User Manual

TeamAFK - Project Predire in Grafana

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Informations about the document

Version	1.0.0
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Description

User manual made by *TeamAFK* for the project *Predire in Grafana*.

Changelog

Version	Date	Description	Name	Role
1.0.0	2020-06-09	Document approval for RQ release.	Davide Zilio	*Manager*
0.4.3	2020-06-07	Final translate of section §7. Document checked.	Alessandro Canesso Victor Dutca	*Programmer Verifier*
0.4.2	2020-06-07	Added screenshots to the sections §4, §5, §6, updated JSON description §5. Document checked.	Victor Dutca Alessandro Canesso Davide Zilio	*Programmer Verifier Verifier*
0.4.1	2020-06-06	Added screenshots, corrected errors in sections §1,§2,§3. Document checked.	Victor Dutca Alessandro Canesso	*Programmer Verifier*
0.4.0	2020-06-06	Written and checked section §7	Victor Dutca Alessandro Canesso	*Programmer Verifier*
0.3.0	2020-06-05	Written and checked section §5,§6	Victor Dutca Alessandro Canesso	*Programmer Verifier*
0.2.0	2020-06-04	Written and checked section §3,§4	Alessandro Canesso Victor Dutca	*Programmer Verifier*
0.1.0	2020-06-03	Written and checked section §1,§2	Alessandro Canesso Victor Dutca	*Programmer Verifier*

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1 Introduction

1.1 General description

This document is *Predire in Grafana*'s user manual, a project developed by *TeamAFK* for use on the Grafana$_G$ platform.

1.2 Purpose of the document

This document's purpose is to demonstrate how to use *Predire in Grafana*'s two software components: the training tool and the prediction plug-in for Grafana itself.

1.3 Predire in Grafana's purpose

Predire in Grafana is a platform which allows users to train linear regression or support vector machine algorithms using machine learning$_G$, and then use these algorithms to monitor and predict the behaviour of various systems of their choosing.

In more detail: users can supply a CSV file to the training tool and receive a JSON file containing values which can then be used to set and calibrate SVM$_G$ or RL$_G$ algorithms by coupling the values contained in the JSON file with data streams coming from a database.

1.4 Glossary

At the end of the document an appendix is available where explanations for new or ambiguous terms can be found. These are marked with a subscript G.

2 System Requirements

Here the requirements for use of the product are listed.

2.1 Minimum Hardware Requirements

Here the requirements for use of the product are listed.

- 2GB of RAM;

- 5GB of space on a drive;

- Dual core processor.

2.2 Compatible Operating Systems

The software was developed and tested on the following:

- Windows 10;

- MacOS 10.15;

- Ubuntu 18, 20.

2.3 Compatible Browsers

Predire in Grafana can be accessed through the following browsers:

- Google Chrome version 58 or newer;

- Mozilla Firefox version 54 or newer;

- Apple Safari version 10 or newer;

- Microsoft Edge version 14 or newer;

- Opera version 55 or newer.

3 Installation

3.1 Grafana

All documetation about Grafana installation is aviable on https://grafana.com/grafana/download.
Here you cand find the download for your preferred operating system, such as : MacOS, Windows adn GNU/Linux and a step-by-step installation guide.

3.1.1 Grafana WEB service

To lounh the Grafana WEB service, the following steps must be follwed dependig on which operating system is used:

- **Linux**: on opened terminal run the following command: `sudo service grafana-server start` ;

- **Windows**: the extracted Grafana folder contains the folder "bin" with the setup WEB services, double click on `grafana-server.exe` ;

- **Mac**: in the "bin" folder on opened terminal run the following comand: `./grafana-server web`.

Sould the user then open the preferred browser and connect to the deafult Grafana local host : `http://localhost:3000/`. The credentials required for a first-time run are "admin" for the username field and "admin" for the password field
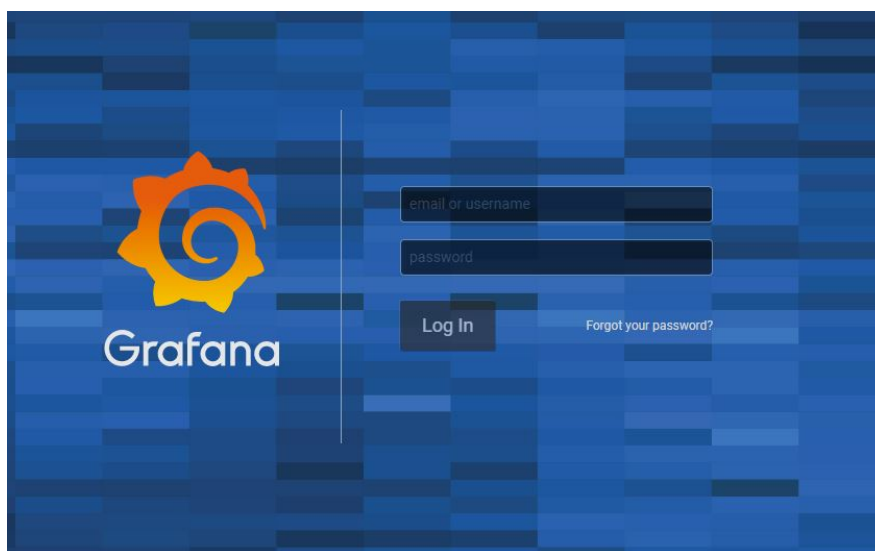

Figure 3.1.1: Grafana login page

4 The training tool

Here the appropriate way of using the training tool is explained in detail.

4.1 Access

The tool is a dynamic web page and can thus be accessed via browser.

4.2 Uploading a CSV file in the tool

The user will need to feed the tool a CSV file containing properly marked values for the algorithm the user has intention of training.

