User-Guide for the EudypTS Web-Application

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1. Introduction

The following is an end-user guide for the time-series comparison web-application presented in the article *EudypTS: A Web-based tool for the visual comparison of time-series*. This web application allows users to upload two time-series datasets and then compare them using the visualization technique for time-series developed by researchers Larrea and Urribarri at the Universidad Nacional del Sur in Argentina [1]. A more comprehensive description of this project can be found in the original article mentioned above.

2. Running the project

2.1. Online deployment

A deployment of the web-application is available at https://time-series-comparison.vercel.app/ . This is probably the easiest way to access the project.

2.2. In a local development server

Important note: Node.js and *npm* are required for running the project this way. Find more information on installing Node on your operating system by visiting the official download guide provided by Node at https://nodejs.org/en/download

Vite, the build-tool chosen for this project, offers a simple way to run the application in a local development server directly from the codebase. The codebase for the project is available in a GitHub repository called FacundoAlvarado9/time-series-comparison. It can be downloaded directly from the project's repository as a zip file as follows:

1. Navigate to the project's repository https://github.com/facundoalvarado9/time-series-comparison .
2. Click the green button with the text "Code" (see Fig. 1).
3. Click on the "Download ZIP" button (see Fig. 1).
4. Extract the contents of the zip file to a directory of your preference in your file-system.

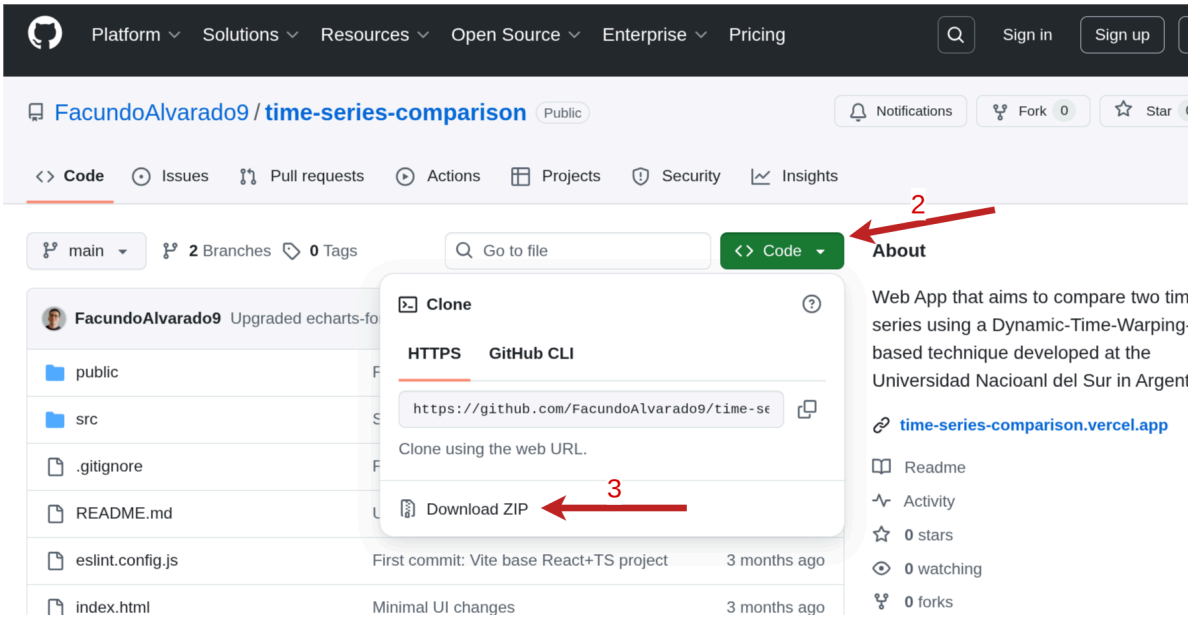


Figure 1 Main repository of the project

5. Open your Terminal or Command Prompt of preference
    a. On Windows you may use Command Prompt or PowerShell
    b. On Linux/MacOS you may use the Terminal
6. Navigate to the project's directory you chose after downloading the codebase. You can do this with the cd command and the absolute path to the project's directory. Remember, this is the folder that contains the *package.json* file. For instance,

```
cd /path/to/projects/directory/  on Linux/MacOS
cd C:/path/to/projects/directory/  on Windows (the drive letter C: might
```

change if your project's directory is on a drive other than the primary system drive)

7. Install the dependencies of the project with the following command

```
npm install
```

Keep in mind that this command requires that *npm* is correctly set up in your system's environment path. If you receive an error along the lines of "*npm is not recognized...*" you will need to adjust your system's PATH environment variable.

