



# User Manual

**TeamAFK - Project Predire in Grafana**

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## Informations about the document

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## Description

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

## Changelog

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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<sub>G</sub>* 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<sub>G</sub>, 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<sub>G</sub> or RL<sub>G</sub> 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 srowers

*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 The plug-in

For the installation of the the plug-in, which is a component of our product, it is necessary to download the repository at the following link:

<https://github.com/teamafkSWE/PredireInGrafana-SW>

All the downloaded files must be inserted into the correct folder, based on the OS used:

- Windows: bin\data\plugins;
- GNU/Linux, MacOS : var\lib\grafana\plugins.

### 3.2 External training tool

The external training tool will momentarily be available online at the following link : <https://trainingtool.000webhostapp.com/>.

### 3.3 Grafana

All documetation about Grafana's installation is available on [grafana.com/grafana/download](https://grafana.com/grafana/download). For a correct using of the plugin you must select Grafana 6.7.3 version. Here the correct download for the operating system of your choice can be found, all major OSs are available : MacOS, Windows and GNU/Linux and a step-by-step installation guide.

#### 3.3.1 Grafana WEB service

To launch the Grafana WEB service, the following steps must be followed depending on which operating system is being used:

- **Linux:** give the following command to a in instance of a terminal:`sudo service grafana-server start` ;
- **Windows:** the extracted Grafana folder contains the folder "bin" with the WEB services setup file, double click on `grafana-server.exe` ;
- **Mac:** in the "bin" folder open an instance of the terminal and give the following command: `./grafana-server web`.

Sould the user then open the preferred browser and connect to the default 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 3.3.1: 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 "Select file" button, which will open a window from which the user will be able to select the CSV file he has intention of uploading.

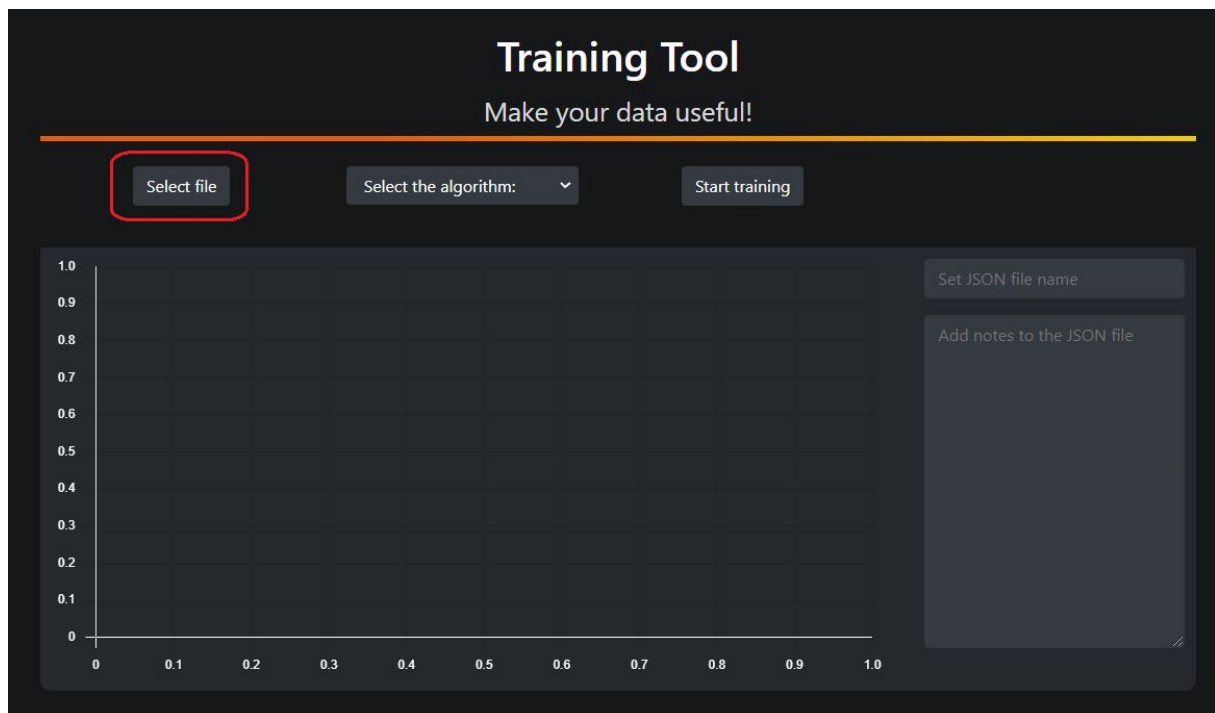


Figure 4.2.1: CSV-File selector

### 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 "Select the algorithm" which displays the two algorithms that can be chosen. The preferred algorithm can at this point be selected.

