University of Science and Technology of Hanoi

Master ICT

MI1.07 –SOFTWARE DEVELOPMENT PROJECT

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GROUP PROJECT – REPORT

Project REDUCE Manual

The aim of this documentation is to deliver instructions to the user of our Software Development Project – the REDUCE algorithm.

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Chapter 1

Software Overview

1.1 Goals

Reduce is a parallel design pattern that consists of compute a value from a set of values. One big problem here is linked to the floating point representation of real numbers. Indeed, it is well-known that the sum of several floats is rarely correct!

For example: Consider 2 arrays of float number

$$A = \{1.000000000, 2.000000000, 3.000000000\},$$
$$B = \{3.000000000, 2.000000000, 1.000000000\}.$$

Let's take sum of all elements inside each array. We may obtain res_A = 6.000000001 and res_B = 5.999999999. These 2 results are not exactly the same!

In order to retrieve a "good" approximation of the result, many algorithms may be proposed.

The goal of this project is to compare some of those algorithms, in quality and complexity, respectively.

1.2 Constraints

- The project must be written in C++ and Qt.
- The user should be able to access saved-experiments-result files.

Chapter 2

Software Manual

2.1 Graphical User Interface

The software GUI contains 3 main regions. They are corresponding to Progress tracking, Main input interface and Output box in succession.

