM) as well as the long-term (user input 20000 days) tendency of prediction target (Holt-Winters). Additionally, users can choose to download their PDF report to gain a further understanding of the trend of their future profits.

Ⅱ. Administrator

After the administrator uses his specific email address and password to login onto our website, the two main features: 'show all users' and 'update models', will be shown on our website. This page is only permitted to be viewed by administrators. On this page, the administrator can click the 'show all users' button to check the Database for all users' email addresses and passwords who have already registered on our website. Additionally, the administrator can update the current time-series prediction pre-trained LSTM model by simply clicking the 'Update models' button to upload the latest version.



2. Installation/Set Up Instructions

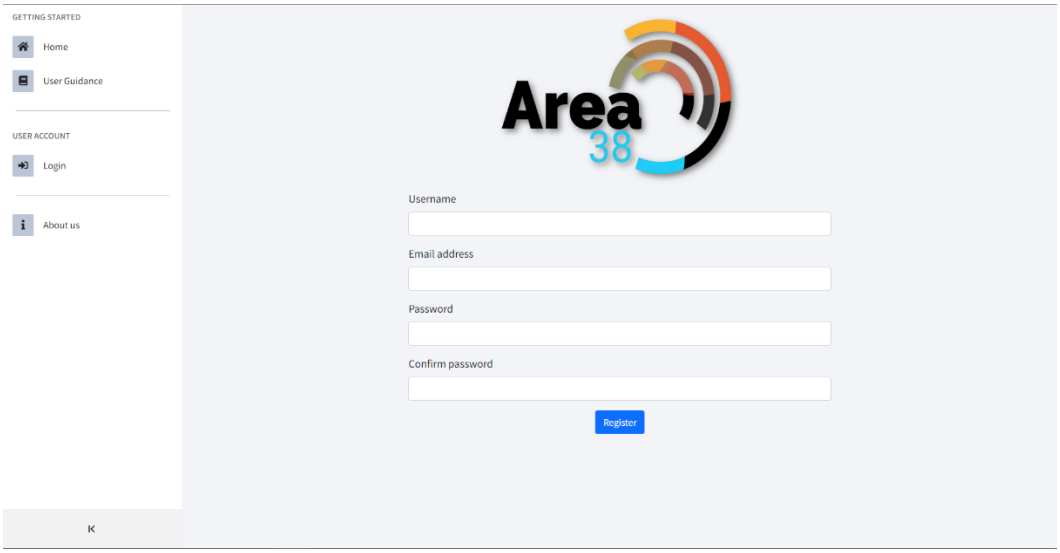
1. Open your web browser
2. Enter the domain name: www.group-38.com
3. Press Enter button to access our website

3. How to Use Instructions

Ⅰ. Common Users

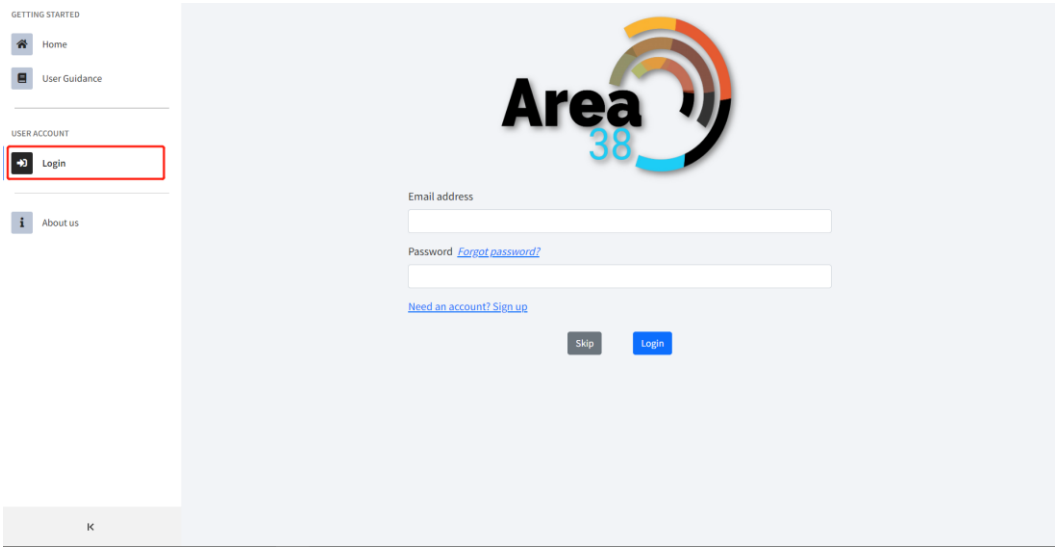
Register

If it is your first time using our website, you are welcome to register an account on our website. For registration, simply input your username, email address and password according to our prompt. After successful registration, you will be redirected to the login interface.