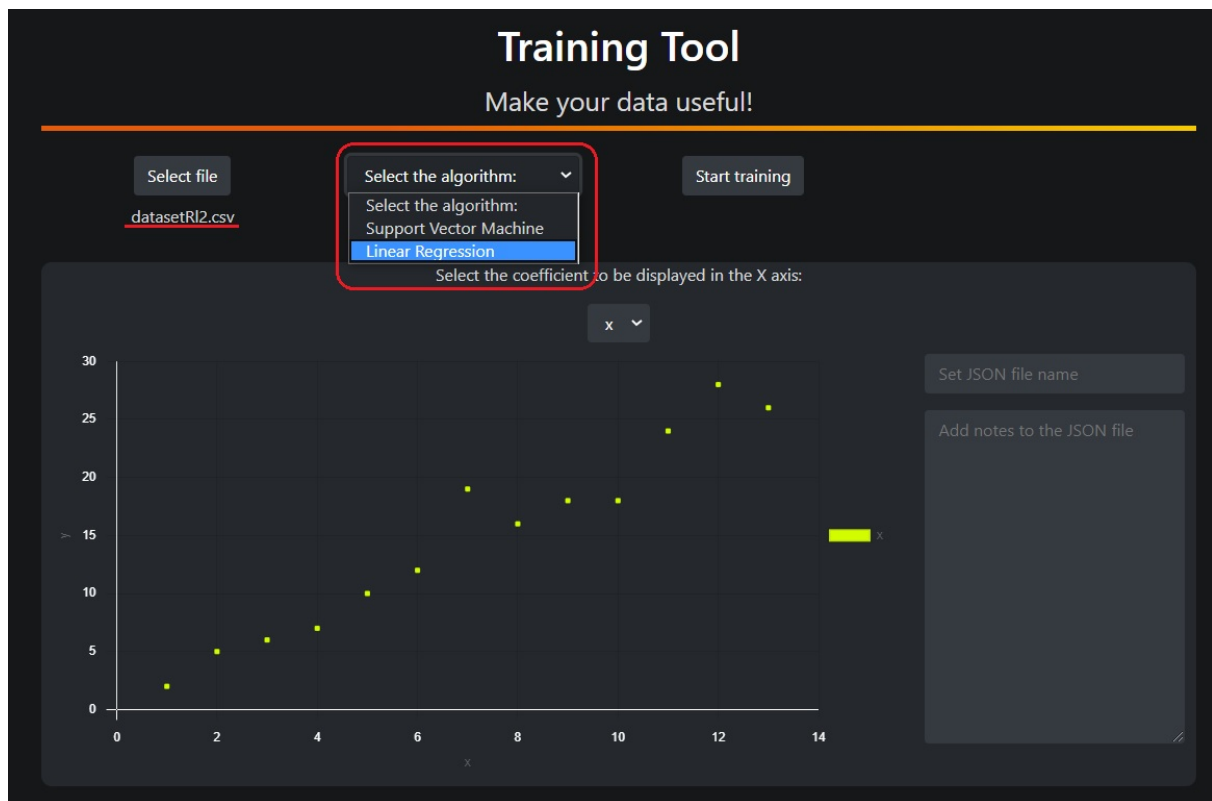


Figure 4.3.1: Training algorithm selector

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

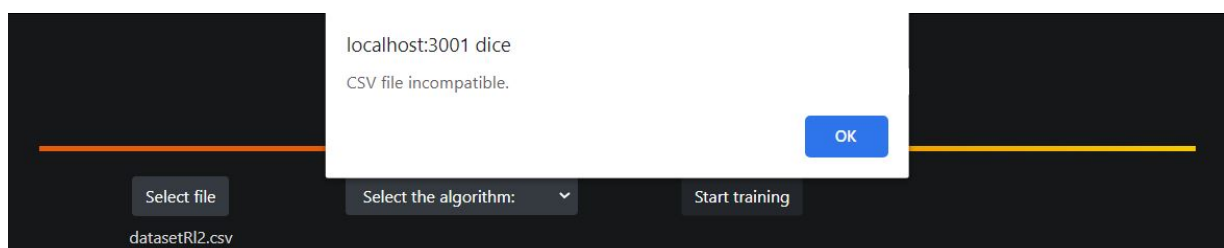


Figure 4.3.2: Incompatible algorithm uploaded

## 4.4 Training operation

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

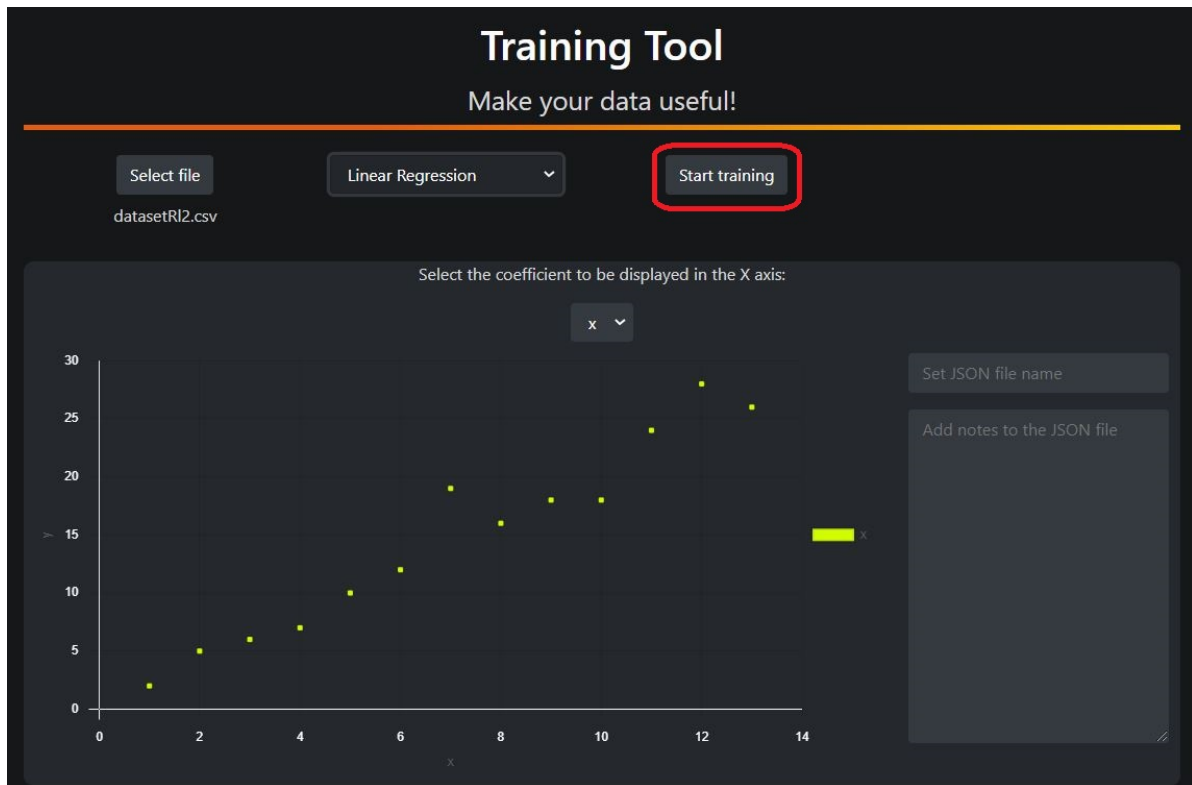


Figure 4.4.1: Training operation with graphic point

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

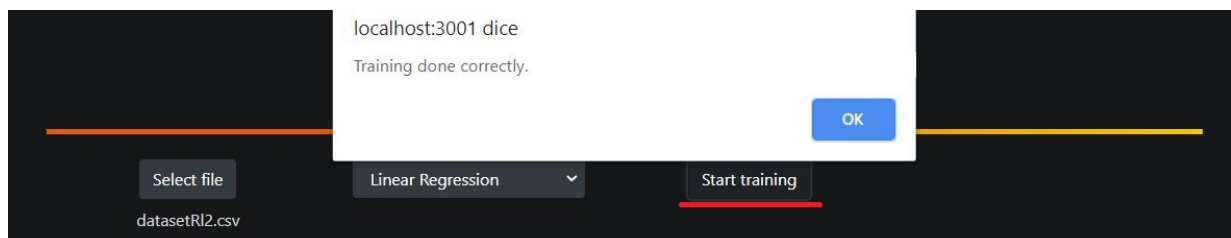


