SUPERCAPACITOR CAPACITANCE CALCULATOR

CALCULATE OPTIONAL PARAMETERS FOR MAXIMUM CAPACITANCE

User Manual

Version 1.0

14/12/2023

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1. Introduction

Welcome to the SuperCapacitor Capacitance Prediction Web Application! This user manual will guide you through the features and functionalities of our web application designed to predict supercapacitor maximum capacitance using machine learning.

1.1 Overview

The SuperCapacitor Capacitance Prediction Web Application is a powerful tool that leverages machine learning algorithms to predict the maximum capacitance of supercapacitors. The primary purpose is to assist researchers, engineers, and enthusiasts in obtaining accurate capacitance predictions based on input parameters.

Key Features:

1. User Authentication: Securely access the application through user authentication for personalized experiences and data tracking.

2. Input Parameters: Receive input parameters such as pH, surface area (SSA), ID/IG ratio, nitrogen, oxygen, sulfur, and density to make accurate predictions.

3. Calculation and Prediction: Utilize machine learning models to calculate and predict the maximum capacitance of supercapacitors based on the provided input.

4. Graphical Representation: Visualize the predicted values through interactive graphs, providing a clear understanding of the predicted capacitance trends.

5. Log Page: Keep track of prediction history with a dedicated log page that displays a comprehensive history of previous predictions, aiding in analysis and decision-making.

6. User Manual Page: Access a user-friendly manual page for guidance on using the application effectively.

2. Getting Started

To begin using the SuperCapacitor Capacitance Prediction Web Application, follow these steps:

2.1 User Registration and Login

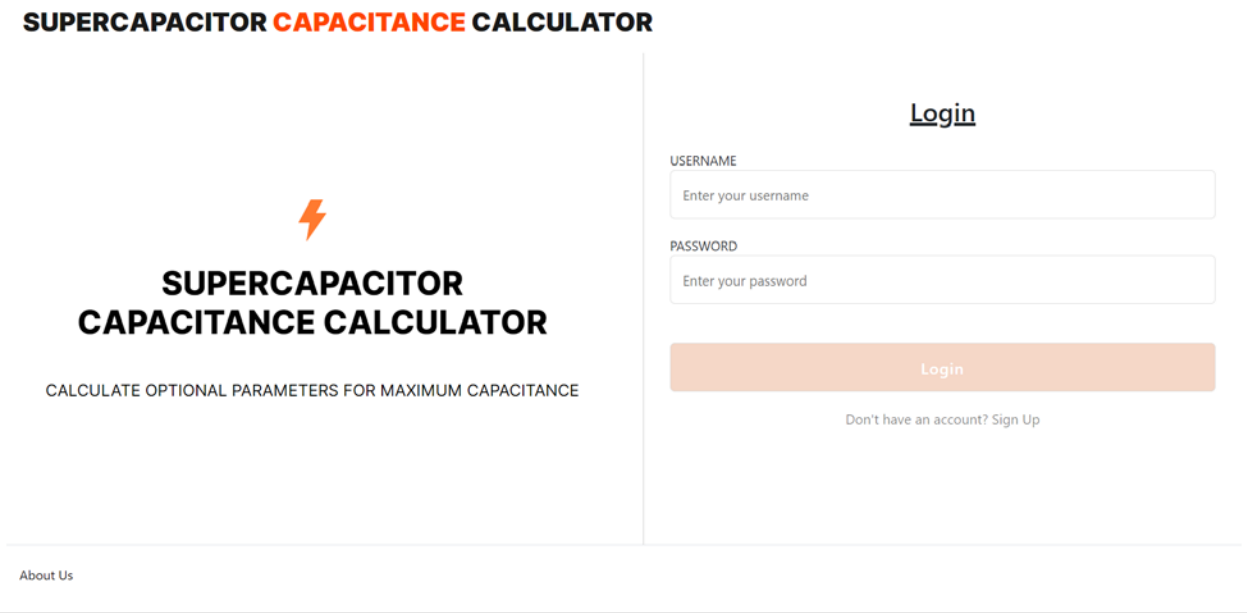


Figure 1: Login Page

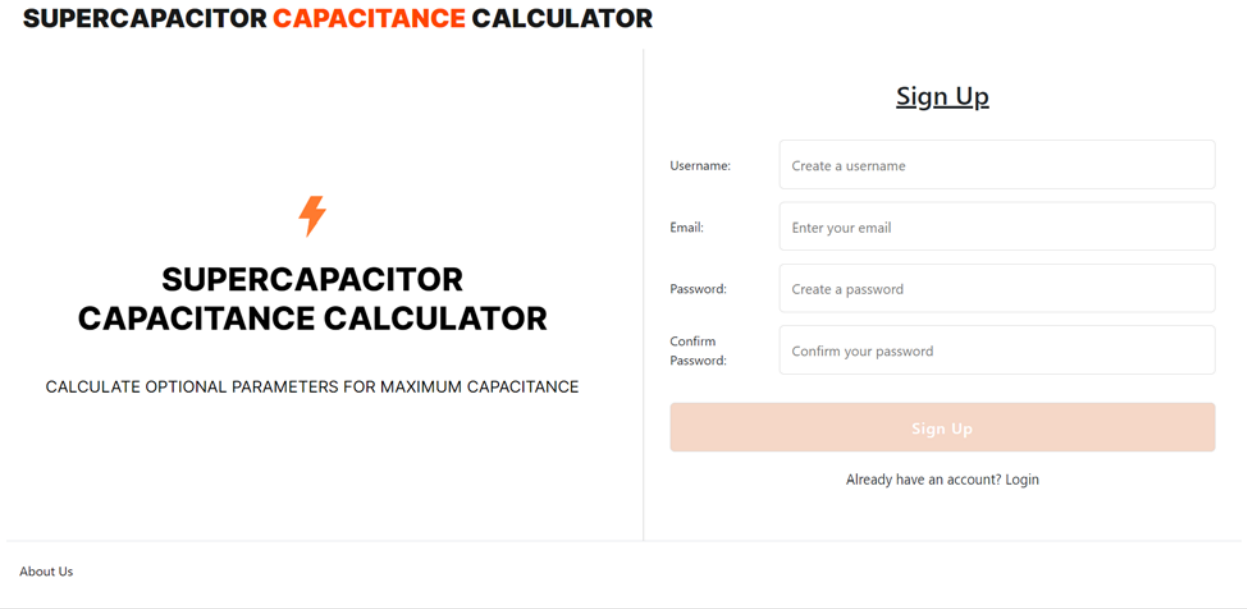


Figure 2: Sign up Page

Start by registering for an account using a valid email address.

Once registered, log in using your credentials (username or email) to access the application features.

2.2 Input Parameters

Navigate to the prediction page and input relevant parameters such as pH, surface area (SSA), ID/IG ratio, nitrogen, oxygen, sulfur, and density.

Input value must be number only (integer and decimal). Alphabet and special symbol is not supported for the current system.

