Abstract
This document contains the software user manual for the Delta extension of the APD tool, developed by the Delta team. This Software User Manual provides tutorials grouped by functionality of the Delta extension, a detailed description of every page the Delta extension contains, and a clear explanation of all errors that could occur, together with possible recovery procedures. This document complies with the ESA Software Engineering Standard [1].
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1 Introduction

1.1 Intended readership

The most important users of the Delta extension of the APD tool are academics. Academics will use the tool to do conformance checking between traces in an event log and a process model. These academics are expected to be active in the field of anomalous pattern discovery, either as researchers or as students. This prior knowledge ensures that the tool does not need to explain all the details of the workings of the APD tool, instead relying on the users to have experience in the required fields.

Two types of academics can be identified: unregistered users and registered users. Unregistered users do not have an account on the APD tool. These academics are users who access the tool for the first time. Registered users are users who have an account on the APD tool. These users have access to more functionality on the tool than unregistered users. All functionality available for both of these user types will be explained in detail in the upcoming sections.

A third type of user of the tool is an administrator, which is a special type of registered user with additional permissions. An administrator is expected to have a lot of experience with the APD tool and related activities. Moreover, an administrator is responsible for maintaining the Delta extension with regards to user and project management. All additional functionality available to administrators will be explained in detail in the upcoming sections.

1.2 Applicability

The document is applicable to the latest version release of the Delta extension of the APD tool.

1.3 Purpose

The purpose of the APD tool is to analyze traces in a provided event log against a provided process model. The tool analyses which traces comply with the model and which traces show anomalous behaviour. This analysis is done in two steps. First, recurrent anomalous subtraces with at least one deviation from the process model are extracted and structured in a subgraph hierarchy. Then, based on this structured subgraph hierarchy, the tool applies a frequent itemset algorithm to determine the anomalous subgraphs that frequently occur together. Finally, the ordering relations among each pair of subgraphs in each itemset are determined. The tool thus generates the set of anomalous patterns representing partially ordered anomalous subgraphs that tend to occur together.

The purpose of the Delta extension to the APD tool is to increase the usability of the tool. It provides administrators of the tool with a user management system. The extension also provides registered users of the tool with proper project and experiment management. The user interface of the tool will be improved, to increase the usability of the tool.

The purpose of this Software User Manual is to guide end users of the APD tool through their usage of the system. The manual provides a detailed description of all functionality available on the tool, and an illustration of all pages the Delta extension consists of.

1.4 How to use this document

This document consists of several tutorials which can be used as a reference guide. A detailed explanation of every page of the tool is also provided, which can be used to learn about all functionality available on the tool. All errors that could occur are explained and possible recovery procedures are discussed.
1.5 Related documents

The document related to the Software User Manual is the User Requirement Document (URD) of the Delta extension [6].

1.6 Conventions

Phrases that are written in italic refer to clickable objects, like buttons and menu items. Clickable icons are referenced to by a description the icon. In the provided tutorials, steps that are marked as optional may be skipped if the user sees fit.

1.7 Problem reporting

When a user encounters a problem during their use of the tool, the user should send an email with a detailed problem description to an administrator of the Delta extension.

1.8 List of references


2 Overview

In Section 3, several tutorials are described. The tutorials are grouped based on the functionality they provide. The tutorials are also ordered based on the permissions of the three different user types. Each type of user will have access to user specific functionality available on the tool. A registered user has access to all functionality of the APD tool that an unregistered user has access to. Similarly, an administrator has access to all functionality of the APD tool that a registered user has access to. An overview of the tutorial order is given below.

1. Registration - 3.1
2. Account Management - 3.2
3. Page Navigation - 3.3
4. Projects - 3.4
5. Experiments - 3.5
6. Anomalous subgraph discovery results - 3.6
7. Partial order discovery results - 3.7
8. Administrator - 3.8

In Section 4, all pages of the Delta extension are separately described. For every page, a detailed description of all functionality available on that specific page is provided, along with a list of possible errors that might occur on this page. The relation between different pages of the Delta extension is also indicated. In Section A a more detailed description of every error that could occur is described, along with possible recovery procedures.
3 Tutorials

This section contains tutorials for every feature the tool provides, grouped by functionality. The tutorials are ordered based on the permissions of the three different user types. For every tutorial, a description is provided, followed by a list of cautions and warnings that have to be taken into account. Afterwards, a set of preconditions describes the environmental needs that have to hold. Furthermore, a step by step description of the described functionality is provided, and an explanation of likely errors that might occur. The tutorial ends with some illustrative figures.

3.1 Registration

This section contains tutorials with regards to the registration of an unregistered user.

3.1.1 Registration

Functional description
This tutorial explains how an unregistered user can register for an account on the APD tool.

Cautions and warnings
The username filled in during registration is final and cannot be changed afterwards.

Preconditions
The user is not logged in.

Procedures
A step-by-step description of this operation is as follows.

1. Open your browser.
2. Go to https://delta-dev.win.tue.nl.
3. Click the Register button on the bottom left of the page.
4. Fill in all required input fields (see Figure 1).
5. (Optional) Fill in optional input fields.
6. (Optional) Read the privacy notice, be clicking on the privacy notice link.
7. Click the checkbox to agree to the privacy notice.
8. Click the Register button, displayed on the bottom of the page.

Likely errors
The content of any input field must be valid. All required input fields must be filled in. Each input field has a maximum input length that cannot be exceeded. Email addresses and user names must be unique. Furthermore, user names cannot contain special characters and email addresses must be valid. Passwords must contain at least one capital letter, one lower case letter, one number and one special character. The confirmation input field must match the original. Lastly, the optional input fields can not contain special characters other than a space, dash, underscore or slash. If any of these errors occurs, this will be indicated below the corresponding input field (see Figure 2).

Figures
See Figures 1 and 2.
3.2 Account Management

This section contains tutorials with regards to the account management of a registered user. These tutorials describe features regarding logging in and out, changing and resetting your password, viewing and editing account information and deleting your account.

3.2.1 Login

Functional description
This tutorial explains how a registered user can log in to the APD tool.

Cautions and warnings
None.

Preconditions
The registered user is not logged in.

Procedures
A step-by-step description of this operation is as follows.
1. Open your browser.
2. Go to https://delta-dev.win.tue.nl.

3. Enter your username and password in the corresponding input fields (see Figure 3).

4. Click the Login button.

**Likely errors**
The username and password are not valid. This will be indicated below the password input field (see Figure 4).

**Figures**
See Figures 3 and 4.

---

### 3.2.2 Logout

**Functional description**
This tutorial explains how a registered user can log out from the APD tool.

**Cautions and warnings**
None.

**Preconditions**
The registered user is logged in to the APD tool.

**Procedures**
A step-by-step description of this operation is as follows.

1. Open the side navigation menu by clicking on the menu icon, displayed on the top left of the page.
2. Click the Logout menu item (see Figure 5).

**Likely errors**
None.

**Figures**
See Figure 5.
3.2.3 Forgot password

Functional description
This tutorial explains how a registered user can reset their password without logging in. If an administrator has reset the password of a registered user, then this user has to execute steps 6 through 10 of this tutorial.

Cautions and warnings
After resetting a password, users are strongly recommended to change their new password to another password in the tool (see Tutorial 3.2.6).

Preconditions
The user is not logged in.

Procedures
A step-by-step description of this operation is as follows.

1. Open your browser.
2. Go to https://delta-dev.win.tue.nl.
3. Click the Forgot password? button.
4. Enter your username or email address in the corresponding input field (see Figure 6).
5. Click the Send button.
6. Open your email client.
7. Open the received email.
8. In the email, click on the password reset link.
9. Enter the new password in both input fields of the modal that opened (see Figure 7).
10. Click the Reset button.
11. Click the link in the modal that opened, in order to go back to the login page.
Likely errors
If no user exists with the entered email address or username of step 4, the password reset link will not be sent. Passwords must contain at least one capital letter, one lower case letter, one number and one special character. If the new password does not comply with these password requirements, or does not match the password confirmation, the password will not be changed. If any of these errors occur, this will be indicated below the corresponding input field.

Figures
See Figures 6 and 7.

3.2.4 View user information

Functional description
This tutorial explains how a registered user can view their user information.

Cautions and warnings
None.

Preconditions
The registered user is logged in to the APD tool.

Procedures
A step-by-step description of this operation is as follows.

1. Open the side navigation menu by clicking on the menu icon, displayed on the top left of the page.
2. Click the User information menu item (see Figure 8).

Likely errors
None.

Figures
See Figure 8.

3.2.5 Edit user information

Functional description
This tutorial explains how a registered user can edit their user information.
Cautions and warnings
Usernames cannot be changed.

Preconditions
The registered user is logged in to the APD tool and the user information page is displayed (see Tutorial 3.2.4).

Procedures
A step-by-step description of this operation is as follows.

1. Click the Edit information button (see Figure 9).
2. Click the input field or dropdown that you want to edit.
3. Edit the information in the input field or dropdown.
4. (Optional) Repeat steps 2 and 3 for other input fields.
5. Click the Confirm button at the bottom-right of the page (see Figure 9).

Likely errors
The content of the input fields might not match the requirements. If this is the case, an error below the corresponding input field will be displayed. These requirements are the same as the errors described in Section 3.1.1.

Figures
See Figure 9.

3.2.6 Change password

Functional description
This tutorial explains how a registered user can change their password.
Cautions and warnings
None.

Preconditions
The registered user is logged in to the APD tool and the user information page is displayed (see Tutorial 3.2.4).

Procedures
A step-by-step description of this operation is as follows.
1. Click the Change password button.
2. Fill in the old password in the corresponding input field and fill in the new password in the remaining fields (see Figure 10).
3. Click the Change button.

