

|   |    |
|---|----|
| 1. Home .....                                     | 2  |
| 1.1   Development .....                           | 4  |
| 1.1.1 Development Process .....                   | 5  |
| 1.1.2 Quality Assurance Guidelines .....          | 6  |
| 1.1.3 Frontend Workspace Structure Proposal ..... | 7  |
| 1.2   Specifications .....                        | 12 |
| 1.2.1   Product Description .....                 | 13 |
| 1.2.2   Motivational Model .....                  | 15 |
| 1.2.3   Personas .....                            | 17 |
| 1.2.4   User Stories .....                        | 24 |
| 1.2.5   Prototype .....                           | 27 |
| 1.2.6   Test cases .....                          | 29 |
| 1.2.7   Acceptance Criteria .....                 | 36 |
| 1.3   Sprint Artefacts .....                      | 37 |
| 1.3.1   Final Presentation .....                  | 38 |
| 1.3.2   Sprint Plan .....                         | 39 |
| 1.4   Resources .....                             | 41 |
| 1.4.1 Team HA - Skills assessment .....           | 42 |
| 1.4.2   Contacts .....                            | 43 |

# Home

## COMP90082 Hacking Materials User Interface (HA)

### Project Overview

Materials science is a complex field that focuses on the study of physical materials and their properties. MatMiner is an existing Python library that combines materials data with Machine Learning strategies and models to study material properties without the need for time-consuming physical experimentation. Our project, Hacking Materials ("HA"), aims to build an easy and intuitive user interface to the [MatMiner library](#)  
 \* to eliminate the need for its users to have substantial Python or machine learning knowledge or experience.

Materials engineering is a field in which physical materials (e.g. metals, ceramics, polymers, composites, etc.) are studied to understand their composition, characteristics and properties. In many industries, such as mining, manufacturing and others, finding the right material for each job is essential for success. Materials engineers and scientists follow many different methods to compare candidate materials and make recommendations based on how they each satisfy the specific use case requirements. Some of these methods include physical experimentation, which can in some cases take up to 20 years to complete.

To avoid this, computer simulations (based on existing databases of known material properties and machine learning algorithms) can be used to compare materials in a much more efficient way. One such tool for this approach is the Python library [MatMiner](#), which allows easy access to ready-made datasets and integrates well with other machine learning Python libraries. However, to use this library, the user must have a substantial level of specialised knowledge in machine learning and programming, which most materials engineering do not have. To help them overcome this, the solution proposed by the client describes a simple and intuitive user interface that would act as a bridge between the user and the MatMiner library in the backend. The vision of this product is to make machine learning methodologies more accessible within the materials science and engineering industry as a whole, minimising the time and financial costs involved and leading to a more efficient industry.

### Goal

*Provide a user interface for standard processes in MatMiner: retrieving data from a database, users selecting features to be extracted from the database, performing simple machine learning tasks (Skikit Learn, Keras), and visualizing the results.*

### Team Members

|   |   |                |  |  |
|---|---|----------------|--|--|
|  |  |                |  |  |
| Name  | Dr Christian Brandl   | Mauro Mello Jr |  |  |
| Role  | Client  | Supervisor     |  |  |

### Useful links

| Trello  | Github  | Slack   |
|---|---|---|
|  |  |  |

### Tasks

- Edit this home page** - Click *Edit* in the top right of this screen to customize your Space home page
- Create your first page** - Click the *Create* button in the header to get started
- Brand your Space** - Click *Configure Sidebar* in the left panel to update space details and logo
- Set permissions** - Click *Space Tools* in the left sidebar to update permissions and give others access

|            |  |                            |                           |                          |                           |
|------------|--|----------------------------|---------------------------|--------------------------|---------------------------|
|            |  |                            |                           |                          |                           |
| Name       | <a href="#">Yanan Liu (Rep)</a>          | <a href="#">Hongpei Lu</a> | <a href="#">Jiahao Ju</a> | <a href="#">Xinle Yu</a> | <a href="#">Rui ZHANG</a> |
| Role       | Team Representative<br>Product Developer | Product Developer          | Product Developer         | Product Developer        | Product Developer         |
| Student ID | 1289747                                  | 1275238                    | 1128182                   | 1294310                  | 1221568                   |

## Project Scope

At this stage in development, we are focusing on a minimal set of features applicable to all users of the product. We have worked with Dr. Brandl to identify a set of core features, and to cleanly separate these from "pro-user" and other nice-to-have features. These high-priority features are identified in the User Stories list.

For now, only the high-priority features are definitely in scope for development. Other nice-to-have features may be developed once the high priority features have been finished and a minimum viable product has been deployed.

This project is intended to be generally useful to a broad range of potential users, including:

- Educators, who may use it to demonstrate the Matminer library and its capabilities
- Students, who may use it to learn about these tools and experiment with them
- Materials engineers, who will need to be able to access more advanced features including downloading generated code and customising workflow components

## Recent space activity

### [Yanan Liu](#)



Team HA - Skills assessment 1

### [Rui ZHANG](#)



| User Stories 5 •

### [Yanan Liu](#)



| Prototype 21 •

### [Jiahao Ju](#)



Sprint 2 Retrospective 10 •

### [Hongpei Lu](#)



Quality Assurance Guidelines 11:43 •

# | Development

# Development Process

*Proposed by Red Back team and approved among three teams*

- All tests are required to pass in the continuous integration before landing a pull request
- Sprint lifecycle:
  - Sprint Kickoff:
    - Review and re-estimate tasks: user stories get t-shirt size and priority
  - Development:
    - Feature kickoff:
      - Specify test cases and acceptance criteria
      - Tasks are estimated in the number of days to complete using the magic estimation approach
    - Code reviews:
      - Require tests to pass in CI before merging
      - At least one other RedBack member must approve the pull request before it can be merged
      - At least one BoxJelly member working on the same piece of technology must approve the pull request before it can be merged
      - At least one BlueRing member working on the same piece of technology must approve the pull request before it can be merged
      - All test cases and acceptance criteria identified in kickoff must be satisfied
    - Use auto-formatters to maintain code quality
    - Branching
      - Use the format `feature/t-<ticket>` as a feature branch template, where `<ticket>` is the Trello card number
      - `<username>/idea` for scratch/experimenting branches
      - `main` is the main branch
      - We will follow the following guidelines: <https://www.atlassian.com/git/tutorials/comparing-workflows/gitflow-workflow> (we probably only need main, release, scratch, and feature branches)
  - Release management:
    - Deploy as required

# Quality Assurance Guidelines

*Group cooperated work*

## Work Quality Guidelines

1. The code should be able to run. No syntax or compile-time errors.
2. If unit or integration tests are included in a pull request, they should pass
3. All preexisting tests should still pass with the new changes in the pull request
4. A branch should not be put up for a pull request if it has merge conflicts with the main. All conflicts should be resolved **before** requesting a review of a pull request.
5. The code should be understandable and contain documentation

## Code Review Guidelines

1. Each PR must be reviewed by one member from each of the other two student teams.
2. Pull requests should:
  - a. Be assigned reviewers within **24 hours** of being submitted
  - b. Be given initial feedback by reviewers within **48 hours** of being submitted
3. Commit messages should describe the work you've done and the steps you took to verify the correctness of your work
4. Pull request descriptions should summarise the commit messages
5. Pull request changes should be reviewed by using the Review Changes button under the Files Changed tab, to encourage the use of **Accept** or **Review Changes** messages.
6. Pull requests should only be merged by the creator of the pull request
7. Branches that have been successfully merged to the main should be deleted by the creator of the pull request
8. Reviewers should check that pull requests follow the work quality guideline above

## Acceptance Criteria definition guidelines

1. Acceptance criteria should be defined from the user's point of view
2. Acceptance criteria should contain a list of steps to test the desired functionality

## Definition of "done" for a user story

1. Acceptance criteria should be defined for the user story and should pass
2. All related code has **passed code review and merged to the main**

# Frontend Workspace Structure Proposal

*Proposed by team Red Back and approved among three teams*

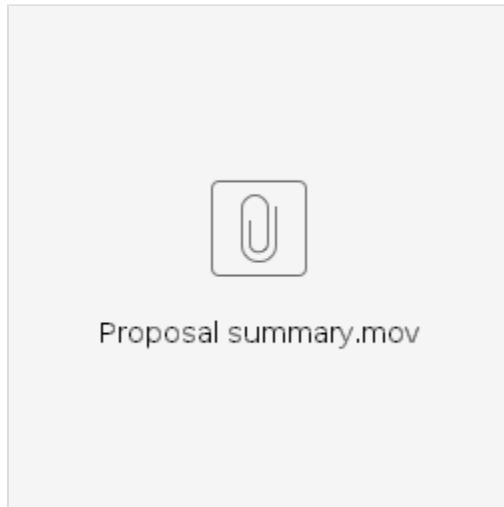
|                      |   |
|----------------------|---|
| <b>Proposed by</b>   | Ghina Yashar  |
| <b>Presented to</b>  | All frontend contributors from teams RedBack, BlueRing and BoxJelly   |
| <b>Proposal date</b> | September 1 2022  |
| <b>Status</b>        | <span style="border: 1px solid green; padding: 2px;">APPROVED</span> - September 2 2022   |
| <b>Approvers</b>     | <ul style="list-style-type: none"><li>■ Mamta Lopes(RedBack): 1/9/2022</li><li>■ Felipe Lin (BoxJelly): 2/9/2022</li><li>■ Rui Zhang (BlueRing): 2/9/2022</li></ul> |

## Proposed Structure

**Please note:** All the names used below can be replaced if needed, the focus of this proposal is more on the structure rather than the naming.