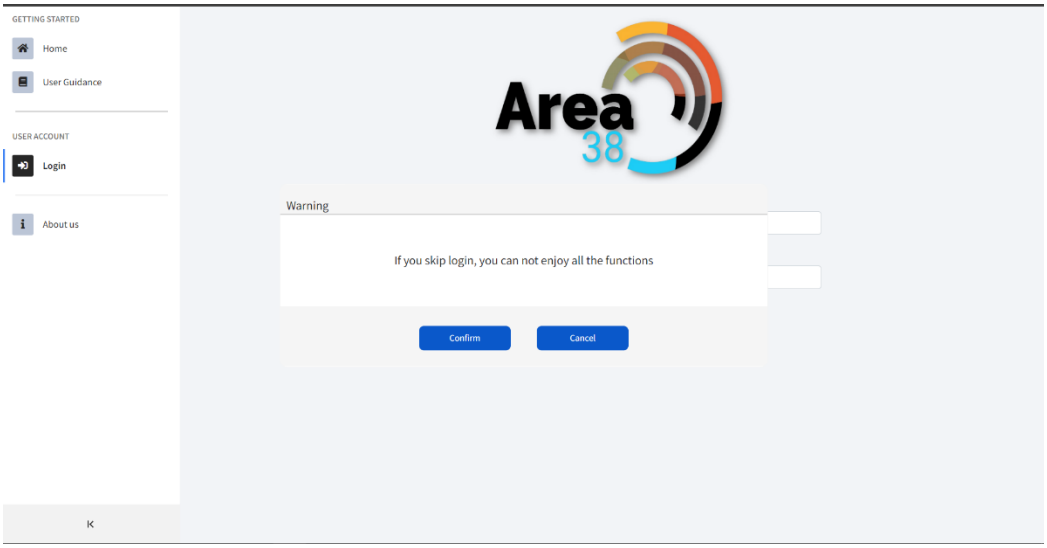
Login

When it comes to the login interface, please input your registered email address and password to log in to our website successfully.



Skip (try without login)

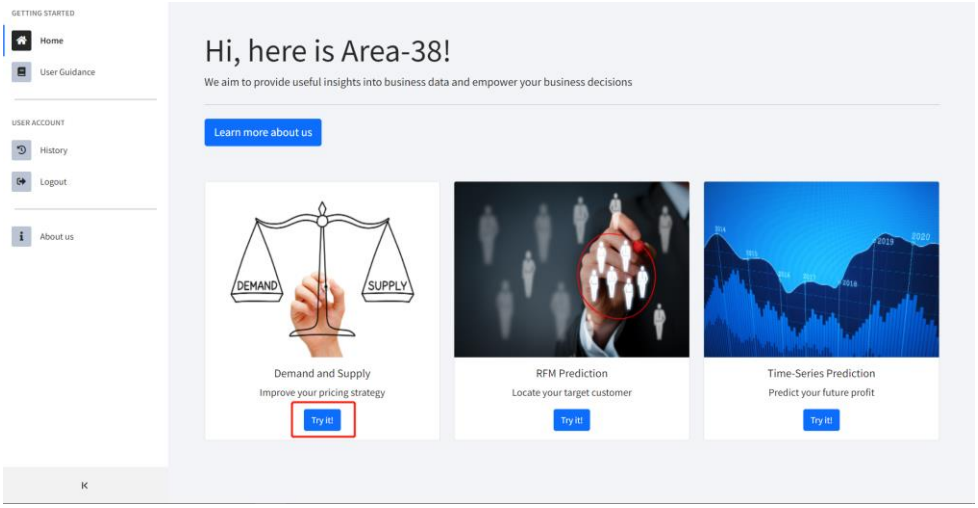
If you don't want to log in or register, you can click the 'Skip' button to experience two free functionalities: Demand Curve and RFM Prediction.



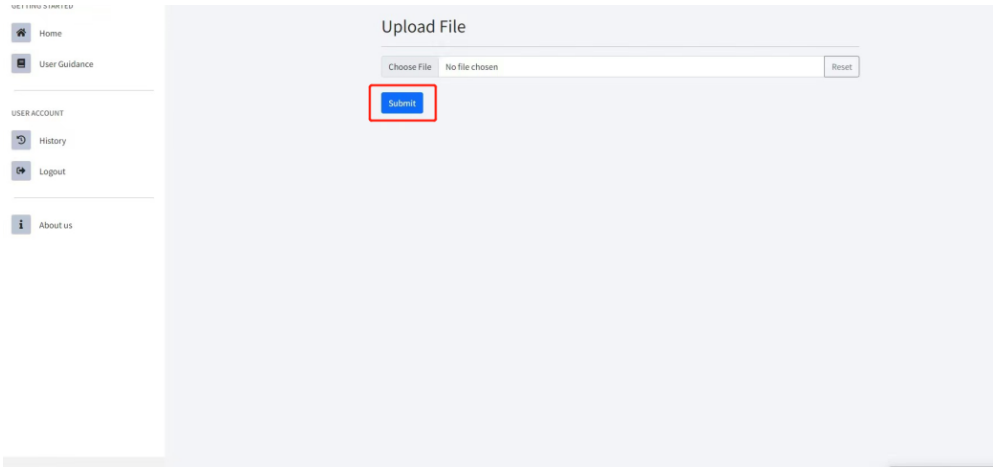
Demand Curve Functionality

If you take an interest in maximising your profit for your stores, you can follow the following steps to get your customised pricing strategy by using our Demand Curve Functionality.