8. Start the local development server running the following command

```
npm run dev
```

You will see the URL to the local server where the application will be running. For example, in the case the case shown in Fig. 2 the URL is *http://localhost:5173/*

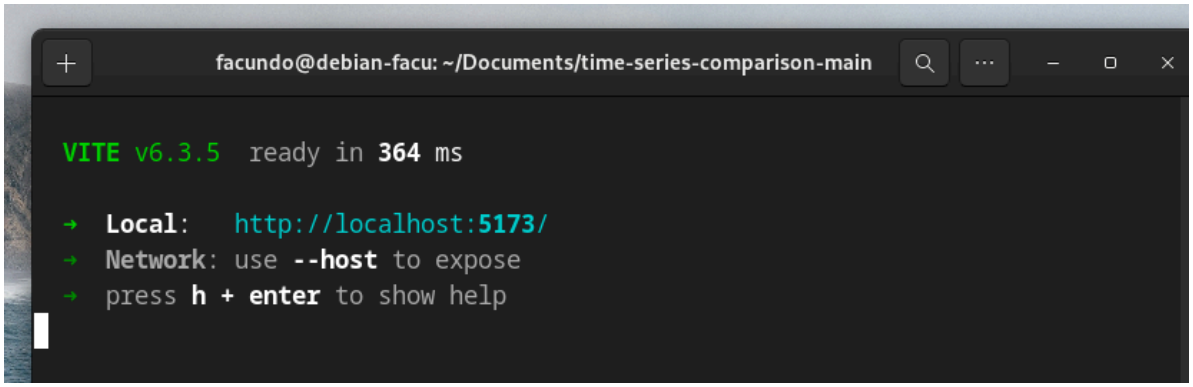


Figure 2 Running the project on a local development server

9. Navigate to the URL with a web-browser of your preference.

3. Using the tool

3.1. Initial screen overview

Figure 3 shows a screen capture of the initial screen. Sections A and C are dedicated to working on the *reference* and *target* datasets, respectively. We will see how along this guide. Section B is a *control panel* for setting the distance measure to be used in the comparison, and a large button for running the comparison.

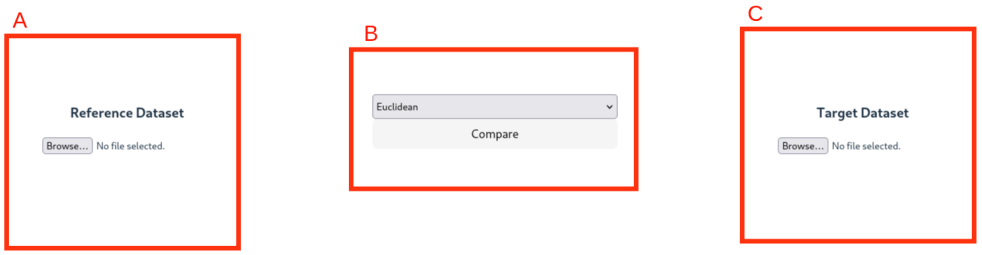


Figure 3 Initial screen

3.2. Comparing two time-series

3.2.1. Example datasets

In this guide we will be working with two example datasets. One dataset shows the daily change of the S&P500 index for the year 2023, and the other does it for the year 2024. For each day, these datasets track the percentual change of the opening price, the closing price, the highest operated price, the lowest operated price, and the volume, compared to each corresponding value of the previous day. These datasets can be found in [No olvidar: insertar link].

3.2.2. Uploading the datasets

The datasets can be uploaded pretty easily by using the file upload buttons on sections A and C, corresponding to the *reference* and *target* datasets, respectively. CSV is the accepted format. The steps below show how a *reference* dataset can be uploaded. A *target* dataset can be uploaded in the exact same way in its corresponding section:

1. Click on the "Choose file" or "Browse…" button (depending on your browser) on the *reference* dataset section (see Fig. 4).
2. Select the dataset you want to upload from your file-system (see Fig. 5).
3. If the dataset has a valid format, it will be uploaded and the data-table is available for editing the dataset (see Fig. 6).