Likely errors
If the old password filled in in step 2 is incorrect, the password of this user will not be changed. Passwords must contain at least one capital letter, one lower case letter, one number and one special character. If the new password does not comply with these password requirements, or does not match the password confirmation, the password will not be changed. If any of these errors occurs, this will be indicated below the corresponding input field.

Figures
See Figure 10.

3.2.7 Delete your account

Functional description
This tutorial explains how a registered user can delete their account.
Cautions and warnings
None.

Preconditions
The registered user is logged in to the APD tool and the user information page is displayed (see Tutorial 3.2.4).

Procedures
A step-by-step description of this operation is as follows.
1. Click the Delete button (indicated by the trash can icon, Figure 11).
2. Click the Confirm button.

Likely errors
None.

Figures
See Figure 11.

3.3 Page Navigation

This section contains tutorials with regards to the page navigation of a registered user of the tool. These tutorials describe features regarding opening the home page of the tool and using the bread-crumbs of the tool.

3.3.1 Open home page

Functional description
This tutorial explains how a registered user can navigate to the home page.

Cautions and warnings
None.

Preconditions
The registered user is logged in to the APD tool.
Procedures
A step-by-step description of this operation is as follows.

1. Open the side navigation menu by clicking on the menu icon, displayed on the top left of the page.
2. Click the Home menu item (see Figure 12).

Likely errors
None.

Figures
See Figure 12.

3.3.2 Use breadcrumbs

Functional description
The pages in the tool form a hierarchy. An example of this is that from the home page, you can open an experiment page and from there you can open a results page. This tutorial explains how a user can go back to a page higher up in the hierarchy.

Cautions and warnings
The user cannot click the rightmost link of the breadcrumbs, since the user is already at that page.

Preconditions
The registered user is logged in to the APD tool.

Procedures
A step-by-step description of this operation is as follows.
1. In the breadcrumbs displayed at the top of the page, click the name of the page you want to view (see Figure 13).

Likely errors
None.

Figures
See Figure 13.

3.4 Projects

This section contains tutorials with regards to the projects of a registered user of the tool. These tutorials describe features regarding creating, opening and deleting projects. Features regarding sorting and filtering the list of projects displayed on your home page are also described.
3.4.1 Create a new project

Functional description
This tutorial explains how a registered user can create a new project.

Cautions and warnings
The .pnml file and the .xes file must represent an actual model and corresponding event log in order to generate results.

Preconditions
The registered user is logged in to the APD tool and the home page is displayed (see Tutorial 3.3.1).

Procedures
A step-by-step description of this operation is as follows.

1. Click the Create project button.
2. Enter a project name in the Project name input field (see Figure 14).
3. Select an event log (a .xes file) in the Log file input field.
4. Select a petri net (a .pnml file) in the Net file input field.
5. Click the Submit button.

Likely errors
All input fields must not be empty. The project name entered in step 2 must be unique: in the entire APD tool, there cannot be two projects with the same name. This project name cannot contain a special character other than a space, underscore or dash. Lastly, the extensions of the two file mentioned in step 3 and 4 must be adhered to. If any of these errors occur, this will be indicated below the corresponding input field.

Figures
See Figure 14.

3.4.2 Open a project

Functional description
This tutorial explains how a user can open an existing project to which they have access.
Cautions and warnings
None.

Preconditions
The registered user is logged in to the APD tool and the home page is displayed (see Tutorial 3.3.1).

Procedures
A step-by-step description of this operation is as follows.

1. In the displayed list of projects, click the project name of the project you want to open (see Figure 15).

Likely errors
None.

Figures
See Figure 15.

Figure 15: Open a project

3.4.3 Delete a project

Functional description
This tutorial explains how a registered user can delete one of their projects.

Cautions and warnings
None.

Preconditions
The registered user is logged in to the APD tool and the home page is displayed (see Tutorial 3.3.1).
Procedures
A step-by-step description of this operation is as follows.

1. Click the Delete button (indicated by the trash can icon) next to the project you want to delete (see Figure 16).
2. Click the Confirm button.

Likely errors
None.

Figures
See Figure 16.

3.4.4 Sort the list of projects

Functional description
This tutorial explains how a registered user can sort the list of projects displayed on their home page (see Tutorial 3.3.1).

Cautions and warnings
None.

Preconditions
The registered user is logged in to the APD tool and the home page is displayed (see Tutorial 3.3.1).

Procedures
A step-by-step description of this operation is as follows.
1. Click the property on which you want to sort, i.e. Project name, Creation date or Ownership (see Figure 17).

2. (Optional) If you want to sort in reversed order, click again on the property.

3. (Optional) If you want to sort based on an additional property, hold Shift on your keyboard and click the additional property.

**Likely errors**
None.

**Figures**
See Figure 17.

![Figure 17: Sort projects](image)

### 3.4.5 Filter the list of projects based on name

**Functional description**
This tutorial explains how a registered user can filter the list of projects displayed on their home page based on name. The user provides a project name, and only projects which project name contains the specified name will be displayed. This filter can be combined with other filter operations, in order to filter based on multiple properties (see Tutorial 3.4.6).

**Cautions and warnings**
None.

**Preconditions**
The registered user is logged in to the APD tool and the home page is displayed (see Tutorial 3.3.1).
Procedures
A step-by-step description of this operation is as follows.

1. in the filter section, enter part of a name in the Project name input field (see Figure 18). The list of projects will automatically update.

Likely errors
None.

Figures
See Figure 18.

3.4.6 Filter the list of projects based on creation date

Functional description
This tutorial explains how a registered user can filter the list of projects displayed on their home page, based on creation date. The user provides a range of creation dates and only projects whose creation date is within the provided range of creation dates will be shown. It can be combined with other filter operations, in order to filter on multiple properties (see Tutorial 3.4.5).

Cautions and warnings
A valid range interval must be chosen: if the earliest creation date lies after the latest creation date, no projects will be displayed.

Preconditions
The registered user is logged in to the APD tool and the home page is displayed.
Procedures
A step-by-step description of this operation is as follows.

1. Click the *Earliest creation date* input field or the *Latest creation date* input field (see Figure 19).
2. In the calendar, select the creation date you want to filter on.
3. Click the OK button.
4. (Optional) Repeat steps 1, 2 and 3 with the other input field.

Likely errors
None.

Figures
See Figure 19.

![Figure 19: Filter projects based on date](image)

3.4.7 Reset a date filter

**Functional description**
This tutorial explains how a registered user can reset a date filter set on the list of projects displayed on the home page (see Tutorials 3.4.5 and 3.4.6).

**Cautions and warnings**
None.

**Preconditions**
The registered user is logged in to the APD tool and the home page is displayed (see Tutorial 3.3.1).
Procedures
A step-by-step description of this operation is as follows.

1. Click the date input field that you want to reset.
2. Click the Clear button (see Figure 20).

Likely errors
None.

Figures
See Figure 20.

3.5 Experiments
This section contains tutorials with regards to the experiments of a registered user of the tool. These tutorials describe features regarding the creation of an experiment as well as the running of experiment phases and viewing experiment results. Features regarding the filtering of the list of experiments displayed on a project page are also described.

3.5.1 Create new experiment

Functional description
This tutorial explains how a registered user can create a new experiment.

Cautions and warnings
This experiment will not contain any experiment phases. Running an experiment phase of an experiment is described in Tutorials 3.5.5 and 3.5.6. Also note that experiment names are not unique.

Preconditions
The registered user is logged in to the APD tool and a project page is displayed (see Tutorial 3.4.2).

Procedures
A step-by-step description of this operation is as follows.

1. Click the Create experiment button.
2. Enter an experiment name in the corresponding input field (see Figure 21).
3. Click the Create button.
Likely errors
An experiment name entered in step 2, must be non-empty and cannot contain special characters other than a space, underscore or dash. If any of these errors occur, this will be indicated below the corresponding input field.

Figures
See Figure 21.

3.5.2 Filter the list of experiments based on name

Functional description
This tutorial explains how a registered user can filter the list of experiments displayed on a project page, based on name. The registered user specifies a name and only experiments which experiment name contains the specified name will be shown. This filter can be combined with other filter operations to filter based on multiple properties, see Tutorial 3.5.3.

Cautions and warnings
None.

Preconditions
The registered user is logged in to the APD tool and a project page is displayed (see Tutorial 3.4.2).

Procedures
A step-by-step description of this operation is as follows.

1. In the filter section, enter part of a name in the Experiment name input field (see Figure 22).
   The list of experiments will automatically update.

Likely errors
None.

Figures
See Figure 22.

3.5.3 Filter the list of experiments based on creation date

Functional description
This tutorial explains how a registered user can filter the list of experiments, displayed on a project page, based on creation date. The registered user provides a range of creation dates, and only experiments whose creation date is within the range of creation dates set will be shown. This filter can be combined with other filter operations to filter based on multiple properties, see Tutorial 3.5.2.
Cautions and warnings
A valid range interval must be chosen: if the earliest creation date lies after the latest creation date, no experiments will be displayed.

Preconditions
The registered user is logged in to the APD tool and a project page is displayed (see Tutorial 3.4.2).

Procedures
A step-by-step description of this operation is as follows.

1. Click the Earliest creation date input field (see Figure 23) or the Latest creation date input field (see Figure 23).
2. Select the date in the calendar.
3. Click the OK button.
4. (Optional) Repeat steps 1, 2 and 3 for the other input field.

Likely errors
None.

Figures
See Figure 23.

3.5.4 Reset a date filter

Functional description
This tutorial explains how a registered user can reset a date filter, set on a list of experiments displayed on a project page (see Tutorials 3.5.2 and 3.5.3).

Cautions and warnings
None.
Preconditions
The registered user is logged in to the APD tool and a project page is displayed (see Tutorial 3.4.2).

Procedures
A step-by-step description of this operation is as follows.