## Summary video

If you don't like reading, please watch the video below for a quick overview of the proposed structure. The sample code snippets shown in the video are copied below as well.



## Summary in writing

The structure I'm proposing would follow this rough directory tree:

### Sample directory structure

```

|_assets
|_src
  |_components
    |_exampleComponent
      |_examples.tsx
      |_index.tsx
      |_test.tsx
      |_styled.tsx
    |_dropdownSelectStepType
      |_examples.tsx
      |_index.tsx
      |_test.tsx
      |_styled.tsx
    ...
  |_steps
    |_datasetSelection // (e.g.)
      |_index.tsx
      |_test.tsx
      |_HelpModal
        |_index.tsx
        |_styled.tsx
      ...
    ...
  ...
  |_sections
    |_appHeader
      |_index.tsx
    ...
    |_appBody
      |_InputPanel
        |_index.tsx
      ...
      |_ViewingWindow
        |_index.tsx
      ...
    |_index.tsx
  |_appFooter // amendment suggested by Felipe
  ...
  |_App.tsx
  ...
|_package.json
|_README.md
...

```

The main ideas of this are as follows:

### Sections

By referring to the [low-fidelity prototype](#) created earlier in the project, we divide the main application page into 2 main sections:

- Header: the top bar, which does not need to have the context of what stage the user is up to and what's happening at any given point.
- Body: Includes 2 subsections that both need to know which stage the user is at (e.g. "Pre-process data" or "Apply machine learning"):
  - Left-side panel: named in the structure as `InputPanel`. Example code for this panel and how it shows the workflow steps is included in the sample code section below.
  - The main window on the right: named in the structure as `ViewingWindow`

### AMENDMENT - 2 SEPTEMBER 2022

Felipe Lin (HA-BoxJelly) suggests potentially adding an `appFooter` as well. No objections to this so far.

**Hacking Materials** **SECTION: HEADER** ≡ ⌂

Step 2.1: Lorem ipsum i

Make a selection  

Execute

Step 2.2: Lorem ipsum i

Lorem ipsum

Step 2.3: Lorem ipsum i

Make a selection  

Execute

...

**SECTION: BODY**

Step 2.1:

Lore ipsum dolor sit amet, consectetur adipiscing elit. Sed tincidunt congue ligula in rutrum. Morbi nec lacus condimentum, hendrerit mi eu, feugiat.

Step 2.2:

Lore ipsum dolor sit amet, consectetur adipiscing elit. Sed tincidunt congue ligula in rutrum. Morbi nec lacus condimentum, hendrerit mi eu, feugiat.

...

< Go back Go

**Hacking Materials** ≡ ⌂

Step 2.1: Lorem ipsum i

Make a selection  

Execute

Step 2.2: Lorem ipsum i

Lorem ipsum

Step 2.3: Lorem ipsum i

Make a selection  

Execute

**SUB-SECTION: INPUT PANEL**

Step 2.1:

Lore ipsum dolor sit amet, consectetur adipiscing elit. Sed tincidunt congue ligula in rutrum. Morbi nec lacus condimentum, hendrerit mi eu, feugiat.

**SUB-SECTION: VIEWING WINDOW**

Step 2.2:

Lore ipsum dolor sit amet, consectetur adipiscing elit. Sed tincidunt congue ligula in rutrum. Morbi nec lacus condimentum, hendrerit mi eu, feugiat.

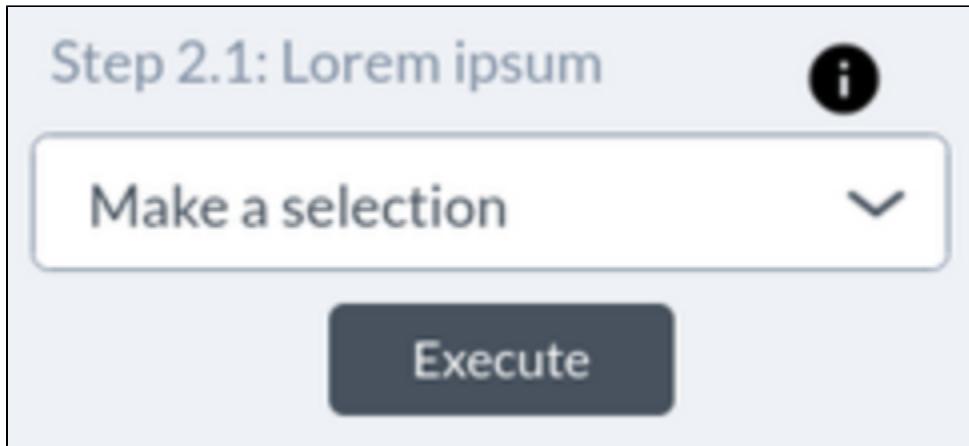
...

< Go back Go

## Components

This folder will mainly contain all reusable components, e.g. Button, Tooltip, Modal, etc.

Notably, some of these reusable components would be "step types", e.g. `DropdownSelectStepType`. This example step type refers to the entire object shown below, including a step number, title, tooltip, dropdown list, button and whatever else may be needed. We would create this as a reusable component because many steps have similar requirements, e.g. selecting a dataset and selecting a featurizer should both be dropdown list type steps.



## Steps

The word "steps" in this section refers specifically to the workflow steps that would be shown in the input panel, e.g. Dataset Selection step, Featurizer Selection step, etc.

A separate folder is created for these so that there would be a clear pattern that is easy to follow whenever more steps need to be added. Each step would use a step type component that is imported from the `/components` folder. For E.g. the `DatasetSelectionStep` would use the `DropdownSelectStepType`, as shown in the sample code snippet below.

## Sample code snippets

### Sample src/steps/datasetSelection/index.tsx

```
import DropdownSelectStepType from '../../../../../components/dropdownSelectStepType';
import HelpModal from './HelpModal';

...
const DatasetSelectionStep = (props) => {
    ...
    const STEP_KEY = "dataset_selection"

    const options = api_call_here() // calls backend API to get the dataset options

    const onSubmit = selected_value => send_to_backend() // send to backend using api

    return (
        <DropdownSelectStepType
            stepNumber={props.stepNumber}
            title="Select Dataset"
            description="bla bla"
            tooltipContent={HelpModal}
            options={options}
            onSubmit={onSubmit}
        />
    );
};
```

**Sample src/sections/appBody/InputPanel/index.tsx**

```
import DatasetSelectionStep from '../../../../../steps/datasetSelectionStep';
import FeatuirzerSelectionStep from '../../../../../steps/featuirzerSelectionStep';
...

const InputPanel = (props) => {
    ...
    const { stage } = props;

    if (stage === 1) {
        return (
            <div>
                <DatasetSelectionStep
                    stepNumber="1.1"
                    data={data}
                    handleChange={handleChange}
                />
                <FeatuirzerSelectionStep
                    stepNumber="1.1"
                    data={data}
                    handleChange={handleChange}
                />
                ...
            </div>
        );
    } else if (stage === 2) {
        return (
            <div>
                ...
            </div>
        );
    }
};

};
```

# | Specifications

- | Product Description
- | Sprint Plan
- | Motivational Model
- | User Stories
- | Persona
- | Prototype
- | Business Case for Cross-Team Collaboration
- | Test cases
- | Acceptance Criteria

# | Product Description

## Background

- In computational materials engineering, the engineering design of new materials is accelerated by avoiding costly and lengthy experiments to demonstrate the properties of materials. Data mining methods discover better materials by searching computer generated databases and making simulation predictions using high throughput and high-performance computing.
- Unfortunately, for some of the first movers, such as Tesla, translating this new thinking into engineering practice is still in its infancy. One obstacle is material engineers' software tools.
- Engineers with knowledge of the material domain need to effectively access and process this data in order to make informed decisions for the final machine learning strategy.

## Goal

- Provide a user interface for standard processes in MatMiner: retrieving data from a database, users selecting features to be extracted from the database, performing simple machine learning tasks (Scikit Learn, Keras), and visualizing the results.

## Sponsor

- **Dr Christian Brandl**
- Lecturer and sponsor at the University Of Melbourne.
- Completed his Ph.D. in Materials Science & Engineering at the École Polytechnique Fédérale de Lausanne EPFL and the Paul Scherrer Institute (Switzerland), followed by a post-doc in the Theoretical Division at the Los Alamos National Laboratory (USA).
- His research focuses on predictive atomistic simulation approaches to enable rational materials design.