Figure 4.4.2: Training operation is successfully completed

## 4.5 Obtaining the JSON file

The user can now select the “Download” button, which will only appear once the training operation has ended successfully, and receive the JSON file.

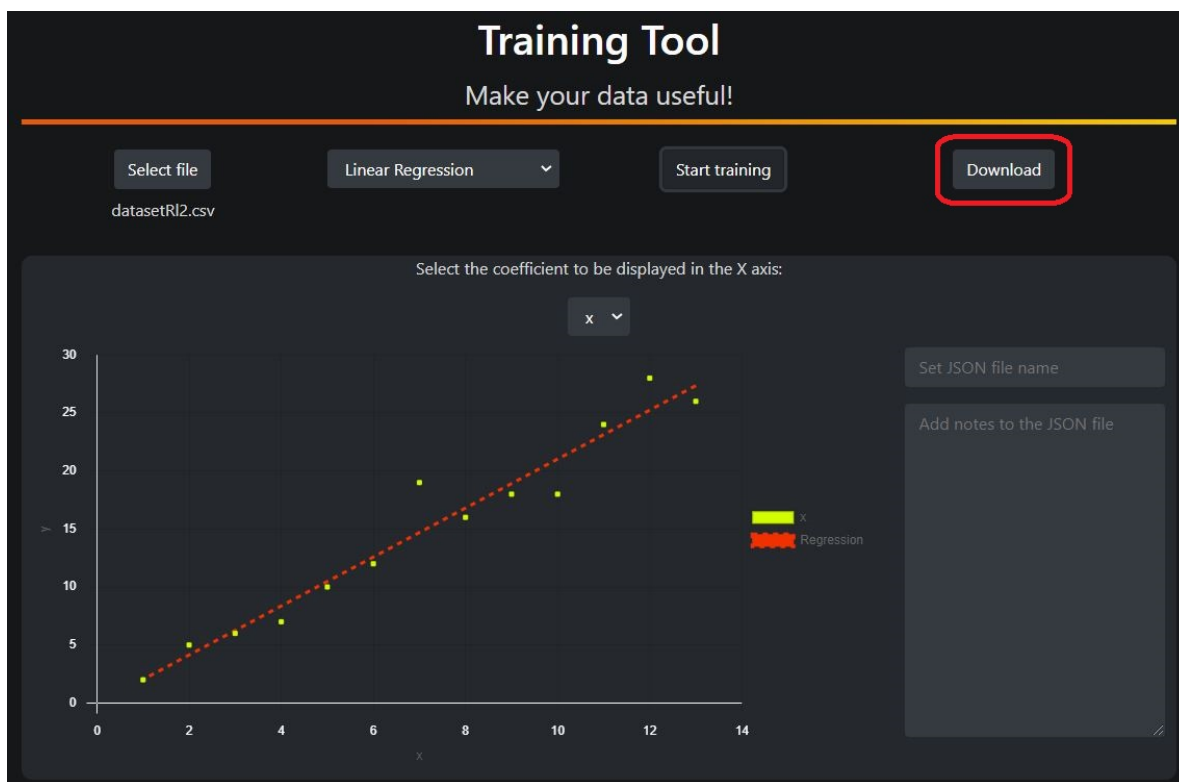


Figure 4.5.1: The "Download" button is then clickable

## 4.6 Info point

Additional information can be accessed by selecting the "information" button, once selected a step-by-step guide will appear.