1. Click the date input field you want to reset.
2. Click the Clear button (see Figure 24).

Likely errors
None.

Figures
See Figure 24.
3.5.5 Start an anomalous subgraph discovery phase

Functional description
This tutorial explains how a registered user can start the anomalous subgraph discovery phase of an experiment.

Cautions and warnings
None.

Preconditions
The registered user is logged in to the APD tool and a project page is displayed (see Tutorial 3.4.2). An experiment is created (see Tutorial 3.5.1).

Procedures
A step-by-step description of this operation is as follows.
1. Select the experiment of which you want to run the anomalous subgraph discovery phase.
2. Click the Run phase button.
3. Select the anomalous subgraph discovery phase in the dropdown menu (see Figure 25).
4. Click the Run button.

Likely errors
None.

Figures
See Figure 25.

3.5.6 Start a partial order discovery phase

Functional description
This tutorial explains how a registered user can start the partial order discovery phase of an experiment.

Cautions and warnings
The partial order discovery phase of an experiment can only be run if the anomalous subgraph discovery phase has already been completed.

Preconditions
The registered user is logged in to the APD tool and a project page is displayed (see Tutorial 3.4.2). An experiment is created which has completed the anomalous subgraph discovery phase.
Procedures
A step-by-step description of this operation is as follows.

1. Select the experiment of which you want to run the partial order discovery phase.
2. Click the Run phase button.
3. Select the partial order discovery phase in the dropdown menu (see Figure 26).
4. Fill in the frequent itemset threshold.
5. Fill in the ordering relation threshold.
6. Click the Run button.

Likely errors
Both threshold fields must be filled in in steps 4 and 5. Furthermore, it is only possible to fill in (positive) numbers in those input fields in steps 4 and 5. Lastly, it is not possible to start this phase if the anomalous subgraph discovery phase has not finished yet. If any of these errors occur, this will be indicated below the corresponding input field or dropdown.

Figures
See Figure 26.

Figure 26: Start the partial order discovery phase

3.5.7 View results of an experiment

Functional description
This tutorial explains how a registered user can view the results of an experiment.

Cautions and warnings
Results of an experiment can only be viewed if at least one of the two phases of the experiment has completed.

Preconditions
The registered user is logged in to the APD tool and a project page is displayed (see Tutorial 3.4.2). An experiment is created (see Tutorial 3.5.1) which has completed at least one phase (see Tutorials 3.5.5 and 3.5.6).

Procedures
A step-by-step description of this operation is as follows.

1. Select the experiment of which you want to open the results.
2. Click the View results button (see Figure 27).
Likely errors
None.

Figures
See Figure 27.

3.5.8 Download log files

Functional description
This tutorial explains how a registered user can download the log file of an experiment phase.

Cautions and warnings
None.

Preconditions
The registered user is logged in to the APD tool and a project page is displayed (see Tutorial 3.4.2). An experiment is created which has completed the phase of which you want to download the log file.

Procedures
A step-by-step description of this operation is as follows.

1. Select the experiment of which you want to download the log files.
2. Click the Logs link, displayed to the right of the phase of which you want to download the log file (see Figure 28).

Likely errors
None.
3.6 Anomalous subgraph discovery results

This section contains tutorials with regards to anomalous subgraph discovery results displayed on the top half of a results page. The partial order discovery results of the same experiment are displayed on the bottom half of the same results page. If no results are available, this will be indicated. The tutorials in this section describe features regarding the selection, deselection, expansion and compression of subgraphs. Several open and download features on the results page are described, as well as the search for a subgraph and the indication of the parents and children of a subgraph.

3.6.1 Select a subgraph

Functional description
This tutorial explains how a registered user can select a subgraph when viewing anomalous subgraph discovery results.

Cautions and warnings
If you click a highlighted subgraph, the subgraph will be deselected.

Preconditions
The anomalous subgraph discovery phase of an experiment has finished (see Tutorial 3.5.5). The registered user is logged in to the APD tool and the results page of the corresponding experiment is displayed (see Tutorial 3.5.7).

Procedures
A step-by-step description of this operation is as follows.

1. Click a subgraph that is not highlighted. The subgraph will be highlighted (see Figure 29).
Likely errors
None.

Figures
See Figure 29.

3.6.2 Deselect a subgraph

Functional description
This tutorial explains how a registered user can deselect a subgraph when viewing anomalous subgraph discovery results.

Cautions and warnings
If you click a subgraph that is not highlighted, the subgraph will be selected.

Preconditions
The anomalous subgraph discovery phase of an experiment has finished (see Tutorial 3.5.5). The registered user is logged in to the APD tool and the results page of the corresponding experiment is displayed (see Tutorial 3.5.7). At least one subgraph is highlighted.

Procedures
A step-by-step description of this operation is as follows.

1. Click a subgraph that is highlighted (see Figure 29). The subgraph will no longer be highlighted.

Likely errors
None.

Figures
See Figure 29.
3.6.3 Select all subgraphs

Functional description
This tutorial explains how a registered user can select all subgraphs when viewing anomalous subgraph discovery results.

Cautions and warnings
None.

Preconditions
The anomalous subgraph discovery phase of an experiment has finished (see Tutorial 3.5.5). The registered user is logged in to the APD tool and the results page of the corresponding experiment is displayed (see Tutorial 3.5.7).

Procedures
A step-by-step description of this operation is as follows.

1. Click the Select all button in the anomalous subgraph discovery part of the displayed results page (see Figure 30). All subgraphs will be highlighted.

Likely errors
None.

Figures
See Figure 30.

3.6.4 Deselect all subgraphs

Functional description
This tutorial explains how a registered user can deselect all subgraphs when viewing anomalous subgraph discovery results.
Cautions and warnings
None.

Preconditions
The anomalous subgraph discovery phase of an experiment has finished (see Tutorial 3.5.5). The registered user is logged in to the APD tool and the results page of the corresponding experiment is displayed (see Tutorial 3.5.7).

Procedures
A step-by-step description of this operation is as follows.

1. Click the Deselect all button in the anomalous subgraph discovery part of the displayed results page (see Figure 31). All subgraphs will no longer be highlighted.

Likely errors
None.

Figures
See Figure 31.

3.6.5 Expand a subgraph

Functional description
This tutorial explains how a registered user can expand a subgraph when viewing anomalous subgraph discovery results.

Cautions and warnings
If you double click an expanded subgraph, the subgraph will be compressed.
Preconditions
The anomalous subgraph discovery phase of an experiment has finished (see Tutorial 3.5.5). The registered user is logged in to the APD tool and the results page of the corresponding experiment is displayed (see Tutorial 3.5.7).

Procedures
A step-by-step description of this operation is as follows.

1. Double click a compressed subgraph. The subgraph will be expanded (see Figure 32).

Likely errors
None.

Figures
See Figure 32.

3.6.6 Compress a subgraph

Functional description
This tutorial explains how a registered user can compress a subgraph when viewing anomalous subgraph discovery results.

Cautions and warnings
If you double click a compressed subgraph, the subgraph will be expanded.

Preconditions
The anomalous subgraph discovery phase of an experiment has finished (see Tutorial 3.5.5). The registered user is logged in to the APD tool and the results page of the corresponding experiment is displayed (see Tutorial 3.5.7).
Procedures
A step-by-step description of this operation is as follows.

1. Double click an expanded subgraph (see Figure 32). The subgraph will be compressed.

Likely errors
None.

Figures
See Figure 32.

3.6.7 Expand all selected subgraphs

Functional description
This tutorial explains how a registered user can expand all selected subgraphs when viewing anomalous subgraph discovery results.

Cautions and warnings
None.

Preconditions
The anomalous subgraph discovery phase of an experiment has finished (see Tutorial 3.5.5). The registered user is logged in to the APD tool and the results page of the corresponding experiment is displayed (see Tutorial 3.5.7).

Procedures
A step-by-step description of this operation is as follows.

1. Click the Expand selected subgraphs button (see Figure 33). All selected subgraphs will be expanded.

Likely errors
None.

Figures
See Figure 33.

3.6.8 Compress all selected subgraphs

Functional description
This tutorial explains how a registered user can compress all selected subgraphs when viewing anomalous subgraph discovery results.

Cautions and warnings
None.

Preconditions
The anomalous subgraph discovery phase of an experiment has finished (see Tutorial 3.5.5). The registered user is logged in to the APD tool and the results page of the corresponding experiment is displayed (see Tutorial 3.5.7).
Procedures
A step-by-step description of this operation is as follows.

1. Click the Compress selected subgraphs button (see Figure 34). All selected subgraphs will be compressed.

Likely errors
None.

Figures
See Figure 34.
3.6.9 Open all selected subgraphs in a new tab

**Functional description**
This tutorial explains how a registered user can open all selected subgraphs in a new tab, when viewing anomalous subgraph discovery results.

**Cautions and warnings**
If no subgraphs are selected, nothing will happen when you follow this procedure.

**Preconditions**
The anomalous subgraph discovery phase of an experiment has finished (see Tutorial 3.5.5). The registered user is logged in to the APD tool and the results page of the corresponding experiment is displayed (see Tutorial 3.5.7). At least one subgraph is selected.

**Procedures**
A step-by-step description of this operation is as follows.

1. Click the **Open selected subgraphs in new tab** button (see Figure 35). All selected subgraphs will be displayed as expanded subgraphs in a new tab.

**Likely errors**
None.

**Figures**
See Figure 35.

---

3.6.10 Download the graph

**Functional description**
This tutorial explains how a registered user can download the entire graph when viewing anomalous subgraph discovery results. The graph can be downloaded as a .svg, .dot, .g or .subs file.
Cautions and warnings
None.

Preconditions
The anomalous subgraph discovery phase of an experiment has finished (see Tutorial 3.5.5). The registered user is logged in to the APD tool and the results page of the corresponding experiment is displayed (see Tutorial 3.5.7).

