Graph Visualizer
User Guide

Graph Visualizer is a tool for displaying sensory data from a wearable device in a variety of formats as designated by you, the user.

This user guide will detail how to use Graph Visualizer for the best results.

Table of Contents:

Data Formatting

Before opening Graph Visualizer, you should prepare your data to be in the correct format for uploading.

You should create a folder named for the Participant ID and include in the folder a .csv file containing the following data fields: Datetime, Timezone, Unix Time, Acceleration Magnitude, EDA Average, Temperature Average, Movement Intensity, Step Count, Rest, and On Wrist.

Datetime should include the date and time information formatted like “2020-01-17T23:48:00Z”. It is in 1 minute resolution.

Timezone should include information about what local timezone the participant was in. It will be formatted like, “-300” which indicates the participant was behind 3 hours. It is in minutes.

Unix Time is the number of seconds that have elapsed since 00:00:00 UTC. It should be formatted like, “1579304880000”.

Acceleration Magnitude indicates the magnitude of acceleration of the wearer and should be formatted like, “1.063262”. This value is over a minute timespan.

EDA Average indicates the average of electrodermal activity and should be formatted like, “0.541921”. This value is over a minute timespan and is expressed in microsiemens.

Temperature Average indicates the average skin temperature of the wearer and should be formatted like, “30.155257”. The units are in Celcius and data is over a minute timespan.

Movement Intensity indicates the intensity of movement of the wearer calculated by Empatica’s Physical Activity Algorithm and should be formatted like, “14”. Value must be an integer in the range of 0 - 180.

Step Count indicates how many steps the wearer took in the time frame and should be formatted like, “39”. This value is over a minute timespan.

Rest indicates whether the wearer is awake or not and should be either a 0, 1, 2, or 3 value. 0 indicates the wearer is awake, 1 indicates they are asleep, 2 indicates tossing and turning, and 3 indicates interruption.

On Wrist results from the analysis of Empatica's compliance detection algorithm and should be either TRUE or FALSE.

About the Application

Upon opening Graph Visualizer, you will notice the ribbon format at the top. The tabs on the ribbon allow you to navigate between different options while the main portion of the app persists. The main white portion of the app is where graphs you choose to add will show. Navigating between tabs will allow you to apply different options to each graph without ever losing sight of them.

The Home Tab will be loaded initially upon opening Graph Visualizer. This tab will allow you to upload folders containing participant data, view recently uploaded files, and clear all data previously uploaded.

The Graph Tab is where you will be able to add and manipulate graphs to the main screen. Graph type, color, start time, end time, and interval will all be customizable.

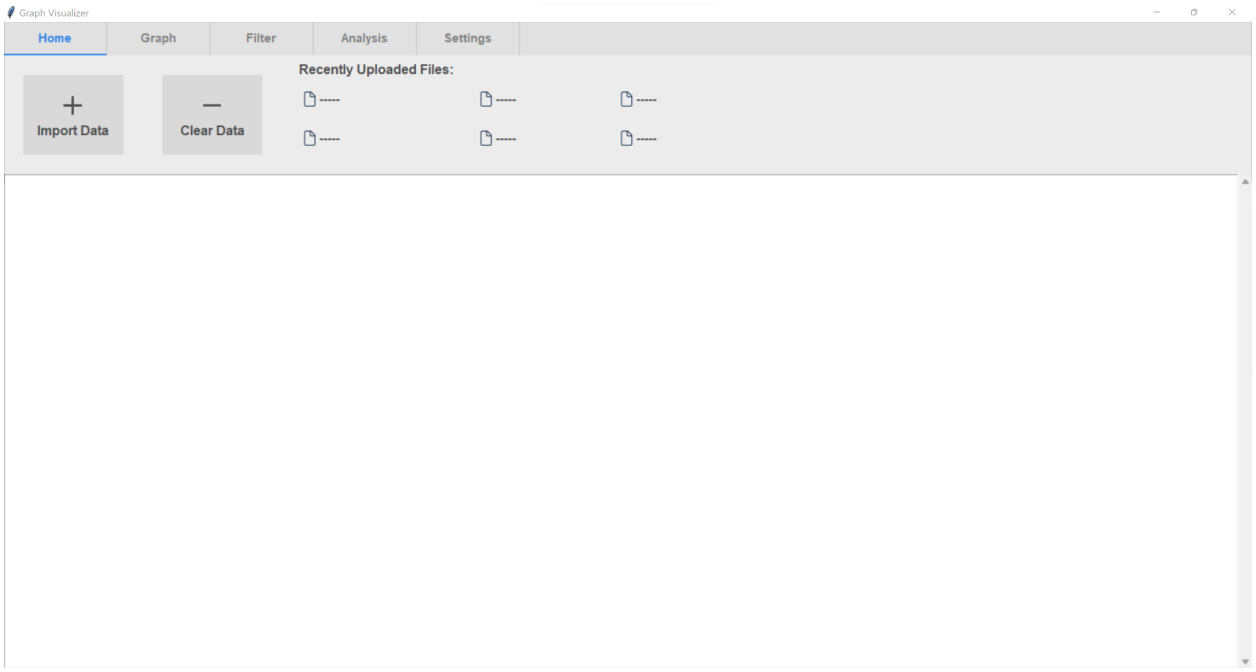
The Filter Tab allows you to highlight certain values on each graph by filtering out data that is not useful to you. Also on this tab is the ability to change the timezone of the graph. You can choose to use local participant time or view in UTC time if you prefer.

The Analysis tab allows you to view statistics about one or two participant features loaded into the app. For a single participant feature, you can view mean, median, mode, standard deviation, max, and minimum values. For two participant features, you can view the covariance between the two.