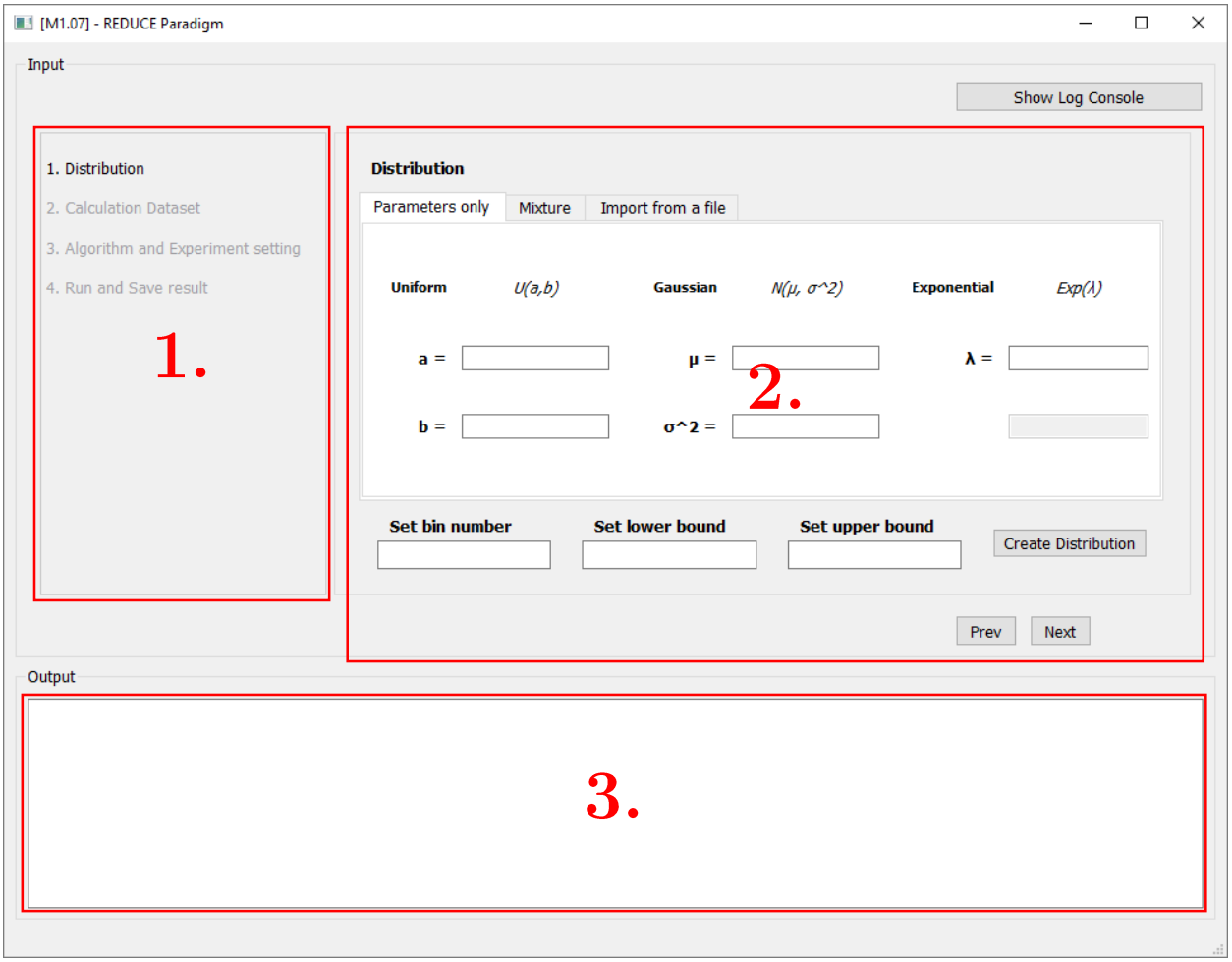

Figure 1: Project GUI – Overview

2.2 Detail features

Region 1: Progress tracking

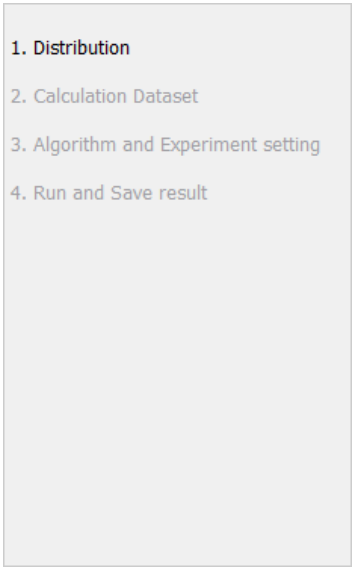

Figure 2: Project GUI – Progress tracking

This region will automatically highlight the current task in the workflow. It ensures that the user know what is going on.