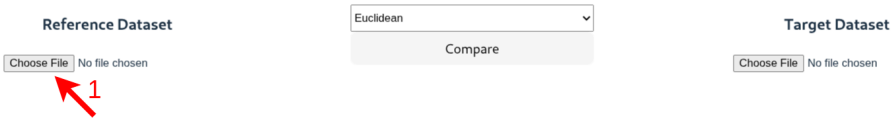


Figure 4 Upload button

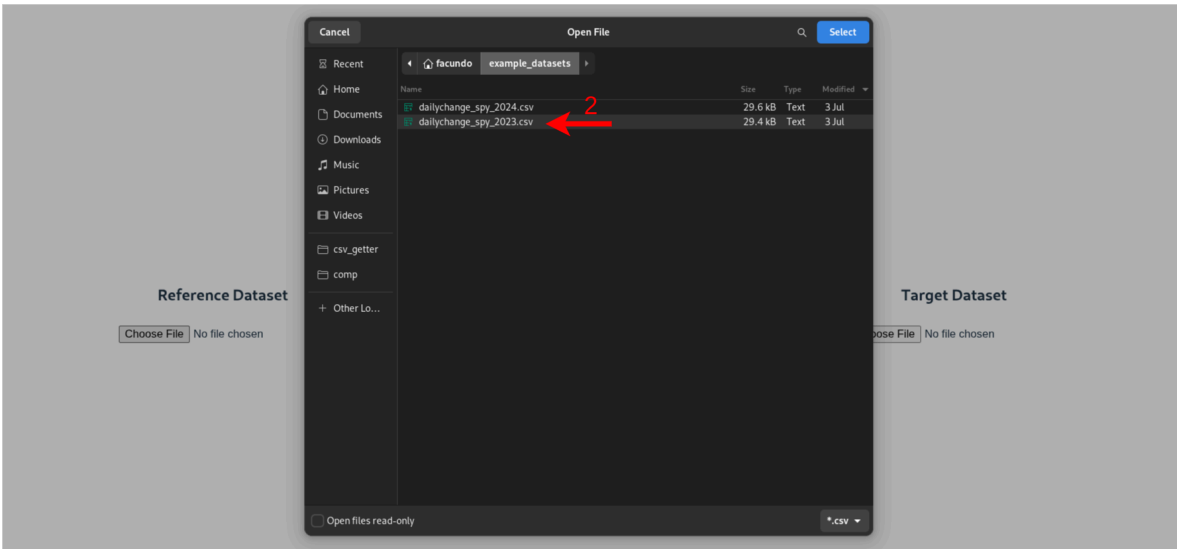
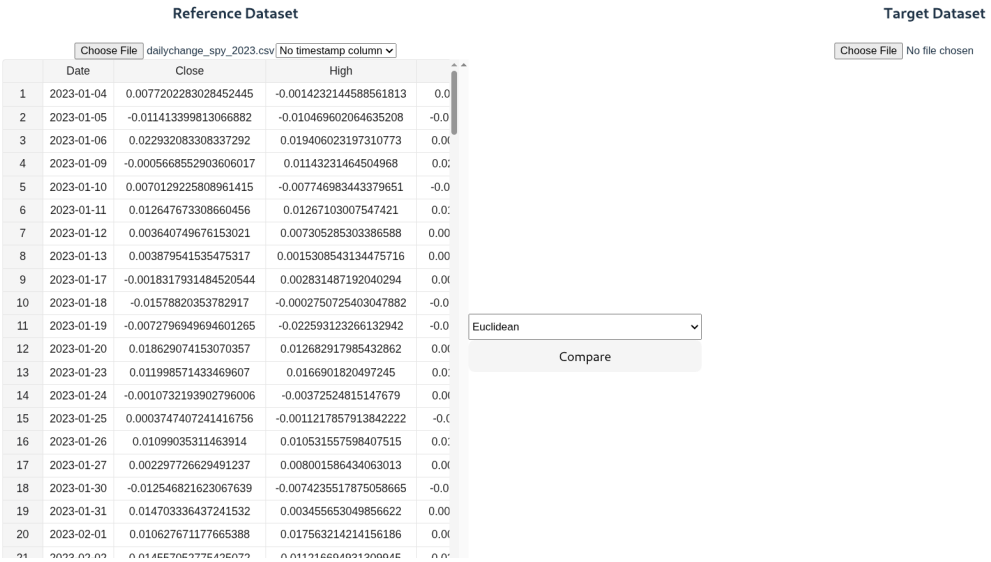


Figure 5 Selecting a file from the file-system



	Date	Close	High	
1	2023-01-04	0.0077202283028452445	-0.0014232144588561813	0.0
2	2023-01-05	-0.011413399813066882	-0.010469602064635208	-0.0
3	2023-01-06	0.022932083308337292	0.019406023197310773	0.0(
4	2023-01-09	-0.0005668552903606017	0.011432314645049 68	0.0:
5	2023-01-10	0.0070129225808961415	-0.007746983443379651	-0.0
6	2023-01-11	0.012647673308660456	0.01267103007547421	0.0:
7	2023-01-12	0.003640749676153021	0.007305285303386588	0.00
8	2023-01-13	0.003879541535475317	0.0015308543134475716	0.00
9	2023-01-17	-0.0018317931484520544	0.002831487192040294	0.0(
10	2023-01-18	-0.01578820353782917	-0.0002750725403047882	-0.0
11	2023-01-19	-0.007279694969601265	-0.022593123266132942	-0.0
12	2023-01-20	0.018629074153070357	0.012682917985432862	0.0(
13	2023-01-23	0.011998571433469607	0.0166901820497245	0.0:
14	2023-01-24	-0.0010732193902796006	-0.00372524815147679	0.0(
15	2023-01-25	0.0003747407241416756	-0.0011217857913842222	-0.(
16	2023-01-26	0.01099035311463914	0.010531557598407515	0.0:
17	2023-01-27	0.002297726629491237	0.008001586434063013	0.0(
18	2023-01-30	-0.012546821623067639	-0.0074235517875058665	-0.0
19	2023-01-31	0.014703336437241532	0.003455653049856622	0.00
20	2023-02-01	0.010627671177665388	0.017563214214156186	0.0(

Figure 6 The *reference* dataset is now ready for editing

Keep in mind that the steps for uploading a *target* dataset are the same, but in the corresponding *Target Dataset* section.

3.2.3. Selecting a *timestamp* column

Each dataset is allowed to have a column that contains a parseable *timestamp* in order to give the final time-series an order. This column can be selected using the dropdown selector on top of the data-table related to the dataset. If no column is selected, the order of the time-series will be the order of the elements in the data-table. In our two example datasets, the *timestamp* column is the *Date* column. And it can be set as follows:

1. Open the dropdown selector on top of the data-table (see Fig. 7).
2. Select the desired *timestamp* column. In our case, the *Date* column (see Fig. 8).