## In-scope

The product is to design and build the following:

- A web page tool to help professional user and regular user or student who has no or very little experience in machine learning analysis method to complete material analysis;

Users requirements:

- Detailed analysis of user requirements;
- Design a beautified, user-friendly interface;
- Design a login page;
- Provide hints and guidance for new users;
- Design various machine learning models in Python that allow users to select features from a database and obtain a visual result;
- Allow to add new features;
- Provide code interface for pro user;
- The workflow allows to download;
- Machine learning model accuracy reaches a sufficient level;
- Complete the improvement suggestions that may be put forward by the clients;
- At least allow 30+ users to operate concurrently;
- Report the progress and results of the product;
- Runs on Melbourne Research Cloud;
- The final product results passed the test.

## Out-of-Scope

- The team has no obligation to release back-end code to the public;
- Operating maintenance is not within the scope of the team's obligations;
- The interpretability of the machine learning model does not need to be guaranteed, which means that the team members can choose the black box model as the machine learning model;
- Due to the lack of resources, the backend server cannot guarantee the stability of multiple simultaneous access.

## Stakeholders

| Name                 | Position   | Internal /External | Project Importance | Product Role   |
|----------------------|--|--------------------|--------------------|----------------|
| Dr. Christian Brandl | The person who originally wanted to start this product | External           | High               | Product Client |

|                |   |          |        |  |
|----------------|---|----------|--------|--|
| Mauro Mello Jr | The person who directs and supervises product team members on the product | Internal | Medium | <b>Product Supervisor</b>                              |
| Yanan Liu      | Student of the University Of Melbourne enrolled in COMP90082              | Internal | High   | <b>Team Representative</b><br><b>Product Developer</b> |
| Hongpei Lu     | Student of the University Of Melbourne enrolled in COMP90082              | Internal | High   | <b>Product Developer</b>                               |
| Jiahao Ju      | Student of the University Of Melbourne enrolled in COMP90082              | Internal | High   | <b>Product Developer</b>                               |
| Xinle Yu       | Student of the University Of Melbourne enrolled in COMP90082              | Internal | High   | <b>Product Developer</b>                               |
| Rui Zhang      | Student of the University Of Melbourne enrolled in COMP90082              | Internal | High   | <b>Product Developer</b>                               |

**Techniques**

- Hosting
  - University of Melbourne Cloud Services
- Web Development Techniques
  - NodeJS
- Frontend
  - React
  - Typescript
- Backend
  - Python
  - Flask
  - Docker
- Machine Learning
  - [MatMiner](#)
  - [Scikit Learn](#)
- Admin & Collaboration Tools
  - Confluence
  - Trello
  - Github
  - Slack

# Motivational Model

Assigned to [Yanan Liu](#), [Hongpei Lu](#)

## Versions

| Version ID | Description  | Editor   | Date      |
|------------|--|--|-----------|
| 1.0        | The first version is based on an initial understanding of the product and the first client meeting | <a href="#">Yanan Liu</a>                            | 2022-8-17 |
| 1.1        | Add a goal model based on the initial do-be-feel list  | <a href="#">Hongpei Lu</a>                           | 2022-8-18 |
| 2.0        | All teams merged the result of the do be feel list and goal model                                  | <a href="#">Yanan Liu</a> <a href="#">Hongpei Lu</a> | 2022-8-19 |

## Version 2.0

Group cooperated work [here](#)

## Do-Be-Feel-Who List

**Overall goal:** Material engineers without a machine learning background can use the software fluently to perform the required data analysis

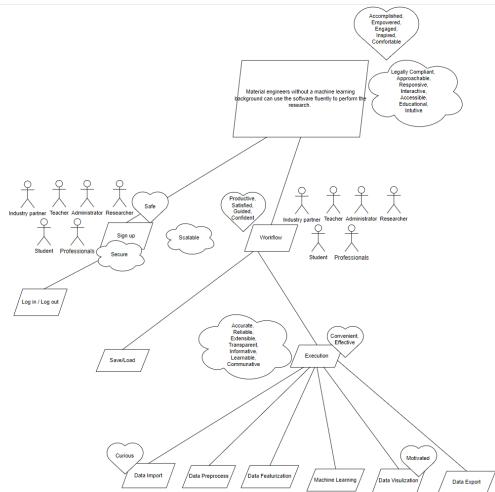
| Who (users)       | Do (functional goals)   | Be (qualitative goals)                                     | Feel (emotional goals) |
|-------------------|---|--|------------------------|
| Students          | Add more database, machine learning method and plot types   | Accessible   | Accomplished           |
| Administrators    | Compare data using tables & plots   | Accurate   | Comfortable            |
| Professionals     | Data Pre-processing: Calculate descriptive statistics   | Approachable   | Confident              |
| Industry Partners | Data Pre-processing: Consider anonymized data   | Communicative  | Convenient             |
| Teachers          | Data Pre-processing: Overview of the current import data  | Educational  | Curious                |
| Researcher        | Data Pre-processing: Reduces noise and eliminates ambiguity   | Extensible   | Effective              |
| Code maintainers  | Data Pre-processing: Standardizing data to bring it into the formatting range   | Informative  | Empowered              |
|                   | Data Visualization: Data processing: Tabular data & Plotted Graph   | Interactive  | Engaged                |
|                   | Edit python code directly in the interface  | Intuitive  | Guided                 |
|                   | Export input data   | Learnable  | Inspired               |
|                   | Export jupyter notebook file  | Legally Compliant  | Motivated              |
|                   | Export output data tables and figures   | Reliable   | Productive             |
|                   | Featurization data: Add multiple composition-based features   | Responsive   | Safe                   |
|                   | Featurization data: Add multiple simple density features  | Scalable   | Satisfied              |
|                   | Import Data: Create working spaces when importing   | Secure   |                        |
|                   | Import Data: Drag and drop import of files  | Transparent (progress, error messages, notebook export...) |                        |
|                   | Import Data: Import data files (CSV, XES, Parquet) from local system  |  |                        |
|                   | Log in/Log out  |  |                        |
|                   | Machine Learning: Define input data and output data: Splitting data into training, test, and validation sets                      |  |                        |
|                   | Machine Learning: Determining model features and training the model: Configure and adjust hyperparameters for optimum performance |  |                        |

|  |   |  |  |
|--|---|--|--|
|  | Machine Learning: Evaluate model performance and establish benchmarks: Continuous measurement and monitoring of model performance       |  |  |
|  | Machine Learning: Evaluate model performance and establish benchmarks: Evaluate models using validation methods and validation datasets |  |  |
|  | Machine Learning: Get model results: The most important features of the current ML model  |  |  |
|  | Machine Learning: Select the machine learning model to be used  |  |  |
|  | Maintain software   |  |  |
|  | save/load workflows   |  |  |
|  | Sign up   |  |  |

## Version 2.0

Group cooperation work [here](#)

## Goal model



# | Personas

Assigned to [Xinle Yu](#)

| Version | Description  | Editor                    | Date       |
|---------|--|---------------------------|------------|
| 1.0     | First version is based on an initial understanding of the project and the first client meeting | <a href="#">Xinle Yu</a>  | 2022-8-19  |
| 1.1     | Round off the sentences and adjust some description  | <a href="#">Xinle Yu</a>  | 2022-8-21  |
| 1.2     | Combine three teams' work  | <a href="#">Yanan Liu</a> | 2022-8-22  |
| 2.0     | Adjust technical skills and edit the text for fitting the change of skills                     | <a href="#">Xinle Yu</a>  | 2022-9-18  |
| 2.1     | Combine three teams' work  | <a href="#">Yanan Liu</a> | 2022-9-19  |
| 3.0     | Update persona profiles based on feedback  | <a href="#">Xinle Yu</a>  | 2022-10-20 |

## **Persona 1: Student (By: BoxJelly)**

# Assol Anahita

age: 22

residence: Melbourne

education: Materials Science and Engineering

occupation: Student

marital status: Single



*"It's SO time consuming to do material research and get decent results through just a semester."*

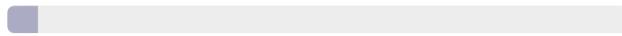
Motivation: As a materials engineering graduate student, Assol gets frustrated and demotivated when she can't make sense of the data she has and feels that she is not really making real progress with her studies. She needs a tool that can speed up materials data retrieval and processing so she can focus in analysing the results to better understand the theory and concepts of materials engineering.

## Comfort With Technology

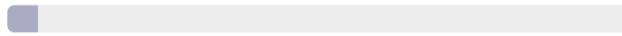
### PROGRAMMING WITH PYTHON



### MACHINE LEARNING



### CLOUD BASED STORAGE



### MATERIALS SCIENCE



## Criteria For Success:

Assol can perform materials data requests/retrievals and accurate materials property predictions supported by Machine Learning technology with easy to follow steps button clicks user interface.