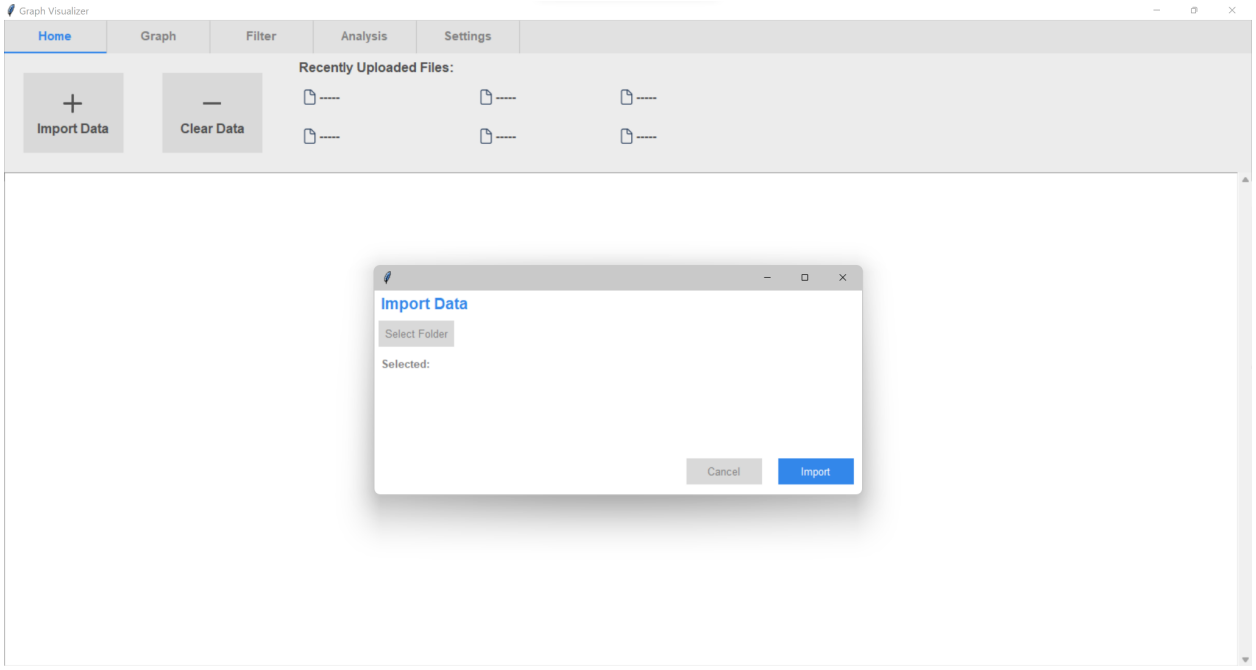
The Settings tab allows you to customize your viewing experience in the app by toggling between light mode and dark mode as well as choosing a larger text size. You can also view this user guide on this tab!

Home Tab

Upon loading Graph Visualizer, the Home Tab is the first thing you will see.

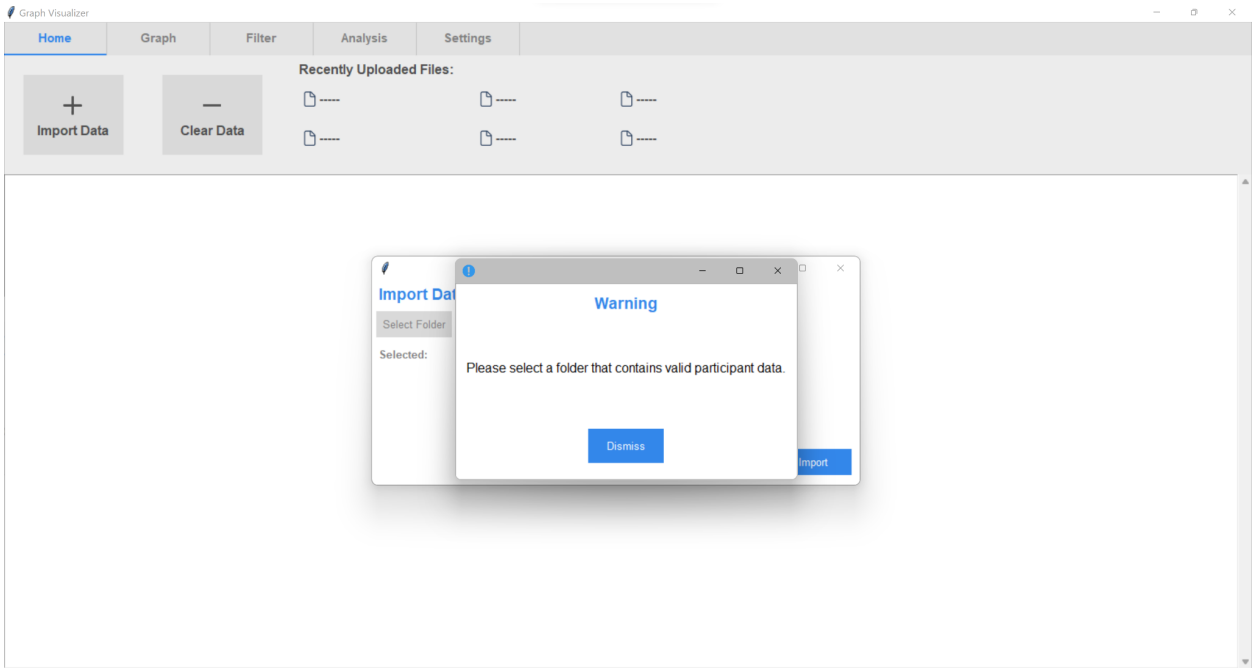


On this tab, if you press the “Import Data” button, a popup will be shown.