This can be done by selecting the "Selezionare il file" button, which will open a window from which the user will be able to select the CSV file he has intention of uploading.
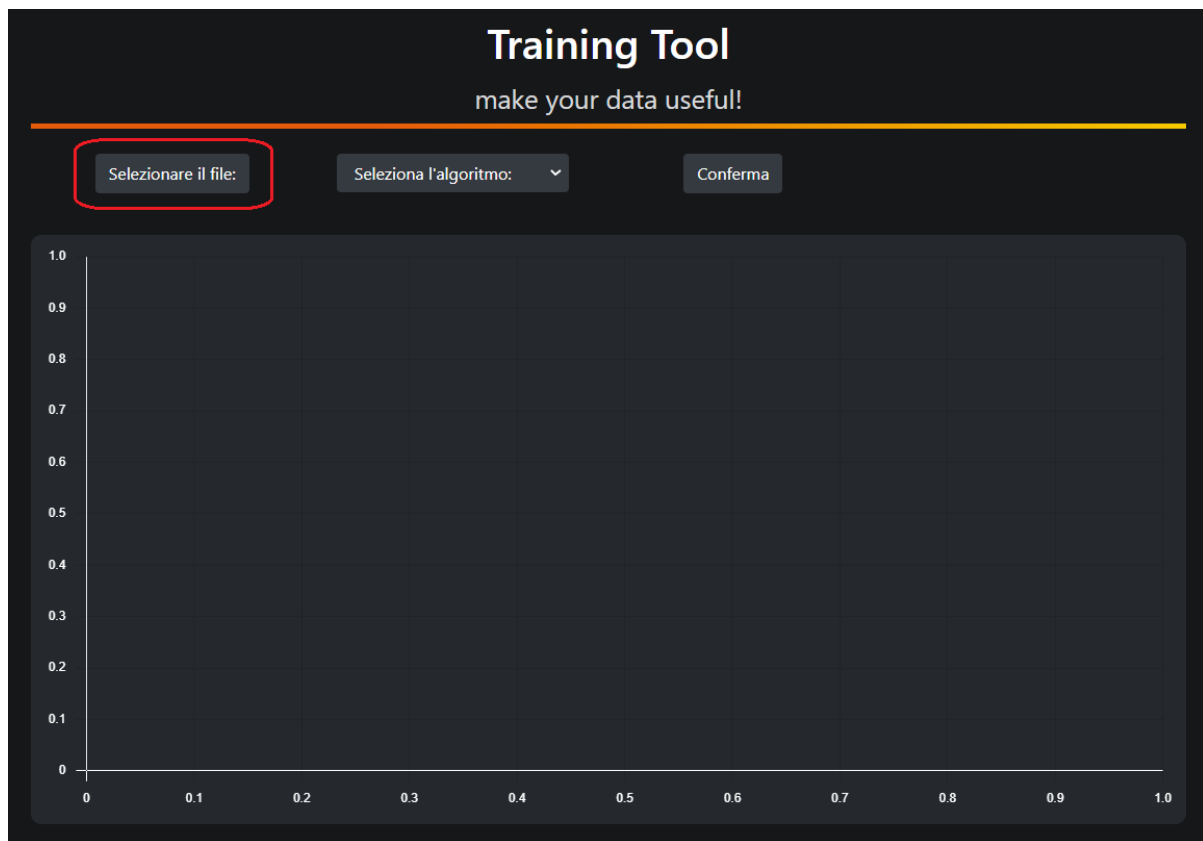

Figure 4.2.1: CSV-File selector

4.3   Selection of the algorithm

The user will have to choose between training a Support Vector Machine or a Linear Regression algorithm with the CSV file he has given to the tool.

To do this, the user can open a drop-down menu called "Seleziona l'algoritmo" which displays the two algorithms that can be chosen. The preferred algorithm can at this point be selected.
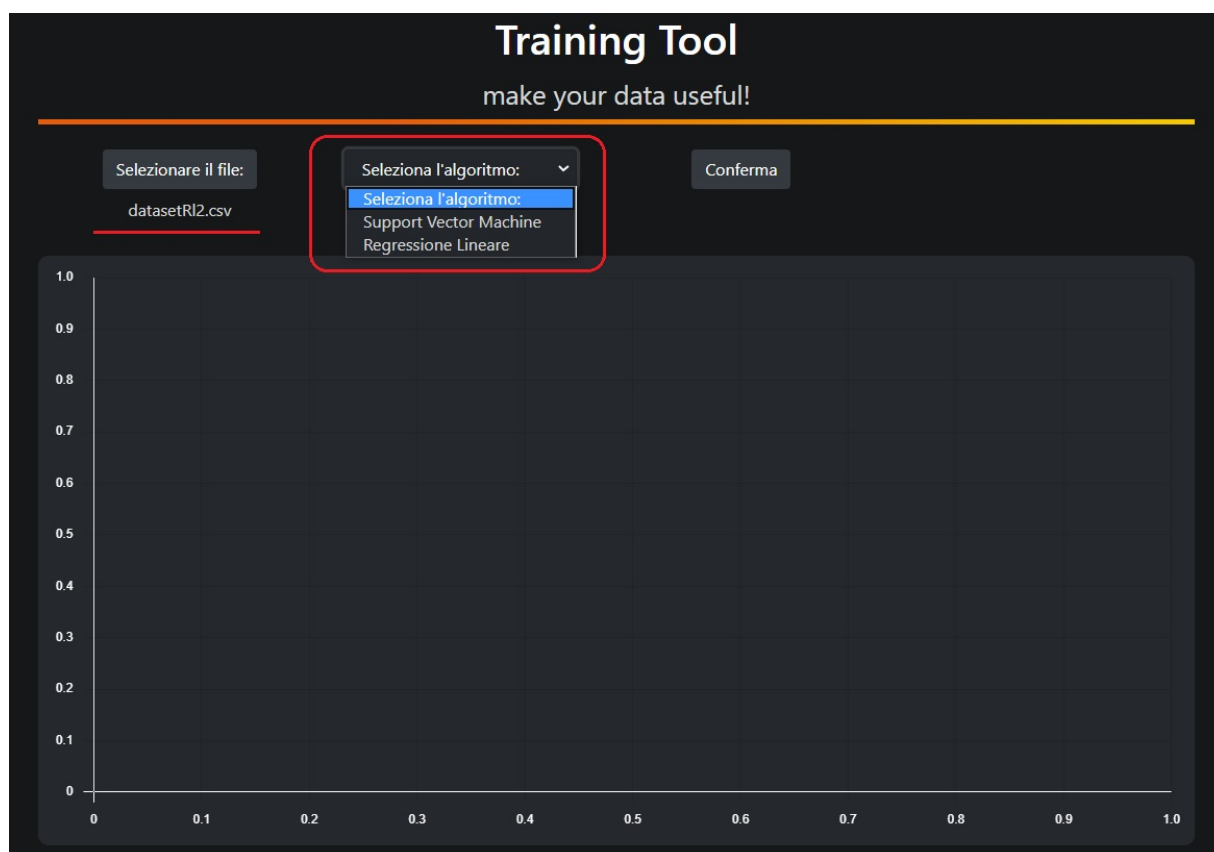