1. Click the 'Try it!' button under the Functional Module of Demand Curve

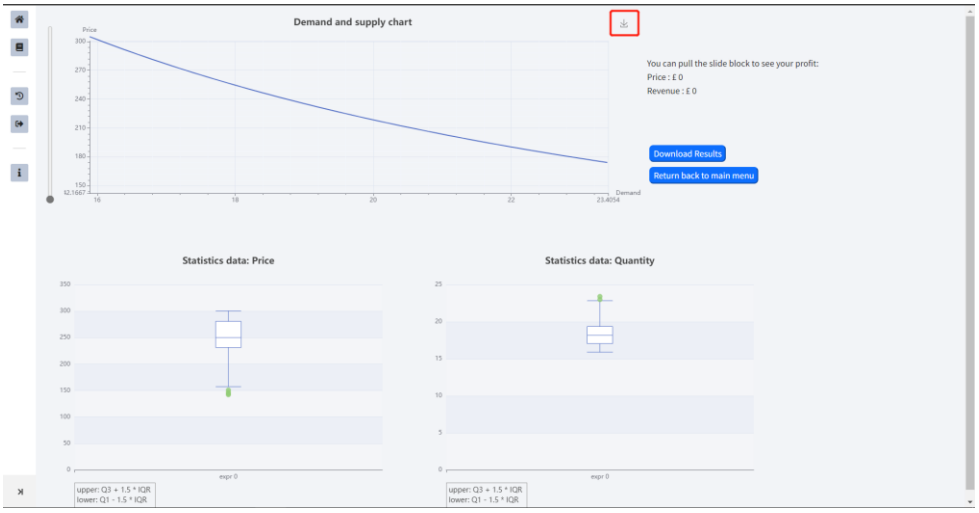


2. When it turns to the page which requires you to upload your dataset file, please strictly follow the format of our demo dataset file to ensure a successful analysis.
3. After choosing your target file, please click the 'Submit' button and then wait for it to finish processing. Otherwise, you can click the 'Reset' button to rechoose your dataset files.



4. When the Price-Demand Curve is shown on your screen, you can pull the slide bar on the left side (y-axis) of the chart, which corresponds to the price going up or down a certain amount. Therefore, you can seek your optimal profit given your target prices. Additionally, prices and predicted revenue are listed alongside the Demand-Price Curve. In addition, the Boxplot visualises the statistical distribution of the raw input data such as range, mean, variance and interquartile range to a great extent.

5. If you only intend to download the Demand Curve Graph, please click the download icon at the top right-hand corner of the graphics. This is free for all, even if they do not register or login onto our website.



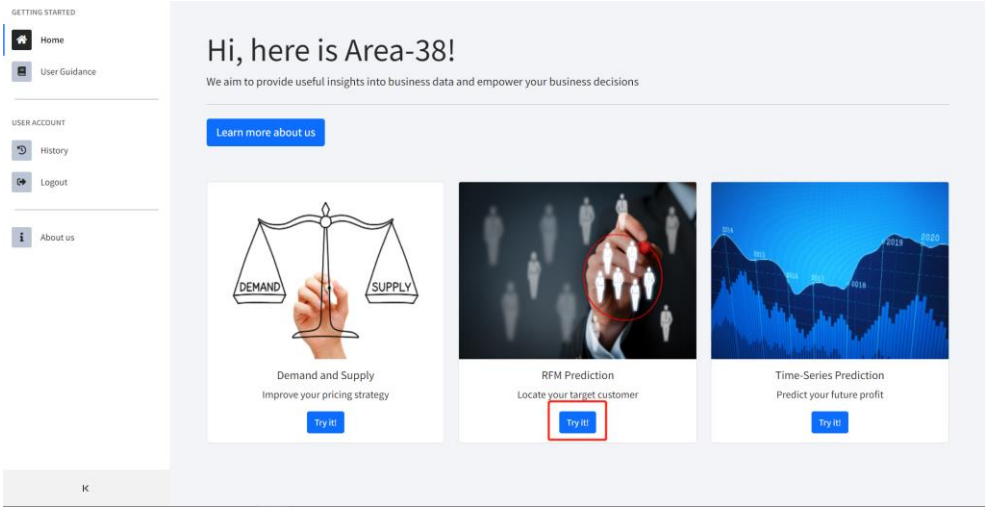
6. If you intend to download the PDF report, please click ‘Download Results’ button to get your PDF report. Please login first before downloading since this is a privilege for our registered users.