## Needs

- Easy-to-use interface materials science data processing and retrieval application
- A tool to predict property of a material with assistance of Machine Learning technology without prior knowledge of Python and Machine Learning programming

## Wants

- A data mining application that helps her research projects
- A better understanding on how Machine Learning can help her to learn more about a material
- Ability to use ML algorithms as a black box
- Freedom to select features on her own terms
- A tool to accelerate research progress

## Values

- Convenience
- Quickness
- Safety
- Understandable

## Fears

- Spends hours working on a research project with very little progress because she neither has an adequate tool to do data mining, nor the programming skill to analyse the data herself
- Have to conduct countless experiments to figure out the properties of the materials

- Hard to choose suitable ML algorithms

***Persona 2: Industry User (By: BlueRing)***

# Gray Zhou

age: 28

residence: Ningde, Fujian, China

education: Master of Material Engineering

occupation: R & D Engineer of Polymer

marital status: Single

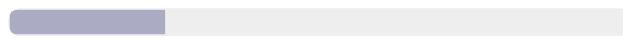


*"It is fantastic to apply a multi-function online tool with ML methods if it is efficient and reliable. Nobody will refuse a tool that can save time"*

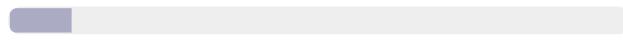
Motivation: Gray Zhou is a R & D Engineer of polymers in a battery factory. His work is searching for better materials for battery production. Gray spends a lot of time testing different materials, but some of tests are waste of time because of the poor performance observed. He needs a system that can predict some useful properties of materials so that he can remove samples with low predicted performance and boost the research. His company provides some ML tools, but they are awkward and only have limited functions.

## Comfort With Technology

### PROGRAMMING WITH PYTHON



### MACHINE LEARNING



### CLOUD BASED STORAGE



### MATERIALS SCIENCE



## Criteria For Success:

Provide a website or online-tool with quick, visual interface which can help him in daily development of new materials.

A successful product should help him save noticeable time on data processing and provide reliable prediction of properties.

## Needs

- Retrieve and extract required data, process the data with ML methods to get some properties
- Provide graphs which can be modified with interface about predicted properties
- Help finding the material with best predicted properties

## Wants

- Ability to interact with the graph to further compare serval materials in detail
- Upload data from his lab for predicting
- Explain what ML method the system applied and how it helps the prediction
- Continue his work on mobile devices without gaps of interaction

## Values

- Easy to get started on both desktop and mobile
- Efficient back-end process
- Abilities to select functions and filter results
- Well organized visualization of interface and

## Fears

- Not enough guidance in the web or tool so him may feel confused to find functions he wants.
- Lacking understand of what the system done, then reducing the confidence level of his report
- Frequently unable to access the system

gr dptts

• Frequently unable to access the system

### **Persona 3: Pro User (By: RedBack)**

# Alex

age: 45

residence: Melbourne

education: Masters Degree in Physics

occupation: Materials Engineer

marital status: Divorced without kids



*"There has got to be a better way to do this."*

Motivation : As an experienced Materials Engineer, Alex's job requires him to narrow down candidate materials by performing physical experiments to choose a material which can takes years to do. He needs a tool that can speed up the process by narrowing down candidate materials for experimentation using Machine Learning and simulations.

## Comfort With Technology

### PROGRAMMING WITH PYTHON



### MACHINE LEARNING



### CLOUD BASED STORAGE



### MATERIAL SCIENCE



## Criteria For Success:

Alex can find the right materials efficiently, with accurate results and that matches the client's requirements.

## Needs

- Products to accelerate his workflow
- Access to wide variety of related tools and resources

## Wants

- Suitable models and featurizers for different use cases
- Demonstrate reproducible results to his clients
- Share resources with others
- Refining generated workflow to reuse

## Values

- Extensibility
- Accuracy
- Reliability
- Responsiveness
- Scalability
- Transparency

## Fears

- Tool is too inflexible
- Losing access to progress on his work
- Not being able to verify his results
- Not having support with the tool



# | User Stories

Assigned to Rui ZHANG

## Versions

| Version ID | Description   | Editor    | Date       |
|------------|---|-----------|------------|
| 1.0        | First version based on initial understanding of the project and first client meeting      | Rui ZHANG | 2022-8-18  |
| 1.1        | Added size estimation, priority, and justifications.                                      | Rui ZHANG | 2022-8-18  |
| 1.2        | Supplement the remaining User Stories   | Jiahao Ju | 2022-8-18  |
| 1.3        | Changed priority to Moscow priority. Added user story 5.                                  | Rui ZHANG | 2022-8-18  |
| 1.4        | Delete unrelated stories. Add some general stories.                                       | Jiahao Ju | 2022-8-19  |
| 2.0        | Merged user stories from all three teams  | Rui ZHANG | 2022-8-20  |
| 2.1        | Reordered the user stories and grouped them by domain. Changed size to estimation of days | Rui ZHANG | 2022-8-21  |
| 2.2        | Regroup Action to new Epic and change original Epic to Domain                             | Yanan Liu | 2022-8-21  |
| 2.3        | Add epics summary table and explanation for size/priority                                 | Rui ZHANG | 2022-9-18  |
| 2.4        | Add new US: US40 and US41 found during implementation                                     | Jiahao Ju | 2022-10-17 |
| 3.0        | Fix order and some grammar. Update consistency with other teams                           | Rui ZHANG | 2022-10-21 |

### i Prioritization Technique

We used the MoSCoW prioritization classification.

Must have - must be included in the scope of the project, we defined this all the must have user stories can create a minimum viable product

Should Have - should be included in the scope of the project

Could Have - could be included in the scope of the project

Won't Have - will not be included in the scope of the project

## Version 3.0 (cross-team effort)

### Epics & Owning team allocation

|   | Epic               | Total Size | Highest Priority within Epic | Assigned Team             |
|---|--------------------|------------|------------------------------|---------------------------|
| 1 | Input Data         | 27         | 1 - Must Have                | RedBack                   |
| 2 | Administration     | 31         | 1 - Must Have                | BoxJelly                  |
| 3 | Machine Learning   | 16         | 1 - Must Have                | BlueRing                  |
| 4 | Data Visualisation | 13         | 1 - Must Have                | BlueRing                  |
| 5 | Jupyter Notebook   | 20         | 2 - Should Have              | Unassigned - stretch goal |
| 6 | External Data      | 8          | 2 - Should Have              | Unassigned - stretch goal |

## User Stories

| ID |      | Role         |           | Action   | Epic       |         | Goal  |  | Size (days) | Priority      | Assigned Team |
|----|------|--------------|-----------|--|------------|---------|---|--|-------------|---------------|---------------|
| 30 | As a | general user | I want to | be able to view the citations for used featurizers | Input Data | so that | I could be know more about the source of the featurizer (legally compliant) |  | 1           | 1 - Must have | RedBack       |