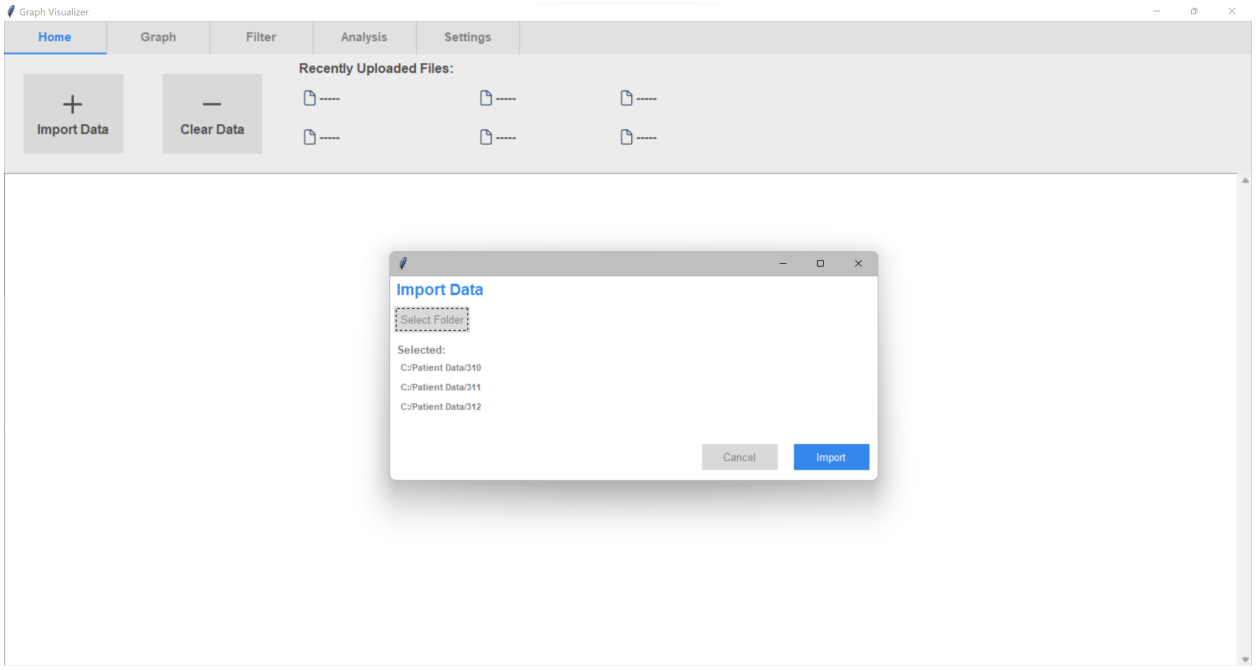


By pressing “Select Folder”, another popup allowing you to navigate through your computer’s file system will show. Choose the folder you prepared in the Data Formatting section.

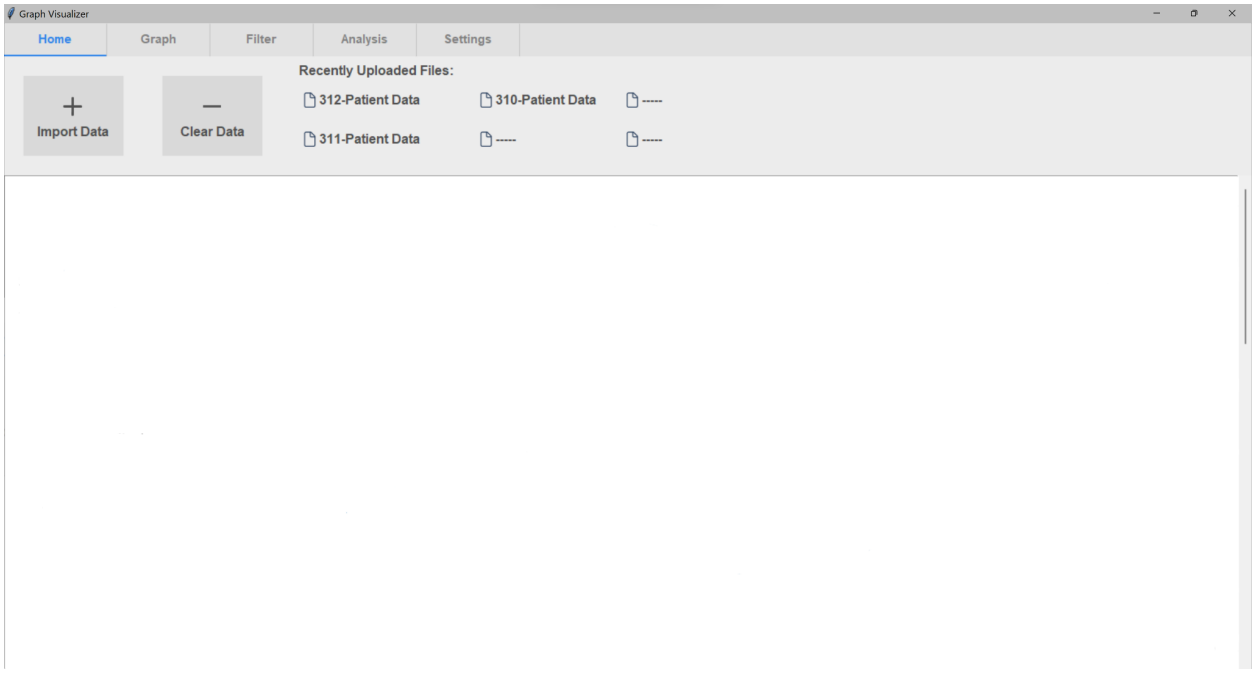
If your folder is formatted incorrectly or the data file is incorrect, a warning popup will show telling you this information.



If you have your folders and data formatted correctly, you will be able to upload as many folders as you would like by pressing “Select Folder” again.



After selecting all of the folders you would like, press “Import” to import it to the application. At any point in the upload process, press “Cancel” to close the import popup and stop importing.