7. Finally, you can click the ‘Return back to main menu’ button to return to home page.

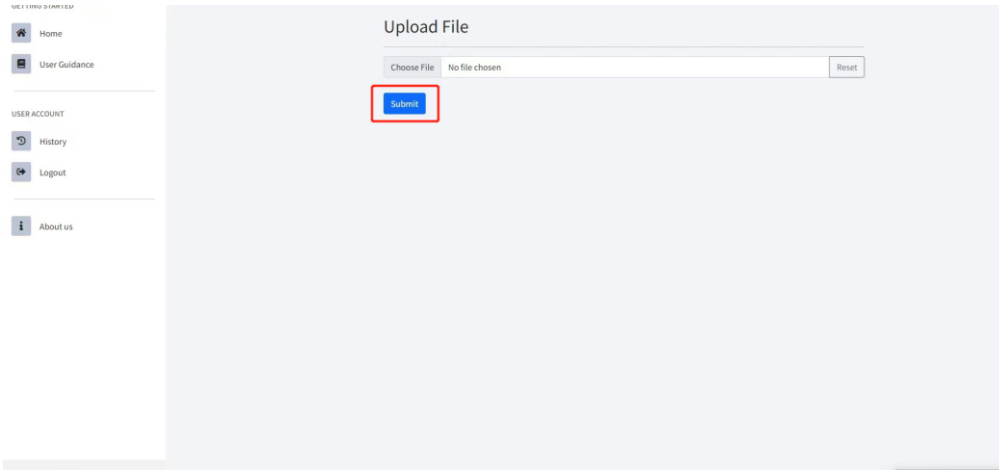
RFM Prediction Functionality

For RFM Prediction functionality, please follow the following steps to obtain your target customer groups and persona.

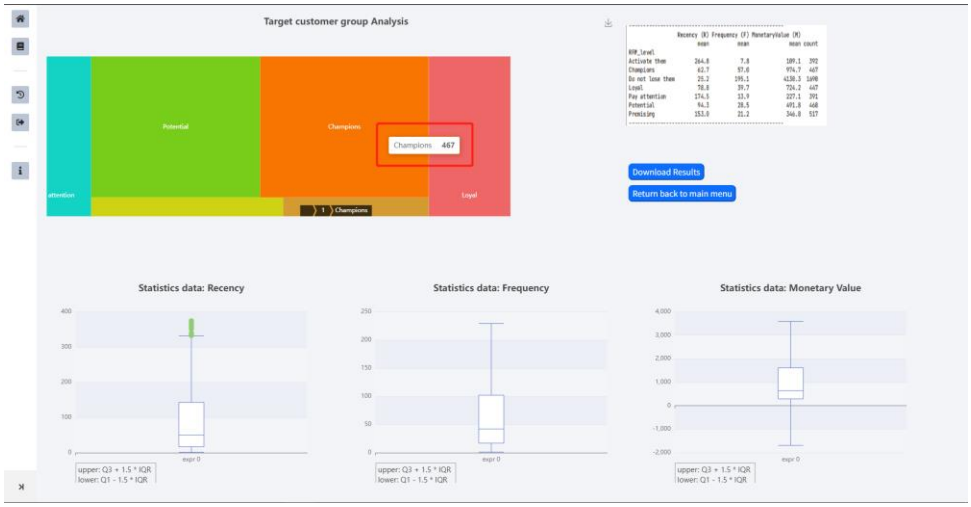
1. Click the 'Try it!' button under the Functional Module of RFM Prediction



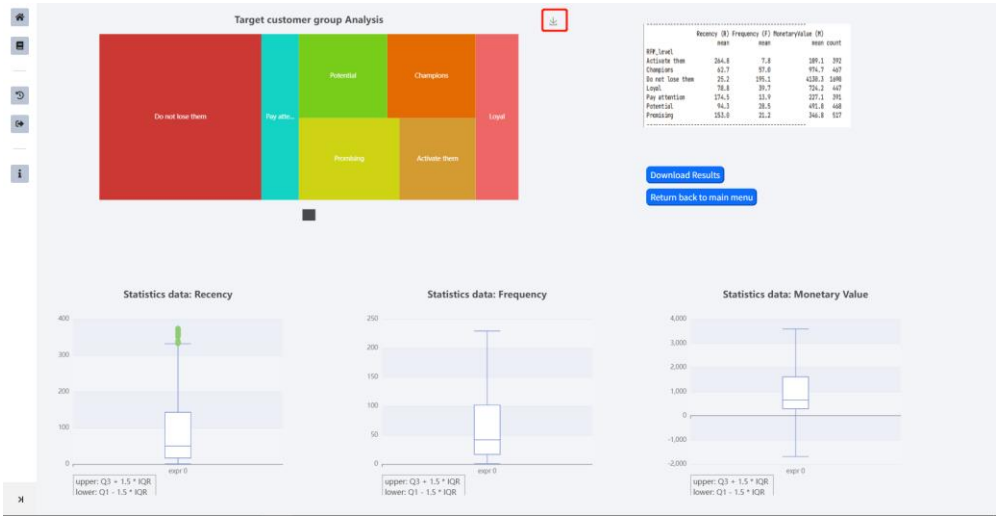
2. When it turns to the page that requires you to upload your dataset file, please strictly follow the format of our demo dataset file to ensure a successful analysis.
3. After choosing your target file, please click the 'Submit' button and then wait for it to finish processing. Otherwise, you can click the 'Reset' button to rechoose your dataset files.



