

User Guide for Software Engineering: Alkalytics

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1 Introduction

Section Overview

This section provides an orientation to the Alkalytics application, its purpose, and the scope of this documentation.

Welcome to the Alkalytics User Guide. This comprehensive document provides complete instructions for installing, configuring, and using all features of the Alkalytics web application.

1.1 Purpose

Alkalytics is designed to:

- Manage experimental data efficiently
- Provide powerful analysis tools
- Generate customizable visualizations
- Support collaborative research workflows

2 System Overview

Section Overview

This section describes the technical architecture, components, and requirements for running Alkalytics.

2.1 Architecture

Alkalytics is a React and TypeScript-based web application that runs locally for security purposes. The system architecture consists of:

- **Frontend:** Built with React and TypeScript
- **Backend:** Python processing with Unicorn server
- **Database:** MongoDB for data storage

2.2 Detailed Requirements

Description

Lists all hardware and software requirements for running the application.

2.2.1 Hardware Requirements

Component	Minimum	Recommended
RAM	8GB	16GB
Storage	10GB	50GB SSD
Processor	2 cores	4 cores

2.2.2 Software Dependencies

Software	Purpose	Version
Node.js	Frontend runtime	16.x LTS
MongoDB	Database	5.0+
Python	Backend processing	3.8+
Unicorn	ASGI server	0.15+

3 Installation Guide

Section Overview

This section provides complete step-by-step instructions for setting up the Alkalytics environment.

3.1 Step-by-Step Installation

1. Prerequisite Installation

- Install Node.js from <https://nodejs.org>
- Install MongoDB from <https://www.mongodb.com>
- Install Python 3.x from <https://www.python.org>

2. Repository Setup

```
git clone https://github.com/your-repo/alkalytics.git
cd alkalytics
```

3. Dependency Installation

```
yarn install
pip install -r requirements.txt
```

4. Database Configuration

- (a) Create data directory:

```
mkdir /data/db
```

- (b) Start MongoDB service:

```
mongod --dbpath /data/db --port 27017
```

5. Application Launch

- (a) Start backend:

```
yarn ts-node src/utils/server.ts
```

- (b) Start frontend:

```
yarn start
```

- (c) Launch ASGI server:

```
univcorn --port 8000 main:app
```

3.2 Verification

After installation, verify all components are running:

1. Frontend: `http://localhost:3000`
2. Backend: `http://localhost:8000/healthcheck`
3. Database: Check MongoDB connection on port 27017

4 User Management

Section Overview

This application has different user roles. Each role has a different set of permissions and respective capabilities within the application.

4.1 Admin and Researcher Role

Administrators have full control over all system functionality including data management, user configuration, and system settings. Both Admin and Researcher roles have the same permissions.

These features include:

- Editing tables, including modifying cells, adding/removing rows and columns.
- Setting data types for columns.
- Using the Excel function bar for calculations.
- Computing efficiency metrics.
- Managing bulk data uploads.
- Generating and exporting graphs.

4.2 Researcher Assistant Role

Researcher assistants can view data, run analyses, and generate reports but have limited system configuration capabilities.

These features include:

- Viewing and searching tables (Experiment, Efficiency, and Raw Data).
- Searching within a specific column or the entire table.
- Generating graphs but with restricted data modification capabilities.

5 Web Application Pages

Section Overview

This section covers all data handling operations including uploads, processing, and table management.

5.1 Login and Sign Up Process

When users first load onto the page, they will be greeted by a log in screen. If the user has login credentials, log in as normal