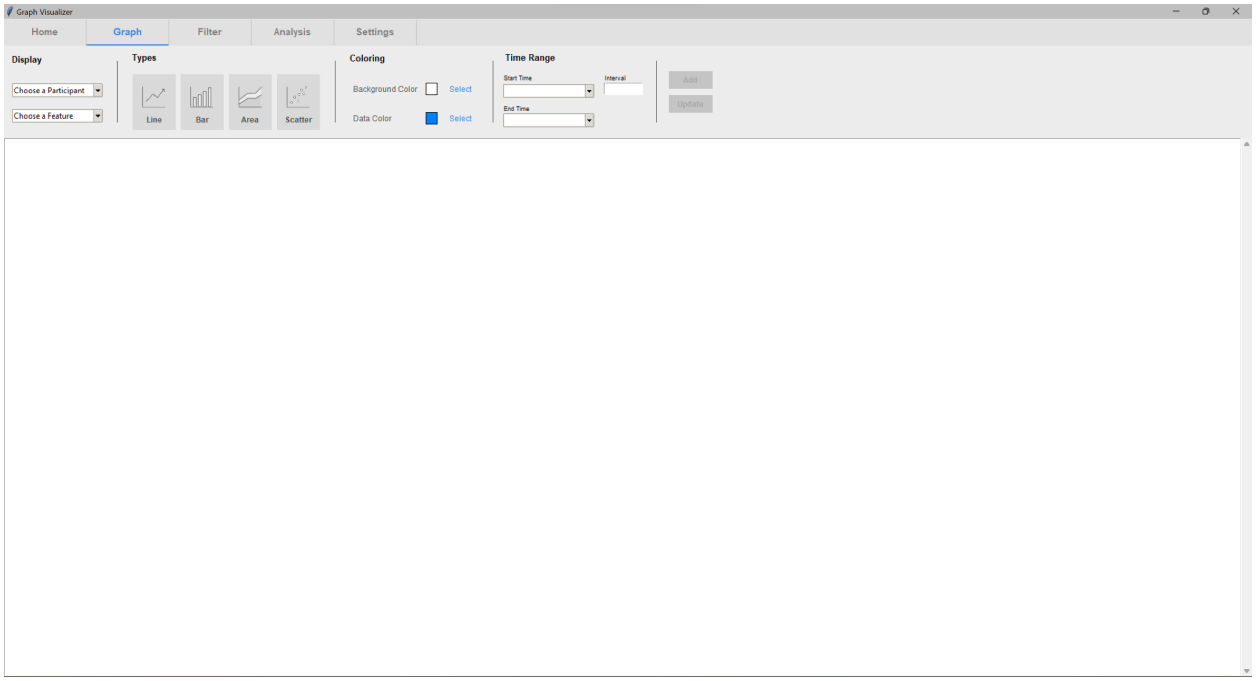
You can see above an example of the Recently Uploaded Files being filled in upon uploading data. If you were to close the application and open it again, pressing on

one of the files in the Recently Uploaded Files section will easily reupload that data into the application, so long as it is still available in the place you originally uploaded it from.

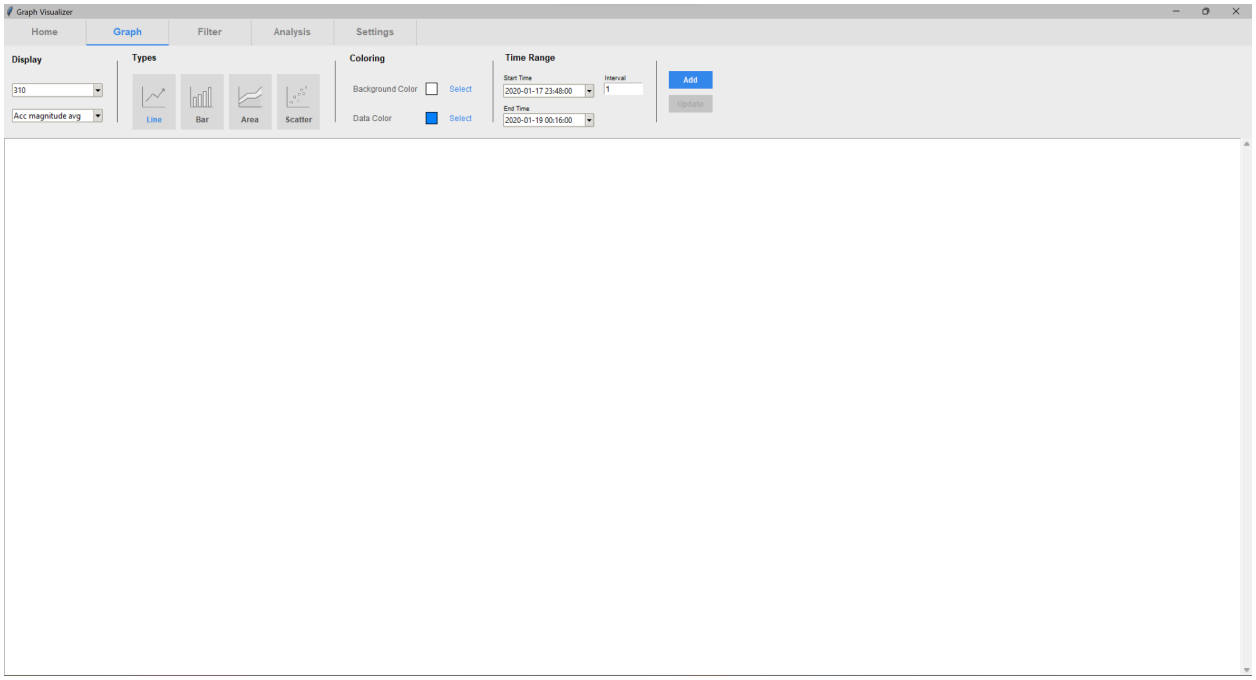
Also on this screen, you can press the “Clear Data” button which will clear all uploaded data from the application. This will also clear the main portion of the screen of any graphs you have added through the graph tab.