Figure 4.3.1: Training algorithm selector

Should the user have uploaded training data incompatible with the selected algorithm, an error message will be displayed on selection of the "Conferma" button.
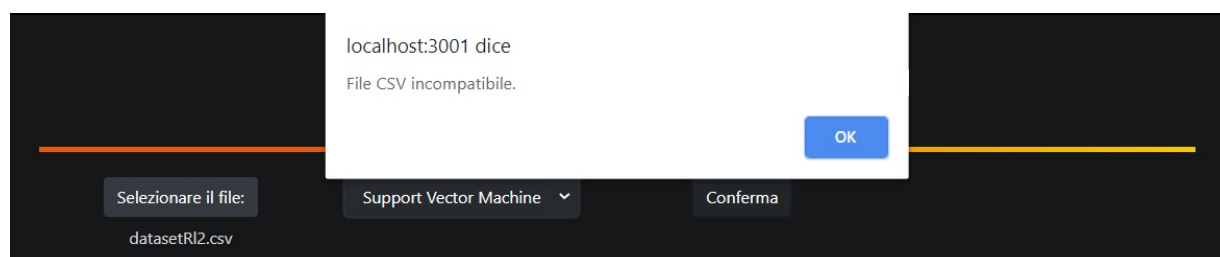

Figure 4.3.2: Incompatible algorithm uploaded

4.4   Training operation

The tool will now be able to perform the training operation by simply having the user select the "Conferma" button. The tool will now have produced a JSON file containing the values needed for use in the plug-in.
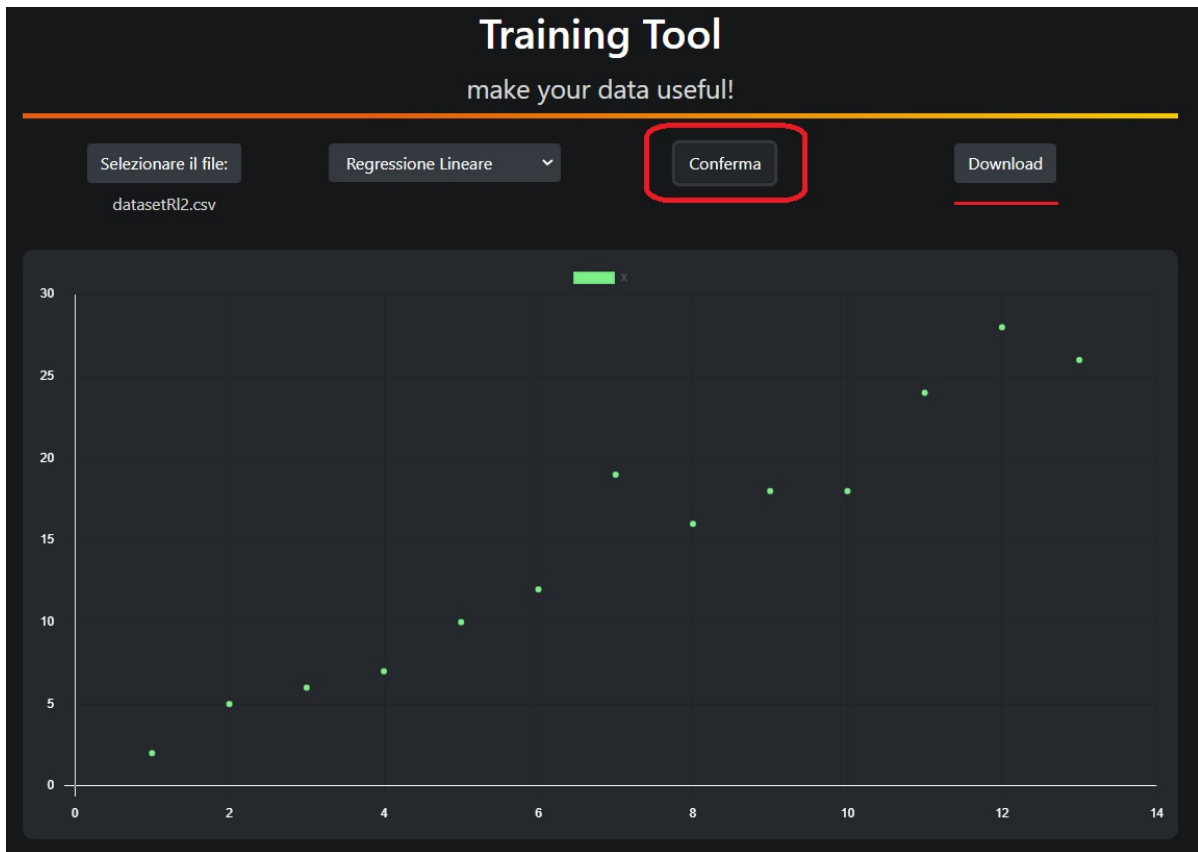

Figure 4.4.1: Training operation with graphic point

A message will be displayed on selection of the "Conferma" button if the training operation is successfully completed.
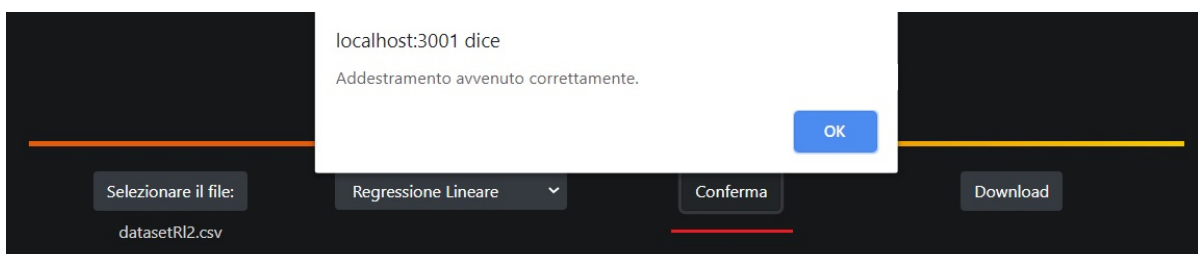