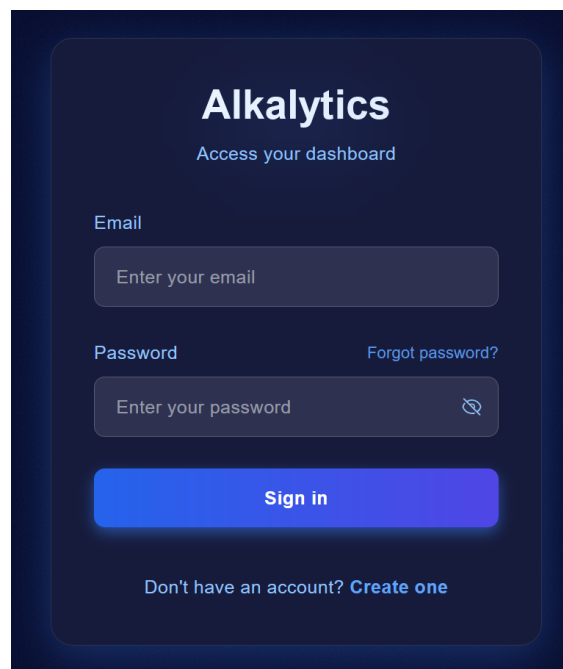
The image shows a login form for 'Alkalytics'. The form is centered on a dark blue background. At the top, the word 'Alkalytics' is written in white, with the tagline 'Access your dashboard' below it. There are two input fields: 'Email' with the placeholder 'Enter your email' and 'Password' with the placeholder 'Enter your password'. A 'Forgot password?' link is next to the password field. Below the inputs is a blue 'Sign in' button. At the bottom, there is a link that says 'Don't have an account? Create one'.

Figure 1: Login Form

5.2 Sign Up Process

If users do not have an account, they will need to create one by clicking the **Create one** button at the bottom of the login form. The user must then enter an email and desired password. There will be three roles to pick from,

Admin, Researcher and Research Assistant. After creating a user account, log in as normal.

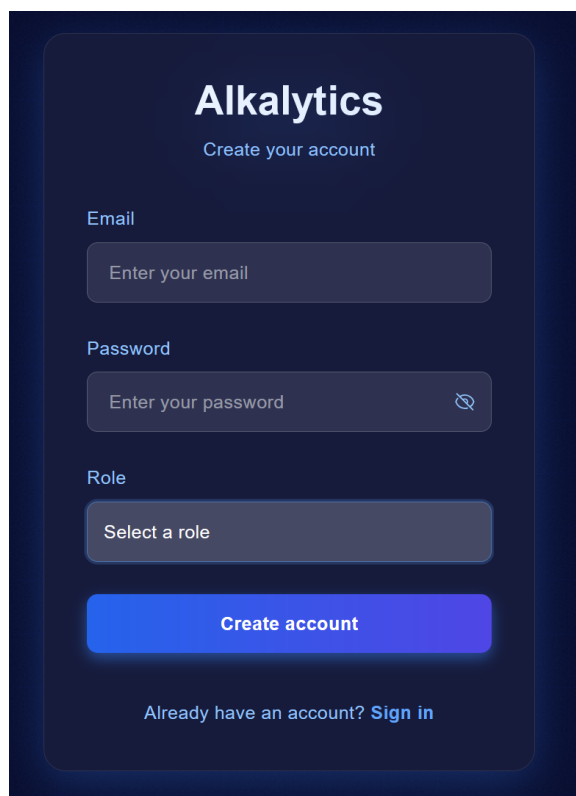
The image shows a sign-up form for 'Alkalytics'. The form is centered on a dark blue background. At the top, the word 'Alkalytics' is written in a large, white, sans-serif font. Below it, the text 'Create your account' is written in a smaller, lighter blue font. The form contains three input fields: 'Email' with a placeholder 'Enter your email', 'Password' with a placeholder 'Enter your password' and a toggle icon, and 'Role' with a placeholder 'Select a role'. Below these fields is a large, rounded blue button with the text 'Create account' in white. At the bottom of the form, there is a link that says 'Already have an account? Sign in' in a light blue font.

Figure 2: Sign Up Form

5.3 Upload Process

Description

The upload functionality allows users to import experimental data in various formats for analysis.

5.3.1 Step-by-Step Upload

1. Navigate to Upload Page
2. Select file type (Experiment Log or Raw Data)

3. Choose upload method:
 - Drag and drop files
 - Browse file system
4. Verify file preview
5. Click **Upload** button
6. Monitor progress in notification panel

5.3.2 File Requirements

Requirement	Specification
File Size	Maximum 10MB per file
Columns	Minimum 5 required fields
Date Format	YYYY-MM-DD
Special Characters	Avoid in header names

5.4 Table View

5.4.1 Table Editing

1. Navigate to Experiment Table
2. Click **Edit** button to enable editing mode
3. Modify cell values directly
4. Use **Save** button to commit changes

5.4.2 Column Management

- **Adding Columns:**
 1. Click **Add Column** button
 2. Enter column name in dialog
 3. Select data type from dropdown

4. Click **Add Column** to confirm

- **Removing Columns:**

1. Click **Remove Column** button
2. Select column from dropdown
3. Confirm deletion

5.4.3 Excel Function Bar

1. Select target rows using checkboxes
2. Choose destination column
3. Enter formula (e.g., `SUM(A,B)`)
4. Click **Apply** to execute

5.5 Graph Generation

Section Overview

This section provides detailed instructions for creating, customizing, and exporting data visualizations.