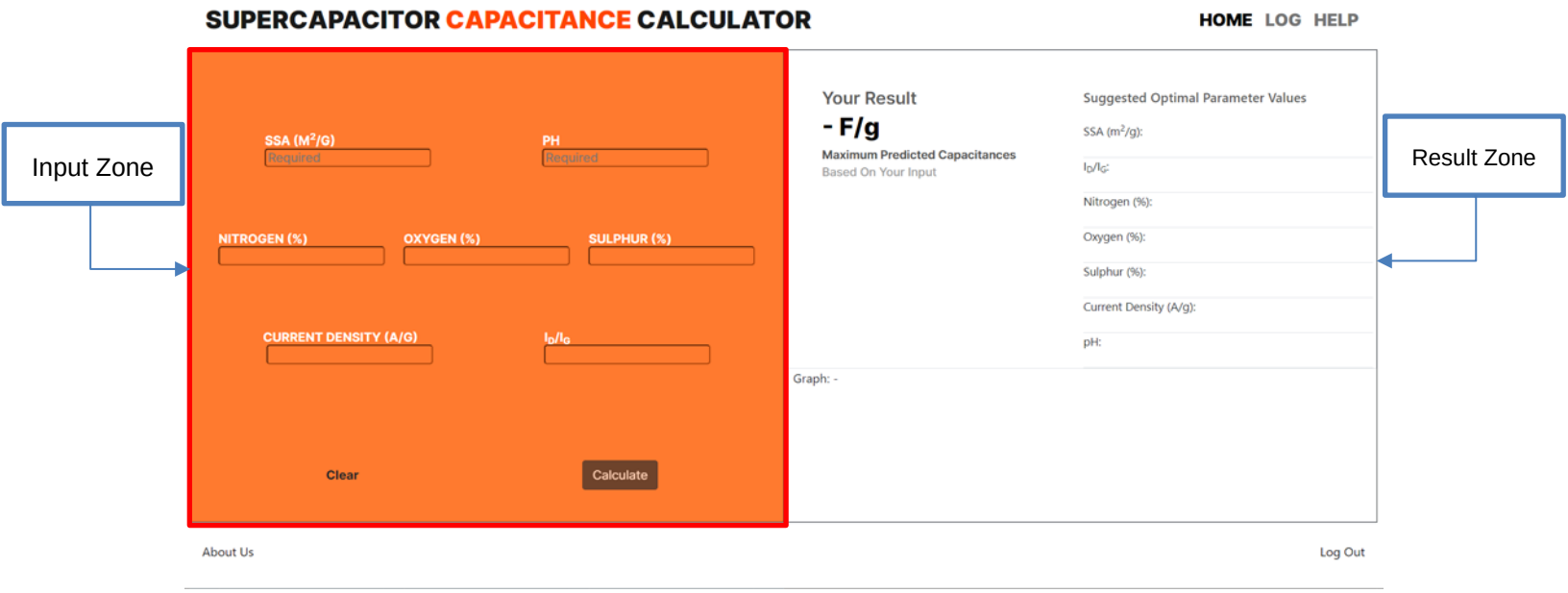


Figure 3: Home Page for predict value

Inputs Constraint:

1. **Required Inputs:** There are 2 inputs that users have to fill in values in order to calculate and predict result which are surface area (SSA) and pH. Others input can be left empty.
2. **Inputs Range:**
    a. SSA: Input value must be between 0 and 2650.
    b. pH: Input value must be between 0 and 15.
    c. Nitrogen: Input value must be between 0 and 15 (Value is in percentage form).
    d. Oxygen: Input value must be between 0 and 30 (Value is in percentage form)
    e. Sulphur: Input value must be between 0 and 15 (Value is in percentage form).

f. Current Density: Input value must be between 0 and 15.

g. I_D/I_G ratio: Input value must be between 0 and 3.

2.3 Prediction and Graph

Figure 4: Calculate Button

- Click the "Calculate" button to initiate the prediction process.
  - Calculate button is unclickable until all input is valid to the constraint
- View the predicted capacitance value.
- User can click ‘Clear’ to clear all value in input fields.

Prediction Result:

1. Fill in all inputs: When user fill in all input and click calculate. The predicted result shows up on the right page.

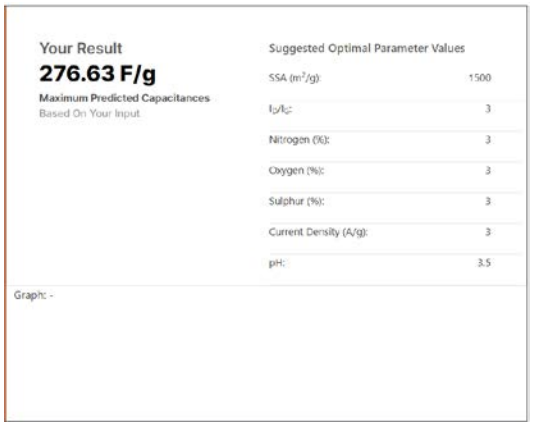


Figure 5: Calculation Result when fill in all inputs

2. Fill in some inputs: When fill in just some input. The predicted result shows as a predicted graph(s) instead of predicted value.