|    |      |              |           |  |                  |         |  |   |                 |          |
|----|------|--------------|-----------|--|------------------|---------|--|---|-----------------|----------|
| 32 | As a | general user | I want to | browse and select built-in featurizers   | Input Data       | so that | I can discover ways of manipulating my data                          | 1 | 1 - Must have   | RedBack  |
| 34 | As a | general user | I want to | browse built-in datasets   | Input Data       | so that | I can discover data to experiment with                               | 1 | 1 - Must have   | RedBack  |
| 19 | As a | student      | I want to | quickly browse the Materials available in the database for retrieval and simulations | Input Data       | so that | I can quickly perform queries.                                       | 3 | 2 - Should have | RedBack  |
| 21 | As a | general user | I want to | be able to select datasets from existing databases                                   | Input Data       | so that | I do not have to worry about how the data is loaded                  | 3 | 1 - Must have   | RedBack  |
| 37 | As a | general user | I want to | be able to preview the output of each execution                                      | Input Data       | so that | I could explore the data   | 1 | 1 - Should have | RedBack  |
| 41 | As a | general user | I want to | view the columns of the saved dataset and select the column I want to featurize      | Input Data       | so that | I can provide the correct input to the featurizer                    | 3 | 1 - Must have   | RedBack  |
| 25 | As a | general user | I want to | Select specific features from a dataset  | Input Data       | so that | I can improve the precision of my model                              | 3 | 2 - Should have | RedBack  |
| 13 | As a | Pro user     | I want to | add new features   | Input Data       | so that | they can be reused in the future                                     | 5 | 2 - Should have | RedBack  |
| 28 | As a | general user | I want to | be able to reference / view citation for original data sources                       | Input Data       | so that | I can retrieve data.   | 1 | 3 - Could have  | RedBack  |
| 18 | As a | pro user     | I want to | be able to apply new featurizers   | Input Data       | so that | I can create new features  | 3 | 3 - Could have  | RedBack  |
| 1  | As a | student      | I want to | clean and tune data input  | Input Data       | so that | I have less noise on visualizations.                                 | 5 | 3 - Could have  | RedBack  |
| 29 | As a | student      | I want to | save project specific data/checkpoints   | Administration   | so that | I can pick up where I left off for specific projects                 | 1 | 1 - Must have   | BoxJelly |
| 35 | As a | pro user     | I want to | export model selections, parameters, and data flows                                  | Administration   | so that | I can save my work and share it with others                          | 1 | 1 - Must have   | BoxJelly |
| 36 | As a | pro user     | I want to | import exported model selections, parameters, and data flows                         | Administration   | so that | I can continue work I had previously saved                           | 1 | 1 - Must have   | BoxJelly |
| 20 | As a | student      | I want to | Create an account using single-sign on, restricted to the *.unimelb.edu.au domain    | Administration   | so that | my research remains secure   | 3 | 1 - Must have   | BoxJelly |
| 23 | As a | pro user     | I want to | Control job execution  | Administration   | so that | I can start, view progress of, and cancel jobs related to my project | 3 | 1 - Must have   | BoxJelly |
| 10 | As a | pro user     | I want to | be able to opt in to pro-user features   | Administration   | so that | I can access pro user features                                       | 5 | 1 - Must have   | BoxJelly |
| 38 | As a | pro user     | I want to | have my pro user settings persist on each visit                                      | Administration   | so that | I don't have to reconfigure settings to use the features I need      | 1 | 2 - Should have | BoxJelly |
| 24 | As a | student      | I want to | receive provided hints and guidance for new users                                    | Administration   | so that | I can quickly learn how to use software                              | 3 | 2 - Should have | BoxJelly |
| 14 | As a | pro user     | I want to | easily find and read documentation on the pro features                               | Administration   | so that | I can use them with ease   | 5 | 2 - Should have | BoxJelly |
| 17 | As a | pro user     | I want to | Be kept informed about job status  | Administration   | so that | I can avoid polling my workspace to check for results                | 3 | 3 - Could have  | BoxJelly |
| 6  | As a | pro user     | I want to | have access to more processing power   | Administration   | so that | I can run more complex operations or use more data                   | 5 | 3 - Could have  | BoxJelly |
| 31 | As a | general user | I want to | able to select a Machine Learning model  | Machine Learning | so that | I could use it to train and run the data                             | 1 | 1 - Must have   | BlueRing |
| 33 | As a | general user | I want to | browse built-in ML models  | Machine Learning | so that | I can discover ways of manipulating my data                          | 1 | 1 - Must have   | BlueRing |
| 39 | As a | user         | I want to | be able to select split ratio of data  | Machine Learning | so that | to train and test the model  | 1 | 2 - Should have | BlueRing |
| 26 | As a | pro user     | I want to | have the option to change the hyperparameters used in the machine learning model     | Machine Learning | so that | I can fine tune my test results.                                     | 3 | 2 - Should have | BlueRing |

|    |      |              |           |   |                    |         |  |   |                 |   |
|----|------|--------------|-----------|---|--------------------|---------|--|---|-----------------|---|
| 15 | As a | pro user     | I want to | be able use additional ML models                                | Machine Learning   | so that | I can improve accuracy   | 5 | 2 - Should have | BlueRing  |
| 7  | As a | pro user     | I want to | combine multiple ML models together                             | Machine Learning   | so that | I can model more complex data manipulations  | 5 | 3 - Could have  | BlueRing  |
| 40 | As a | general user | I want to | select features used for x and y axis                           | Data Visualisation |         | I can plot the chart based on features I'm interested in                                   | 1 | 1 - Must have   | BlueRing  |
| 22 | As a | general user | I want to | see clear annotation or explanation of data points and features | Data Visualisation | so that | I can understand the results of the analysis   | 3 | 1 - Must have   | BlueRing  |
| 8  | As a | student      | I want to | use different type of plotting graphs                           | Data Visualisation | so that | I have flexibility to visualize data according to my needs.                                | 5 | 1 - Must have   | BlueRing  |
| 9  | As a | general user | I want to | able to view and plot the results of the model                  | Data Visualisation | so that | I could analysis and visualise the effects of the model                                    | 5 | 1 - Must have   | BlueRing  |
| 12 | As a | student      | I want to | export my work to a Jupyter Notebook                            | Jupyter Notebook   | so that | I can extend my work beyond the capability of the application                              | 5 | 2 - Should have | TBD - after the completion of all assigned "should have's |
| 2  | As a | general user | I want to | attach comments to workflow objects                             | Jupyter Notebook   | so that | I can document my work   | 5 | 3 - Could have  | TBD - after the completion of all assigned "could have's  |
| 4  | As a | Pro user     | I want to | edit python code on the interface                               | Jupyter Notebook   | so that | I can have control how the ML algorithms works   | 5 | 3 - Could have  | TBD - after the completion of all assigned "could have's  |
| 5  | As a | Pro user     | I want to | upload my own script (in python) if possible                    | Jupyter Notebook   | so that | I can extend the tool to support custom models and featurizers                             | 5 | 3 - Could have  | TBD - after the completion of all assigned "could have's  |
| 27 | As a | pro user     | I want to | be able to access new databases                                 | External Data      | so that | I can access addional data   | 3 | 2 - Should have | TBD - after the completion of all assigned "should have's |
| 3  | As a | Pro user     | I want to | be able to add new datasets in the future                       | External Data      | so that | if there's a new dataset that can be used on a new project, it can be added instantly      | 5 | 3 - Could have  | TBD - after the completion of all assigned "could have's  |
| 11 | As a | student      | I want to | analyze the relationship between different features             |                    | so that | I can identify which features I need to select for my analysis                             | 5 | 2 - Should have | TBD - after the completion of all assigned "should have's |
| 16 | As a | general user | I want to | add specific materials to the workflow for analysis             |                    | so that | compare the performance of the specific material my client or I choose with other material | 3 | 3 - Could have  | TBD - after the completion of all assigned "could have's  |

# | Prototype

Assigned to [Yanan Liu](#)

## Versions

| Version ID | Description  | Editor  | Date      |
|------------|--|---|-----------|
| 1.0        | First version based on initial understanding of the project and client meeting<br>Made in collaboration with team redback and boxjelly | <a href="#">Yanan Liu</a> <a href="#">Ghina Yashar</a> <a href="#">Felipe Leefu</a> <a href="#">Huang Lin</a> | 2022-8-20 |

## User Testing Prototypes

After we divided the workflow steps into three stages, it became unclear when and how the user would execute the workflow. After asking the client what he preferred, we realised that this is a more complex decision than we expected and it would need more consideration. To help the client reach a decision, we prepared three functional low-fi prototypes for user testing. Each prototype represented a different approach. The approaches were as follows:

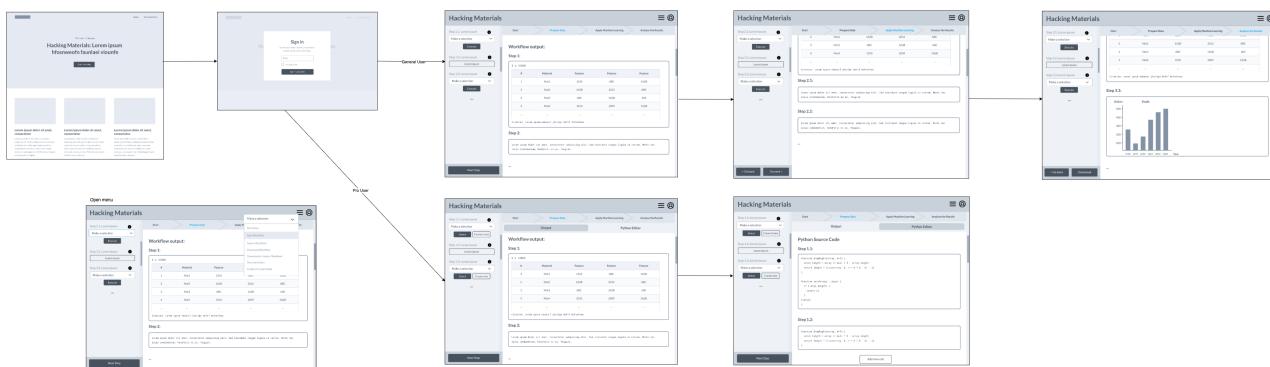
- Approach A - Run workflow steps individually. Prototype: <https://marvelapp.com/prototype/2g445gdg/screen/88805093>
- Approach B - Run the full workflow at once at the end. Prototype: <https://marvelapp.com/prototype/2g445gdg/screen/88805697>
- Approach C - Run each stage (which includes a number of steps) individually. Prototype: <https://marvelapp.com/prototype/2g445gdg/screen/88805736>

The prototypes were shared with the client, but as he was unavailable at the time, we decided to preemptively adopt Approach C as it offered the best balance between . Once the client was able to respond, he agreed with our decision. We then implemented Approach C, using the prototype as a guide.