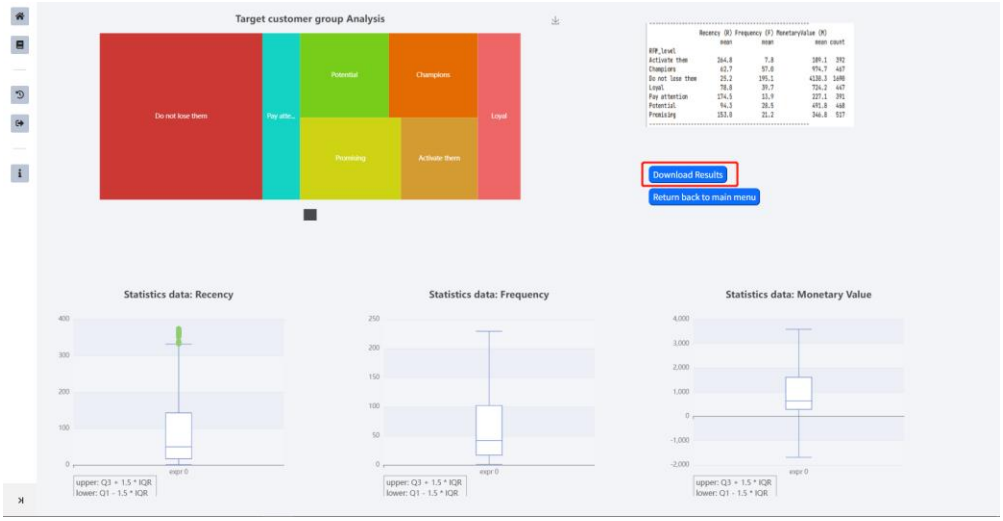
4. When the Target Customer Group Analysis Graph is shown on your screen, you can simply zoom in and out by scrolling up and down. Additionally, when you place the pointer over each customer group block, it will automatically display the group name and total group amount. Moreover, statistics such as Recency, Frequency and Monetary Value of each customer group are listed on the right-hand side of the graph. In addition, the Boxplot below visualises the statistical distribution of the raw input data such as range, mean, variance and interquartile range.



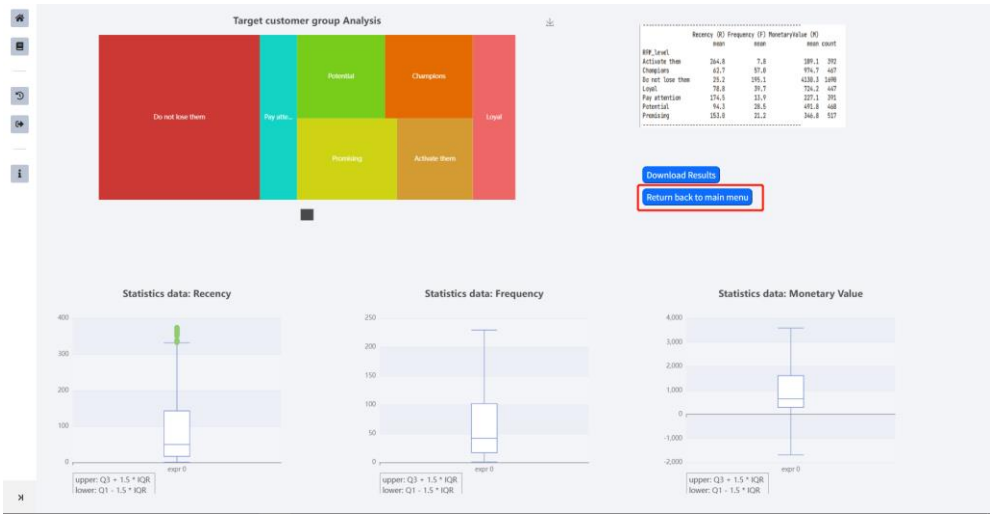
5. If you only intend to download the Target Customer Group Analysis image, please click the download icon at the top right-hand corner of the graphics. This is free for all, even if they do not register or login onto our website.



6. If you intend to download the PDF report, please click the 'Download Results' button to get your PDF report. Please login first before downloading since this is a privilege for our registered users.