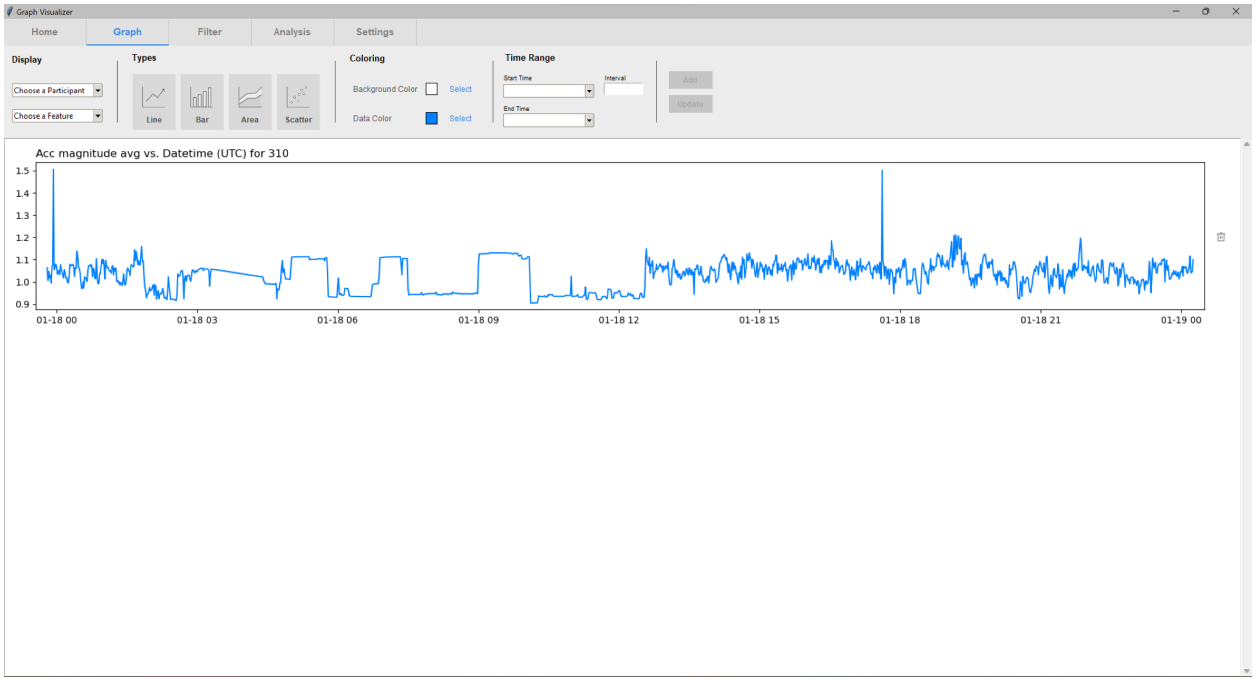
Graph Tab

After uploading data on the Home Tab, navigating to the Graph Tab will allow you to add graphs to the screen and customize them.



As you can see, the first section on this tab is titled Display and has two dropdowns. From these dropdowns, you can select a Participant and a Feature from the data you've uploaded. If the graph for that Participant and Feature combo isn't on the screen, the Add button will become active. If it is on the screen, the Update button will become active and current graph settings will be autofilled. Either way, the fields for Start Time, End Time, and Interval will be autofilled.





First of the customization is the graph type. You can choose from Line, Bar, Scatter, and Area graph types. The chosen type will be highlighted with blue text.

The next customization is coloring. You can change the background color of the graph as well as the data color (meaning your line, dots, bars, etc.). Defaults will

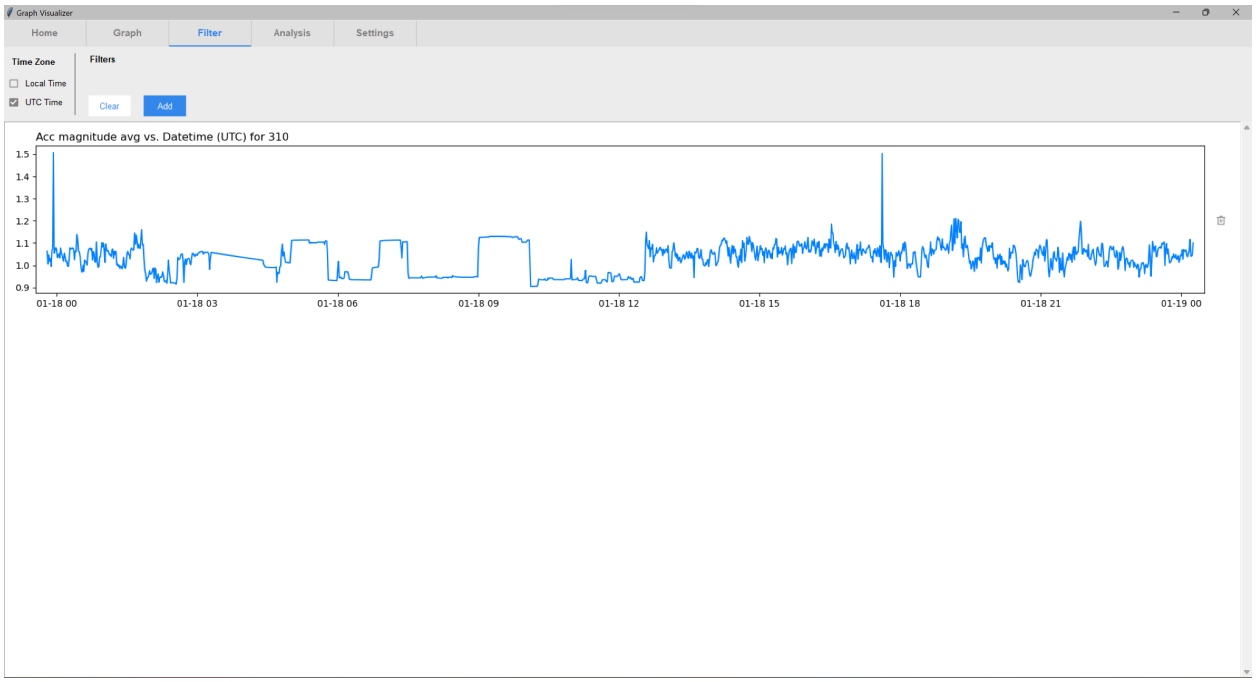
be applied if you don’t care about specific colors, but this feature allows you to color different graphs to tell differences or even to accommodate color blindness.

The final customization has to do with Time Range properties. The start time is the point at which the graph will start and the end time is the point at which the graph will end. You can customize these values to zoom into the graph. These are auto filled with the minimum and maximum values upon choosing Participant and Feature. The interval field allows you to choose how often data points are shown on the graph. A smaller interval will show more data points while a larger interval will show less data points. This interval is auto filled and defaults to the interval provided in the provided data.

Pressing Add will add the graph to the screen while pressing update will change the graph that's already on the screen.