*Group cooperation work, work in marvel*

## Low-fidelity Prototype

### Version 1.0



*Descriptive Notes recorded by team redback*

## Descriptive Notes

- Landing page:
  - Static page with information about the app and project
  - Link to access the app
    - On click, it opens a login modal
    - Once the user is logged in, they're redirected to the app
- Single page app:

- Top bar:
  - User profile button at the top opens a menu to give the user the option to log out
  - Menu button at the top has options to import or save a workflow, download it in different formats, start over, a link to the documentation and a toggle to enable pro view.
- General user:
  - The workflow is divided into major and minor steps. Each major step would have its own page. The user can go back and forth between the major steps as needed.
  - Left panel:
    - All the minor steps are numbers and named to guide the user
    - Inputs can be of different types
    - Each step has a tooltip button that would open a modal with guidance information about the step
    - The steps and options in the left panel should always be the same no matter what selections the user made in previous steps. Any step that requires customised inputs would open in a modal.
      - Example 1: Step 3.1 might be "Selecting a plot type". As there is a known, limited list of different plot types, this step may be a drop-down menu that is displayed directly in the left panel.
      - Example 2: Step 3.2 might be customising the selected plot's configuration options. As different plot types may need different configuration options, these options will not be displayed in the panel directly. Instead, the panel will include only a button that says "Configure plot", which would open a modal with the specific options applicable to the selected plot type.
    - Pinned buttons at the bottom of the panel: navigate between the different major steps. Last step page may also have a button to download the full workflow.
  - Viewing window:
    - At the top of the viewing window, the user can see the progression of major steps with the current step highlighted.
    - The output of each minor step is labelled with the step number and contained inside a box. The output inside the box is the same output produced by running the python code, simply copied over for transparency.
    - The outputs from the previous pages are also always displayed, so it's not just the outputs of the current page.
    - Where a resource with citations is used, the citations will be automatically printed after the output of the step where the resource was selected.
- Pro user:
  - Left panel: has all the same options as a general user, plus additional buttons to configure their own settings as needed
  - Viewing window: the window has 2 tabs:
    - Output: same as the viewing window of the general user
    - Python source code:
      - An editable view of all the code generated by their selections, looks similar to a Jupyter notebook.
      - User can add new cells as desired
      - Brings up the following question: what happens if the user edits the code generated by one of the steps? This may lead to inconsistencies between what is shown in the step's input field and what the code now actually does. This is an implementation decision so is not a major concern right now, but one option that we decided to show in the prototype is that the step's input in the left panel would change to say "Custom" or something similar, indicating that the configuration was changed.

# | Test cases

## Versions

| Version ID | Description                          | Editor     | Date       |
|------------|--------------------------------------|------------|------------|
| 1.0        | Add test cases for the US 31         | Hongpei Lu | 2022-9-15  |
| 2.0        | Add test cases for the US 08, 09, 40 | Hongpei Lu | 2022-10-16 |

## US 31: As a general user, I want to be able to select a Machine Learning model.

### US31, TC 01: Select a model (successful)

|   |                                  |
|---|----------------------------------|
| <b>Test Type:</b><br>Functional   | <b>Execution Type:</b><br>Manual |
| <b>Objective:</b>   |                                  |
| Verify if a machine learning model is correctly selected.   |                                  |
| <b>Setup:</b>   |                                  |
| The IO stream has been established between the front end and the back end.  |                                  |
| <b>Pre-Condition:</b>   |                                  |
| 1. The user has inputted the data or selected the data.<br>2. The user has selected the target feature.   |                                  |
| <b>Notes:</b>   |                                  |
| [1] Select the machine learning model in the interface.<br><br>Must select a choice in the given place.<br><br>Do not select the models that are out of scope in the given choices (Linear regression model and Random forest model).<br><br>[2] Submit the information.<br><br>* Application starts machine learning using the given input dataset and selected feature. |                                  |
| <b>Time constraint:</b>   |                                  |
| Minimum: 10 min<br><br>Maximum: 30 min  |                                  |

### US31, TC 02: Select a model (unsuccessful)

|  |                                  |
|--|----------------------------------|
| <b>Test Type:</b><br>Functional  | <b>Execution Type:</b><br>Manual |
| <b>Objective:</b>  |                                  |
| Verify if a machine learning model is correctly selected.                  |                                  |
| <b>Setup:</b>  |                                  |
| The IO stream has been established between the front end and the back end. |                                  |

**Pre-Condition:**

1. The user has inputted the data or selected the data.
2. The user has selected the target feature.

**Notes:**

- [1] Try not to select the machine learning model in the interface.  
[2] Submit the information.  
\* Application cannot learn without a selected machine learning model.

**Time constraint:**

Minimum: 10 min

Maximum: 30 min

## **US 40: As a general user, I want to select features used for the x-axis and y-axis.**

### **US40, TC 01: Select an x-axis feature (successful)**

|   |                        |
|---|------------------------|
| <b>Test Type:</b>   | <b>Execution Type:</b> |
| Functional  | Manual                 |
| <b>Objective:</b>   |                        |
| Verify if a feature for the x-axis is correctly selected.   |                        |
| <b>Setup:</b>   |                        |
| The IO stream has been established between the front end and the back end.  |                        |
| <b>Pre-Condition:</b>   |                        |
| <ol style="list-style-type: none"> <li>1. The user has inputted the data or selected the data.</li> <li>2. The user has executed the machine learning model.</li> </ol>   |                        |
| <b>Notes:</b>   |                        |
| <p>[1] Select the feature for the x-axis in the interface.<br/> Must select a choice in the given place.<br/> Do not select the features that are out of scope in the given choices (The features are displayed in the interface).<br/> [2] Click the Execute button.<br/> * Application receives the x-axis feature value.</p> |                        |
| <b>Time constraint:</b>   |                        |
| <p>Minimum: 1 min</p>   |                        |
| <p>Maximum: 5 min</p>   |                        |

### **US40, TC 02: Select an x-axis feature (unsuccessful)**

|   |                        |
|---|------------------------|
| <b>Test Type:</b>   | <b>Execution Type:</b> |
| Functional  | Manual                 |
| <b>Objective:</b>   |                        |
| Verify if a feature for the x-axis is correctly selected. |                        |

**Setup:**

The IO stream has been established between the front end and the back end.

**Pre-Condition:**

1. The user has inputted the data or selected the data.
2. The user has executed the machine learning model.

**Notes:**

- [1] Try not to select a feature for the x-axis in the interface.
  - [2] Click the Execute button.
- \* Application cannot learn without a selected x-axis feature value.

**Time constraint:**

Minimum: 1 min

Maximum: 5 min

**US40, TC 03: Select a y-axis feature (successful)**

| Test Type: | Execution Type: |
|------------|-----------------|
| Functional | Manual          |

**Objective:**

Verify if a feature for the y-axis is correctly selected.

**Setup:**

The IO stream has been established between the front end and the back end.

**Pre-Condition:**

1. The user has inputted the data or selected the data.
2. The user has executed the machine learning model.

**Notes:**

- [1] Select the feature for the y-axis in the interface.

Must select a choice in the given place.

Do not select the features that are out of scope in the given choices (The features are displayed in the interface).

- [2] Click the Execute button.

\* Application receives the y-axis feature value.

**Time constraint:**

Minimum: 1 min

Maximum: 5 min

**US40, TC 04: Select a y-axis feature (unsuccessful)**

| Test Type: | Execution Type: |
|------------|-----------------|
| Functional | Manual          |

**Objective:**

Verify if a feature for the y-axis is correctly selected.

**Setup:**

The IO stream has been established between the front end and the back end.

**Pre-Condition:**

1. The user has inputted the data or selected the data.
2. The user has executed the machine learning model.

**Notes:**

- [1] Try not to select a feature for the y-axis in the interface.  
[2] Click the Execute button.  
\* Application cannot learn without a selected y-axis feature value.