Region 2: Main input interface

Region 2.1: Set Distribution

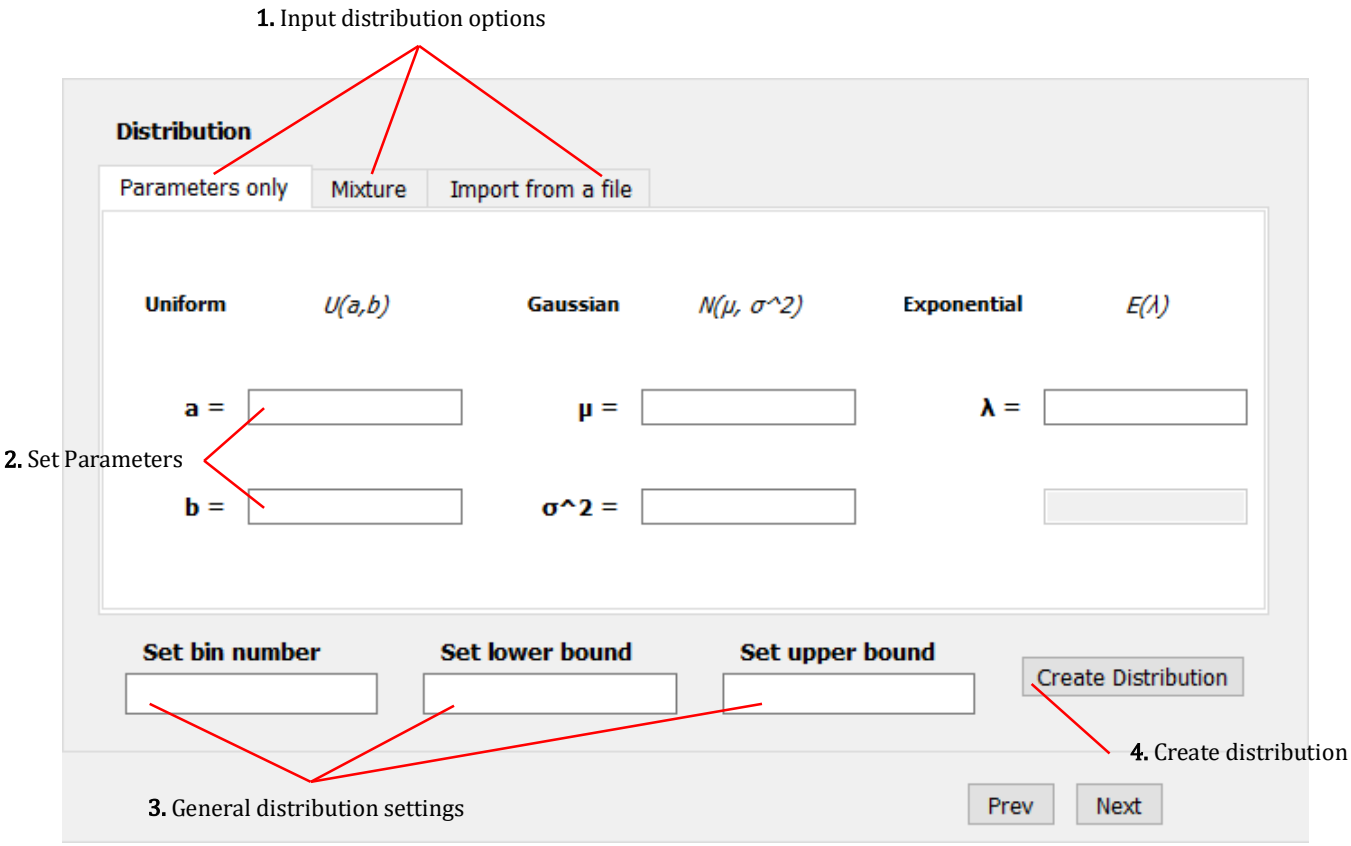

Figure 3: Project GUI – Set Distribution area

- The very first step is to select the most proper input options (see **1.** Input distribution options above). There are 3 ways to setup distribution:

+ Parameters only: The user needs to type in the parameters. The system then parse those parameters to form a distribution.

Choose this option for a distribution such as U(a, b) + N(μ, σ^2) + E(λ).

+ Mixture: The user can type in an equation of distribution. The system then parse the string to form a distribution.

Choose this option for a complex mixture of distribution such as

(U(a, b) + N(μ_1, σ_1^2)) * (N(μ_2, σ_2^2) + E(λ))

+ Note: only parentheses "(" and ")" are supported

+ Import from a file: The user can select a text file which contains strings of distribution.

Choose this option to import complex mixture of distributions from a text file such as ((U(a, b) + N(μ_1, σ_1^2)) * N(μ_2, σ_2^2)) + E(λ_1) + E(λ_2)

- After setup distribution, it's time to establish bin number (the higher bin number, the higher precision), then Lower and Upper bound (measurement range).
- Click Next button to go to the next task.

* **Note: If uniform distribution is used,** then **a**, **b** must be inside **lower bound –> upper bound** range.