Procedures
A step-by-step description of this operation is as follows.

1. Click the Download graph button (see Figure 36).
2. Select the file extension you want to download.

Likely errors
None.

Figures
See Figure 36.

3.6.11 Download an occurrence matrix

Functional description
This tutorial explains how a registered user can download an occurrence matrix when viewing anomalous subgraph discovery results.

Cautions and warnings
Two different types of tables can be downloaded. Table 1 is the table with all anomalous subgraphs, and table 2 is the table containing only minimal subgraphs.
Preconditions
The anomalous subgraph discovery phase of an experiment has finished (see Tutorial 3.5.5). The registered user is logged in to the APD tool and the results page of the corresponding experiment is displayed (see Tutorial 3.5.7).

Procedures
A step-by-step description of this operation is as follows.

1. Click the Download graph button (see Figure 36).
2. Click Table 1 if you want to download the table with all anomalous subgraphs, or Table 2 if you want to download the table containing only minimal subgraphs.

Likely errors
None.

Figures
See Figure 36.

3.6.12 Search a subgraph

Functional description
This tutorial explains how a registered user can search for a subgraph when viewing anomalous subgraph discovery results.

Cautions and warnings
None.

Preconditions
The anomalous subgraph discovery phase of an experiment has finished (see Tutorial 3.5.5). The registered user is logged in to the APD tool and the results page of the corresponding experiment is displayed (see Tutorial 3.5.7).

Procedures
A step-by-step description of this operation is as follows.

1. Click the Search for subgraphs button (see Figure 37).
2. Enter the string you want to search for.
3. Click the Search results dropdown. All expanded subgraphs containing the string are displayed below the Expanded header; the compressed subgraphs containing the string are displayed below the Compressed header.
4. Click a subgraph in the dropdown. The subgraph is selected and displayed now.

Likely errors
None.

Figures
See Figure 37.
3.6.13 Indicate parents and children

**Functional description**
This tutorial explains how a registered user can see the direct parents and children of a selected subgraph when viewing anomalous subgraph discovery results.

**Cautions and warnings**
If multiple subgraphs are selected, the intersection of the parents and the intersection of the children will be displayed. Hence, no parents and children will be displayed if the intersection is empty.

**Preconditions**
The anomalous subgraph discovery phase of an experiment has finished (see Tutorial 3.5.5). The registered user is logged in to the APD tool and the results page of the corresponding experiment is displayed (see Tutorial 3.5.7). At least one subgraph is selected.

**Procedures**
A step-by-step description of this operation is as follows.

1. Click the *Parents/children* dropdown (see Figure 38). All direct parents of the subgraph are displayed below the *Parents* header; the direct children of the subgraph are displayed below the *Children* header.

2. (Optional) Click a subgraph in the dropdown. The subgraph is selected now.

**Likely errors**
None.

**Figures**
See Figure 38.
3.7 Partial order discovery results

This section contains tutorials with regards to partial order discovery results displayed on the bottom half of a results page. The anomalous subgraph discovery results of the same experiment are displayed on the top half of the same results page. If no results are available, this will be indicated. The tutorials in this section describe features regarding the selection, deselection, expansion and compression of patterns. The filtering of patterns on the results page is described, as well as several open and download features of the results page.

3.7.1 Select a pattern

Functional description
This tutorial explains how a registered user can select a pattern when viewing partial order discovery results.

Cautions and warnings
If you click a highlighted pattern, the pattern will be deselected. If a subgraph inside the pattern is clicked, nothing will happen.

Preconditions
The partial order discovery phase of an experiment has finished (see Tutorial 3.5.6). The registered user is logged in to the APD tool and the results page of the corresponding experiment is displayed (see Tutorial 3.5.7).

Procedures
A step-by-step description of this operation is as follows.

1. Click a pattern that is not highlighted. The pattern will be highlighted (see Figure 39).

Likely errors
None.
3.7.2 Deselect a pattern

**Functional description**
This tutorial explains how a registered user can deselect a pattern when viewing partial order discovery results.

**Cautions and warnings**
If you click a pattern that is not highlighted, the pattern will be selected. If a subgraph inside the pattern is clicked, nothing will happen.

**Preconditions**
The partial order discovery phase of an experiment has finished (see Tutorial 3.5.6). The registered user is logged in to the APD tool and the results page of the corresponding experiment is displayed (see Tutorial 3.5.7).

**Procedures**
A step-by-step description of this operation is as follows.

1. Click a pattern that is highlighted (see Figure 39). The pattern will no longer be highlighted.

**Likely errors**
None.

**Figures**
See Figure 39.
3.7.3 Select all patterns

**Functional description**
This tutorial explains how a registered user can select all patterns when viewing partial order discovery results.

**Cautions and warnings**
None.

**Preconditions**
The partial order discovery phase of an experiment has finished (see Tutorial 3.5.6). The registered user is logged in to the APD tool and the results page of the corresponding experiment is displayed (see Tutorial 3.5.7).

**Procedures**
A step-by-step description of this operation is as follows.

1. Click the **Select all** button in the partial order discovery part of the displayed results page (see Figure 40). All patterns will be highlighted.

**Likely errors**
None.

**Figures**
See Figure 40.

![Figure 40: Select all patterns](image)

3.7.4 Deselect all patterns

**Functional description**
This tutorial explains how a registered user can deselect all patterns when viewing partial order discovery results.
Cautions and warnings
None.

Preconditions
The partial order discovery phase of an experiment has finished (see Tutorial 3.5.6). The registered user is logged in to the APD tool and the results page of the corresponding experiment is displayed (see Tutorial 3.5.7).

Procedures
A step-by-step description of this operation is as follows.

1. Click the Deselect all button in the partial order discovery part of the displayed results page (see Figure 41). All patterns will no longer be highlighted.

Likely errors
None.

Figures
See Figure 41.

Figure 41: Deselect all patterns

3.7.5 Expand a pattern

Functional description
This tutorial explains how a registered user can expand a pattern when viewing partial order discovery results.

Cautions and warnings
If you double click an expanded pattern, the pattern will be compressed. If a subgraph inside the pattern is clicked, nothing will happen.
**Preconditions**
The partial order discovery phase of an experiment has finished (see Tutorial 3.5.6). The registered user is logged in to the APD tool and the results page of the corresponding experiment is displayed (see Tutorial 3.5.7).

**Procedures**
A step-by-step description of this operation is as follows.

1. Double click a compressed pattern. The pattern will be expanded (see Figure 42).

**Likely errors**
None.

**Figures**
See Figure 42.

---

![Figure 42: Expand a pattern](image)

3.7.6 Compress a pattern

**Functional description**
This tutorial explains how a registered user can compress a pattern when viewing partial order discovery results.

**Cautions and warnings**
If you double click a compressed pattern, the pattern will be expanded. If a subgraph inside the pattern is clicked, nothing will happen.

**Preconditions**
The partial order discovery phase of an experiment has finished (see Tutorial 3.5.6). The registered user is logged in to the APD tool and the results page of the corresponding experiment is displayed (see Tutorial 3.5.7).
Procedures
A step-by-step description of this operation is as follows.

1. Double click an expanded pattern (see Figure 42). The pattern will be compressed.

Likely errors
None.

Figures
See Figure 42.

3.7.7 Expand all selected patterns

Functional description
This tutorial explains how a registered user can expand all selected patterns when viewing partial order discovery results.

Cautions and warnings
None.

Preconditions
The partial order discovery phase of an experiment has finished (see Tutorial 3.5.6). The registered user is logged in to the APD tool and the results page of the corresponding experiment is displayed (see Tutorial 3.5.7).

Procedures
A step-by-step description of this operation is as follows.

1. Click the Expand selected patterns button (see Figure 43). All selected patterns will be expanded.

Likely errors
None.

Figures
See Figure 43.

3.7.8 Compress all selected patterns

Functional description
This tutorial explains how a registered user can compress all selected patterns when viewing partial order discovery results.

Cautions and warnings
None.

Preconditions
The partial order discovery phase of an experiment has finished (see Tutorial 3.5.6). The registered user is logged in to the APD tool and the results page of the corresponding experiment is displayed (see Tutorial 3.5.7).
Procedures
A step-by-step description of this operation is as follows.

1. Click the Compress selected patterns button (see Figure 44). All selected patterns will be compressed.

Likely errors
None.

Figures
See Figure 44.
3.7.9 Filter patterns

Functional description
This tutorial explains how a registered user can filter patterns when viewing partial order discovery results.

Cautions and warnings
None.

Preconditions
The partial order discovery phase of an experiment has finished (see Tutorial 3.5.6). The registered user is logged in to the APD tool and the results page of the corresponding experiment is displayed (see Tutorial 3.5.7).

Procedures
A step-by-step description of this operation is as follows.

1. Click the Filter patterns button (see Figure 45).
2. Enter a support value (as percentage) in the input field.
3. Select the type of patterns that you want to see in the dropdown.
4. Click the Filter button. Only patterns with support value equal or higher to the support value entered in step 2 and the type entered in step 3 will be displayed.

Likely errors
It is only possible to fill in a (positive) number in the support input field in step 2. Furthermore, the input field must not be empty. If any of these errors occur, this will be indicated below the input field.

Figures
See Figure 45.

Figure 45: Filter patterns
3.7.10  Download all patterns

**Functional description**
This tutorial explains how a registered user can download the patterns as an svg file when viewing partial order discovery results.

**Cautions and warnings**
None.

**Preconditions**
The partial order discovery phase of an experiment has finished (see Tutorial 3.5.6). The registered user is logged in to the APD tool and the results page of the corresponding experiment is displayed (see Tutorial 3.5.7).

