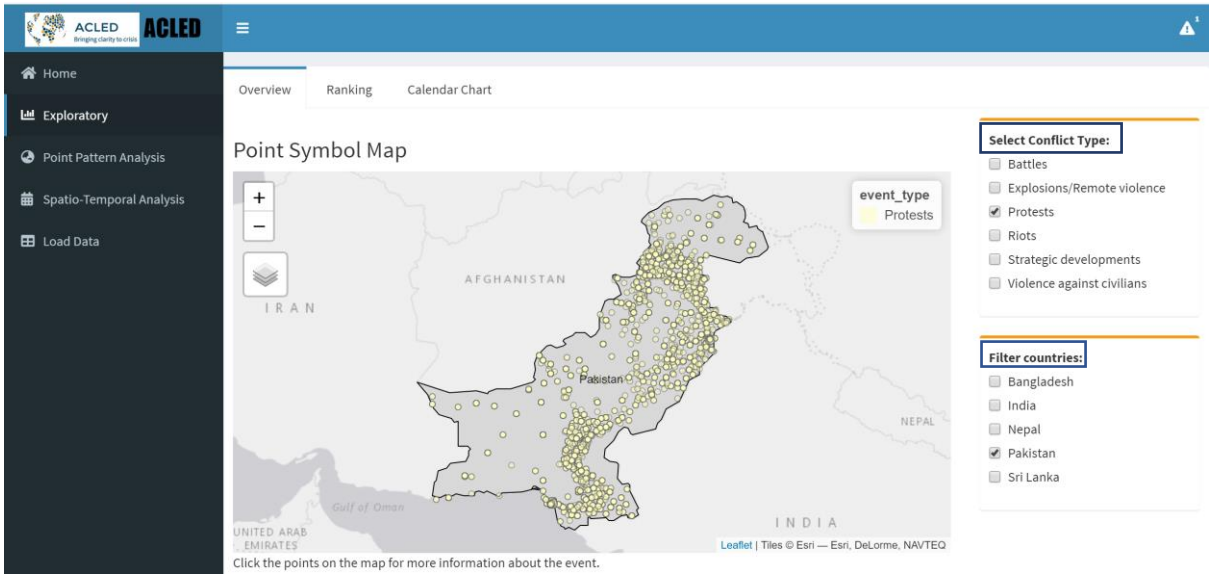
USER GUIDE FOR GEOSPATIAL VISUAL ANALYTICS TOOL FOR EXPLORING AND ANALYZING ARMED CONFLICTS IN SOUTH ASIA

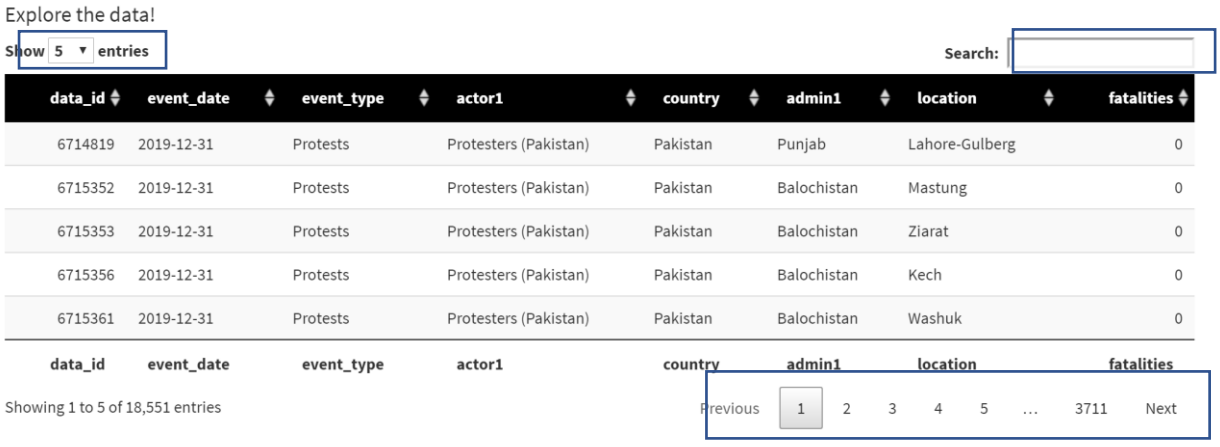
1. Exploratory Tab

There are 3 sections in the Exploratory tab. These are different types of exploratory analyses.