Region 2.2: Set Calculation Dataset

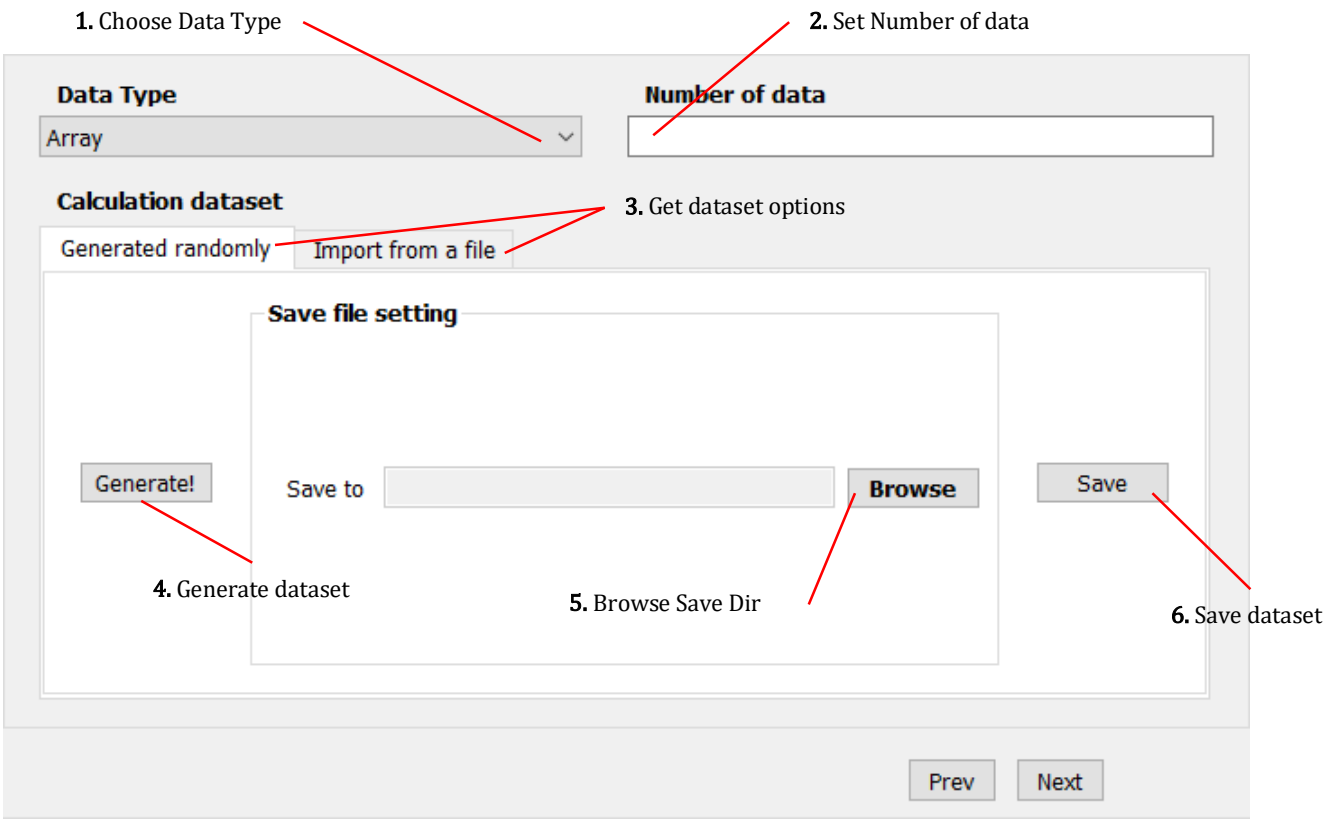

Figure 4: Project GUI – Set Calculation Dataset area

- Click Next button to go to the next task.
- Click Prev button to go to the previous task.