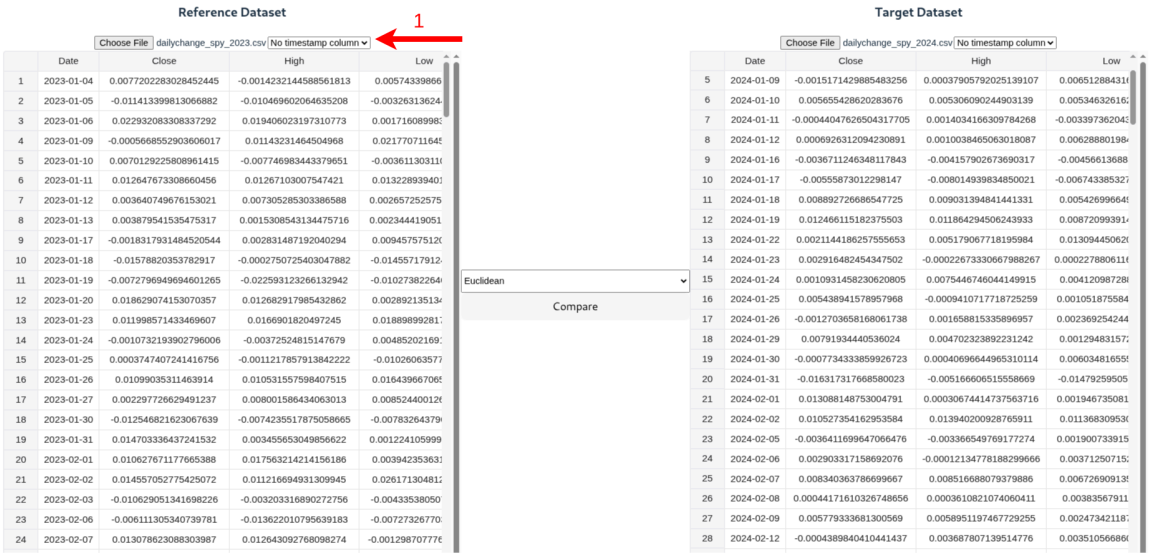


Figure 8 Open the dropdown selector

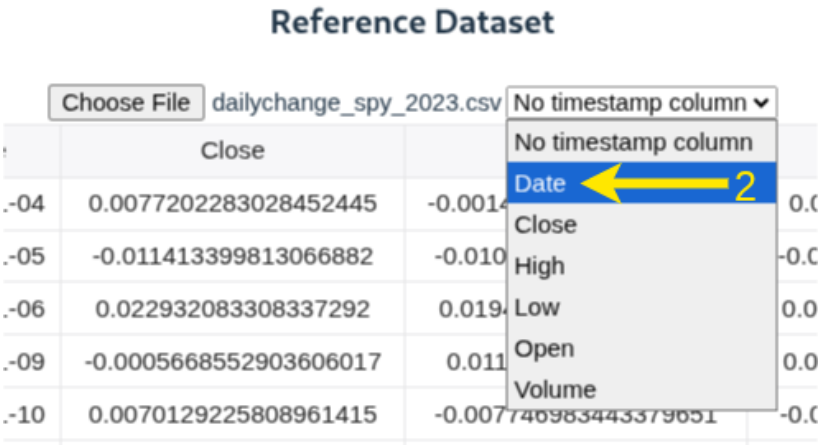


Figure 9 Select the desired *timestamp column*. In our case, the *Date* column

The selection of a *timestamp* column for the *target* dataset is analogous on its own section.

3.2.4. Editing the datasets

Both datasets can be freely edited by the user in order to comply with the time-series comparison restrictions. Right before comparison, all values apart from those in the *timestamp* column (if selected) must be numeric. No cell must be empty. And the number of columns, excluding the *timestamp column(s)*, must be the same for both datasets.

In order to achieve this, the following interactions are available to the user:

- Editing a single cell by double-clicking on it. Pressing the enter key will save the changes.
- Deleting an entire row by right-clicking on the row number and selecting the corresponding option (see Fig. 10).
- Deleting an entire column by right-clicking on the column's name and selecting the corresponding option.
- Inserting an entire row by right-clicking on it and selecting whether the new row will be added above or below the selected row.