1.1 Overview

In the Overview section, there are two control filters for the Point Symbol Map. The first one is “Select Conflict Type” where the user can choose one or more types of conflicts. The second one is “Filter countries” where the select one or more countries.

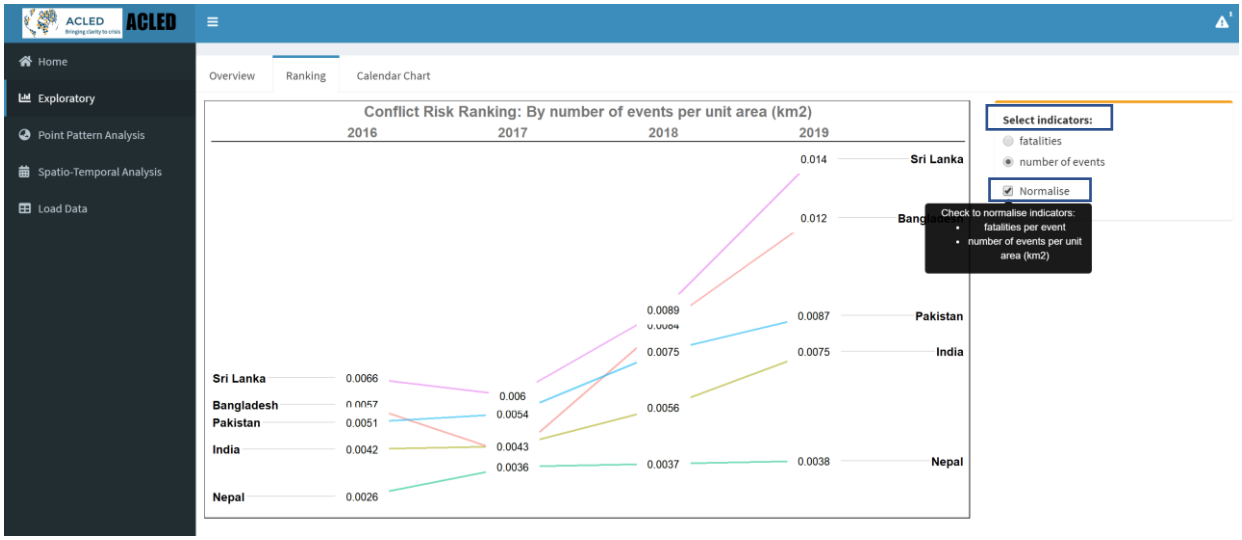


In the second half of the Overview page, the user can explore the data. Firstly, this is dependent on the filters chosen in the first half of the page. There are three user controls here. The user can select the number of entries to view per page using the “Show entries” control. Next, the user can search for a specific value using the “Search” box. Lastly, the user can browse the different pages using the Pages control at the end.