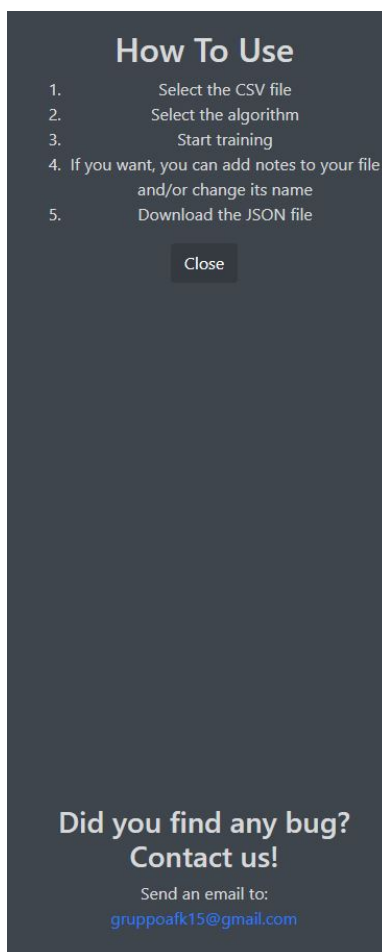


Figure 4.6.1: Info point button

### 4.6.1 Bug reporting

The email address to which bug reports should be sent is displayed below the step-by-step guide, we will later explain in greater detail how to report a bug.