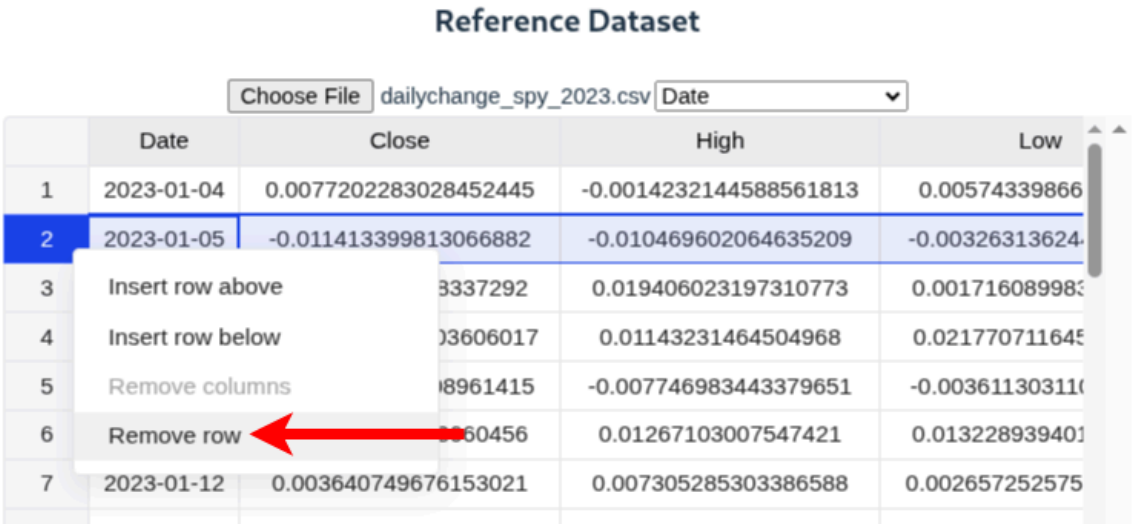


Figure 10 Deleting a row of the dataset

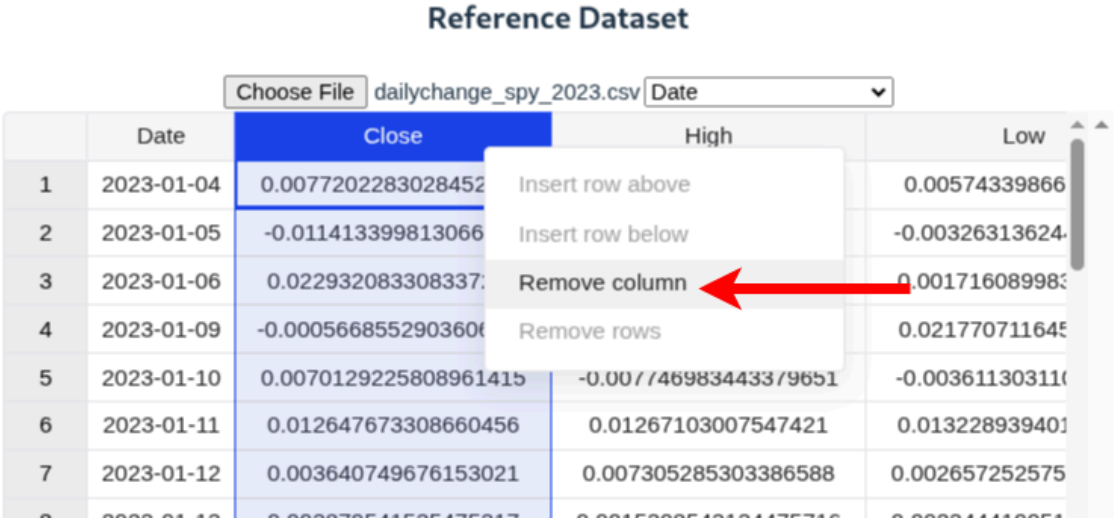


Figure 11 Deleting a column of the dataset

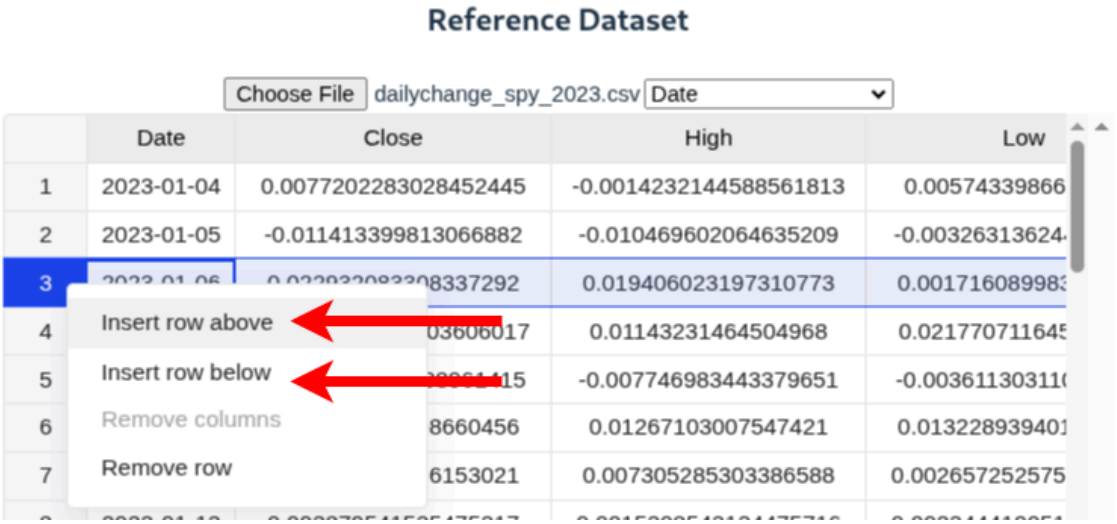


Figure 12 Available options for adding a row into the dataset

3.2.5. Running the comparison

The comparison may be run at any time by clicking on the *Compare* button in the center of the screen (see Fig. 13). The distance measure to be used for the comparison can be selected using the dropdown selector on top of the *Compare* button (see Fig. 14 and 15). If any of the datasets does not comply with the format expected, the comparison will not run and a message with an error description will be shown.