**Procedures**
A step-by-step description of this operation is as follows.
1. Click the Download patterns button (see Figure 46).
2. Select the .svg file extension.

**Likely errors**
None.

**Figures**
See Figure 46.

![Figure 46: Download all patterns](image)

3.7.11  View border legend

**Functional description**
This tutorial explains how a registered user can view information about the borders of patterns when viewing partial order discovery results.
Cautions and warnings
None.

Preconditions
The partial order discovery phase of an experiment has finished (see Tutorial 3.5.6). The registered user is logged in to the APD tool and the results page of the corresponding experiment is displayed (see Tutorial 3.5.7).

Procedures
A step-by-step description of this operation is as follows.

1. Click the *Show border legend* button (see Figure 47).
2. Close the modal by clicking anywhere outside the modal.

Likely errors
None.

Figures
See Figure 47.

![Figure 47: View border legend](image)

3.7.12 Search a pattern

Functional description
This tutorial explains how a registered user can search for a pattern when viewing partial order discovery results.

Cautions and warnings
None.
Preconditions
The partial order discovery phase of an experiment has finished (see Tutorial 3.5.6). The registered user is logged in to the APD tool and the results page of the corresponding experiment is displayed (see Tutorial 3.5.7).

Procedures
A step-by-step description of this operation is as follows.

1. Click the **Search for patterns** button (see Figure 48).
2. Enter the string you want to search for.
3. Click the **Search results** dropdown. All expanded patterns containing the string are displayed below the **Expanded** header; the compressed patterns containing the string are displayed below the **Compressed** header.
4. Click the pattern in the dropdown. The pattern is selected and displayed now.

Likely errors
None.

Figures
See Figure 48.

![Figure 48: Search a pattern](image)

3.8 Administrator

This section contains tutorials with regards to the features of an administrator of the tool. These tutorials describe features regarding the opening of projects of other users, opening the administrator page, resetting the passwords of other users and deleting user accounts.

3.8.1 Open a project of another user

Functional description
This tutorial explains how an administrator can open a project of a registered user.
Cautions and warnings
Users that are not an administrator cannot follow this procedure.

Preconditions
The administrator is logged in to the APD tool and the home page is displayed (see Tutorial 3.3.1).

Procedures
A step-by-step description of this operation is as follows.

1. Click the project name of the project that you want to open (see Figure 49).

 Likely errors
None.

Figures
See Figure 49.

Figure 49: View all projects as administrator

3.8.2 Open the administrator page

Functional description
This tutorial explains how an administrator can open the administrator page. On this page, administrators have an overview of all users.

Cautions and warnings
Users that are not an administrator cannot follow this procedure.

Preconditions
The administrator is logged in to the APD tool and the administrator page is not displayed.
**Procedures**
A step-by-step description of this operation is as follows.

1. Open the side navigation menu by clicking on the menu icon, displayed on the top left of the page.
2. Click the Admin tools menu item (see Figure 50).

**Likely errors**
None.

**Figures**
See Figure 50.

---

3.8.3 Reset the password of a user

**Functional description**
This tutorial explains how an administrator can reset the password of a user. Afterwards, the user whose password is reset has to follow steps 6 through 10 from tutorial 3.2.3.

**Cautions and warnings**
Users that are not an administrator cannot follow this procedure.

**Preconditions**
The administrator is logged in to the APD tool and the administrator page is displayed (see Tutorial 3.8.2).

**Procedures**
A step-by-step description of this operation is as follows.

1. Select the user whose password you want to reset.
2. Click the **Reset password** button, displayed below the user information (see Figure 51).

3. Click the **Confirm** button.

**Likely errors**
None.

**Figures**
See Figure 51.

---

**3.8.4 Delete a user**

**Functional description**
This tutorial explains how an administrator can delete a user.

**Cautions and warnings**
Users that are not an administrator cannot follow this procedure.

**Preconditions**
The administrator is logged in to the APD tool and the administrator page is displayed (see Tutorial 3.8.2).

**Procedures**
A step-by-step description of this operation is as follows.

1. Select the user who you want to delete.
2. Click the **Delete** button (indicated by the trash can icon, Figure 52).
3. Click the Confirm button.

Likely errors
None.

Figures
See Figure 52.

Figure 52: Delete user as administrator
4 Reference

4.1 Login page

4.1.1 Functional description

This page allows users to log in to the APD Tool, reset their password, or open the register page. The page is shown in Figure 53.

![Login page](image)

**Figure 53: Login page**

4.1.2 Cautions and warnings

None.

4.1.3 Formal description

<table>
<thead>
<tr>
<th>Operation</th>
<th>Description</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Set username</td>
<td>Fill in a username in the <strong>Username</strong> input field.</td>
<td>The username is filled in.</td>
</tr>
<tr>
<td>2 Set password</td>
<td>Fill in a password in the <strong>Password</strong> input field.</td>
<td>The password is filled in.</td>
</tr>
<tr>
<td>3 Login</td>
<td>Click the <strong>Login</strong> button.</td>
<td>The user is logged in using the filled in username and password, and the home page is displayed.</td>
</tr>
<tr>
<td>4 Open register</td>
<td>Click the <strong>Register</strong> button.</td>
<td>The register page is displayed.</td>
</tr>
<tr>
<td>5 Display forgot</td>
<td>Click the <strong>Forgot password?</strong> button.</td>
<td>The password reset modal is displayed.</td>
</tr>
<tr>
<td>password modal</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4.1.4 Possible errors

- *Please enter your username*: The username input field is empty.
- *Please enter your password*: The password input field is empty.
- *Username and password did not match*: The combination of username and password is invalid.
4.1.5 Related operations

- **Register page**: The page where a user can register for an account on the APD tool (see Section 4.2).
- **Password reset modal**: A modal used to reset a user's password (see Section 4.3).

4.2 Register page

4.2.1 Functional description

This page allows users to register for an account on the APD tool or go back to the login page. The page is shown in Figure 54.

![Register page](image)

Figure 54: Register page
4.2.2 Cautions and warnings

None.

4.2.3 Formal description

<table>
<thead>
<tr>
<th>Operation</th>
<th>Description</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Set username</td>
<td>Fill in a username in the Username input field.</td>
<td>The username is filled in.</td>
</tr>
<tr>
<td>2 Set email address</td>
<td>Fill in an email address in the Email address input field.</td>
<td>The email address is filled in.</td>
</tr>
<tr>
<td>3 Set password</td>
<td>Fill in a password in the Password input field.</td>
<td>The password is filled in.</td>
</tr>
<tr>
<td>4 Set password confirmation</td>
<td>Fill in a password confirmation in the Password confirmation input field.</td>
<td>The password confirmation is filled in.</td>
</tr>
<tr>
<td>5 Set optional information</td>
<td>Fill in optional information in the input fields.</td>
<td>The optional information is filled in.</td>
</tr>
<tr>
<td>6 Set consent checkbox</td>
<td>Click the consent checkbox.</td>
<td>The consent checkbox is checked.</td>
</tr>
<tr>
<td>7 Open privacy notice modal Register</td>
<td>Click the Privacy notice link.</td>
<td>The privacy notice is displayed.</td>
</tr>
<tr>
<td>8 Register</td>
<td>Click the Register button.</td>
<td>The account is registered, a registration confirmation modal is displayed, and the login page is displayed.</td>
</tr>
<tr>
<td>9 Open login page</td>
<td>Click the Back to login link.</td>
<td>The login page is displayed.</td>
</tr>
</tbody>
</table>

4.2.4 Possible errors

- **Empty required input field**: One of the required input fields is empty.
- **Email address already taken**: The entered email address has already been used by a different user.
- **Username already taken**: The entered username has already been used by a different user.
- **No special characters allowed**: It is not allowed to use special characters other than a space, dash, underscore or slash. In the username, using a slash is also not allowed.
- **Maximum length exceeded**: Each input field has a maximum length which must not be exceeded.
- **Invalid email address**: The email address must have a valid format.
- **Password too short**: A password must contain at least eight characters.
- **Password too simple**: A password needs at least 1 capital letter, 1 lowercase letter, 1 number and 1 special character.
- **Passwords do not match**: The password and password confirmation do not match.

4.2.5 Related operations

- **Login page**: The page where a user can log in (see Section 4.1).
4.3 Password reset modal

4.3.1 Functional description

This modal allows users to reset their password without logging in. It is only possible to access this modal from the login page (Section 4.1). The modal is shown in Figure 55.

![Password reset modal]

Figure 55: Password reset modal

4.3.2 Cautions and warnings

None.

4.3.3 Formal description

<table>
<thead>
<tr>
<th>Operation</th>
<th>Description</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Set username or email</td>
<td>Fill in a username or email address in the Enter your username or email address input field.</td>
<td>Either the username or the email address is filled in.</td>
</tr>
<tr>
<td>2 Send email</td>
<td>Click the Send button.</td>
<td>The user received an email with a password reset link.</td>
</tr>
<tr>
<td>Close modal</td>
<td>Click outside the modal or press the Esc key.</td>
<td>The login page is displayed.</td>
</tr>
</tbody>
</table>

4.3.4 Possible errors

- *Please fill in a username*: The username/email address input field of the forgot password modal is empty.
- *The user does not exist*: The filled in username or email address does not exist.

4.3.5 Related operations

- *Login page*: The page where a user can log in (see Section 4.1).

4.4 Side navigation menu

4.4.1 Functional description

This menu allows users to navigate through the web application. The menu is shown in Figure 56.
4.4.2 Cautions and warnings

None.