Filter Tab

After adding graphs to the screen and customizing them, you may want to filter out some data points that are skewing your results or that you don't need to see. The Filter Tab allows you to do this and more.

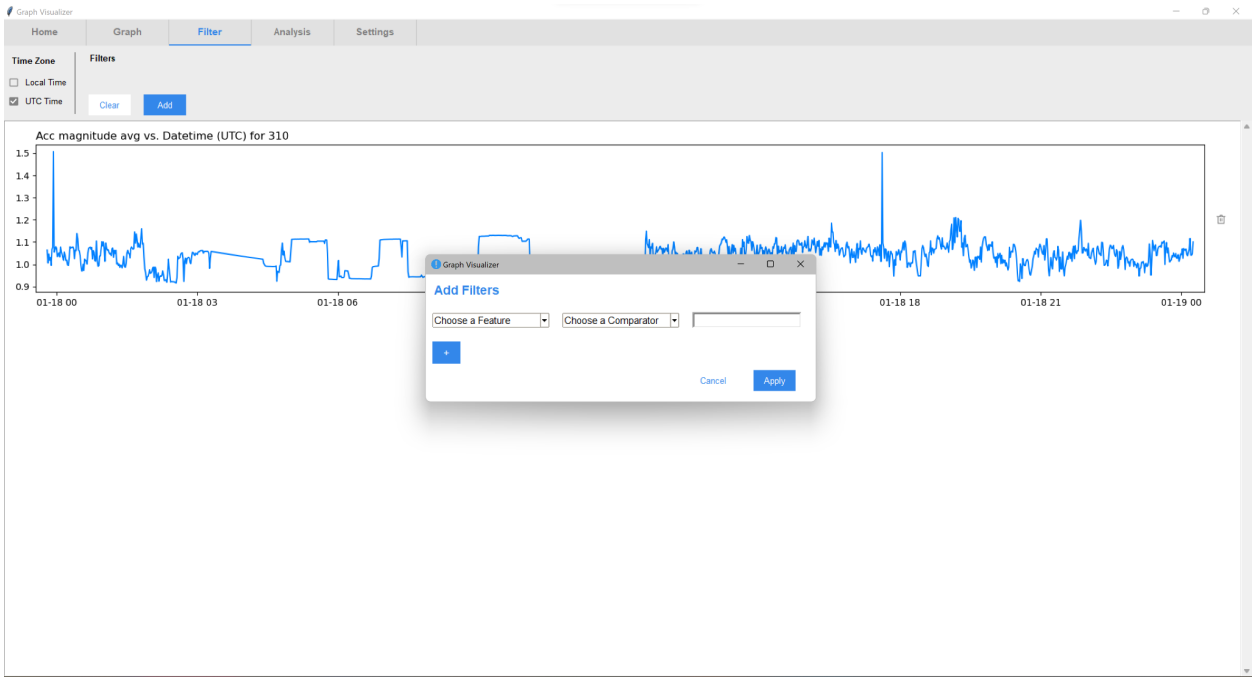


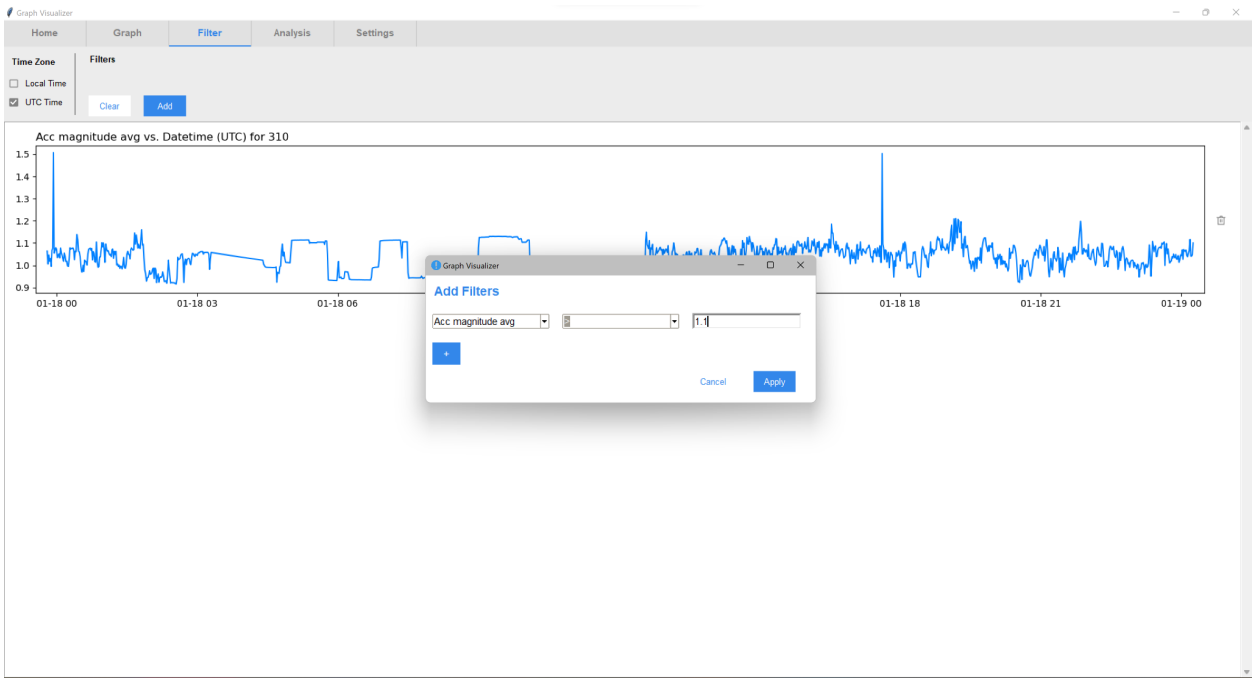
The first section on the Filter Tab has to do with the time zone of the graphs. By default, each graph is in UTC time. Sometimes, you may want to know the local timezone of the wearer so that you can better make sense of some of the data points. If you select "Local Time", each graph will show data points in the local timezone of the wearer. Toggling back to UTC time will change all graphs to UTC time.