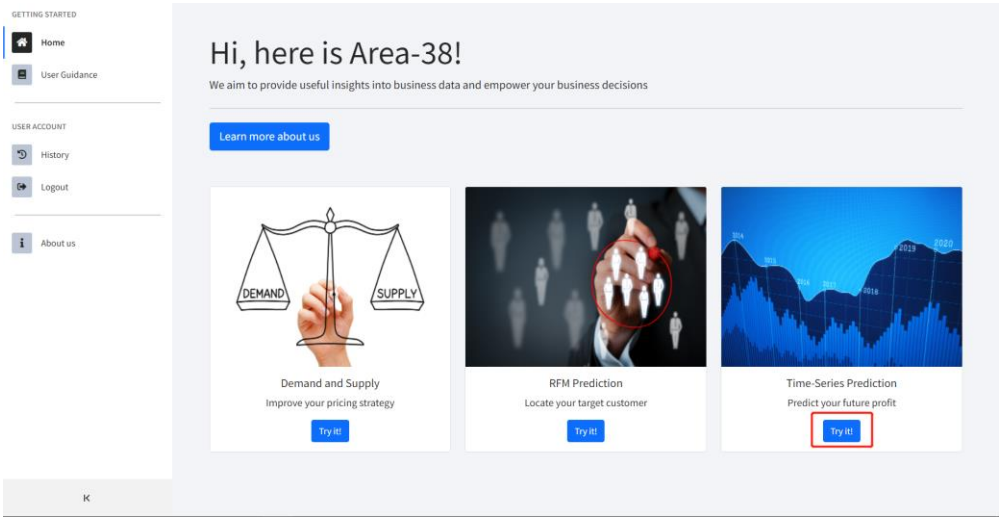
7. Finally, you can click the ‘Return back to main menu’ button to return to home page.



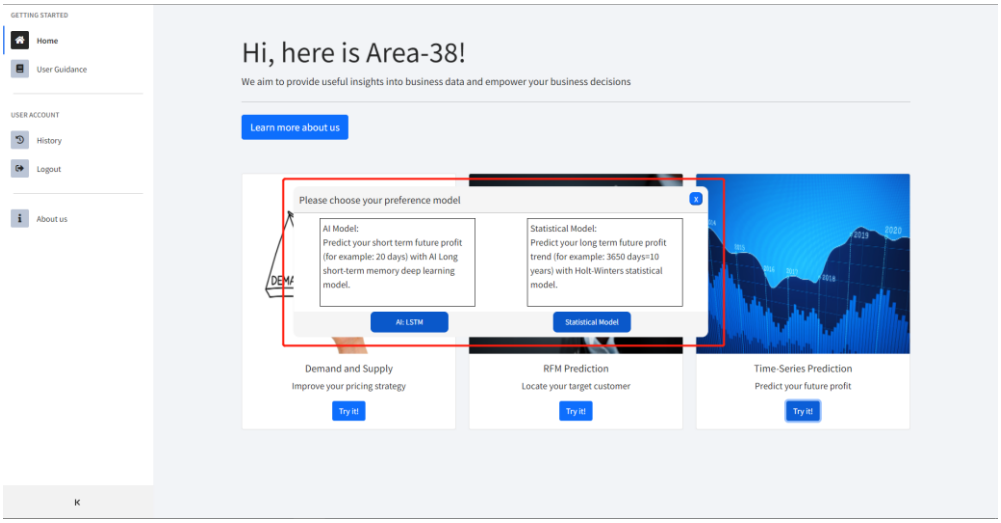
Time Series Prediction Functionality

If you have already registered and logged into our website, you can follow the following steps to view the future profit prediction of your target business metric by using our Time Series Prediction Functionality.

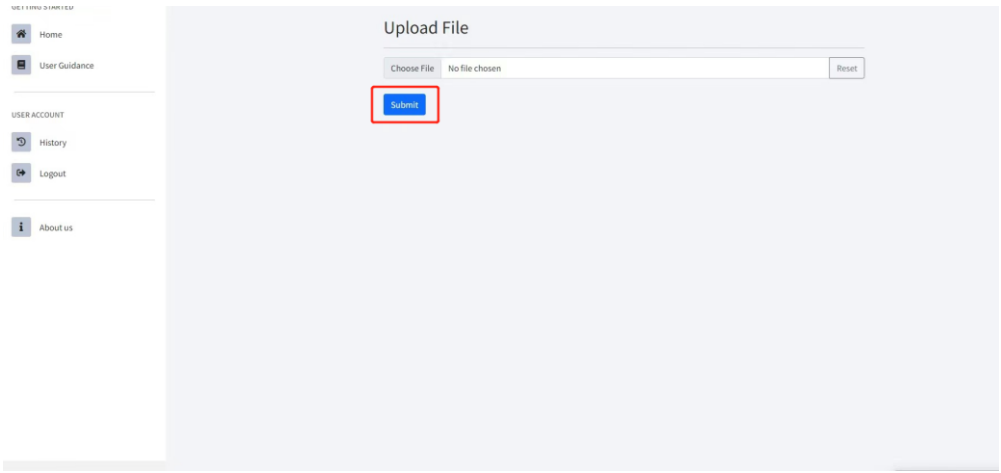
1. Click the ‘Try it!’ button under the Functional Module of Time Series Prediction.



2. Then, you can choose whether to use AI model (LSTM) or traditional statistical model (Holt-Winters) for your future profit prediction.