## 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;

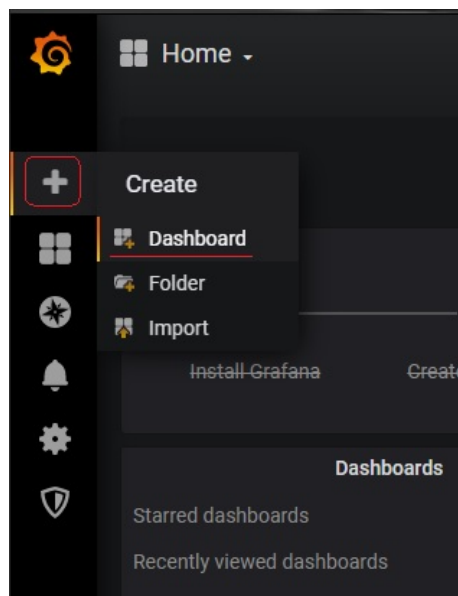


Figure 5.1.1: Training operation with graphic point

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

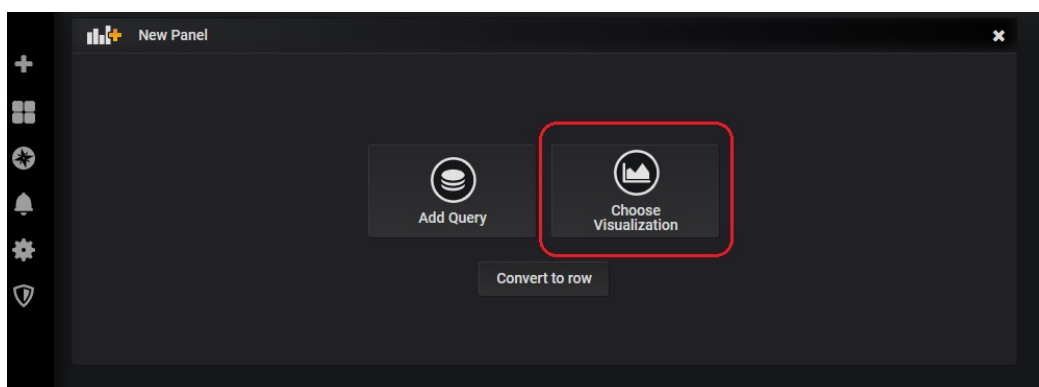


Figure 5.1.2: Chose Visualization button

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

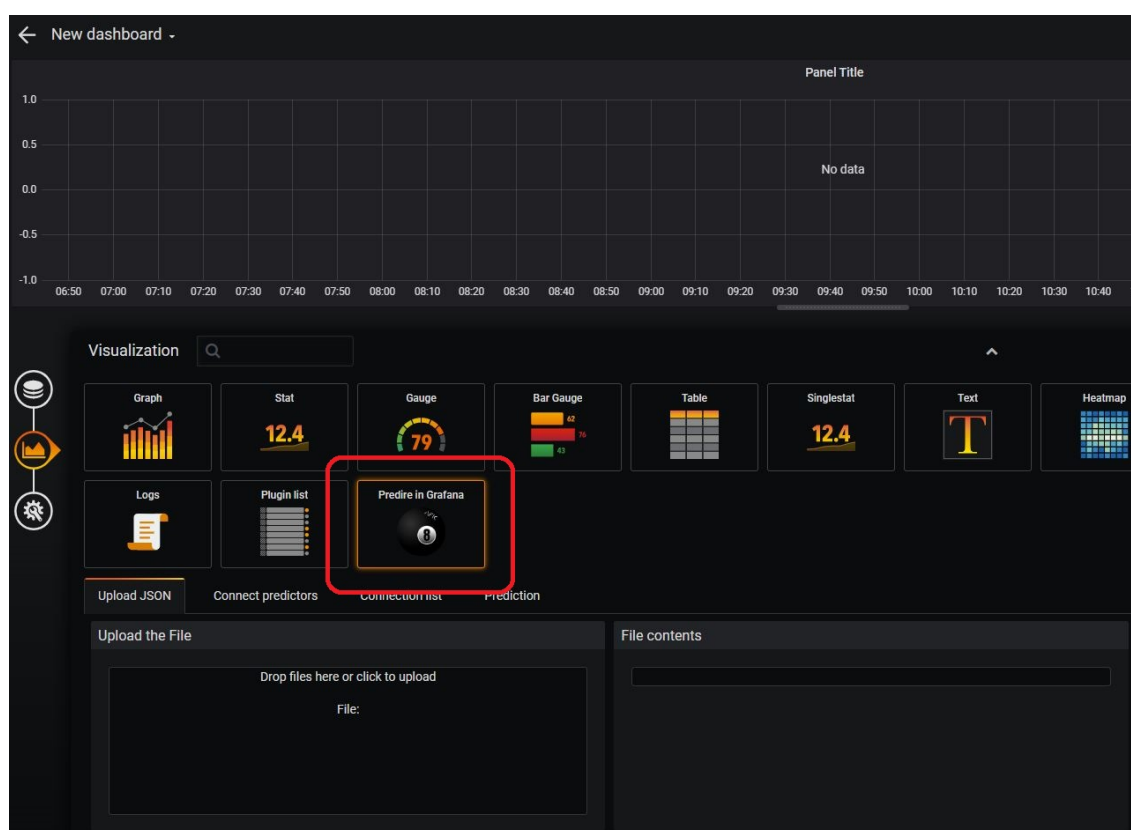


Figure 5.1.3: "Predire in Grafana" Panel

## 5.2 Loading a JSON file

The user can select the “Upload the file” button contained in the “Upload 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 "Upload the file" section. The content of the JSON file will be displayed in a panel called "File contents" to the right of the previously mentioned section.



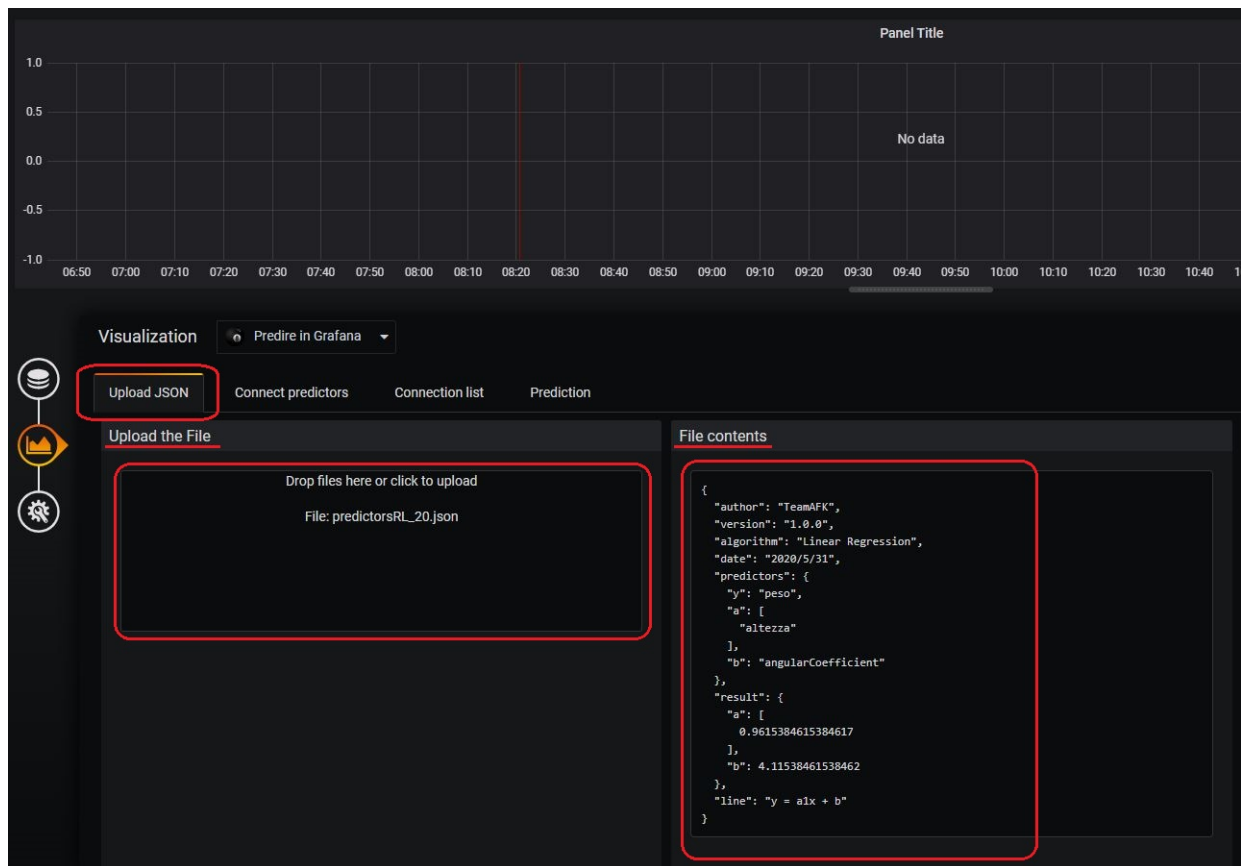


Figure 5.2.1: Loading window and displayed loaded JSON

### 5.3 Connecting predictors

The portion of the software dedicated to the connection of the nodes can be accessed by selecting the "Connect predictors" tab:

1. the user can choose from the "Insert connection" section which queries are to be associated with which nodes. Once all the nodes are connected, the user can select the "Add connection" button and confirm the operation;

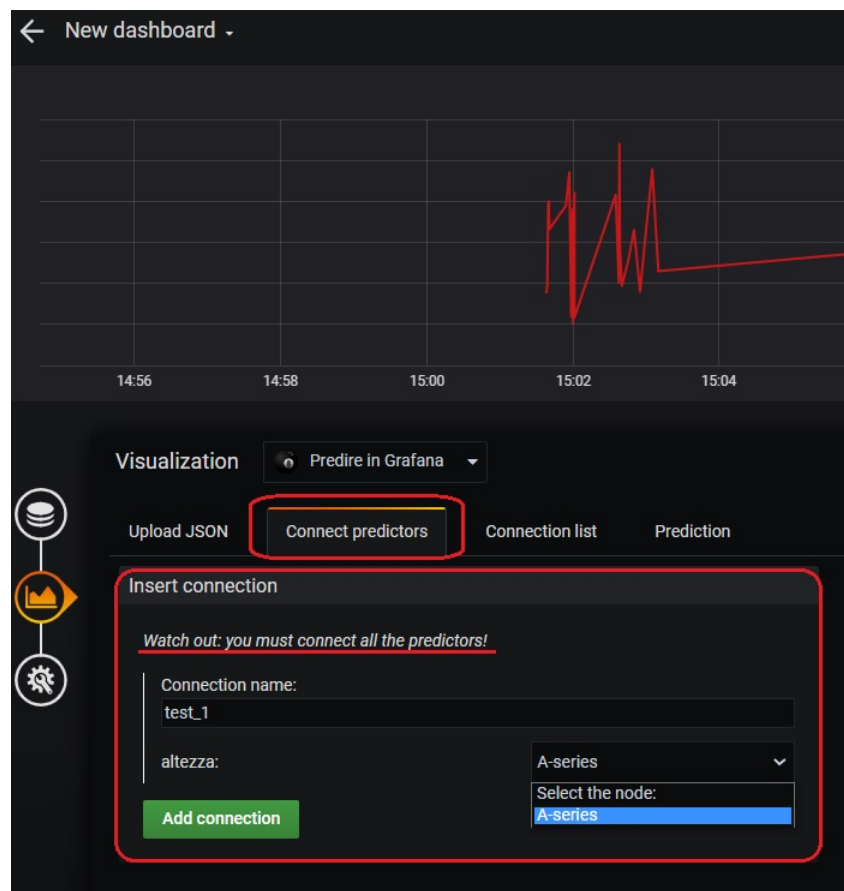


Figure 5.3.1: Connection coupling (a)

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

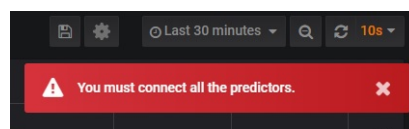


Figure 5.3.2: Connection coupling error message

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

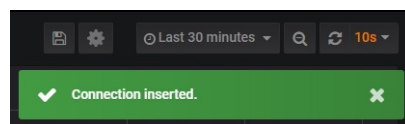


Figure 5.3.3: Connection coupling confirm message

## 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 "Connection list" tab. The user can also modify the connection, by pressing on the "Edit" button, or delete it, by selecting the "Disconnect" button.