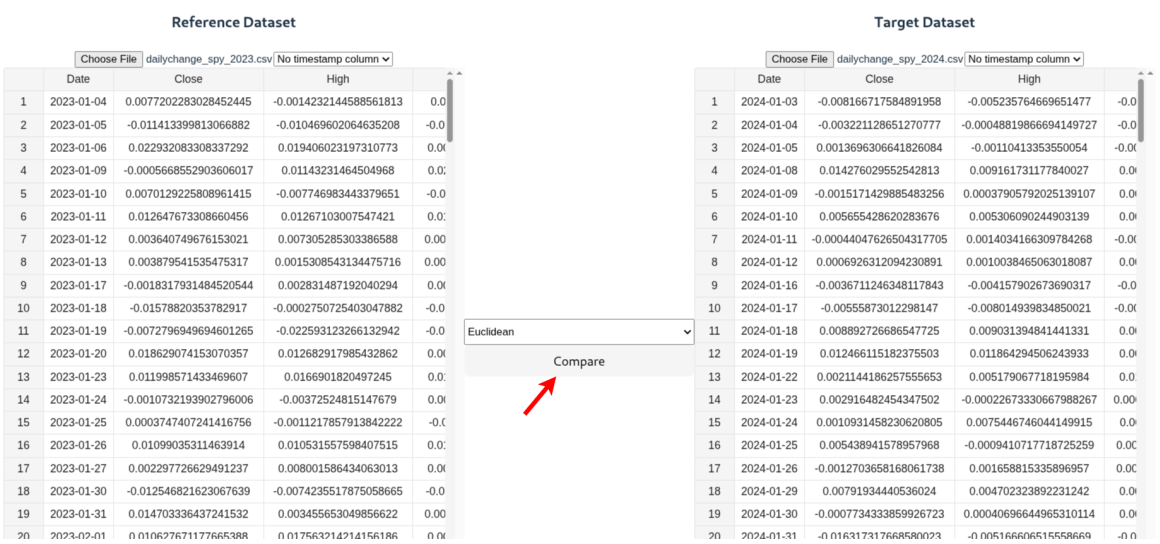


Figure 13 Compare button in the center of the screen

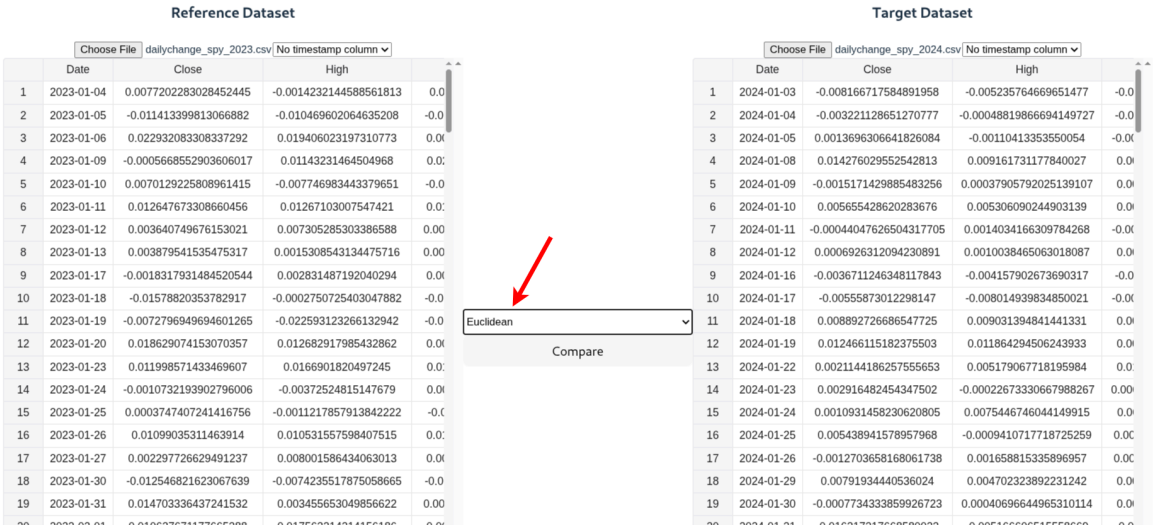


Fig. 14 Distance measure selector

Figure 15 Available distance measures at the time of writing this user-guide

3.2.6. Visualizing the results

If the datasets are valid time-series, the comparison will be run. After its completion, the resulting visualizations will appear down the page (see Fig. 16).