4.4.3 Formal description

<table>
<thead>
<tr>
<th>Operation</th>
<th>Description</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  Open navigation menu</td>
<td>Click the menu icon.</td>
<td>The navigation menu is displayed.</td>
</tr>
<tr>
<td>2  Open referenced top-level page</td>
<td>Click on the breadcrumb.</td>
<td>The referenced top-level page is displayed.</td>
</tr>
<tr>
<td>3  Open second-level page</td>
<td>Click on the breadcrumb.</td>
<td>The referenced second-level page is displayed.</td>
</tr>
<tr>
<td>4  Open user information</td>
<td>Click on the username or email address.</td>
<td>The user information page is displayed.</td>
</tr>
<tr>
<td>5  Open home</td>
<td>Click the home button.</td>
<td>The home page is displayed.</td>
</tr>
<tr>
<td>6  Open user information</td>
<td>Click the User information button.</td>
<td>The user information page is displayed.</td>
</tr>
<tr>
<td>7  Log out</td>
<td>Click the Log out button.</td>
<td>The user is logged out and the login page is displayed.</td>
</tr>
</tbody>
</table>

4.4.4 Possible errors

None.

4.4.5 Related operations

- *User information page*: On this page, the user can view and edit all their personal information (see Section 4.7).
- *Home page*: The home page lists all projects the user has access to (see Section 4.5).
- *Login page*: The page where a user can log in (see Section 4.1).
4.5 Home page

4.5.1 Functional description

This page shows a list of all the projects of the logged in user. The name, creation date, and owner for each project is shown. Users can filter projects by name or date by using the filter menu and they can sort the project list by clicking on the header of the project list. Finally, new projects can be created. The page is shown in Figure 57.

![Home page screenshot](Image)

Figure 57: Home page

4.5.2 Cautions and warnings

Clicking any of the delete buttons (indicated by trash cans) will display a modal asking the user to confirm if they truly want to delete the project.

4.5.3 Formal description

<table>
<thead>
<tr>
<th>Operation</th>
<th>Description</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Create project</td>
<td>Click the Create project button.</td>
<td>The create project modal is displayed.</td>
</tr>
<tr>
<td>2 Sort the list of projects</td>
<td>Click on the property by which to sort.</td>
<td>The projects are sorted by value of the clicked column.</td>
</tr>
<tr>
<td>3 Filter on project name</td>
<td>Enter a search string.</td>
<td>Only the projects that have the given string in their name are shown.</td>
</tr>
<tr>
<td>4 Filter on earliest date of creation</td>
<td>Indicate the earliest date of creation.</td>
<td>Only the projects that are created at and after the given date are shown.</td>
</tr>
<tr>
<td>5 Filter on latest date of creation</td>
<td>Indicate the latest date of creation.</td>
<td>Only the projects that are created at and before the given date are shown.</td>
</tr>
<tr>
<td>6 Delete project</td>
<td>Click the trash can icon.</td>
<td>The project is deleted.</td>
</tr>
<tr>
<td>7 Open project</td>
<td>Click on a project’s row.</td>
<td>The project page is displayed.</td>
</tr>
</tbody>
</table>

4.5.4 Possible errors

None.
4.5.5 Related operations

- **Project page**: This page lists all the experiments associated with a project (see Section 4.11).
- **New project modal**: The modal that is used to create a new project (see Section 4.6).

4.6 New project modal

4.6.1 Functional description

This modal allows users to create a new project. The modal is shown in Figure 58.

![Figure 58: New project modal](image)

4.6.2 Cautions and warnings

4.6.3 Formal description

<table>
<thead>
<tr>
<th>Operation</th>
<th>Description</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Set project name</td>
<td>Fill in a project name in the <em>Project name</em> input field.</td>
<td>The project name field is filled in.</td>
</tr>
<tr>
<td>2 Upload log file</td>
<td>Click on the first <em>Browse</em> button and upload a '.xes' file.</td>
<td>The log file is selected.</td>
</tr>
<tr>
<td>3 Upload net file</td>
<td>Click on the second <em>Browse</em> button and upload a '.pnml' file.</td>
<td>The net file is selected.</td>
</tr>
<tr>
<td>4 Submit</td>
<td>Click the <em>Submit</em> button.</td>
<td>The project is created and is shown on the project page.</td>
</tr>
</tbody>
</table>

4.6.4 Possible errors

- **No special characters allowed**: The project name cannot contain special characters.
- **Project name too long**: The project name must not be longer than 64 characters.
- **Missing project name**: A project name must not be empty.
- **The project name already exists**: The entered project name has already been used.

4.6.5 Related operations

- **Project page**: This page lists all the experiments associated with a project (see Section 4.11).
4.7 User information page

4.7.1 Functional description

This page allows users to view their user information and to delete their user account. The page is shown in Figure 59.

![User information page](image)

Figure 59: User information page

4.7.2 Cautions and warnings

Clicking the *Delete* button displays a modal asking the user to confirm if they truly want to delete their account.

4.7.3 Formal description

<table>
<thead>
<tr>
<th>Operation</th>
<th>Description</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Change password</td>
<td>Click the <em>Change password</em> button.</td>
<td>The change password modal is displayed.</td>
</tr>
<tr>
<td>2 Make user information</td>
<td>Click the <em>Edit information</em> button.</td>
<td>The user information fields are editable.</td>
</tr>
<tr>
<td>3 Delete user account</td>
<td>Click the trash can icon.</td>
<td>The project is deleted.</td>
</tr>
<tr>
<td>4 Open privacy notice modal</td>
<td>Click the <em>Privacy notice</em> link.</td>
<td>The privacy notice that the user agreed with is displayed.</td>
</tr>
</tbody>
</table>

4.7.4 Possible errors

None.

4.7.5 Related operations

- *Change password modal*: A modal that changes the password of a user (see Section 4.9).
- *User information page (edit information)*: A special state of the user information page where the personal information of a user can be changed (see Section 4.8).
4.8 User information page (edit information)

4.8.1 Functional description

This page allows users to edit their personal information, and to delete their user account. The page is shown in Figure 60.

Figure 60: User information page (edit information)

4.8.2 Cautions and warnings

Clicking the Delete button displays a modal asking the user to confirm if they truly want to delete their account.

4.8.3 Formal description

<table>
<thead>
<tr>
<th>Operation</th>
<th>Description</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Change password</td>
<td>Click the Change password button.</td>
<td>The change password modal is displayed.</td>
</tr>
<tr>
<td>2 Make user</td>
<td>Click the Edit information button.</td>
<td>The user information fields are editable.</td>
</tr>
<tr>
<td>information</td>
<td></td>
<td></td>
</tr>
<tr>
<td>editable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Delete user</td>
<td>Click the trash can icon.</td>
<td>The project is deleted.</td>
</tr>
<tr>
<td>account</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Open privacy</td>
<td>Click the Privacy notice link.</td>
<td>The privacy notice that the user agreed with is displayed.</td>
</tr>
<tr>
<td>notice modal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Confirm changes</td>
<td>Click the Confirm button.</td>
<td>The user information is updated and the user information fields are</td>
</tr>
<tr>
<td></td>
<td></td>
<td>disabled.</td>
</tr>
<tr>
<td>6 Cancel changes</td>
<td>Click the Cancel button.</td>
<td>The user information fields are disabled and the previous values are</td>
</tr>
<tr>
<td></td>
<td></td>
<td>loaded, any changes are not saved.</td>
</tr>
<tr>
<td>7 Edit user</td>
<td>Edit user information in the input</td>
<td>The information in the input fields is changed.</td>
</tr>
<tr>
<td>information</td>
<td>fields.</td>
<td></td>
</tr>
</tbody>
</table>
4.8.4 Possible errors

- *Empty email address input field:* The email address must not be empty.
- *Email address already taken:* The entered email address has already been used by a different user.
- *Invalid email address:* The entered email address is ill formatted.
- *Maximum length exceeded:* Each input field has a maximum length which must not be exceeded.
- *No special characters allowed:* Using special characters other than a space, dash, underscore, or slash in any field except the "How did you hear about the tool?" field is not allowed.

4.8.5 Related operations

- *Change password modal:* A modal that changes the password of a user (see Section 4.9).
- *User information page:* On this page, the user can view and edit all their personal information (see Section 4.7).

4.9 Change password modal

4.9.1 Functional description

This modal allows users to change their password. The modal is shown in Figure 61.

![Figure 61: Change password modal](image)

4.9.2 Cautions and warnings

None.

4.9.3 Formal description

<table>
<thead>
<tr>
<th>Operation</th>
<th>Description</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Set old password</td>
<td>Fill in the old password in the Old password input field.</td>
<td>The old password is filled in.</td>
</tr>
<tr>
<td>2 Set new password</td>
<td>Fill in the new password in the New password input field.</td>
<td>The new password is filled in.</td>
</tr>
<tr>
<td>3 Confirm new password</td>
<td>Fill in the new password in the Confirm new password input field.</td>
<td>The new password confirmation is filled in.</td>
</tr>
<tr>
<td>4 Change password</td>
<td>Click the Change button.</td>
<td>The password is updated and the user information page is displayed.</td>
</tr>
</tbody>
</table>
4.9.4 Possible errors

- **No password given**: A password must be given in all three text fields.
- **Password too short**: A password must contain at least eight characters.
- **Password too simple**: Password needs at least 1 capital letter, 1 lowercase letter, 1 number and 1 special character.
- **Passwords do not match**: The password and password confirmation do not match.
- **Incorrect password**: The old password does not match with the user’s password.

4.9.5 Related operations

- **User information page**: On this page, the user can view and edit all their personal information (see Section 4.7).
- **User information page (edit information)**: A special state of the user information page where the personal information of a user can be changed (see Section 4.8).

4.10 Administrator page

4.10.1 Functional description

This page allows administrators to view user information of all users, reset passwords of all users, and delete user accounts. The page is shown in Figure 62.