Page Overview

The graph page is separated in two sections.

Side Bar:

On the left side of the page is the sidebar where it displays all the recently generated graphs and has the generate new graph button.

Main Content:

On the right is the main content of the page. Here, the generated graph will be displayed along with a quick linear regression analysis with a short statement of its findings

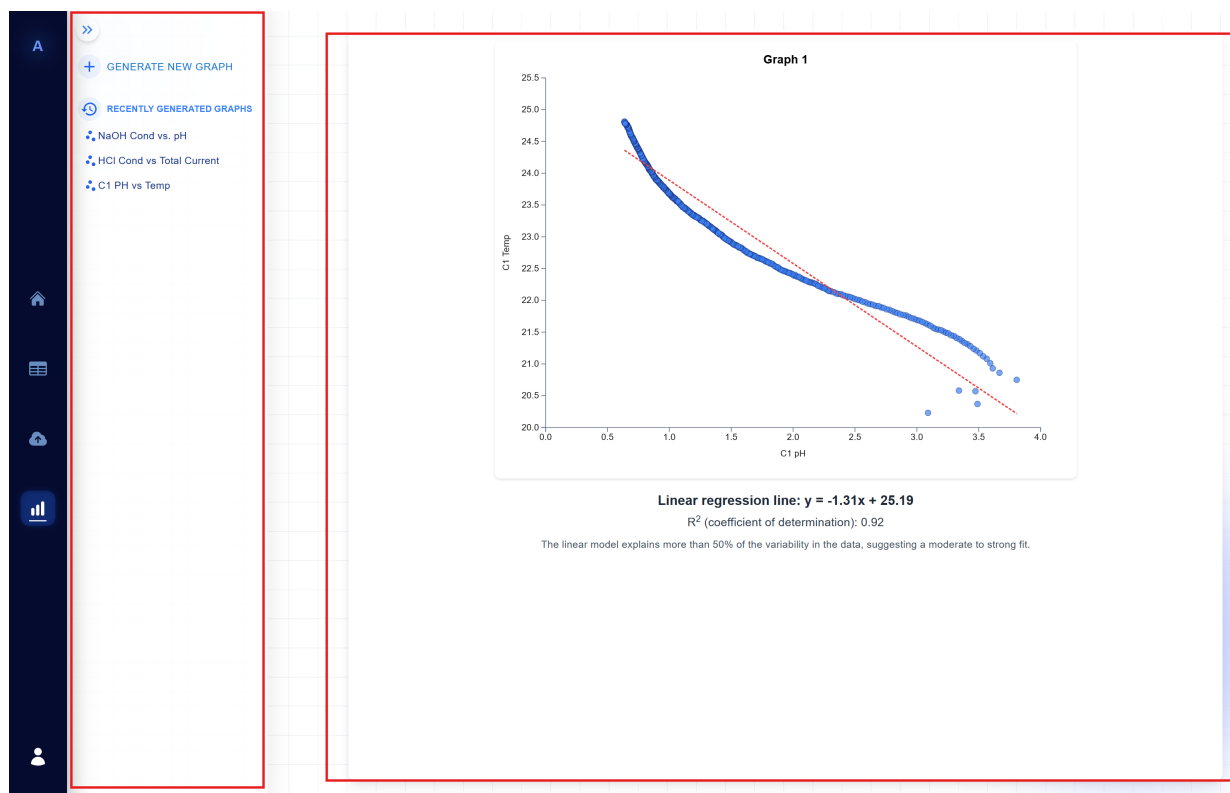


Figure 3: Graph page Separation Display

On the side bar, beside each generated graph item has an icon which signifies the type of graph it is.