Figure 4.4.2: Training operation is successfully completed

4.5   Obtaining the JSON file

The user can now select the "download" button, which will only appear once the training operation has ended succesfully, and receive the JSON file.
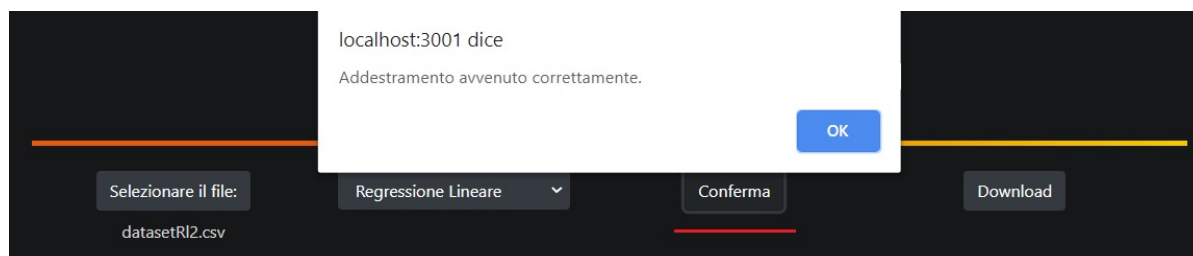

Figure 4.5.1: The "Download" button is then clickable

5   The plug-in

Here a step by step explanation will guide the user through the proper usage of the prediction plug-in.

5.1   Loading the plug-in

1. the user will have to select the plus icon from the sidebar, from which a drop-down menu containing four options will appear; from this menu the "dashboard" option has to be selected;
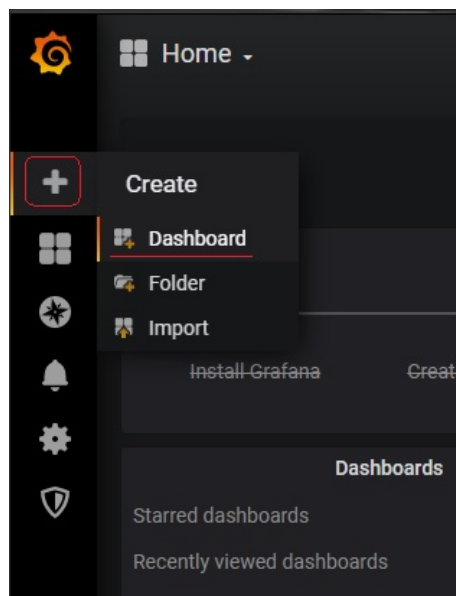

Figure 5.1.1: Training operation with graphic point

2. the user will now have to select the "Chose Visualization" button;
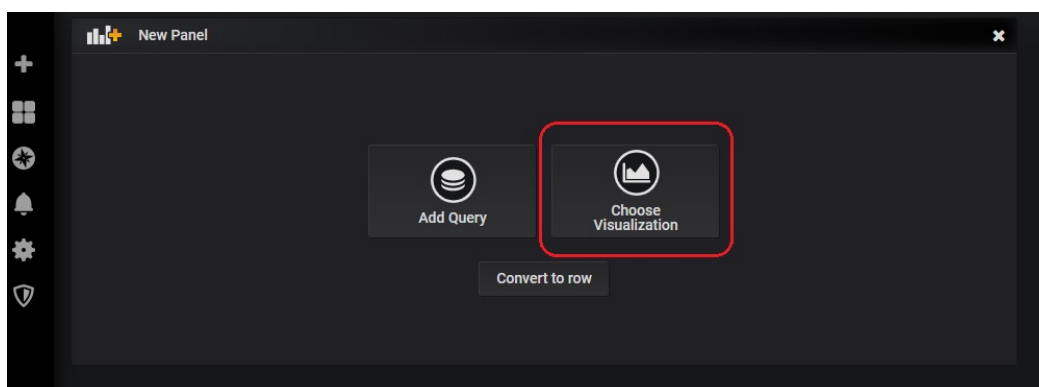

Figure 5.1.2: Chose Visualization button

3. finally, by pressing on the "Predire in Grafana" button, the user can use the plug-in.
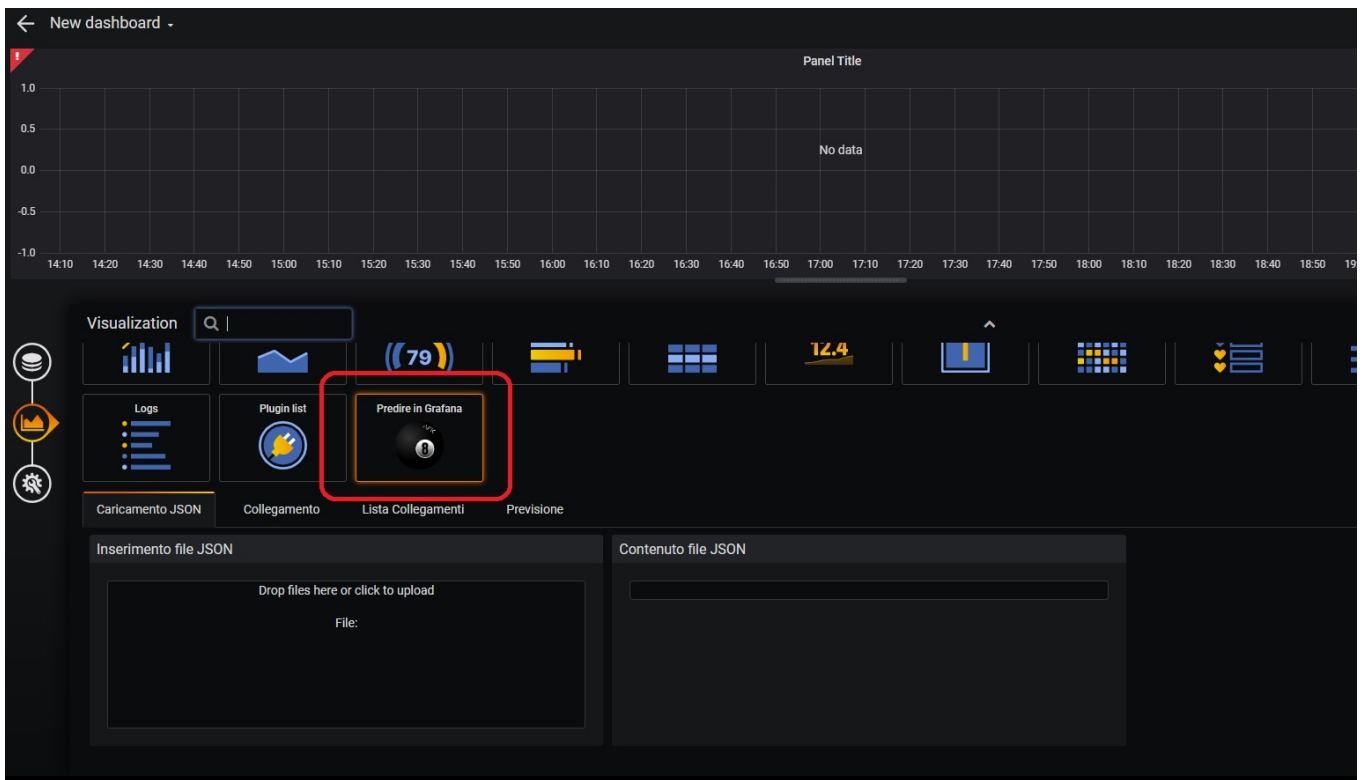
Figure 5.1.3: "Predire in Grafana" Panel