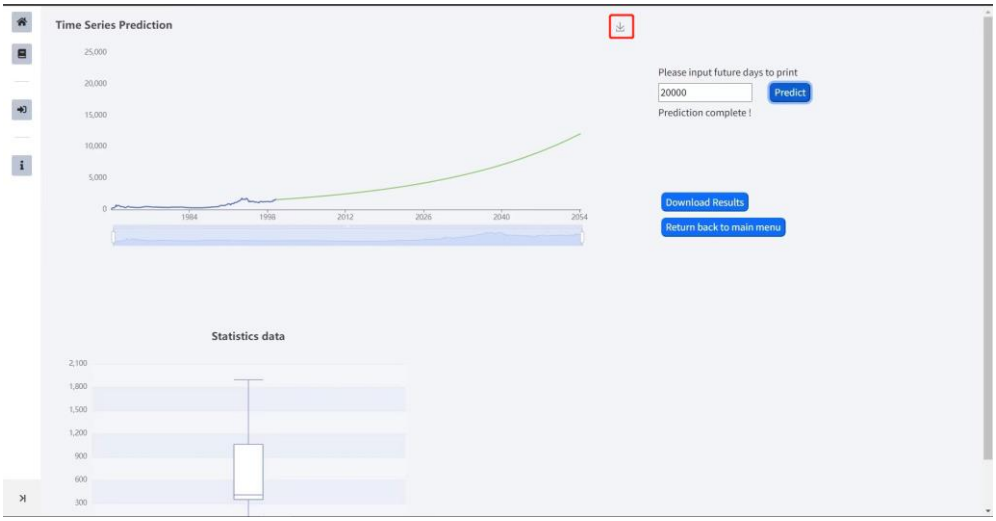


3. After choosing the model you prefer, you are prompted to upload your historic dataset file; please ensure the format of your dataset file follows that of a time series where the first column of your dataset must be “Time”.
4. After choosing your target file, please click the ‘Submit’ button and then wait for it to finish processing. Otherwise, you can click the ‘Reset’ button to rechoose your dataset files.

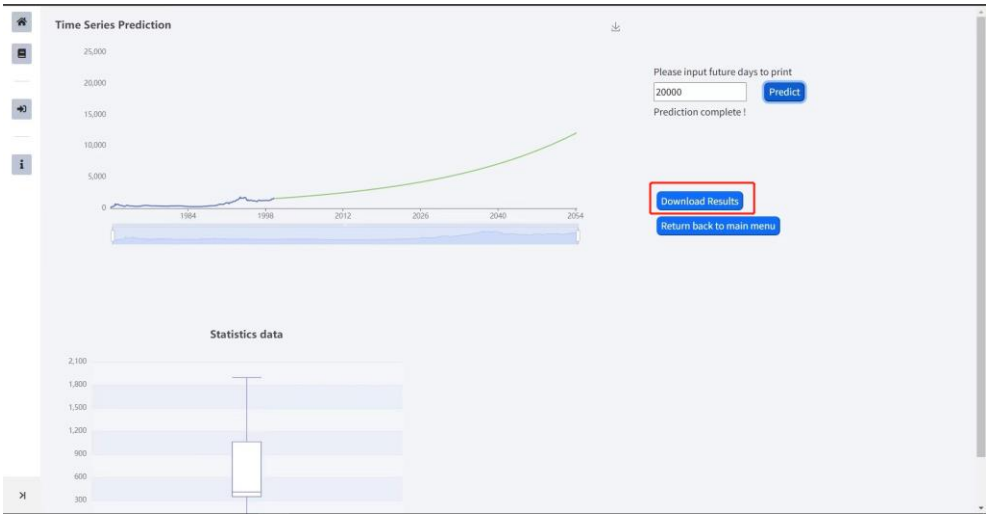


5. Whichever model you chose earlier, the website will first plot your original dataset. Then, you can input how many days in the future you want to predict and see the result right after to foster more profound insight into the tendency (Holt-Winters) and finer short-term detail (LSTM) of your future profit. Moreover, users can change the start and end of the x-axis to zoom in or out the whole line graph. In addition, the Boxplot below visualises the statistical distribution of the raw input data such as range, mean, variance and interquartile range.

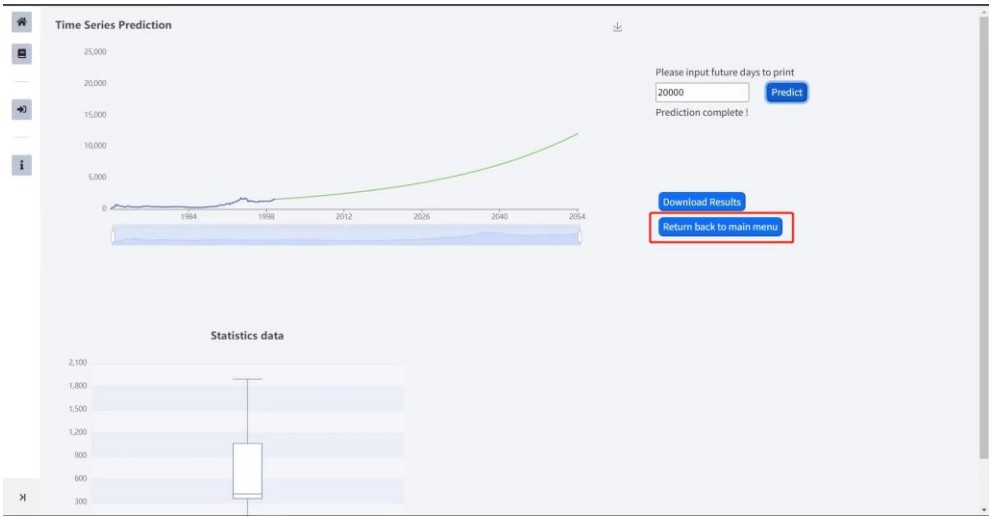
6. If you only intend to download the Time Series Prediction Graph, please click the download icon at the top right-hand corner of the graphics. This is free for all, even if they do not register or login onto our website.