![Figure 62: Administrator page](image)

4.10.2 Cautions and warnings

Clicking the Delete button for a user displays a modal asking the admin to confirm if they truly want to delete this account.
4.10.3  Formal description

<table>
<thead>
<tr>
<th>Operation</th>
<th>Description</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expand user information</td>
<td>Click on the username.</td>
<td>The user’s information is expanded.</td>
</tr>
<tr>
<td>Collapse user information</td>
<td>Click an upward facing triangle icon.</td>
<td>The user’s information is collapsed.</td>
</tr>
<tr>
<td>Reset password</td>
<td>When expanded, click the Reset password button.</td>
<td>A password reset email is sent to the user.</td>
</tr>
<tr>
<td>Delete user account</td>
<td>When expanded, click the trash can icon.</td>
<td>The user account is deleted.</td>
</tr>
</tbody>
</table>

4.10.4  Possible errors

None.

4.10.5  Related operations

None.

4.11  Project page

4.11.1  Functional description

This page allows users to manage their experiments within a project. The page is shown in Figure 63.

![Figure 63: Project page](image)

4.11.2  Cautions and warnings

None.
### 4.11.3 Formal description

<table>
<thead>
<tr>
<th>Operation</th>
<th>Description</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Create experiment</td>
<td>Click the Create experiment button.</td>
<td>The create experiment modal is displayed.</td>
</tr>
<tr>
<td>2 Filter on experiment name</td>
<td>Enter a part of the experiment name.</td>
<td>Only experiments that contain the given string are shown.</td>
</tr>
<tr>
<td>3 Deselect experiment</td>
<td>Click on the experiment name.</td>
<td>The experiment details are collapsed.</td>
</tr>
<tr>
<td>4 Filter on earliest date of creation</td>
<td>Indicate the earliest date of creation.</td>
<td>Only the experiments that are created at and after the given date are shown.</td>
</tr>
<tr>
<td>5 Filter on latest date of creation</td>
<td>Indicate the latest date of creation.</td>
<td>Only the projects that are created at and before the given date are shown.</td>
</tr>
<tr>
<td>6 Show logs</td>
<td>Click the Logs button.</td>
<td>The log files are downloaded.</td>
</tr>
<tr>
<td>7 Run phase</td>
<td>Click the Run phase button.</td>
<td>The new phase modal is displayed.</td>
</tr>
<tr>
<td>8 View results</td>
<td>Click the View results button.</td>
<td>The results page is displayed.</td>
</tr>
<tr>
<td>9 Select experiment</td>
<td>Click on the experiment name.</td>
<td>The experiment details are expanded.</td>
</tr>
</tbody>
</table>

### 4.11.4 Possible errors

None.

### 4.11.5 Related operations

- **New experiment modal**: A modal that allows the user to create a new experiment (see Section 4.12).
- **New phase modal**: A modal that allows the user to start a new phase of an experiment (see Section 4.13).
- **Anomalous subgraph discovery results**: The view that displays the results of anomalous subgraph detection (see Section 4.14).
- **Partial order discovery results**: The view that displays the results of partial order discovery (see Section 4.15).

### 4.12 New experiment modal

#### 4.12.1 Functional description

This modal allows users to create a new experiment. The modal is shown in Figure 64.

![Figure 64: New experiment modal](image)
4.12.2  Cautions and warnings

None.

4.12.3  Formal description

<table>
<thead>
<tr>
<th>Operation</th>
<th>Description</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  Set experiment</td>
<td>Fill in an experiment name in the <strong>Experiment name</strong> input field.</td>
<td>The experiment name is filled in.</td>
</tr>
<tr>
<td>name</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2  Create experiment</td>
<td>Click the <strong>Create</strong> button.</td>
<td>The experiment is created and is shown on the project page.</td>
</tr>
</tbody>
</table>

4.12.4  Possible errors

- *No special characters allowed*: The experiment name cannot contain special characters.
- *Experiment name too long*: The experiment name must not be longer than 64 characters.

4.12.5  Related operations

- *Project page*: This page lists all the experiments associated with a project (see Section 4.11).

4.13  New phase modal

4.13.1  Functional description

This modal allows the user to create a new experiment phase. The modal is shown in Figure 65.

![Figure 65: New phase modal](image)

4.13.2  Cautions and warnings

None.
### 4.13.3 Formal description

<table>
<thead>
<tr>
<th>Operation</th>
<th>Description</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Select experiment phase</td>
<td>Select a phase in the Select phase dropdown menu.</td>
<td>A phase is selected.</td>
</tr>
<tr>
<td>2 Set frequent itemset threshold</td>
<td>Fill in a number in the Freq. itemset thresh. (e.g. 0.5) field.</td>
<td>The frequent itemset threshold is filled in.</td>
</tr>
<tr>
<td>3 Set ordering relation threshold</td>
<td>Fill in a number in the Ord. rel. thresh. (e.g. 0.5) field. This is only possible when the 'Partial order discovery' phase was selected in operation 1.</td>
<td>The ordering relation threshold is filled in.</td>
</tr>
<tr>
<td>4 Run phase</td>
<td>Click the Run button.</td>
<td>The phase is running and the project page is displayed.</td>
</tr>
</tbody>
</table>

### 4.13.4 Possible errors

- **Only numbers allowed**: Both the frequent itemset threshold and the ordering relation threshold must be numbers.
- **No value entered**: Both the frequent itemset threshold and the ordering relation threshold fields must not be empty.

### 4.13.5 Related operations

- **Project page**: This page lists all the experiments associated with a project (see Section 4.11).

### 4.14 Anomalous subgraph discovery results

#### 4.14.1 Functional description

This view allows the user to display the results of the anomalous subgraphs discovery phase of an experiment. The user can also perform certain operations on the results, which are described in Section 4.14.3. The view is shown in Figure 66.

![Anomalous subgraph discovery results](image)

Figure 66: Anomalous subgraph discovery results
4.14.2 Cautions and warnings
None.

4.14.3 Formal description

<table>
<thead>
<tr>
<th>Operation</th>
<th>Description</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Select all subgraphs</td>
<td>Click the Select all button.</td>
<td>All subgraphs are selected.</td>
</tr>
<tr>
<td>2 Deselect all subgraphs</td>
<td>Click the Deselect all button.</td>
<td>All subgraphs are deselected.</td>
</tr>
<tr>
<td>3 Expand subgraphs</td>
<td>Click the Expand selected subgraphs button.</td>
<td>All selected subgraphs are expanded.</td>
</tr>
<tr>
<td>4 Compress subgraphs</td>
<td>Click the Compress selected subgraphs button.</td>
<td>All selected subgraphs are compressed.</td>
</tr>
<tr>
<td>5 Open subgraphs in new tab</td>
<td>Click the Open selected subgraphs in a new tab button.</td>
<td>All selected subgraphs are displayed and expanded in a new tab.</td>
</tr>
<tr>
<td>6 Download the graph</td>
<td>Click the Download graph button.</td>
<td>A dropdown menu is displayed with the formats in which the user can download the graph.</td>
</tr>
<tr>
<td>7 Search a subgraph</td>
<td>Click the Search for subgraphs button.</td>
<td>An input field is displayed. By typing in this field the user can search for subgraphs.</td>
</tr>
<tr>
<td>8 Search results</td>
<td>Click the Search results dropdown.</td>
<td>A list with all subgraphs that match the search string is displayed.</td>
</tr>
<tr>
<td>9 Indicate parents and children</td>
<td>Click the Parents/children dropdown.</td>
<td>The intersection of all direct parents and children of the selected subgraph(s) are displayed.</td>
</tr>
<tr>
<td>10 Explain parents and children</td>
<td>Hover over the Help icon.</td>
<td>An explanation for the parents and children functionality is displayed.</td>
</tr>
<tr>
<td>- Select a subgraph</td>
<td>Click once on any subgraph that is not selected.</td>
<td>The subgraph is selected.</td>
</tr>
<tr>
<td>- Deselect a subgraph</td>
<td>Click once on any subgraph that is already selected.</td>
<td>The subgraph is deselected.</td>
</tr>
<tr>
<td>- Expand a subgraph</td>
<td>Double-click on any unexpanded subgraph.</td>
<td>The subgraph is now expanded.</td>
</tr>
<tr>
<td>- Compress a subgraph</td>
<td>Double-click on any expanded subgraph.</td>
<td>The subgraph is now compressed.</td>
</tr>
<tr>
<td>- Move the graph</td>
<td>Click and drag on the graph.</td>
<td>The graph moves as the mouse is dragged.</td>
</tr>
<tr>
<td>- Zoom the graph</td>
<td>Scroll with the mouse over the graph.</td>
<td>The level of zoom changes as the user scrolls.</td>
</tr>
</tbody>
</table>

4.14.4 Possible errors
None.

4.14.5 Related operations
None.
4.15 Partial order discovery results

4.15.1 Functional description

This view allows the user to display the results of the partial order discovery phase of an experiment. The user can also perform certain operations on the results, which are described in Section 4.15.3. The view is shown in Figure 67.