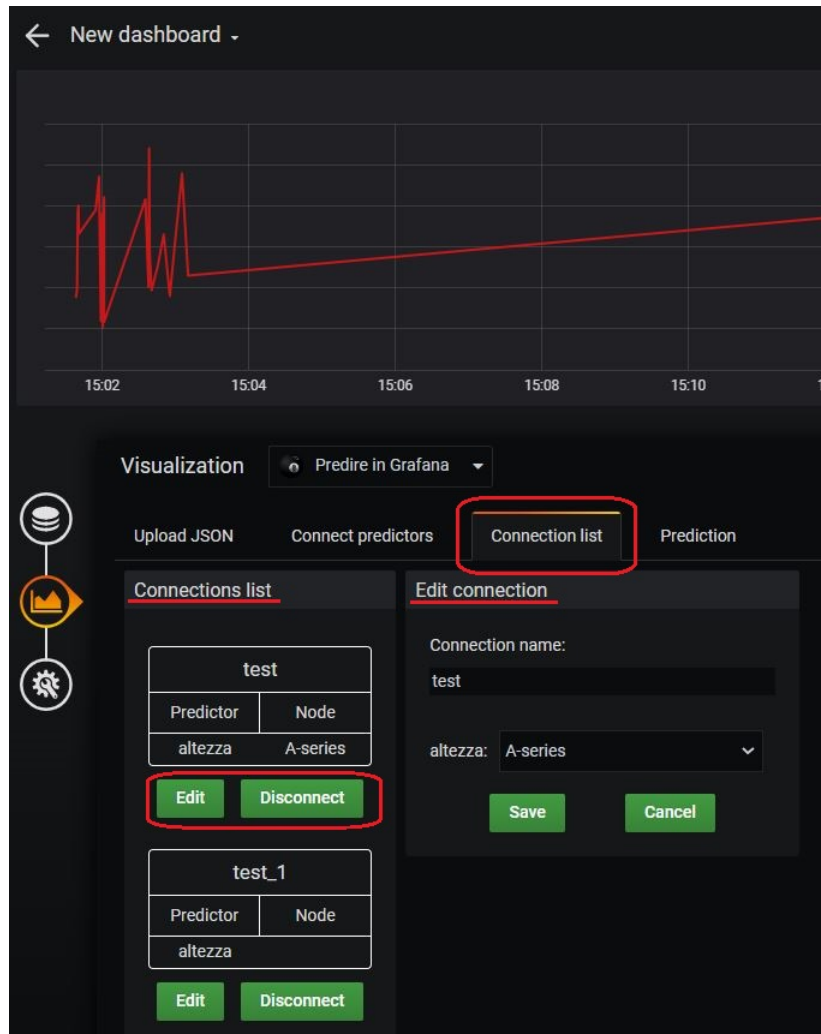


Figure 5.4.1: Node linking

## 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 "Prediction" 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 "Start monitoring", which starts the prediction operations, and a second one named "Enable saving", which saves the data collected up to the point it is pressed.

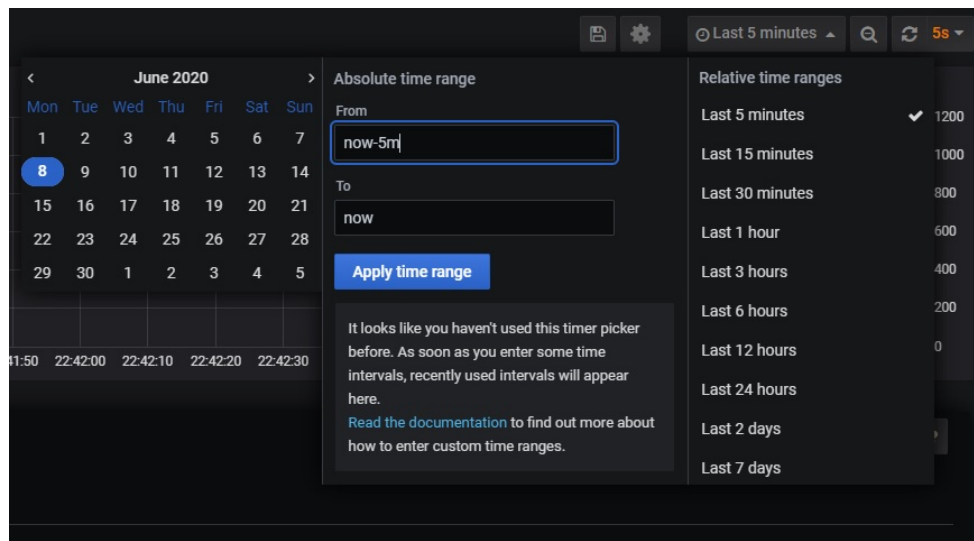


Figure 5.5.1: Time picker

When the prediction has been started, the "Start monitoring" button becomes "Stop monitoring", which, if pressed, will stop the monitoring.