1.2 Ranking

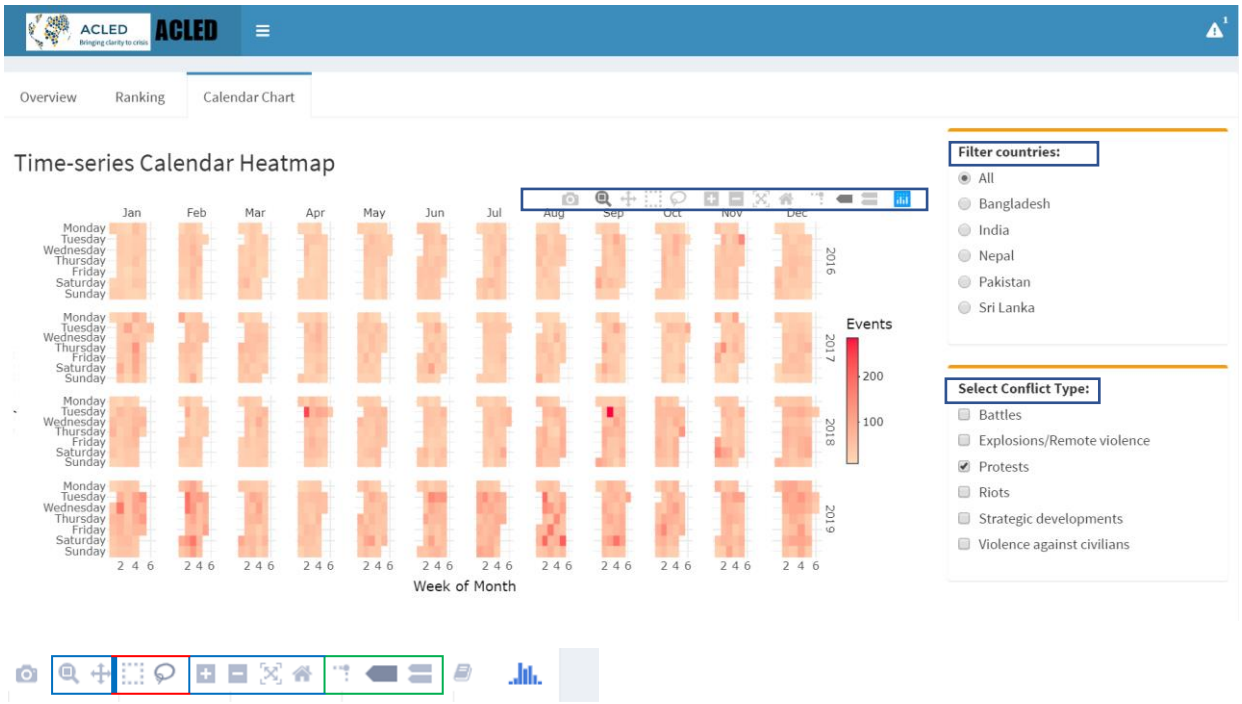
Ranking section is the second section of the Exploratory tab. Here, there are two controls for the user. First, the user can select the indicators using the “Select indicators” filter. Second, the user has the

option to normalize the chosen indicator using the “Normalise” check box filter. Additional information about how the indicators are normalized can be found in the tooltip upon hovering the cursor over the checkbox.



1.3 Calendar

Calendar Chart is the third and last section of the Exploratory tab. There are two user control here called “Filter countries” and “Select Conflict Type” where the user can select all or specific countries alongside single/multiple event types.



<u>Selecting Points – Red</u>

To select the observation, user can choose either to click the observation to observe a single point, or to select a number of observations at one goal. To select multiple number of observations, user is allowed to choose the two tools highlighted in red. While the left tool

will allow user to do a square selection and the right tool will provide user a free-style selection with lasso.

Zooming in and out of boxplot - Blue

To make controls easier, users are allowed to zoom in and out to have more granular selections. After tempering with the boxplot view, user can reset back to the original view by clicking the home button. The controls for this activity are highlighted in blue.

Graph Inferring Aids - Green

To allow better readability, user can activate line-aids that will help in making inference to the x and y axis of the graph. Furthermore, comparing multiple observation points are also enabled by toggling between the two right-most features within the green box.