![Partial order discovery results](image)

Figure 67: Partial order discovery results

4.15.2 Cautions and warnings

None.
### 4.15.3 Formal description

<table>
<thead>
<tr>
<th>Operation</th>
<th>Description</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select all patterns</td>
<td>Click the Select all button.</td>
<td>All patterns are selected.</td>
</tr>
<tr>
<td>Deselect all patterns</td>
<td>Click the Deselect all button.</td>
<td>All patterns are deselected.</td>
</tr>
<tr>
<td>Expand patterns</td>
<td>Click the Expand selected patterns button</td>
<td>All selected patterns are expanded.</td>
</tr>
<tr>
<td>Decompress patterns</td>
<td>Click the Compress selected patterns button</td>
<td>All selected patterns are compressed.</td>
</tr>
<tr>
<td>Filter patterns</td>
<td>Click the Filter patterns button.</td>
<td>A modal is displayed where the user can filter the patterns based on their support and whether they are minimal or maximal patterns.</td>
</tr>
<tr>
<td>Download the graph</td>
<td>Click the Download graph button.</td>
<td>A dropdown menu is displayed with the formats in which the user can download the graph.</td>
</tr>
<tr>
<td>View border legend</td>
<td>Click the Show border legend button.</td>
<td>A modal with the legend is displayed explaining what the different types of borders mean.</td>
</tr>
<tr>
<td>Search a pattern</td>
<td>Click the Search for patterns button.</td>
<td>An input field is displayed. By typing in this field the user can search for patterns.</td>
</tr>
<tr>
<td>Search results</td>
<td>Click the Search results dropdown.</td>
<td>A list with all patterns that match the search string is displayed.</td>
</tr>
<tr>
<td>- Select a pattern</td>
<td>Click once on any pattern that is not selected.</td>
<td>The pattern is selected.</td>
</tr>
<tr>
<td>- Deselect a pattern</td>
<td>Click once on any pattern that is already selected.</td>
<td>The pattern is deselected.</td>
</tr>
<tr>
<td>- Expand a pattern</td>
<td>Double-click on any unexpanded pattern.</td>
<td>The pattern is now expanded.</td>
</tr>
<tr>
<td>- Compress a pattern</td>
<td>Double-click on any expanded pattern.</td>
<td>The pattern is now compressed.</td>
</tr>
<tr>
<td>- Move the graph</td>
<td>Click and drag on the graph.</td>
<td>The graph moves as the mouse is dragged.</td>
</tr>
<tr>
<td>- Zoom the graph</td>
<td>Scroll with the mouse over the graph.</td>
<td>The level of zoom changes as the user scrolls.</td>
</tr>
</tbody>
</table>

#### 4.15.4 Possible errors

- *Invalid support value when filtering patterns:* Either the support value is not a number or is left empty.

#### 4.15.5 Related operations

None.
A Error messages and recovery procedures

In this section, a detailed description is provided for every error that could occur on the Delta extension. The error messages are grouped based on the pages they occur on. For every error, the error message is provided, after which the diagnosis of the error is given. This diagnoses expands upon the possible cause of the error. Afterwards, possible recovery procedures are provided.

The error messages that could occur on the registration page are as follows:

- **Invalid username on registration**
  - Diagnosis: The given username is invalid. It is either too long or contains a special character that is not allowed.
  - Recovery procedure: Fill in a valid username.

- **Username already exists**
  - Diagnosis: The given username is already taken by another registered user.
  - Recovery procedure: Fill in a unique username.

- **Invalid password on registration**
  - Diagnosis: The given password is invalid. It is either too long or too short, does not match with the password confirmation, or does not meet the password requirements. The password requirements state that a password should contain at least one lower-case letter, one upper-case letter, one number and one special character.
  - Recovery procedure: Fill in a valid password.

- **Invalid email address on registration**
  - Diagnosis: The given email address is too long, invalid, or is already used by another registered user.
  - Recovery procedure: Fill in a unique and valid email address.

- **Invalid profile information**
  - Diagnosis: One or more profile information fields contain invalid data. All profile information fields have a limited amount of allowed characters. The Invalid profile information error message is displayed when this character amount is exceeded or when forbidden special characters are used in the profile information fields.
  - Recovery procedure: Fill in valid profile information or clear the profile information fields.

- **User data required on registering**
  - Diagnosis: A valid username, password, confirmation of the password, and email address are needed to register. This error message is shown when one or more of these inputs are missing.
  - Recovery procedure: Fill in all required data.

The error messages that could occur on the login page are as follows:

- **Invalid login**
  - Diagnosis: The given username and password combination does not match with a registered user’s account. Either no registered user with the given username exists or the password does not match the stored password of the registered user with the given username.
  - Recovery procedure: Fill in a registered username and password combination.

- **Invalid password reset request**
- **Diagnosis:** When requesting a password reset, a valid username or email address has to be provided. This error message is shown when no user with the given username exists or no user with the given email address exists.

- **Recovery procedure:** Fill in a registered username or a registered email address.

  - **Invalid password on reset**
    - **Diagnosis:** This error message is shown when an invalid password is filled in when changing a password that is reset. It is either too long or too short, or does not meet the password requirements. The password requirements state that a password should contain at least one lower-case letter, one upper-case letter, one number and one special character.
    - **Recovery procedure:** Fill in a valid password.

The error messages that could occur on the user information page are as follows:

  - **Invalid account information during account editing**
    - **Diagnosis:** One or more profile information fields contain invalid data when editing account information. All profile information fields have a limited amount of allowed characters. The *Invalid profile information* error message is displayed when this character amount is exceeded or when forbidden special characters are used in the profile information fields.
    - **Recovery procedure:** Fill in valid account information or clear the profile information fields.

  - **Invalid old password on change**
    - **Diagnosis:** This error message is shown when an invalid old password is filled in when changing a password on the user information page. It does not match the current password of the user.
    - **Recovery procedure:** Fill in the correct password.

  - **Invalid new password on change**
    - **Diagnosis:** This error message is shown when an invalid new password is filled in when changing a password on the user information page. It is either too long or too short, or does not meet the password requirements. The password requirements state that a password should contain at least one lower-case letter, one upper-case letter, one number and one special character.
    - **Recovery procedure:** Fill in a valid password.

The error messages that could occur on the home page are as follows:

  - **Project name already exists**
    - **Diagnosis:** There already exists a project with the given project name.
    - **Recovery procedure:** Fill in a non-existing project name.

  - **Project name invalid**
    - **Diagnosis:** The given project name contains special characters which are not allowed.
    - **Recovery procedure:** Fill in a valid project name.

  - **Incorrect file extension**
    - **Diagnosis:** A file is uploaded which does not have the correct file extension. The correct file extensions for the log and net files are `.xes` and `.pnml` respectively.
    - **Recovery procedure:** Upload files with the correct file extensions.

The error messages that could occur on the project page are as follows:

  - **Experiment name invalid**
– **Diagnosis:** The given experiment name contains special characters which are not allowed.

– **Recovery procedure:** Fill in a valid experiment name.

- **Invalid partial order discovery parameters**
  – **Diagnosis:** The given partial order discovery parameters are invalid. Either the parameters are not numbers, or they are left empty.
  – **Recovery procedure:** Fill in valid parameter values.

- **Anomalous subgraph discovery not finished**
  – **Diagnosis:** This error message is shown when an attempt to start the partial order discovery phase is made when the anomalous subgraph discovery phase has not finished yet. The results of that phase are needed for the partial order discovery phase to run.
  – **Recovery procedure:** None.

The error messages that could occur on the results page are as follows:

- **No anomalous subgraph discovery results**
  – **Diagnosis:** The anomalous subgraph discovery phase has not yet finished while viewing the results. This error message indicates that no results were found for this phase.
  – **Recovery procedure:** None.

- **No partial order discovery results**
  – **Diagnosis:** The partial order discovery phase has not yet finished while viewing the results. This error message indicates that no results were found for this phase.
  – **Recovery procedure:** None.

- **Invalid support value when filtering patterns**
  – **Diagnosis:** The given support value is invalid. Either the given support value is not a number or is left empty.
  – **Recovery procedure:** Fill in a valid support value.
## Glossary

**Administrator**
A registered user with the highest available access rights who manages both the tool and its users.

**Anomalous subgraph discovery**
An experiment phase that extracts recurrent subgraphs involving one or more deviations from the process model [5].

**APD tool**
The APD tool is an extension of the Esub tool designed to extract anomalous patterns together with their correlations. These patterns are extracted from historical logging data from past process executions. Users can upload event logs and process models on which experiments can be run. After the experiments are completed, the tool supports the users in exploring the obtained results [5].

**Esub tool**
An online webtool supporting the visualization and exploration of the outcome of the frequent subgraph mining algorithm SUBDUE [3].

**Experiment**
An experiment consists of both the anomalous subgraph discovery phase and partial order discovery phase.

**Experiment log**
A file that tracks all activities performed within an experiment.

**Experiment phase**
Anomalous subgraph discovery and partial order discovery are the two phases of one experiment.

**Event log file**
A file that consists of traces [5].

**Final Result**
The outcome of an experiment.

**GDPR**
The General Data Protection Regulation is a set of laws guiding the processing and gathering of personal information in the EU.

**Graph .g file**
A file that collects multiple graphs, each involving a set of edges and vertices.

**Intermediate result**
The outcome of either a component or an experiment phase.

**Partial order discovery**
An experiment phase creating patterns from anomalous subgraphs and partially ordering them based on their location in the log traces [5].

**Petri net**
A mathematical model used for the specification and the analysis of parallel processes [4].

**Process model**
A representation of the prescribed behavior of a business process [5].

**Project**
A combination of an event log, a process model, and a unique project name. The project is stored together with any experiments run under that project name.

**Project owner**
The user who created the project.

**Registered user**
A user with a registered account on the APD tool.

**Result**
Either an intermediate result or final result.

**Subgraph**
A graph $S$ is a subgraph of $S'$ if the vertices and edges of $S$ are a subset of the vertices and edges of $S'$ [2].
<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Support</strong></td>
<td>The support of a subgraph/pattern is equal to the fraction of graphs which involve the subgraph/pattern at least once [5].</td>
</tr>
<tr>
<td><strong>Synchronous function</strong></td>
<td>A task that have to be completed before a new task can be called.</td>
</tr>
<tr>
<td><strong>Trace</strong></td>
<td>A trace in a business process model is a sequence of events generated during a process execution.</td>
</tr>
<tr>
<td><strong>Unregistered user</strong></td>
<td>A user who does not have an account on the APD tool.</td>
</tr>
<tr>
<td><strong>User</strong></td>
<td>A person who is currently using the APD tool or who has previously used the APD tool.</td>
</tr>
</tbody>
</table>