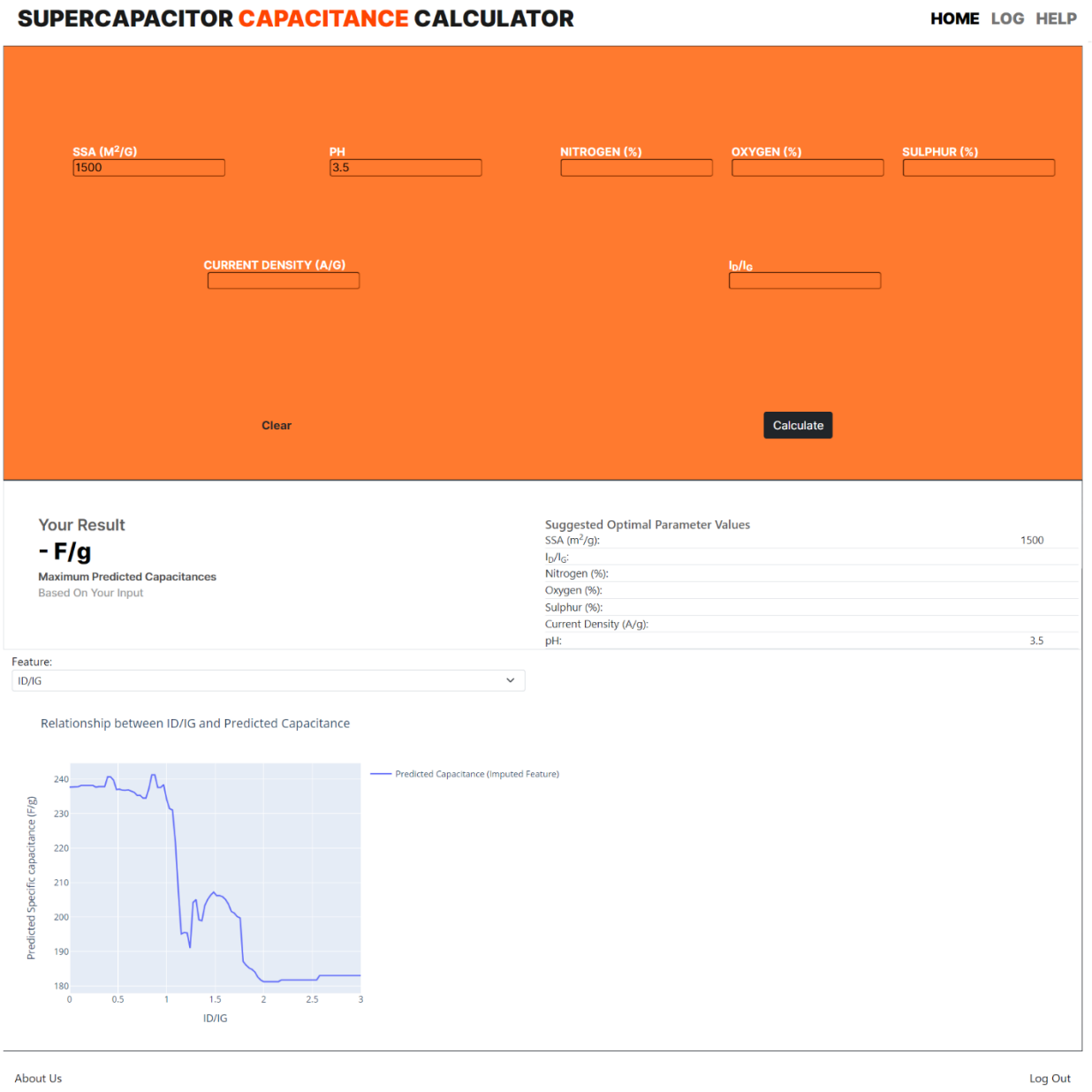


Figure 6: Prediction Result when fill in some inputs

- Graph show the relationship between the selected value and the predicted capacitance.
- User can select to see others missing features relationship with predicted capacitance by click the features selected bar.
- When select the missing feature, others values of features that are not selected is