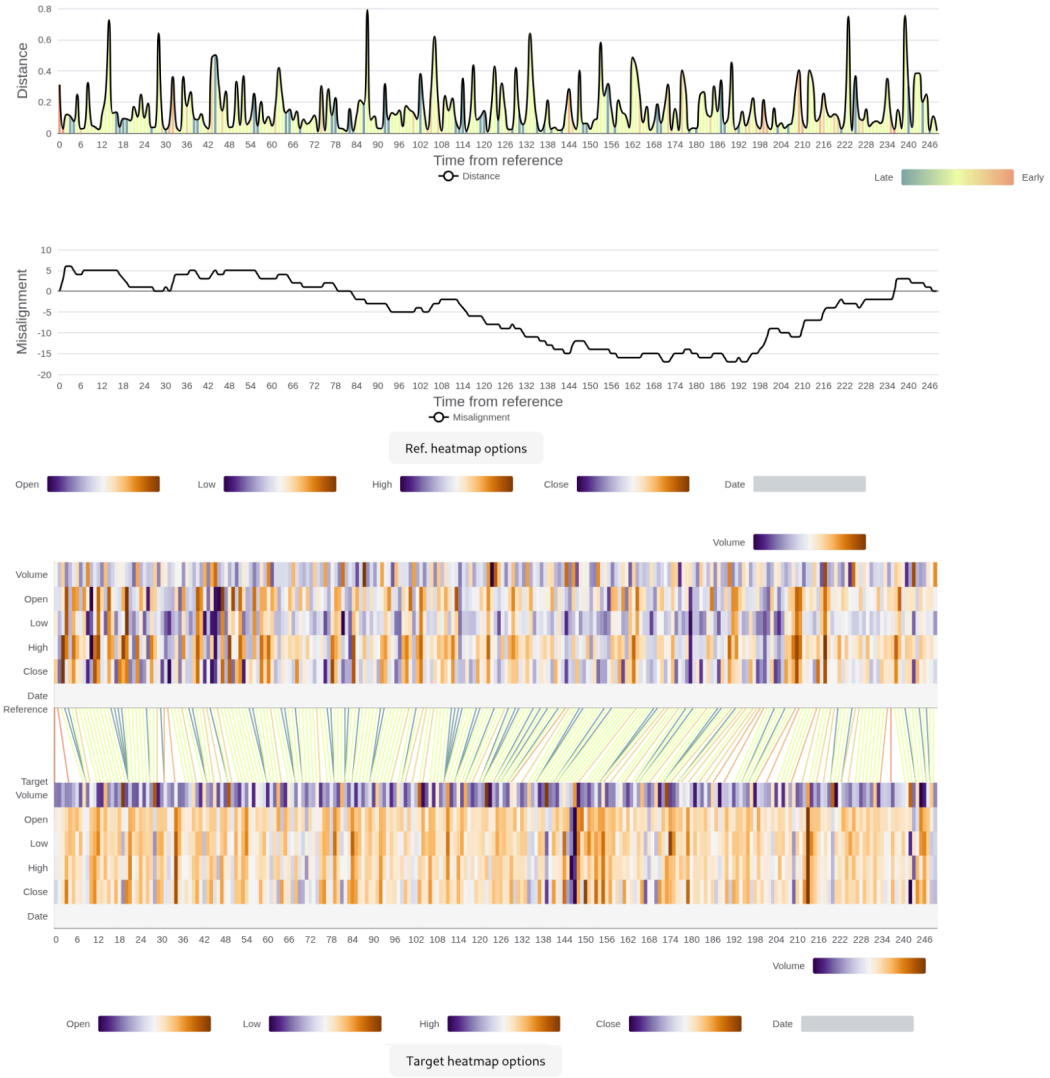


Figure 16 Resulting visualizations

More details about these charts can be found in the original articles for both this web-application and the original technique.

The parallel-heatmaps visualization, being the third from top to bottom, offers certain interactions in order to better meet user visual-analysis requirements. The user may change both the color-scale for each variable of a heatmap and the minimum and maximum values related to this color scale. By default, these default minimum and maximum values are those found in the original time-series, that is, the minimum and maximum value for that variable in that dataset. To toggle these options, two buttons can be found: one on top of the heatmap related to the *reference* time-series; and one under the heatmap related to the *target* time-series (see Fig. 17).

For each variable of the heatmap, a text input is available for changing the minimum and maximum values, and a dropdown selector is available for changing the color-scale (see Fig. 18). The color-scale can be selected from a predefined set of options. See Fig. 18 and 19 for an example of changing the color scale of the *Volume* variable in the *target* heatmap.