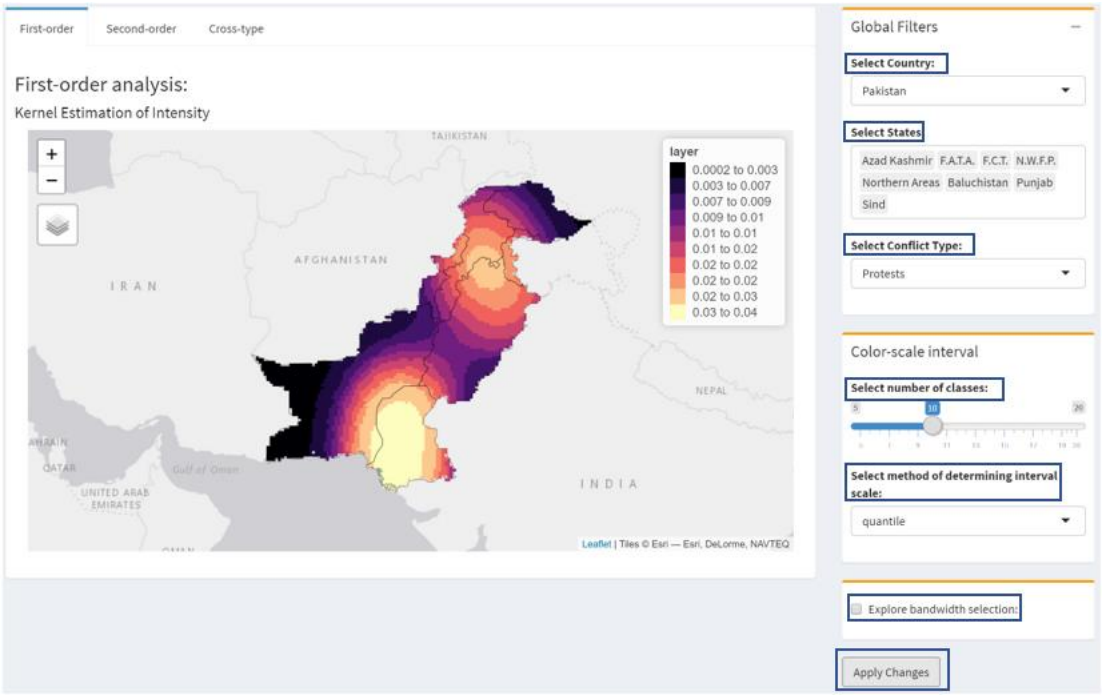
Resetting Selection

To reset and remove selected markers from the map, user can double click at any blank spaces available within the boxplot.

2. Point Pattern Analysis Tab

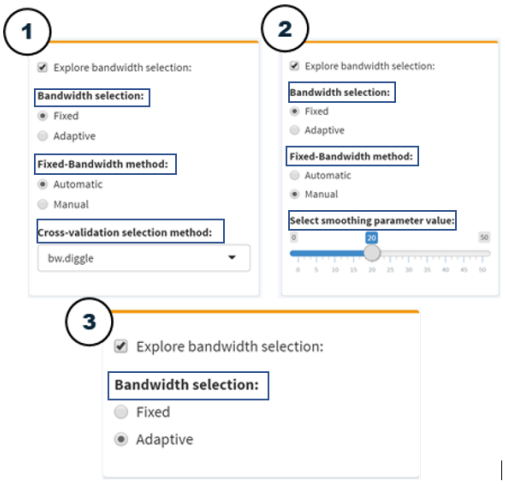
This Tab consists three types of point pattern analysis, namely analysis on first-order property, second-order property, and as well as cross-type analysis of multi-type point patterns. The box on the top right-corner of the app titled 'Global Filters' contains filters for country, state(s), and type of conflict to allow users to define their focus of analysis.