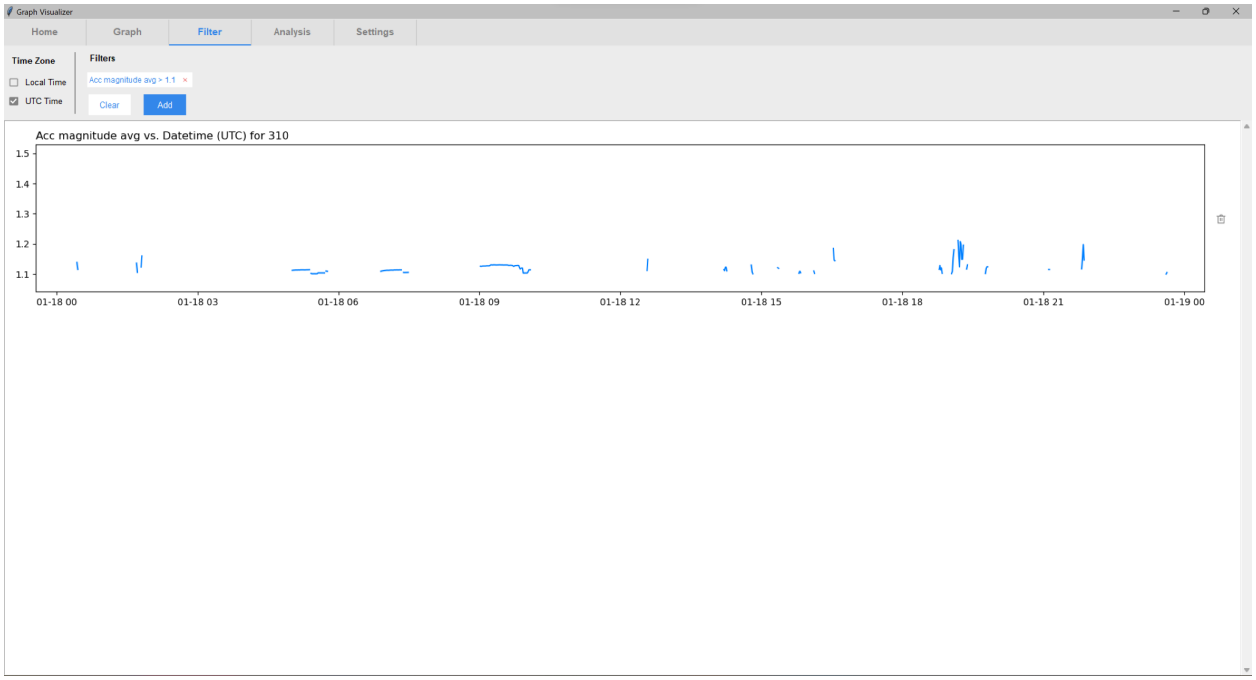
The second section deals with actually filtering out data from the graphs. Clicking the "Add" button will open a popup. Within this popup, you can add multiple filters. To add a filter, choose a Feature, a comparator, and a value. The comparator will be either <, >, <=< >=, or =. Once you complete the first filter, either press + to add another or press "Apply" to apply the selected filters to the graphs. You can also press "Cancel" at any time to exit the dialog.

After pressing “Apply”, the popup will close out and you will see your filters under the “Filters” section on the ribbon. Pressing the X next to a singular filter will delete the filter and unapply it from the graphs. Pressing the chip will allow you to edit the filter. Pressing “Clear” will clear all filters from all graphs.

When a filter is applied to a graph, the sections not corresponding to the filter will be deleted or “whited-out” so that you can no longer see them.






Graph Visualizer
Home
Graph
Filter
Analysis
Settings
Time Zone
Local Time
UTC Time
Filters
Acc magnitude avg > 1.1
Clear
Add
Acc magnitude avg vs. Datetime (UTC) for 310
1.5
1.4
1.3
1.2
1.1
01-18 00
01-18 03
01-18 06
01-18 09
01-18 12
01-18 15
01-18 18
01-18 21
01-19 00

Analysis Tab

After adding graphs and filtering through them, one final method of analysis is valuable on this type of data. The Analysis Tab will give the statistics about a certain feature.

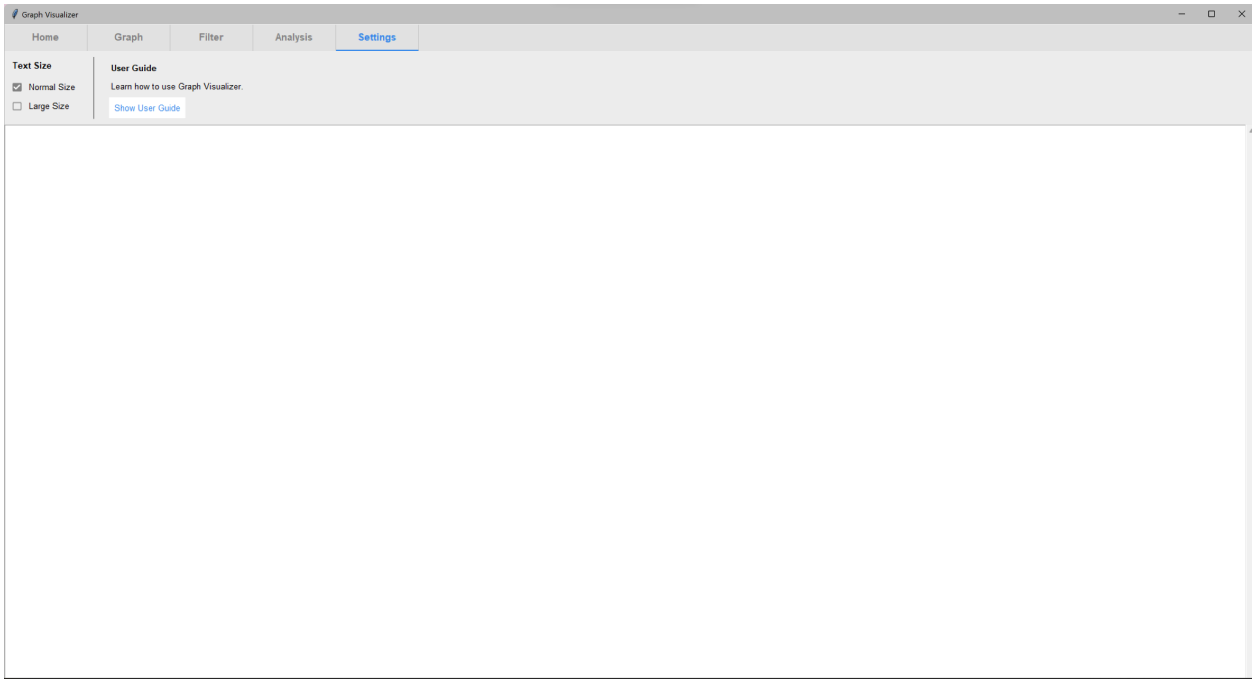
The first section on this tab is titled “Basic Statistical Analysis”. Two dropdowns exist in this section, one for Participant and one for Feature. Upon choosing the Participant and the Feature, the fields to the right will auto populate with the corresponding values. These values are Mean, Median, Mode, Standard Deviation, Maximum and Minimum.