Region 2.3: Set Experiment setting and Choose Algorithm

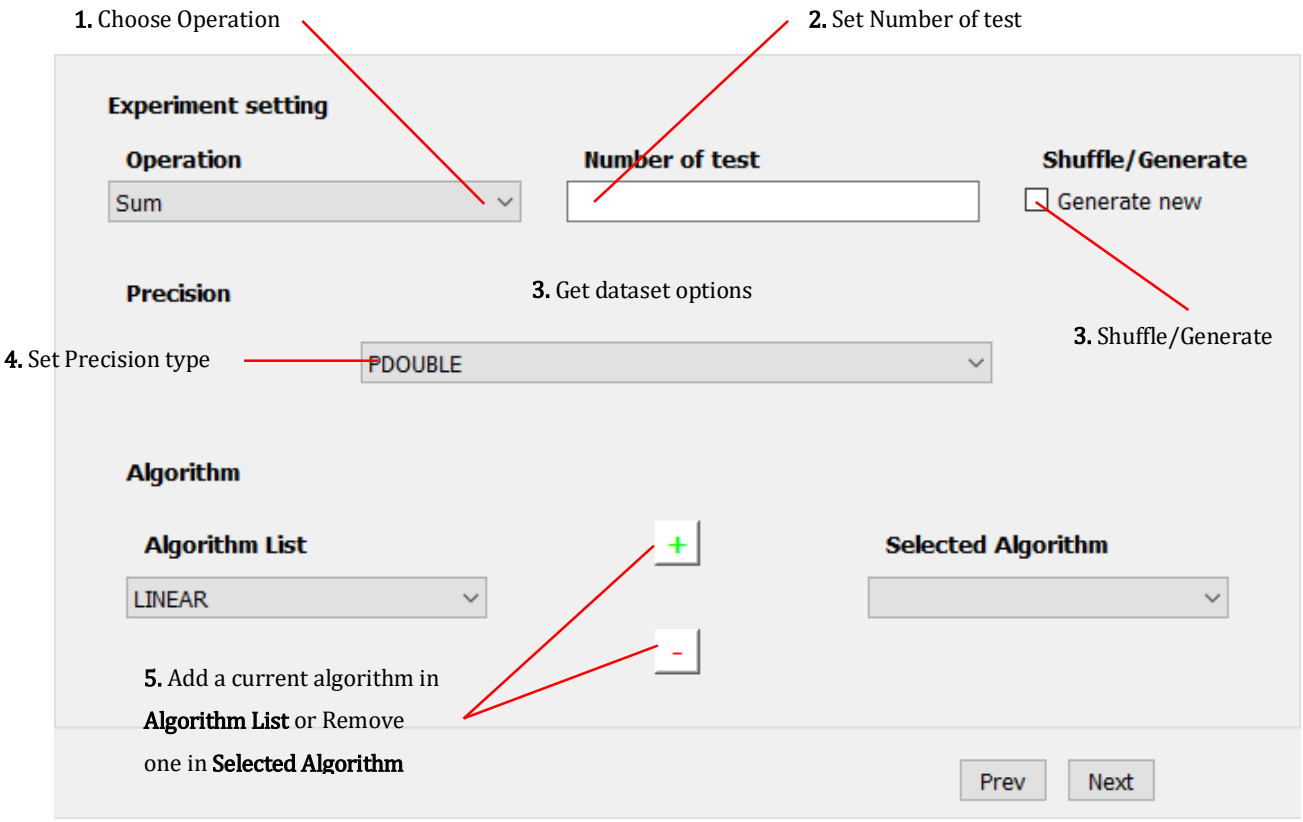

Figure 5: Project GUI – Set Experiment setting and Choose Algorithm area

- Click Next button to go to the next task.
- Click Prev button to go to the previous task.

Region 2.4: Run and Save Experiment

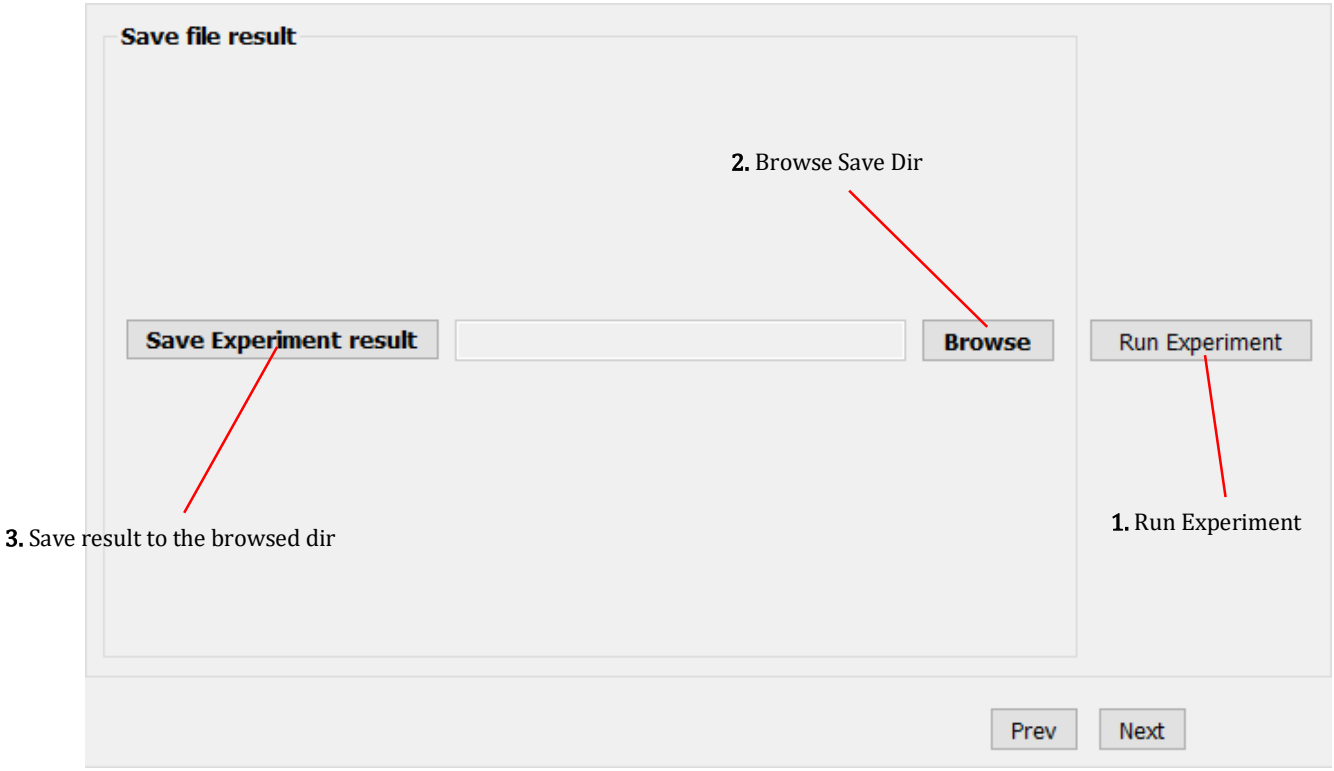

Figure 6: Project GUI – Run and Save Experiment area

- Click Prev button to go to the previous task.