5.2 Loading a JSON file

The user can select the "Inserimento file JSON" button contained in the "Caricamento JSON" section. This will open a window from which the JSON file can be selected. Alternatively, the user can drag and drop the JSON file in the "Inserimento file JSON" section. The content of the JSON file will be displayed in a panel called "Contenuto file JSON" to the right of the previously mentioned section.
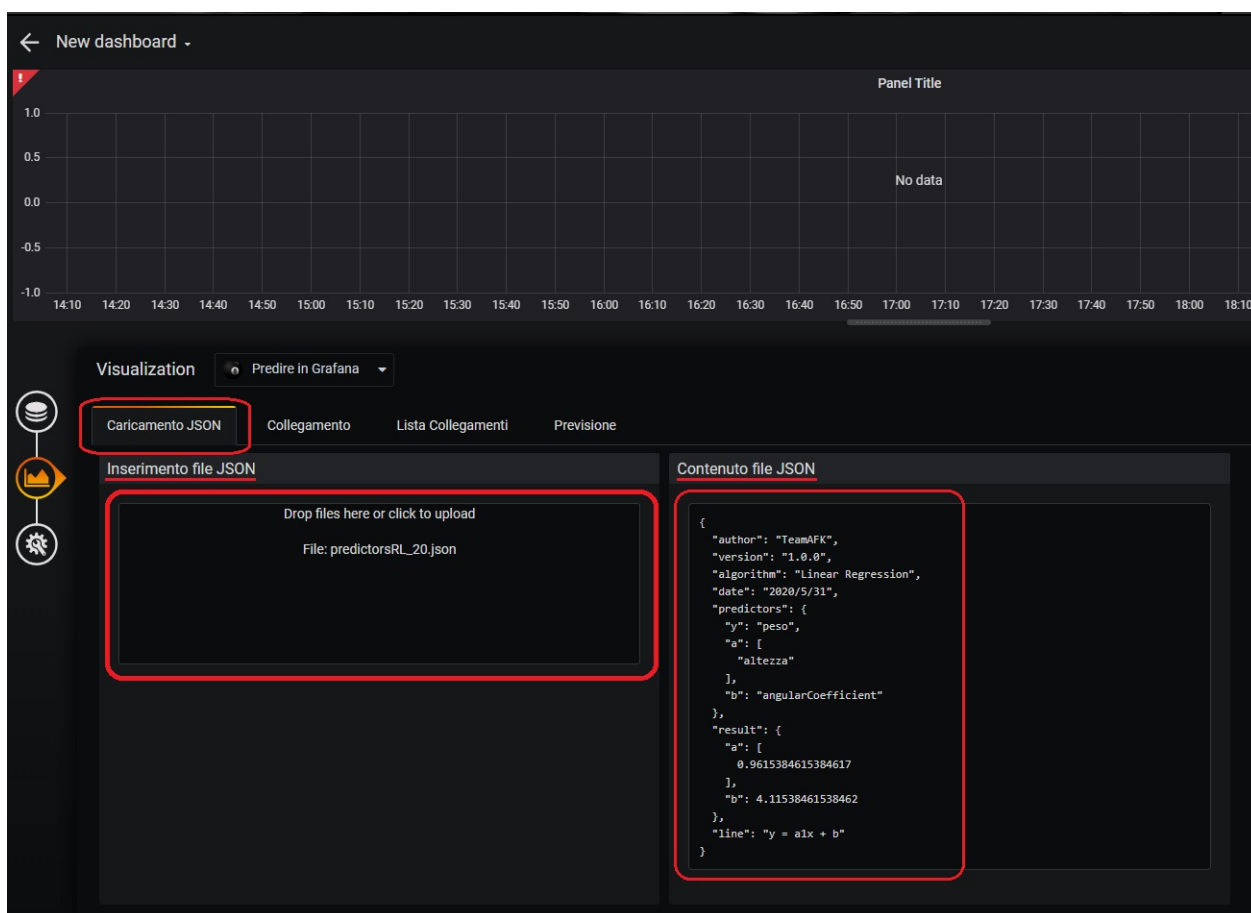
Figure 5.2.1: Loading window and displayed loaded JSON

5.3 Connecting the nodes

The portion of the software dedicated to the connection of the nodes can be accessed by selecting the "Collegamento" tab.