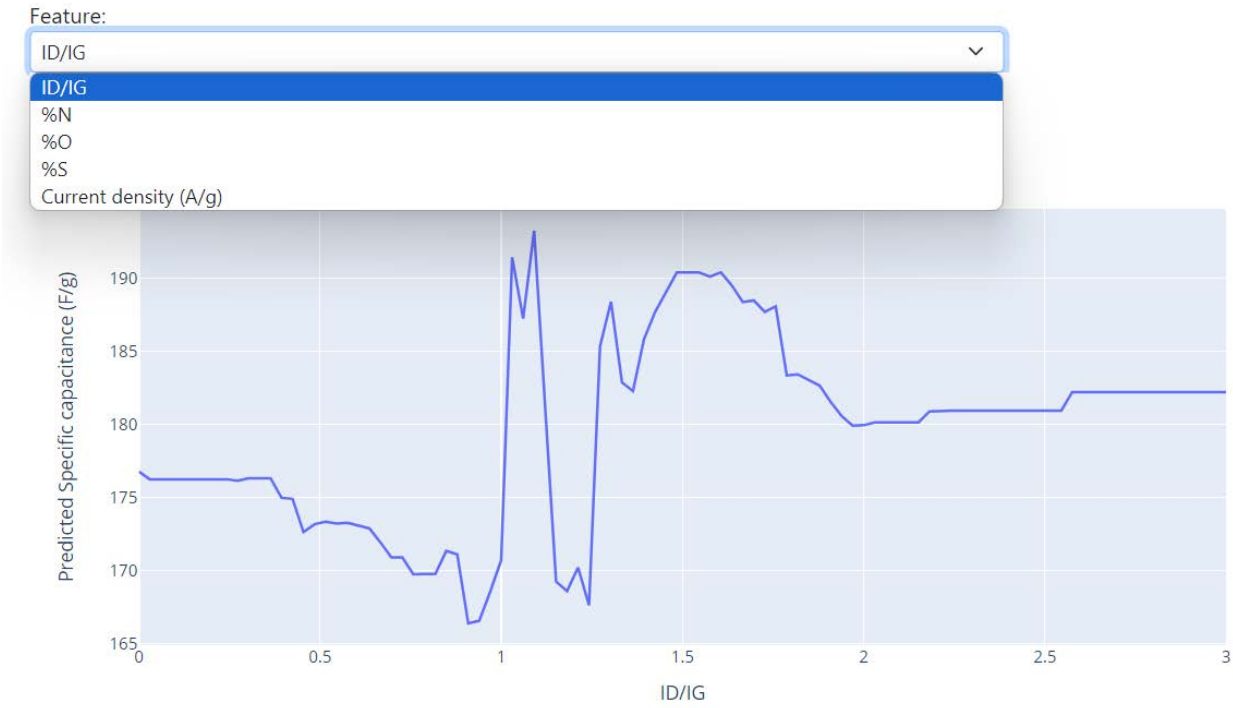


Figure 7: Missing Feature Selection

- User can interact with the graph by using cursor
  - Move the cursor to the point in graph to see the actual values of selected feature and predicted capacitance at that point.
  - Save/Download graph
  - Zoom, pan, auto scale, reset axis are available.