**Time constraint:**

Minimum: 1 min

Maximum: 5 min

## US 09: As a general user, I want to be able to view and plot the results of the model.

### US09, TC 01: Plot the diagram (successful)

| Test Type:  | Execution Type: |
|---|-----------------|
| Functional  | Manual          |
| <b>Objective:</b>   |                 |
| Verify if a diagram can be displayed correctly.   |                 |
| <b>Setup:</b>   |                 |
| The IO stream has been established between the front end and the back end.  |                 |
| <b>Pre-Condition:</b>   |                 |
| <ol style="list-style-type: none"> <li>1. The user has inputted the data or selected the data.</li> <li>2. The user has executed the machine learning model.</li> <li>3. The user has selected features for the x-axis and the y-axis.</li> </ol> |                 |
| <b>Notes:</b>   |                 |
| <p>[1] Click the Plot button.<br/> Must select an x-axis and the y-axis feature value before plotting the diagram.<br/> * Application receives the requests and plots the diagram.</p>  |                 |
| <b>Time constraint:</b>   |                 |
| Minimum: 1 min  |                 |
| Maximum: 10 min   |                 |

### US09, TC 02: Plot the diagram (unsuccessful)

| Test Type:   | Execution Type: |
|--|-----------------|
| Functional   | Manual          |
| <b>Objective:</b>  |                 |
| Verify if a diagram can be displayed correctly.                            |                 |
| <b>Setup:</b>  |                 |
| The IO stream has been established between the front end and the back end. |                 |

|   |
|---|
| <b>Pre-Condition:</b>   |
| 1. The user has inputted the data or selected the data.   |
| 2. The user has executed the machine learning model.  |
| <b>Notes:</b>   |
| [1] The required choices are not selected:<br>[1.1] Not select the x-axis feature.<br>[1.2] Not select the y-axis feature.<br><br>[2] Click the Plot button.<br><br>* Application cannot plot the diagram without the x-axis and y-axis feature values. |
| <b>Time constraint:</b>   |
| Minimum: 1 min  |
| Maximum: 10 min   |

## US 08: As a student, I want to use different types of plotting graphs

### US08, TC 01: Select a type of regression model (successful)

|   |                                  |
|---|----------------------------------|
| <b>Test Type:</b><br>Functional   | <b>Execution Type:</b><br>Manual |
| <b>Objective:</b>   |                                  |
| Verify if a regression model is correctly selected.   |                                  |
| <b>Setup:</b>   |                                  |
| The IO stream has been established between the front end and the back end.  |                                  |
| <b>Pre-Condition:</b>   |                                  |
| 1. The user has inputted the data or selected the data.<br>2. The user has executed the machine learning model.   |                                  |
| <b>Notes:</b>   |                                  |
| [1] Select the regression model in the interface.<br>Must select a choice in the given place.<br><br>Do not select the regression models that are out of scope in the given choices (The regression model choices are displayed in the interface).<br><br>[2] Click the Execute button.<br><br>* Application receives the regression model. |                                  |
| <b>Time constraint:</b>   |                                  |
| Minimum: 1 min  |                                  |
| Maximum: 5 min  |                                  |

### US08, TC 02: Select a type of regression model (unsuccessful)

|   |                                  |
|---|----------------------------------|
| <b>Test Type:</b><br>Functional                     | <b>Execution Type:</b><br>Manual |
| <b>Objective:</b>                                   |                                  |
| Verify if a regression model is correctly selected. |                                  |

|  |
|--|
| <b>Setup:</b>  |
| The IO stream has been established between the front end and the back end.   |
| <b>Pre-Condition:</b>  |
| 1. The user has inputted the data or selected the data.<br>2. The user has executed the machine learning model.  |
| <b>Notes:</b>  |
| [1] Try not to select a regression model in the interface.<br>[2] Click the Execute button.<br>* Application cannot execute without a selected regression model value. |
| <b>Time constraint:</b>  |
| Minimum: 1 min<br>Maximum: 5 min   |

### US08, TC 03: Create the regression plot (successful)

|   |                        |
|---|------------------------|
| <b>Test Type:</b>   | <b>Execution Type:</b> |
| Functional  | Manual                 |
| <b>Objective:</b>   |                        |
| Verify if a regression plot can be displayed correctly.   |                        |
| <b>Setup:</b>   |                        |
| The IO stream has been established between the front end and the back end.  |                        |
| <b>Pre-Condition:</b>   |                        |
| 1. The user has inputted the data or selected the data.<br>2. The user has executed the machine learning model.<br>3. The user has selected features for the x-axis and the y-axis.<br>4. The user has selected the regression model. |                        |
| <b>Notes:</b>   |                        |
| [1] Click the Plot button.<br>Must select an x-axis, the y-axis feature value, and a regression model before plotting the diagram.<br>* Application receives the requests and plots the diagram.                                      |                        |
| <b>Time constraint:</b>   |                        |
| Minimum: 1 min<br>Maximum: 10 min   |                        |

### US08, TC 04: Create the regression plot (unsuccessful)

|  |                        |
|--|------------------------|
| <b>Test Type:</b>  | <b>Execution Type:</b> |
| Functional   | Manual                 |
| <b>Objective:</b>  |                        |
| Verify if a regression plot can be displayed correctly.                    |                        |
| <b>Setup:</b>  |                        |
| The IO stream has been established between the front end and the back end. |                        |

**Pre-Condition:**

1. The user has inputted the data or selected the data.
2. The user has executed the machine learning model.

**Notes:**

[1] The required choices are not selected:

- [1.1] Not select the x-axis feature.
- [1.2] Not select the y-axis feature.
- [1.3] Not select the regression model.

[2] Click the Plot button.

\* Application cannot plot the diagram without filling in the required choices.

**Time constraint:**

Minimum: 1 min

Maximum: 10 min

# | Acceptance Criteria

| User Story ID | User Story   | Given   | When   | Then   |
|---------------|--|---|--|--|
| 33            | Browse Machine Learning models   | I have selected the target feature and I'm at the model selection step                            | I click on the dropdown menu   | I should see a list of Machine Learning models with readable names                                       |
| 31            | Select a Machine Learning model  | I'm at the model selection step and I can see a list of Machine Learning models                   | I select one of the Machine Learning models and click on save              | I should receive some feedback on whether the action is successful or not                                |
| 39            | be able to select split ratio of data                                    | I've selected a dataset and saved my selection  | I type in a ratio of train and test data and click the continue button     | I should receive some feedback on whether the action is successful or not                                |
| 26            | Browse the hyperparameters used in the machine learning model            | I successfully select one of the Machine Learning models  | I receive the feedback that my selection is succeed                        | I should see some adjustable functionality for the hyperparameters of the model I selected               |
| 26            | Be able to change the hyperparameters used in the machine learning model | I see some adjustable functionality for the hyperparameters of the model I selected               | I adjust the values of these hyperparameters and click the continue button | I should receive some feedback on whether the action is successful or not                                |
| 15            | be able use additional ML models   | I have selected the target feature and I'm at the model selection step                            | I click on the dropdown menu   | I see enough Machine Learning models with readable names   |
| 7             | Browse multiple models to be combined                                    | I have selected the target feature and I'm at the model selection step                            | I receive the successful feedback from feature selection                   | I should see multiple dropdown menus that allow me to select multiple Machine Learning models to combine |
| 7             | Combine multiple models together   | I see multiple dropdown menus that allow me to select multiple Machine Learning models to combine | I select several different models  | I should receive some feedback on whether the action is successful or not                                |
| 40            | Browse features used for selecting x and y axis                          | I've selected a dataset and saved my selection  | I click on the dropdown menu   | I see a list of column names in the dropdown menu  |
| 40            | Select features used for x and y axis                                    | I am at the x and y axis selection step and I see a list of column names                          | I select two of the data columns as x and y axis and clicked on execution  | I should receive some feedback on whether the action is successful or not                                |
| 9             | View and plot the results of the model                                   | I successfully select x and y axis used for plotting  | I click the plot button  | I can see plots about the selected columns   |
| 8             | Browse different regression models                                       | I successfully select x and y axis used for plotting  | I click on the dropdown menu of selecting regression models                | I see several types of regression models   |
| 8             | See different results of plotting graphs                                 | I see several types of regression models  | I choose one of the regression models and click on the plot button         | I see a correct regression plot of my selection  |

## Change Log

| Date       | Version | Author    | Comment        |
|------------|---------|-----------|----------------|
| 2022-10-17 | 1.0     | Jiahao Ju | First version. |

# | Sprint Artefacts

# | Final Presentation

|                          |   |
|--------------------------|---|
| Date                     | 2022-10-19 15:00  |
| Presentation Recording   | <a href="https://drive.google.com/file/d/1XFPP1e2R8pmjp7nLiCsyl5EVvZ9Cm50/view?usp=sharing">https://drive.google.com/file/d/1XFPP1e2R8pmjp7nLiCsyl5EVvZ9Cm50/view?usp=sharing</a> |
| Presentation Slide (PDF) | <br>HA final presentation.pdf  |

# | Sprint Plan

Assigned to @Rui Zhang, [Xinle Yu](#), [Hongpei Lu](#)

See details on Trello board [HERE](#).