1. the user can choose from the "Lista predittori" section which queries are to be associated with which nodes, by selecting a particular query to the right of a predictor: this can be done by opening the drop-down menu tagged with "Seleziona il nodo" and then selecting a query. Once all the nodes are connected, the user can select the "Inserisci collegamento" button and confirm the operation;
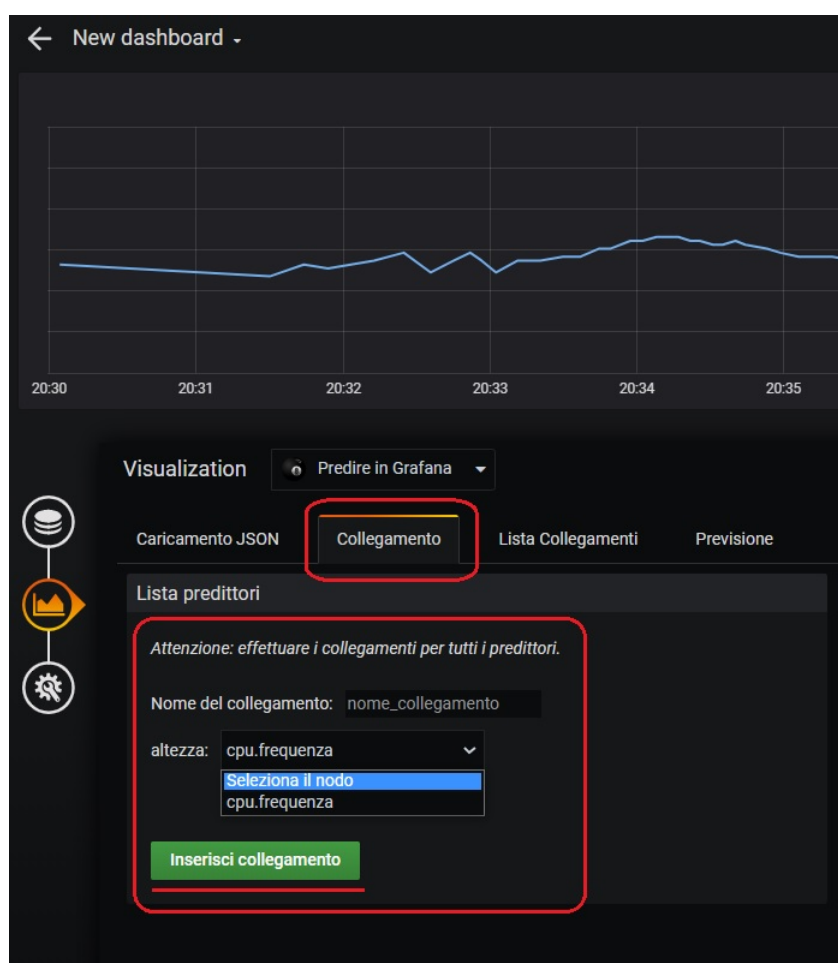
Figure 5.3.1: Node coupling (a)

(a) should the user have not filled all the required fields, an error message will be displayed on selection of the "Inserisci collegamento" button;
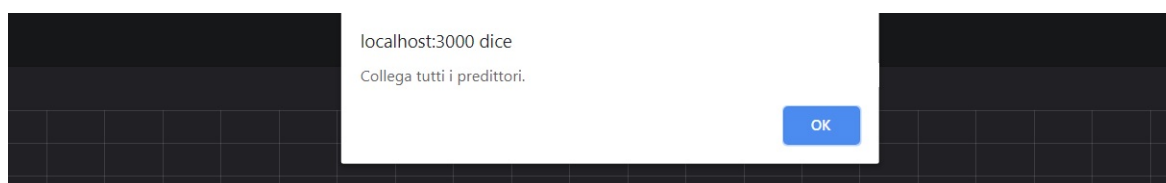

Figure 5.3.2: Node coupling error message

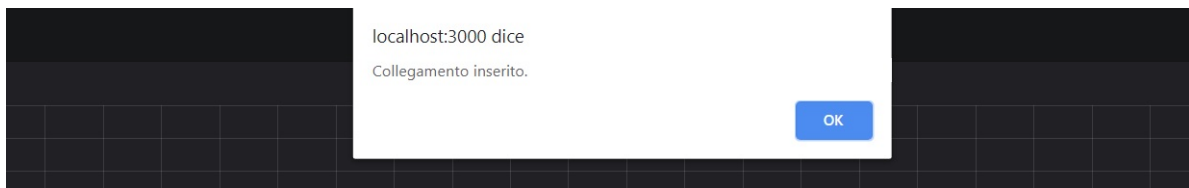(b) once all the required fields are correctly chosen, a confirm message will be displayed.

Figure 5.3.3: Node coupling confirm message

2. maximum and minimum thresholds can be set in the "Impostazione soglie" section, by inserting numbers in the dedicated boxes and then selecting the "Conferma Collegamento" button.
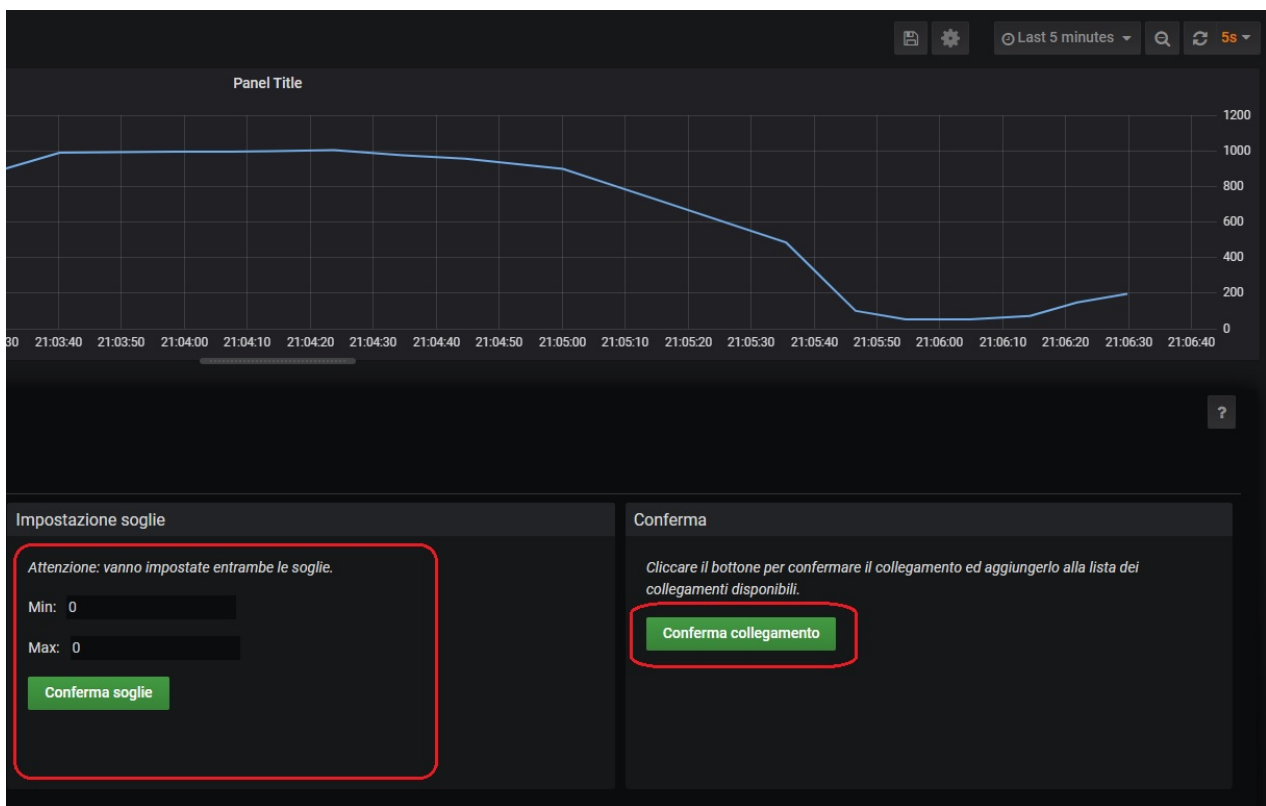