7. If you intend to download the PDF report, please click the 'Download Results' button to get your PDF report.



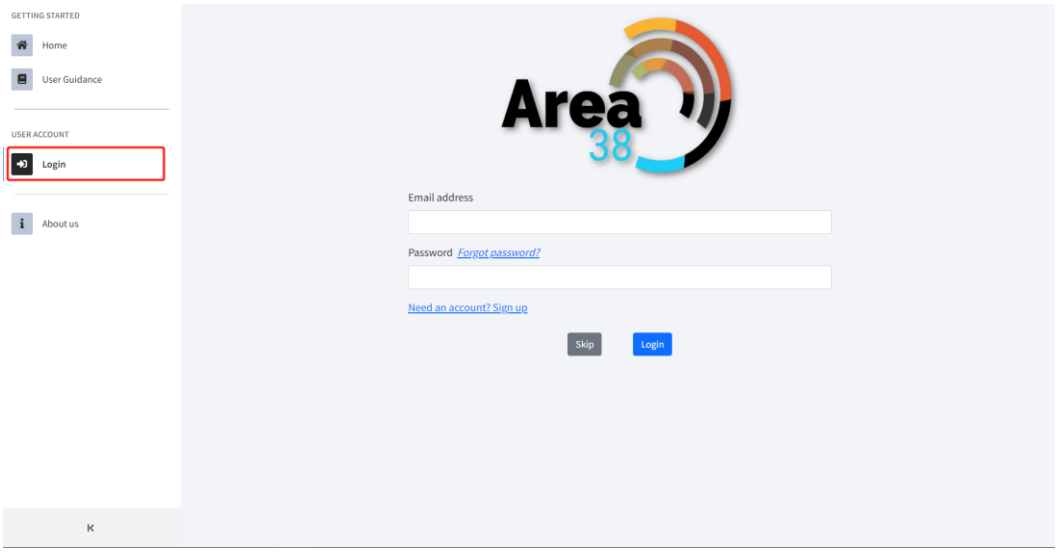
8. Finally, you can click the ‘Return back to main menu’ button to return to home page.



II. Administrator

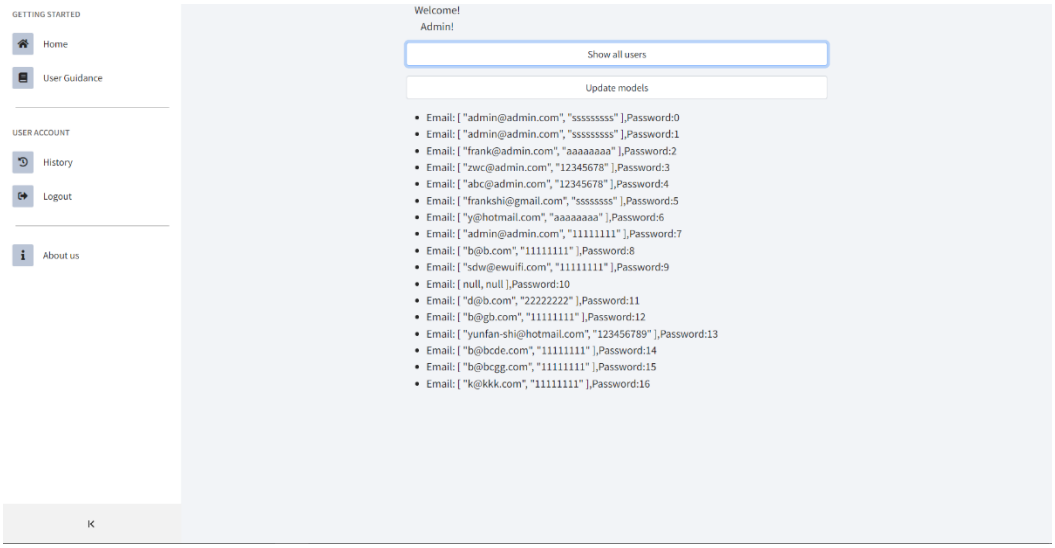
Login

Click the ‘login’ button on the left of our website. Then, enter the admin dedicated email address and password, and then the website will redirect to the exclusive admin page inaccessible to standard users.



Show all users

Click the ‘show all users’ button to check the Database for all users’ email addresses and passwords who have already registered on our website.



Update models

Click the 'Update models' button to upload the latest version of time-series prediction pre-trained LSTM model.