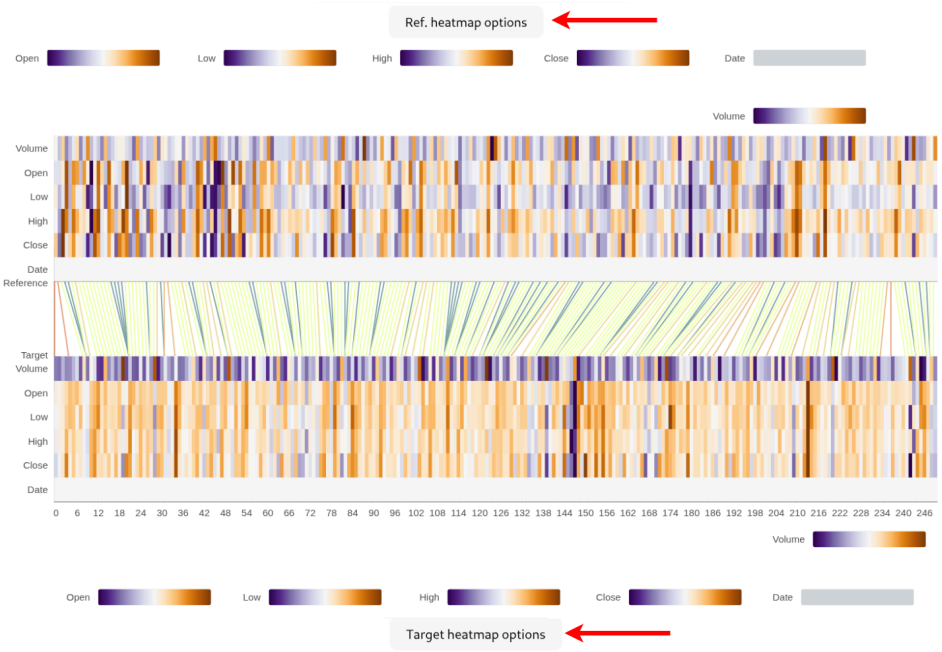


Figure 17 Buttons for toggling the heatmap options for each heatmap

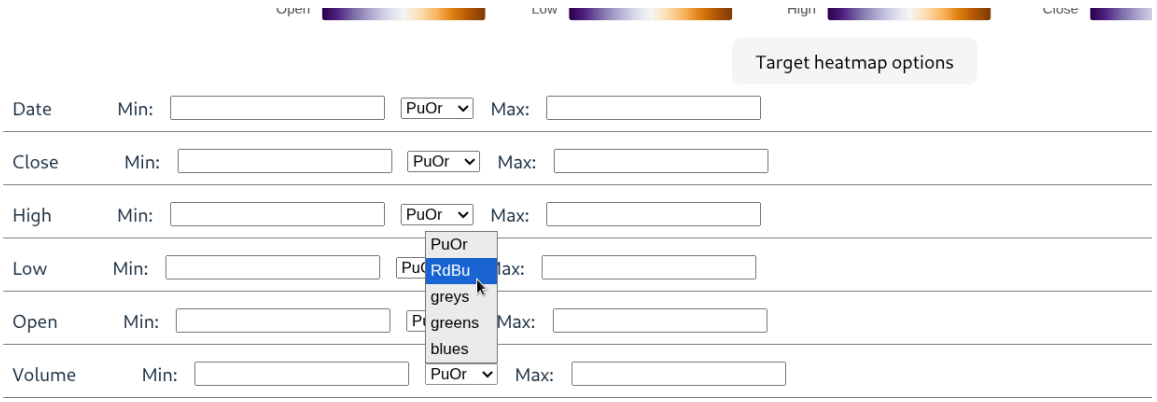


Figure 18 Heatmap options and available color-scales

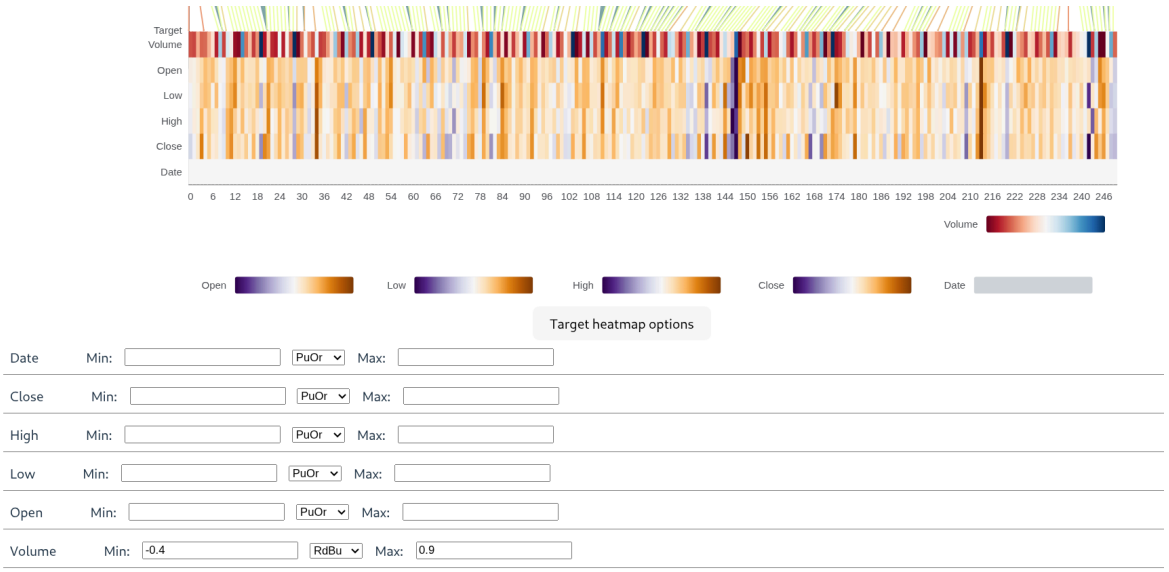


Figure 19 The *target* heatmap's variable *Volume* has a Red-Blue diverging color-scale that goes from daily changes of -40% to +90% with respect to the previous day

3.2.7. Re-running the visualization

After a first run of the comparison, the datasets are still available for editing at the top of the page. They may still be edited, and the comparison may be run again by the user, even with a different distance measure.

4. More information

More information about this project can be found on the original article, as well as on its main GitHub repository.

5. References

[1] M. L. Larrea and D. K. Urribarri, "A visualization technique to assist in the comparison of large meteorological datasets", Computers & Graphics, vol. 104, pp. 1-10, 2022, doi: 10.1016/j.cag.2022.02.011.