Figure 5.3.4: Node coupling (b)

5.4 Modifying the connections

In this section the user can view all the predictor-data stream connections that have been made. This section can be accessed by selecting the "Lista Collegamenti" tab. The user can also modify the connection, by pressing on the "Modifica Collegamento" button, or delete it, by selecting the "Elimina Collegamento" button.
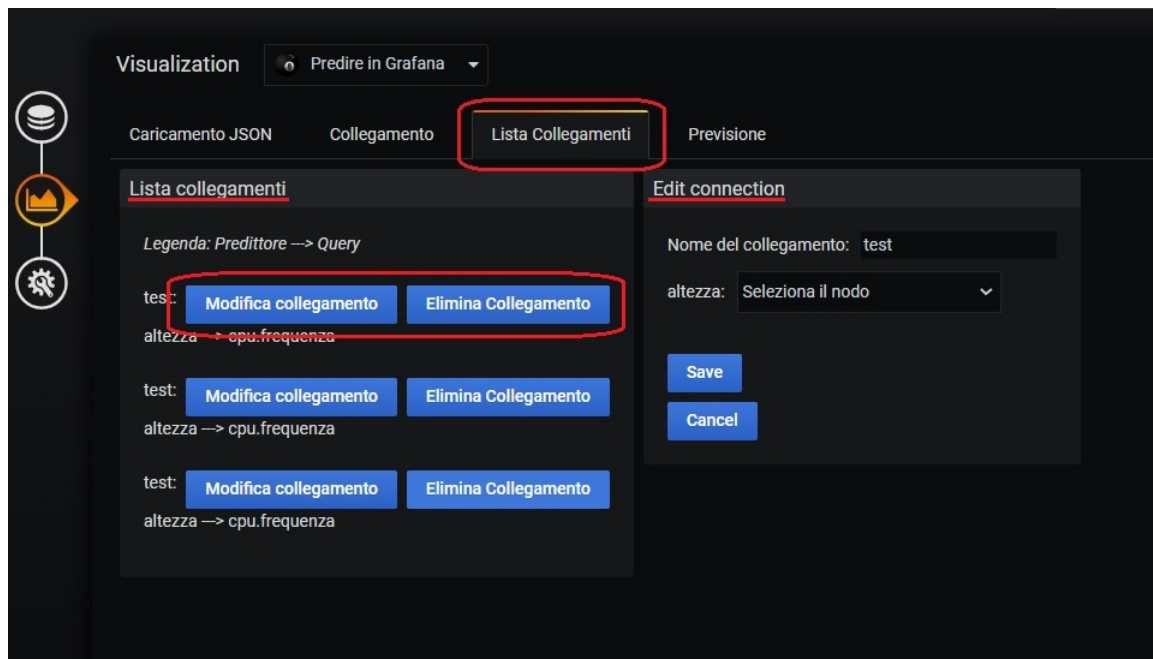
Figure 5.4.1: Node linking

5.5 Prediction operations

In this last section the user will be able to launch the prediction algorithms of the plug-in. This section is accessed by selecting the "Previsione" tab. Here the user will be able to select, in the top right corner, a temporal policy by choosing starting and ending dates and choosing how often to sample the data. The user also has access to two buttons, one called "Avvia monitoraggio", which starts the prediction operations, and a second one named "Salva previsione", which saves the data collected up to the point it is pressed.
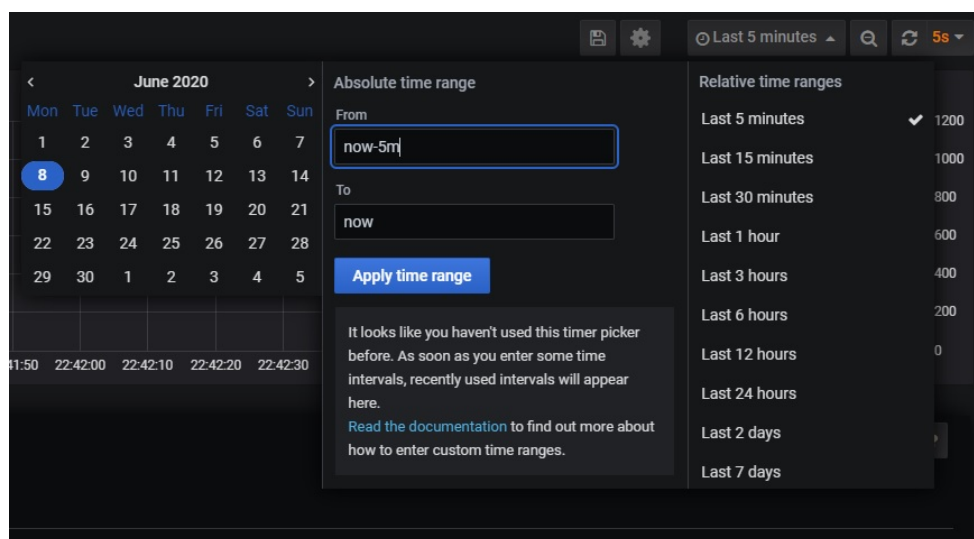