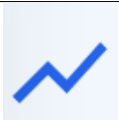


Icon	Definition
	Line Graph
	Bar Graph
	Scatter Plot

Table 1: Graph Types and Their Definitions

Generting a New Graph:

To create a new graph, click on the **Generate New Graph** button at the top of the side bar:

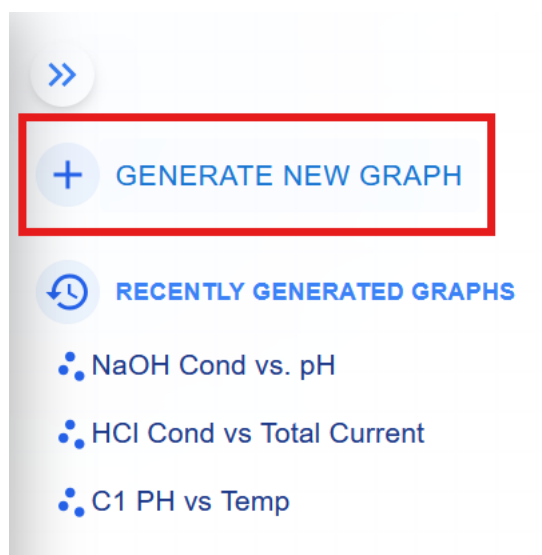


Figure 4: Highlights the Generate New Graph Button

5.5.1 Detailed Workflow

Description

There is a five-step process for generating custom graphs from experimental data.

1. Select Graph Type:

The app currently only supports 3 types of graphs.

- Line graph
- Bar graph
- Scatter plot

Generate Graph ×

1 2 3 4 5

Graph Filter Date Parameters Customize

Type of Graph
Select the graph to display the data

Graph Type * ▼

Previous Next

Figure 5: Highlights the Generate New Graph Button

2. Optional: Apply Filters:

Use this part of the form to filter experiment dates based on a certain attribute. The attribute could be from the Experiment or Raw Data files.

Note: Either all form field must be filled out or all must be empty in order to progress to the next stage of the form.

- (a) Choose which data file attribute to filter by
- (b) Choose filter attribute
- (c) Select filter value from dropdown

Generate Graph

×

✓

2

3

4

5

Graph

Filter

Date

Parameters

Customize

Parameter Type

Filter with datasheet or experiment attributes

Param Type

Experiment Log File

▼

Filter Parameters

Narrow down the data points with an attribute

Filter Attribute

of Stacks

▼

Filter Parameters

Filter by a value

Attribute Value

None

3

10

11

Previous

Next

Figure 6: Sample Input of the Filter Step

3. Selecting Dates:

If no filter is applied, all experiemnt dates wil be listed.

Generate Graph

✓

✓

3

4

5

Graph

Filter

Date

Parameters

Customize

Experiment Dates

Select the experimental date(s) of the datasheet(s)

Previous

Select Date *

2024-02-09

2024-02-08

2024-09-26

☐ 2024-09-23

☒ 2024-09-26

☒ 2024-02-08

Figure 7: Sample Input of the Date Step

4. **Set Parameters:**

Select the attributes for the X and Y axis to plot. The two attributes must be from the same experiment sheet.

Generate Graph

✓

✓

✓

4

5

Graph

Filter

Date

Parameters

Customize

Parameter Type

Filter with datasheet or experiment attributes

Param Type *

Experiment Log File

Compare Parameters

Select axis parameters

X *

of Stacks

Y *

Potential Diff (V)

Previous

Next

Figure 8: Sample Input of the Filter Step

5. Customize Display:

Users are able to customize the graphs. All fields on this step are optional. If no axis labels are inputted, the axis would be named the attribute name selected by default.

There are the following options for customization

- Graph title
- Axis Ranges
- Axis Labels

Generate Graph

×

✓

✓

✓

✓

5

Graph

Filter

Date

Parameters

Customize

Graph Title

Title

Custom Axis Settings

Axis Range

▼

Will take min and max values from data set as default

X Axis Range

Set values for the range of the axis

Min

Max

Y Axis Range

Set values for the range of the axis

Min

Max

Axis Labels

▼

X Axis Label

X Axis

Y Axis Label

Y Axis

Previous

Submit

Figure 9: Sample Input of the Filter Step

6 Troubleshooting

Section Overview

This section lists common issues, error messages, and their solutions, along with advanced diagnostic procedures.

6.1 Common Graphing Issues

Issue	Solution
Dropdown options not appearing	There may be no value for the selected combination of attributes or filters. Check to verify inputted options
Frozen form	There may be a large number of options to select from. Please give the page a few minutes to finishing loading up and displaying all the data
Rendering failed	Validate data selection