2.1 First-order analysis



The first section in the Point Pattern Analysis tab is First-order. There are six user controls on this page. There are three user controls in the Global Filters pane. The user can select the country using the

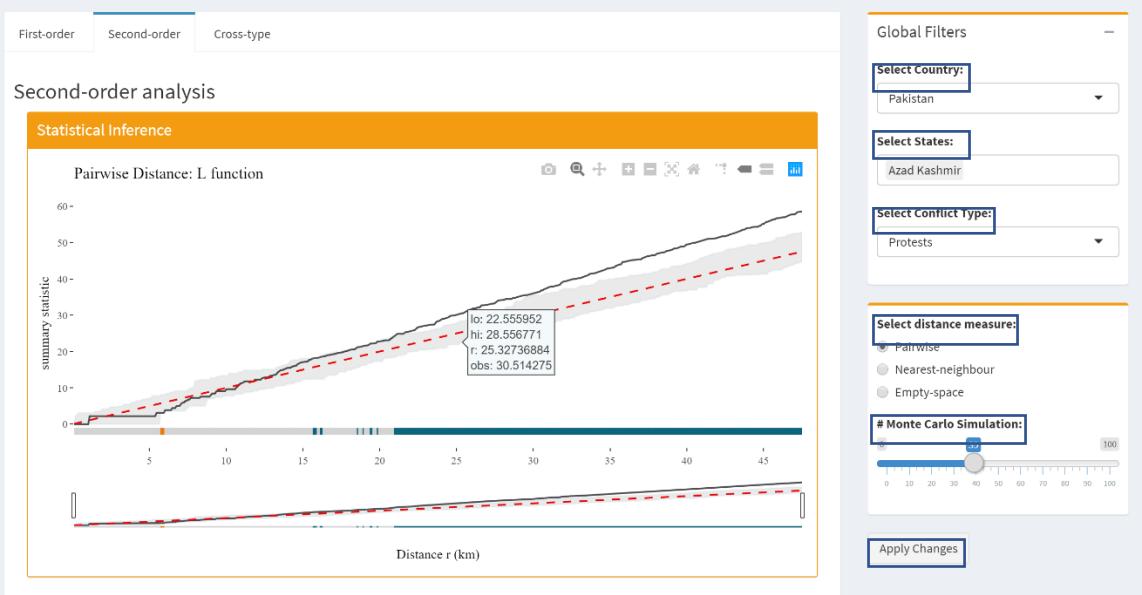
“Select Country” filter. The second control allows the user to select states. This can be done using the “Select States” filter. The user can also select the conflict type using the “Select Conflict Type” filter. There are two user controls in the Color-scale interval pane. The user can select the number of classes using the “Select number of classes” slider input filter and the interval method using the “Select method of determining interval scale”. The user can select the “Explore bandwidth selection” filter to explore different methods shown below. Finally, the user has to click on “Apply Changes” button to see the changes.



By default, the kernel function is computed using the rule-of-thumb bandwidth estimator. When the “Explore bandwidth selection” option is checked, users can choose between fixed-bandwidth and adaptive bandwidth kernel estimation. Under the fixed option, users can further customize how the bandwidth value should be derived; that is, either through built-in algorithms that automatically computes the optimal bandwidth (different methods available in the user-selection field under “Cross-validation method”); Or they can manually adjust the bandwidth parameter value using the slider control. When adaptive-bandwidth is selected, the user-selection options for fixed bandwidth disappears for a cleaner interface.