Figure 5.5.1: Time picker

When the prediction has been started, the "Avvia monitoraggio" button becomes "Interrompi monitoraggio", which, if pressed, will stop the monitoring.
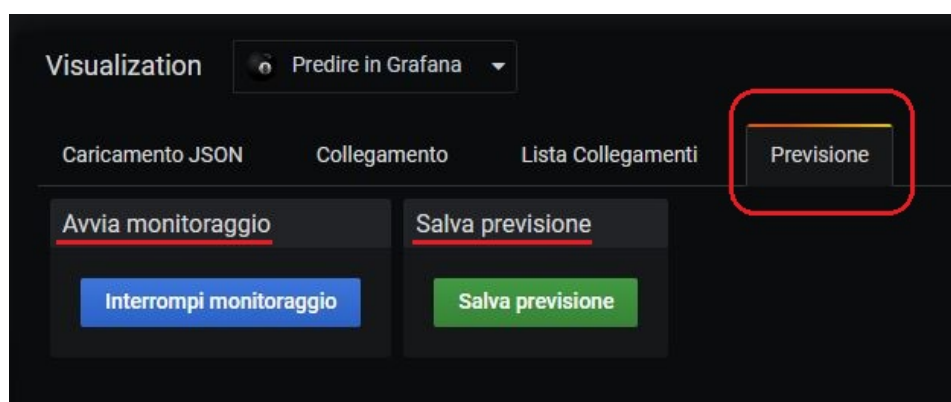

Figure 5.5.2: Begin\end data monitoring and Prediction save

6 File structure

6.1 JSON structure

The JSON files containing the configurations of the various prediction algorithms must be structured in the following way

6.1.1 Support Vector Machine

- **author**: file author;

- **version**: version of the application with the which the file was created;

- **algorithm**: states which algorithm was used for training, in this particular case "SVM";

- **date**: date on which the file was created;

- **predictors**: list of predictor tags;

- **result**: list of coefficients obtained from training.

```
1   {
2     "author": "TeamAFK",
3     "version": "1.0.0",
4     "algorithm": "SVM",
5     "date": "2020/5/29",
6     "predictors": {
7       "w": [
8         "x",
9         "z",
10        "s",
11        "y"
12      ],
13      "b": "label"
14    },
15    "result": {
16      "w": [
17        -0.03581449414618954,
18        -0.022834922413948373,
19        -0.0033914640906372653,
20        -0.05088164058443299
21      ],
22      "b": 1.4362243753384667
23    }
24  }
```

Figure 6.1.1: Support Vector Machine JSON example

6.1.2   Linear Regression

- **author**: file author;

- **version**: version of the application with the which the file was created ;

- **algorithm**: states which algorithm was used for training, in this particular case "Linear Regression";

- **date**: date on which the file was created;

- **predictors**: list of predictor tags;

- **result**: list of coefficients obtained from training;

- **line**: the equation of the Linear Regression.

```
 1 ∨ {
 2       "author": "TeamAFK",
 3       "version": "1.0.0",
 4       "algorithm": "Linear Regression",
 5       "date": "2020/06/08",
 6 ∨     "predictors": {
 7         "y": "y",
 8 ∨       "a": [
 9           "x"
10         ],
11         "b": "angularCoefficient"
12       },
13 ∨     "result": {
14 ∨       "a": [
15           2.1098901098901095
16         ],
17         "b": -0.07692307692306599
18       },
19       "line": "y = a1x + b"
20     }
```

Figure 6.1.2: Linear Regression JSON example

6.2   CSV file structure

The CSV files are structured based on which algorithm must be trained, RL or SVM. Each column contains the values of the corresponding predictor$_G$. The first line of each column must contain the tag associated to the particular predictor. Depending on the case, one or more columns must be present for the predictors.

(a) RL CSV file example

(b) SVM CSV file example

Figure 6.2.1: CSV input file examples

7 Reporting errors

Should anomalies or errors encountered during the execution of the plug-in or the training tool, it is possible to report them ad the following mail address: gruppoafk15@gmail.com.
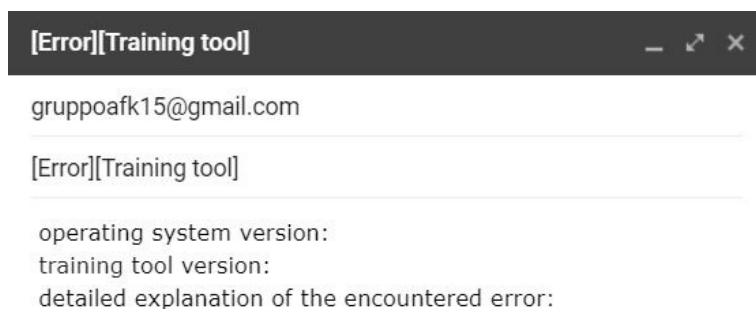
7.1 Reporting Training tool errors

In the object field the type of error must be stated in the following way:

<div align="center">

[Error][Training tool]

</div>

The body of the mail must contain the following statements:

- operating system version;

- training tool version;

- detailed explanation of the encountered error.

Figure 7.1.1: Training tool error mail template

7.2 Reporting Plug-in errors

To report Plug-in errors instead: the object field has to be compiled as such:

<div align="center">

[Error][Plug-in]

</div>

and the body must contain the following statements:

- Grafana version;

- plug-in version;

- browser version;

- operating system version;
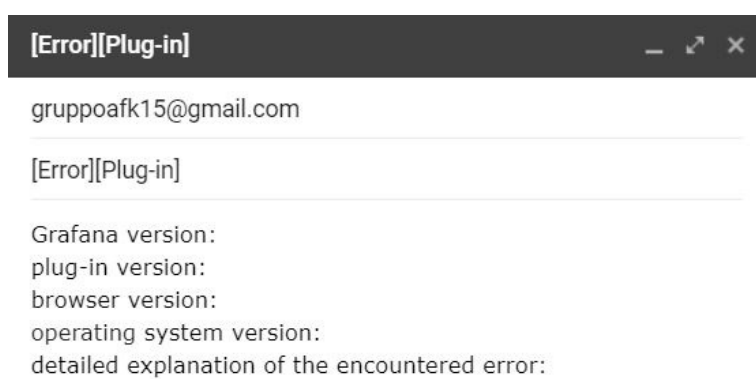
- detailed explanation of the encountered.

Figure 7.2.1: Plug-in error mail template

A   Glossary

G

Grafana
Open source platform which allows users to monitor data coming from various sources.

M

Machine Learning
Machine learning is the study of algorithms which self improve through experience. Machine learning algorithms build mathematical models based on sample data known as "traning data".

P

Predictor
It is a function of the data, with the purpose of calculating predictions on one or more variables.

R

RL
It is a method of estimating the expected value of a dependent variable given the values of the indipendent variables. It is defined as: $y = \alpha x + \beta$.

S

SVM
It is a supervised machine learning model which uses classification algorithms to evaluate specific problems.