The last section on this tab is titled “Advanced Statistical Analysis” and contains two sets of two dropdowns. Each set contains a Participant and a Feature. Upon filling in all four dropdowns, the fields to the right will be filled. These fields are Covariance and Correlation between the two Participant/Features.

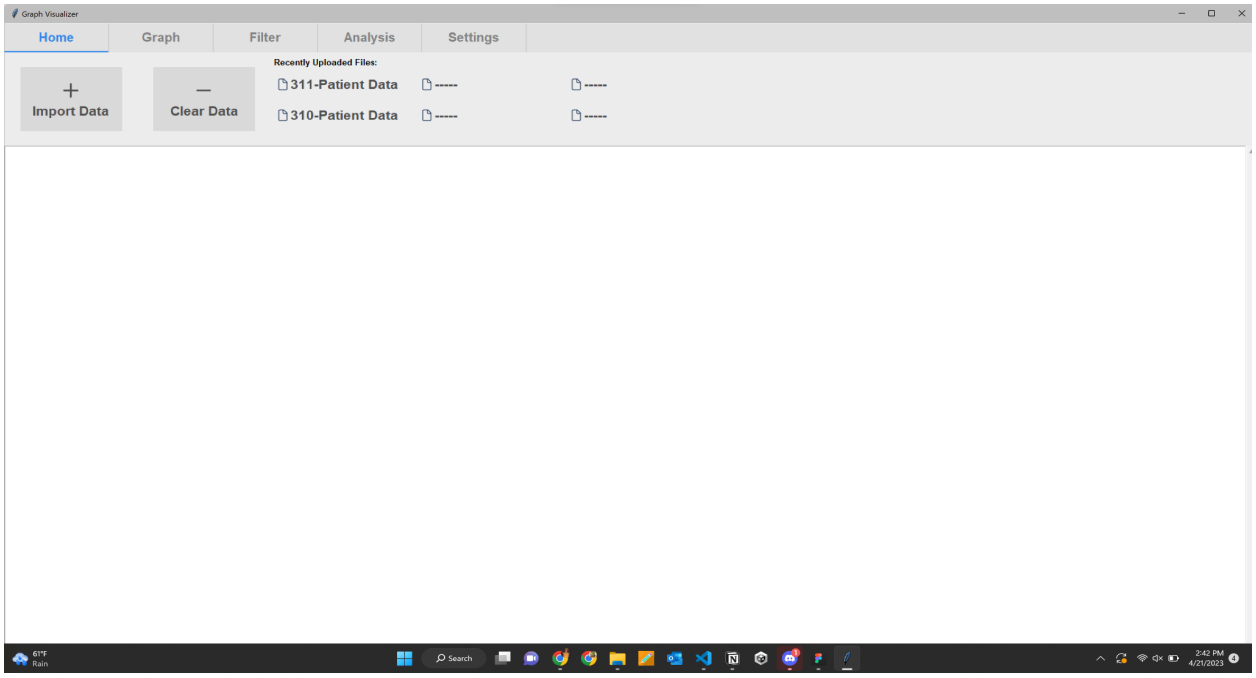

Graph Visualizer
Home
Graph
Filter
Analysis
Settings
Basic Statistical Analytics
310
Mean
1.03059173
Mode
0.943813
Max
1.507012
Acc magnitude avg
Median
1.040111
Standard Deviation
0.05662880
Min
0.904704
Advanced Statistical Analytics
Feature 1
310
Feature 2
311
Covariance
0.001445624
Correlation
1.0
Acc magnitude avg
Acc magnitude avg
Clear
Acc magnitude avg vs. Datetime (UTC) for 310
1.5
1.4
1.3
1.2
1.1
1.0
0.9
01-18 00
01-18 03
01-18 06
01-18 09
01-18 12
01-18 15
01-18 18
01-18 21
01-19 00
Acc magnitude avg vs. Datetime (UTC) for 311
1.125
1.100
1.075
1.050
1.025
1.000
0.975
0.950
01-18 13
01-18 14
01-18 15
01-18 16
01-18 17
01-18 18
01-18 19
01-18 20
01-18 21
01-18 22
01-18 23
01-19 00

Settings Tab

The Settings Tab contains settings that may make your experience with Graph Visualizer better.



The first of these has to do with text sizes. Two checkboxes can be toggled back and forth to choose between “Normal Size” text and “Large Size” text. The larger text can make it easier to read everything on the app for those that need it.



The final section is where you can access this user guide! Pressing “Show User Guide” will load this document.

Development

Graph Visualizer was developed by a group of students at the University of Louisville in Louisville, KY. The team consisted of Cristian Rodriguez Pena, Hoc Nguyen, Taylor Logan, Nathan Zabloudil, and Tahereh Alamdari. Cristian led the team and did a large portion of the development efforts with help from Hoc and Nathan. Taylor did the UI design with help from Tahereh.