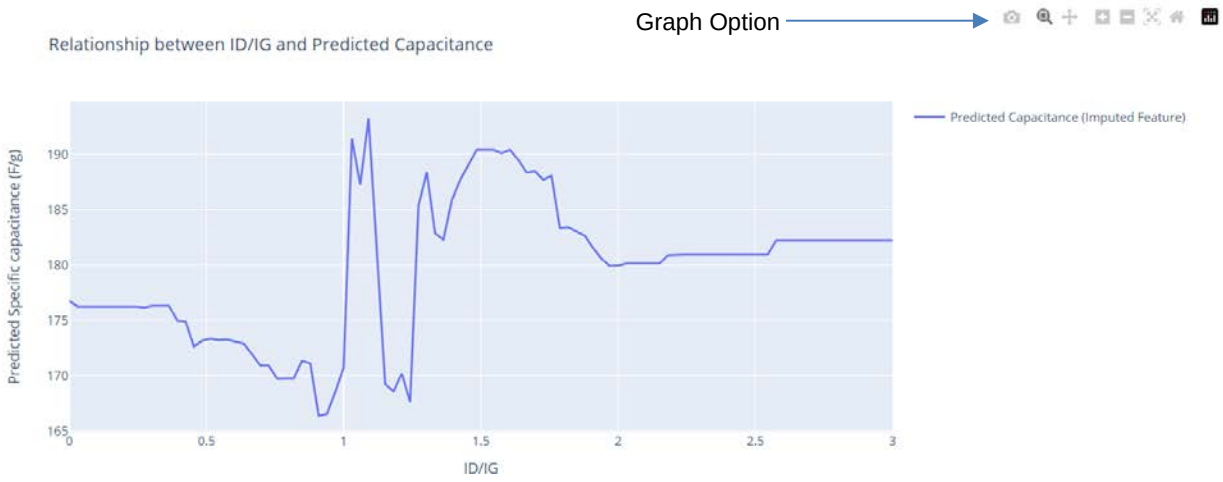
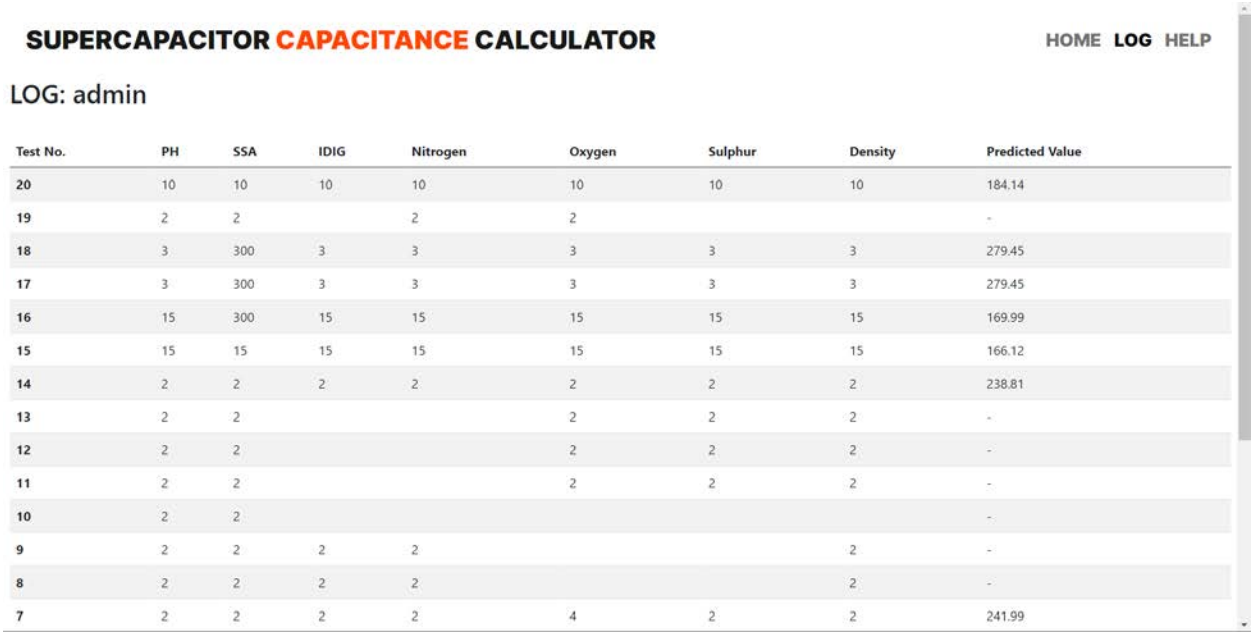


Figure 8: Graph Option Bar

2.4 Log Page

Explore the log page to review the history of previous predictions, including input parameters and predicted values.



SUPERCAPACITOR CAPACITANCE CALCULATOR

HOME LOG HELP

LOG: admin

Test No.	PH	SSA	IDIG	Nitrogen	Oxygen	Sulphur	Density	Predicted Value
20	10	10	10	10	10	10	10	184.14
19	2	2		2	2			-
18	3	300	3	3	3	3	3	279.45
17	3	300	3	3	3	3	3	279.45
16	15	300	15	15	15	15	15	169.99
15	15	15	15	15	15	15	15	166.12
14	2	2	2	2	2	2	2	238.81
13	2	2			2	2	2	-
12	2	2			2	2	2	-
11	2	2			2	2	2	-
10	2	2						-
9	2	2	2	2			2	-
8	2	2	2	2			2	-
7	2	2	2	2	4	2	2	241.99

Figure 9: Log Page

2.5 Exit

- User can log out from web by clicking ‘Log Out’ at the bottom right of the page.