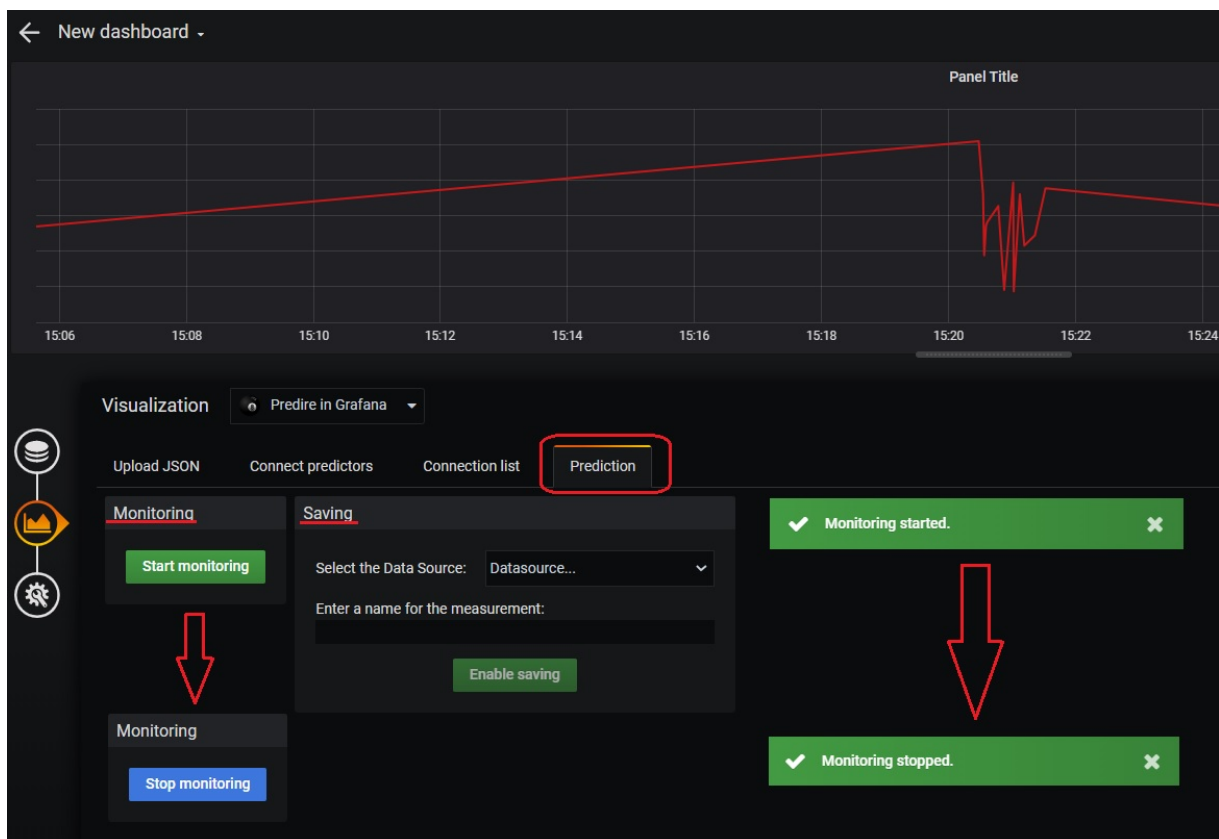


Figure 5.5.2: Begin\end data monitoring and Prediction save

## 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";
- **notes:** additional notes added to the file;
- **date:** date on which the file was created;
- **predictors:** list of predictor tags;
- **result:** list of coefficients obtained from training.

```
{
  "author": "TeamAFK",
  "version": "1.0.0",
  "algorithm": "SVM",
  "notes": "This is a note.",
  "date": "2020/7/15",
  "predictors": {
    "w": [
      "weight",
      "size"
    ],
    "b": "bias"
  },
  "result": {
    "w": [
      -0.8890353574075149,
      -0.9601581860001165
    ],
    "b": 66.48454029594677
  }
}
```

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";
- **notes**: additional notes added to the file;
- **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.

```
{
  "author": "TeamAFK",
  "version": "1.0.0",
  "algorithm": "Linear Regression",
  "notes": "This a note.",
  "date": "2020/7/15",
  "predictors": {
    "y": "y",
    "a": [
      "x",
      "x1"
    ],
    "b": "angularCoefficient"
  },
  "result": {
    "a": [
      0.08640900619401126,
      0.08760164313749375
    ],
    "b": -4.103581234222119
  },
  "line": "y = a1x,a2x + b"
}
```

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<sub>G</sub>. 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	B
1	x	y
2	1	2
3	2	5
4	3	6
5	4	7
6	5	10
7	6	12
8	7	19
9	8	16
10	9	18
11	10	18
12	11	24
13	12	28
14	13	26
15		

(a) RL CSV file example

	A
1	weight;size;label
2	69;4.39;1
3	69;4.21;1
4	65;4.09;1
5	72;5.85;-1
6	67;4.70;1
7	73;5.68;-1
8	70;5.56;-1
9	75;5.11;-1
10	74;5.36;-1
11	65;4.27;1
12	73;5.79;-1
13	70;5.47;-1
14	74;5.53;-1
15	68;4.47;1
16	74;5.22;-1

(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](mailto:gruppoafk15@gmail.com).

### 7.1 Reporting Training tool errors

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

**[Error][Training tool]**

The body of the mail must contain the following statements:

- operating system version;
- training tool version;
- detailed explanation of the encountered error.



The image shows a screenshot of an email template. At the top, there is a dark header bar with the text "[Error][Training tool]" on the left and three small icons (minimize, maximize, close) on the right. Below the header, the email address "gruppoafk15@gmail.com" is displayed. Underneath the address, the subject line "[Error][Training tool]" is shown. The body of the email contains three lines of text: "operating system version:", "training tool version:", and "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:

**[Error][Plug-in]**

and the body must contain the following statements:

- Grafana version;
- plug-in version;
- browser version;
- operating system version;
- detailed explanation of the encountered.



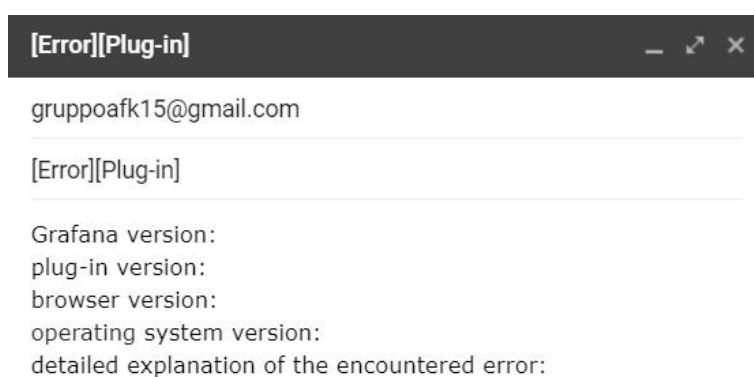


Figure 7.2.1: Plug-in error mail template

## 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 "training 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 independent 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.