## Product Preparation (Aug 1 - Aug 7)

- Team form (Aug 1-3)
- Meeting with supervisor (Aug 4)
- Create a workspace on GitHub and Trello (Aug 5)
- Create Confluence pages (Aug 6)
- Draft of the workflow (Aug 7)

## Sprint 1: Inception (Aug 8 - Aug 21)

- Kick-off Meeting with Client (Aug 12)
- Motivational Model (Aug 8 - Aug 14)
- User Story & Personas Of Users (Aug 15 - Aug 21)
  - Student: Box Jelly
  - Industry: Blue Ring
  - Pro-user: Red Back
- Prototype (Aug 20 - Aug 21)
- Development Environment (Aug 15 - Aug 18)
- Development workflow (Aug 19 - Aug 21)
- Documentation (Aug 8 - Aug 21)

## Sprint 2: Development (Aug 22 - Sep 19)

- Retrospective of sprint 1 (Aug 22 - Aug 24)
- Sprint planning (Aug 23 - Aug 25)
- Sprint period (Aug 26 - Sep 19)
  - US 9 View and plot the results of the model
    - Frontend ([Rui ZHANG](#), 5 days)
  - US 22 See clear annotation or explanation of data points and features
    - Frontend ([Rui ZHANG](#), 5 days)
  - US 31 Select a Machine Learning model
    - Frontend ([Rui ZHANG](#), 2 days)
    - Machine learning ([Hongpei Lu Yenan Liu](#), 3 days each)
    - Backend ([Xinle Yu Jiahao Ju](#), 5 days each)
  - US 33 Browse built-in ML models
    - Frontend ([Rui ZHANG](#), 2 day)
    - Machine learning ([Hongpei Lu Yenan Liu](#), 10 days each)
    - Backend ([Xinle Yu Jiahao Ju](#), 5 days each)
  - Testing
    - Frontend ([Rui ZHANG](#), 3 days)
    - Machine learning ([Hongpei Lu Yenan Liu](#), 3 days each)
- Task Tracking (Aug 22 - Sep 19)
- Documentation (Aug 22 - Sep 19)

## Sprint 3: Development (Sep 20 - Oct 21)

- Retrospective of sprint 2 (Sep 20 - Sep 23)
- Sprint planning (Sep 20 - Sep 23)
- Sprint period (Sep 24 - Oct 21)
  - US 8 Use different types of plotting graphs
    - Frontend ([Rui ZHANG](#), estimated 10 days)
  - US 9 View and plot the results of the model
    - Frontend ([Rui ZHANG](#), estimated 3 days)
    - Machine learning ([Hongpei Lu Yenan Liu](#), estimated 3 days each)
    - Backend ([Xinle Yu Jiahao Ju](#), estimated 5 days each)
  - US 31 Select a Machine Learning model
    - Frontend ([Rui ZHANG](#), estimated 5 days)
    - Machine learning ([Hongpei Lu Yenan Liu](#), estimated 3 days each)
    - Backend ([Xinle Yu Jiahao Ju](#), estimated 5 days each)
  - US 33 Browse built-in ML models
    - Frontend ([Rui ZHANG](#), estimated 5 days)
    - Machine learning ([Hongpei Lu Yenan Liu](#), estimated 5 days each)
    - Backend ([Xinle Yu Jiahao Ju](#), estimated 5 days each)
  - US 39 Select split ratio of data
    - Frontend ([Rui ZHANG](#), estimated 5 days)

- Machine learning ([Hongpei Lu Yanan Liu](#), estimated 5 days each)
- Backend ([Xinle Yu Jiahao Ju](#), estimated 5 days each)
- Testing
  - Frontend ([Rui ZHANG](#), estimated 5 days)
  - Machine learning ([Hongpei Lu Yanan Liu](#), estimated 5 days each)
  - Backend ([Xinle Yu Jiahao Ju](#), estimated 5 days each)
- Task Tracking (Sep 20 - Oct 21)
- Documentation (Sep 20 - Oct 21)

## Sprint 4: Product (Oct 22 - Nov 4, Planned)

- Retrospective of sprint 3 (Oct 22 - Oct 26)
- Sprint planning (Oct 22 - Oct 26)
- Sprint period (Oct 24 - Nov 1)
  - Testing
- Task Tracking (Oct 22 - Nov 4)
- Prepare for final presentation (Oct 31 - Nov 4)
- Documentation (Oct 22 - Nov 4)
  - Release Note & release tag (Oct 31 - Nov 4)

# | Resources

**GitHub:** <https://github.com/COMP90082-2022-SM2/HA-BlueRing>

**Trello:** <https://trello.com/b/Q1AZdIXb/ha-bluering-sprints>

**Matminer:** [https://nbviewer.org/github/hackingmaterials/matminer\\_examples/blob/main/matminer\\_examples/index.ipynb](https://nbviewer.org/github/hackingmaterials/matminer_examples/blob/main/matminer_examples/index.ipynb)

**LMS Project:** [https://canvas.lms.unimelb.edu.au/courses/126944/pages/hacking-materials-user-interface-code-ha?module\\_item\\_id=3996633](https://canvas.lms.unimelb.edu.au/courses/126944/pages/hacking-materials-user-interface-code-ha?module_item_id=3996633)

**Dr. Christian Brandl information:** <https://findanexpert.unimelb.edu.au/profile/826808-christian-brandl>

**Motivational Model:** <https://momo-staging.eresearch.unimelb.edu.au/dashboard>

# Team HA - Skills assessment

| Email Address      | Team     | Matminer | React | Flask | Pandas | Scikit-learn | Numpy | Matplotlib | Seaborn | Plotly | Bokeh | Tensorflow | Keras | Pytorch | NodeJS | Pure HTML/CSS | Angular | Vue | Django | NodeJS | Any other suggestions for backend |
|--------------------|----------|----------|-------|-------|--------|--------------|-------|------------|---------|--------|-------|------------|-------|---------|--------|---------------|---------|-----|--------|--------|-----------------------------------|
| Hongpei Lu         | Bluering | 0        | 0     | 2     | 3      | 2            | 0     | 0          | 0       | 0      | 0     | 0          | 0     | 0       | 0      | 1             | 0       | 0   | 0      | 0      | 0                                 |
| Jiaheo Ju          | Bluering | 0        | 0     | 0     | 4      | 4            | 4     | 4          | 0       | 0      | 1     | 0          | 2     | 0       | 3      | 0             | 0       | 0   | 0      | 0      | 0                                 |
| Xinle Yu           | Bluering | 0        | 0     | 0     | 4      | 4            | 4     | 4          | 4       | 4      | 2     | 3          | 3     | 3       | 1      | 1             | 0       | 0   | 0      | 0      | 1                                 |
| Rui ZHANG          | Bluering | 1        | 2     | 3     | 4      | 5            | 4     | 0          | 0       | 1      | 0     | 1          | 5     | 3       | 2      | 1             | 0       | 0   | 0      | 0      | 0                                 |
| Yanan Liu          | Bluering | 0        | 0     | 0     | 4      | 4            | 4     | 4          | 4       | 2      | 0     | 3          | 3     | 3       | 0      | 0             | 0       | 0   | 0      | 0      | 0                                 |
| Dara O'Hehir       | Bokehly  | 0        | 1     | 2     | 1      | 5            | 5     | 5          | 3       | 3      | 2     | 0          | 4     | 4       | 1      | 2             | 2       | 1   | 0      | 0      | 2                                 |
| Yeonming Xuan      | Bokehly  | 0        | 0     | 0     | 4      | 5            | 5     | 5          | 0       | 0      | 0     | 0          | 1     | 1       | 0      | 0             | 3       | 0   | 0      | 0      | 0                                 |
| Tengfei Huang Lin  | Bokehly  | 0        | 1     | 4     | 2      | 1            | 1     | 1          | 1       | 0      | 0     | 0          | 0     | 0       | 4      | 4             | 0       | 0   | 3      | 3      | 3                                 |
| Zhaoxu WANG        | Bokehly  | 0        | 1     | 0     | 4      | 2            | 4     | 3          | 2       | 2      | 0     | 3          | 0     | 2       | 0      | 2             | 0       | 0   | 1      | 1      | 1                                 |
| Radimka Djan       | Bokehly  | 0        | 0     | 0     | 3      | 4            | 4     | 4          | 3       | 3      | 1     | 1          | 3     | 3       | 2      | 2             | 0       | 0   | 3      | 0      | 0                                 |
| Marta Reith Lopes  | Redback  | 0        | 1     | 3     | 0      | 3            | 5     | 5          | 4       | 0      | 0     | 0          | 1     | 1       | 0      | 0             | 4       | 0   | 0      | 0      | 0                                 |
| Ghina Yashar       | Redback  | 1        | 5     | 0     | 4      | 4            | 4     | 4          | 0       | 4      | 0     | 4          | 4     | 4       | 2      | 5             | 2       | 1   | 0      | 1      | 2                                 |
| Chunbabue Yang     | Redback  | 1        | 0     | 0     | 3      | 4            | 3     | 2          | 2       | 0      | 0     | 3          | 3     | 1       | 0      | 1             | 0       | 0   | 0      | 0      | 0                                 |
| Sanjeevani Avasthi | Redback  | 2        | 1     | 1     | 5      | 5            | 5     | 4          | 2       | 4      | 0     | 3          | 3     | 4       | 0      | 3             | 0       | 1   | 0      | 0      | 0                                 |
| Alastair Davies    | Redback  | 1        | 1     | 2     | 2      | 2            | 3     | 2          | 2       | 2      | 0     | 1          | 1     | 3       | 2      | 2             | 1       | 2   | 1      | 2      | 1                                 |

| Description            | Files |
|------------------------|-------|
| Summary                |       |
| Distribution of skills |       |

# | Contacts

## Team Members

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| Yanan Liu (Team representative) | <a href="mailto:yananl7@student.unimelb.edu.au">yananl7@student.unimelb.edu.au</a>   | 1289747    |
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## Client

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