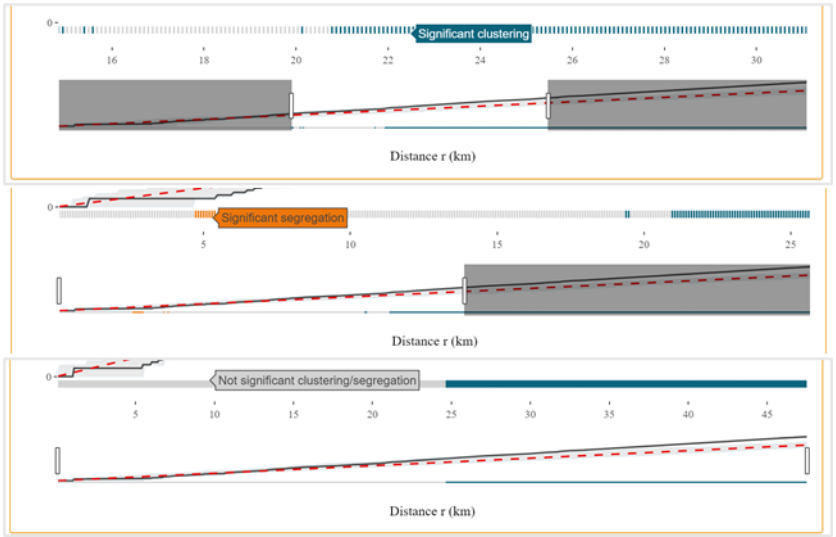
2.2 Second-order analysis

This is the second section in the Point-Pattern Analysis Tab.



There are six user controls on this page. There are three user controls in the Global Filters pane. The user can select the country using the “Select Country” filter. The second control allows the user to select states. This can be done using the “Select States” filter. The user can also select the conflict type using the “Select Conflict Type” filter. In this section, users can choose the distance-based method used to characterize the point pattern (using L, G or F-function) and assess if the deviation from a spatially independent Poisson process is statistically significant or not. This is done using the “Select distance measure”. The number of Monte Carlo simulation, which determines the acceptance interval, can be defined by the user from the slider control on the right named “Monte Carlo Simulation”. The range slider below the plot enables users to pan and zoom in to a specific range of distance. Finally, the user has to click on “Apply Changes” button to see the changes.

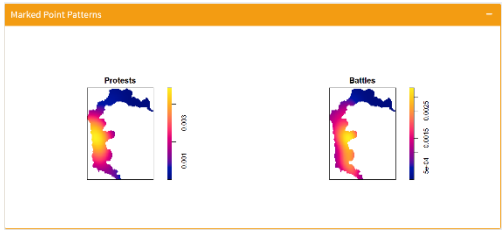
The colored bands at the bottom of the line graph gives a clearer indication of significant or insignificant spatial segregation/ clustering at distance r. Dark green bands indicate significant clustering, orange indicate significant segregation, while grey indicates insignificant clustering/segregation. Tooltips were added to provide color legend information.



2.3 Cross-type analysis

This is the third section in the Point-Pattern Analysis Tab.

There are six user controls on this page. There are three user controls in the Global Filters pane. The user can select the country using the “Select Country” filter. The second control allows the user to select states. This can be done using the “Select States” filter. The user can also select the conflict type using the “Select Conflict Type” filter. Further, cross-type K function is used to assess spatial dependence between two types of marked point patterns. The type of map is selected using the “Select maptype” user control. Users need to define the second event type (the first type is defined in the global filters) to perform the analysis. This is done using the “Select second pair of types” filter. The number of Monte Carlo simulation can be varied using the slider control named “Monte Carlo Simulation”. Users can choose to expand the ‘Marked Point Patterns’ box to have visual comparison of either the kernel estimation of intensity or point symbol map of each event type. Finally, the user has to click on “Apply Changes” button to see the changes.