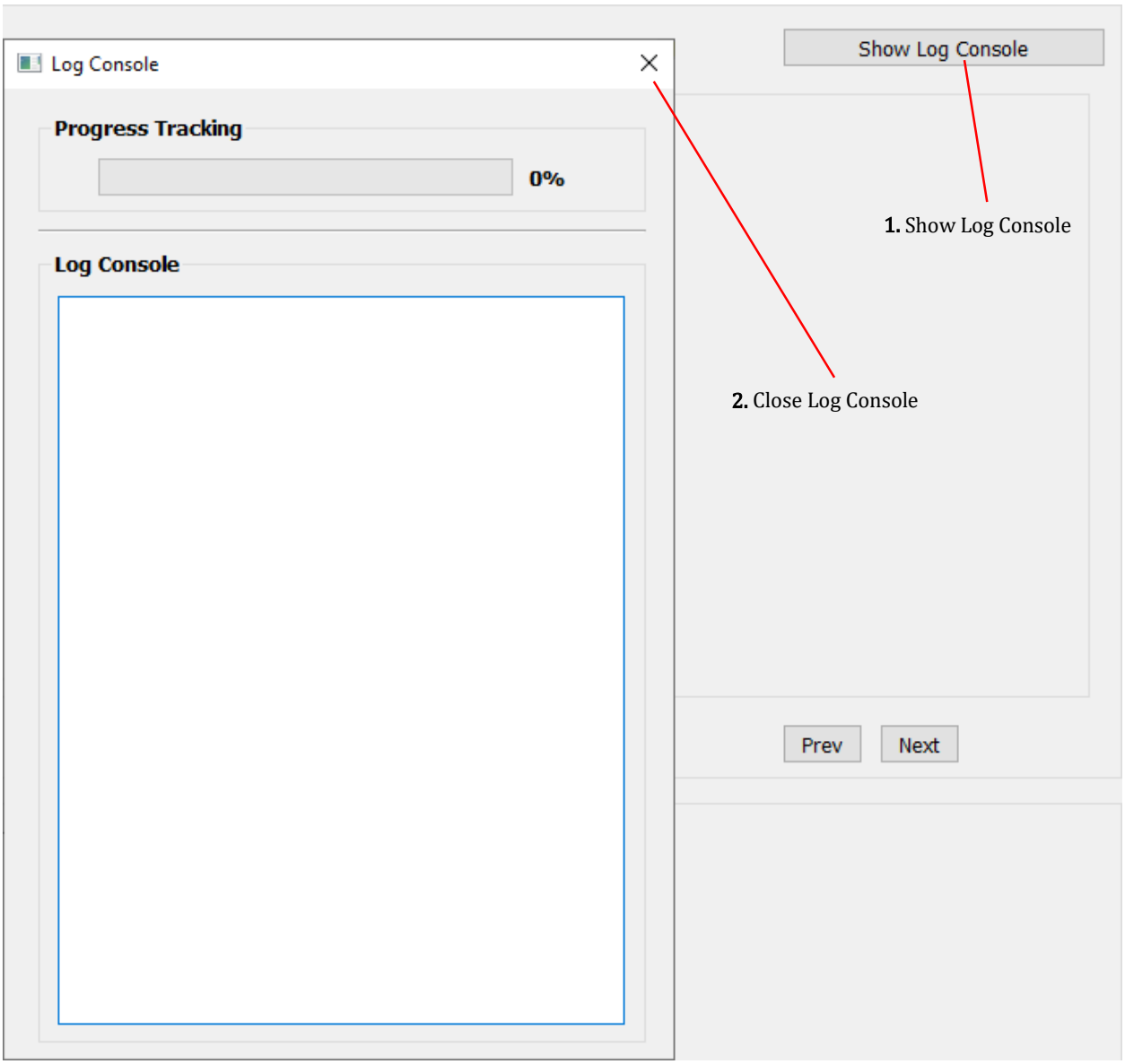

Figure 7: Project GUI – Show Log Console option

Region 3: Output box

Figure 8: Project GUI – Output box

This region displays the result of the finished experiment(s).