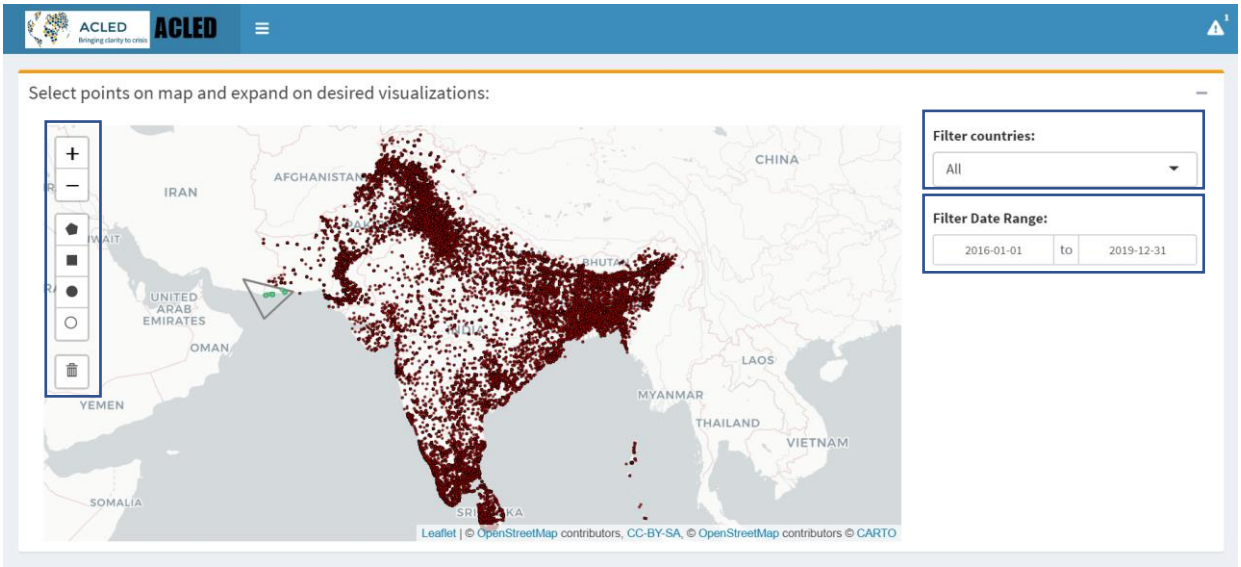


3. Spatiotemporal Analysis Tab

This part of the app provides the user with the capability to perform spatio-temporal analysis based on the point patterns as shown on the map. As for user interactivity there are filters provided for country as well as Dates as “Filter countries” and “Filter Date Range” for helping the user to filter the points on the leaflet map.

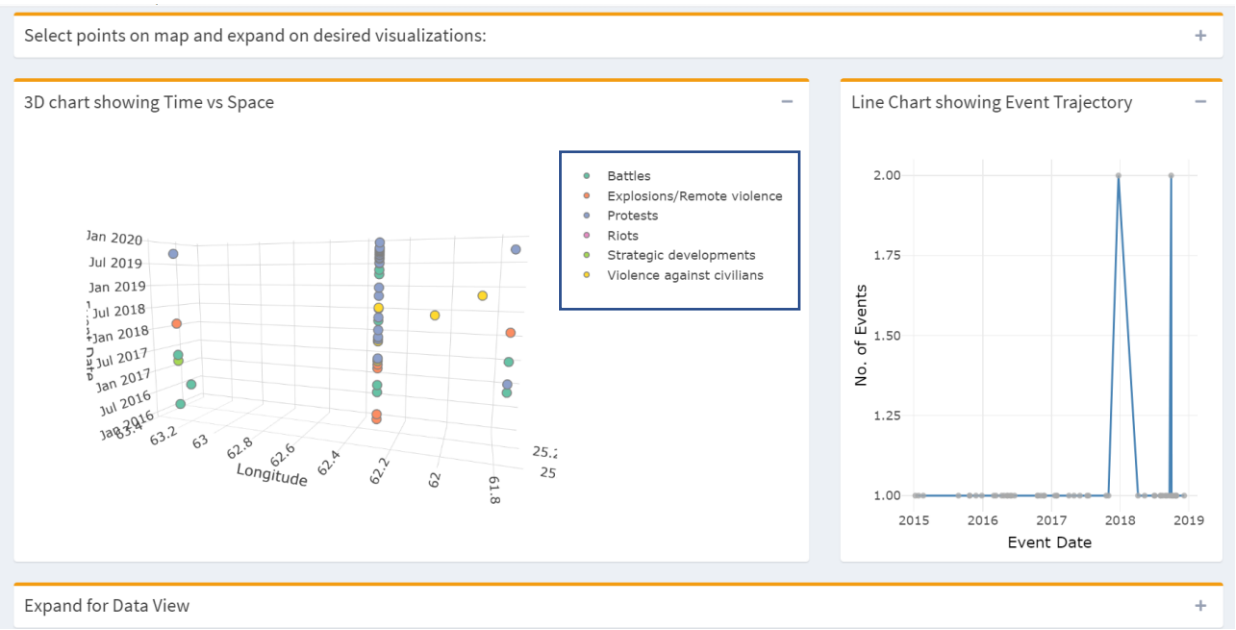
On the map as shown below, the user needs to make a selection with the help of the selection tools provided in the left panel as highlighted in the image below. The polygon with green points within is

the selection made based on which the spatio-temporal visualizations will be populated on the application.

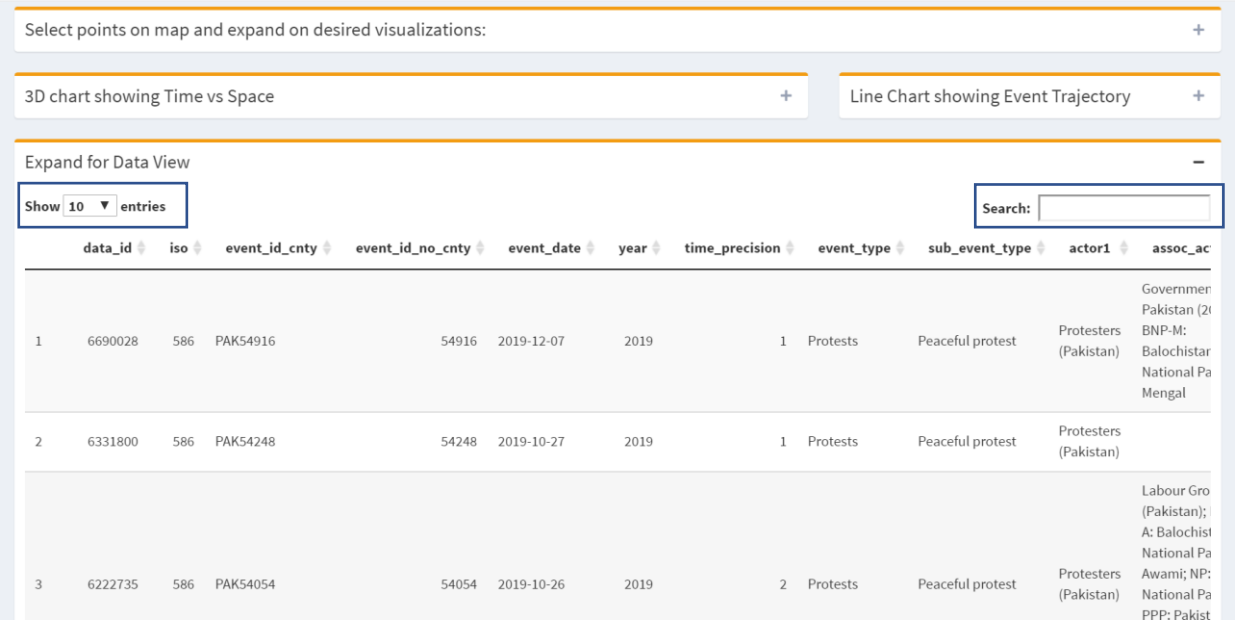


Based on the selection triangle on the map, the following charts can be viewed by expanding the headers in the same tab. For clarity, upon making the selection, the map collapsible tab can be minimized.

This window gives a preview of the spatio-temporal visualizations which is a 3D chart showing space (latitude and longitude) and time (event date) at the same time. The points on the map can be hovered over for highlight and tooltip with brief detail on latitude, longitude and date. The legend on the right side can be also used as a user control to filter based on the conflict types. The line chart also provides with information about the point on the tooltip. Both these visualizations are created using plotly so the user controls described under the Calendar chart can be applied here as well.

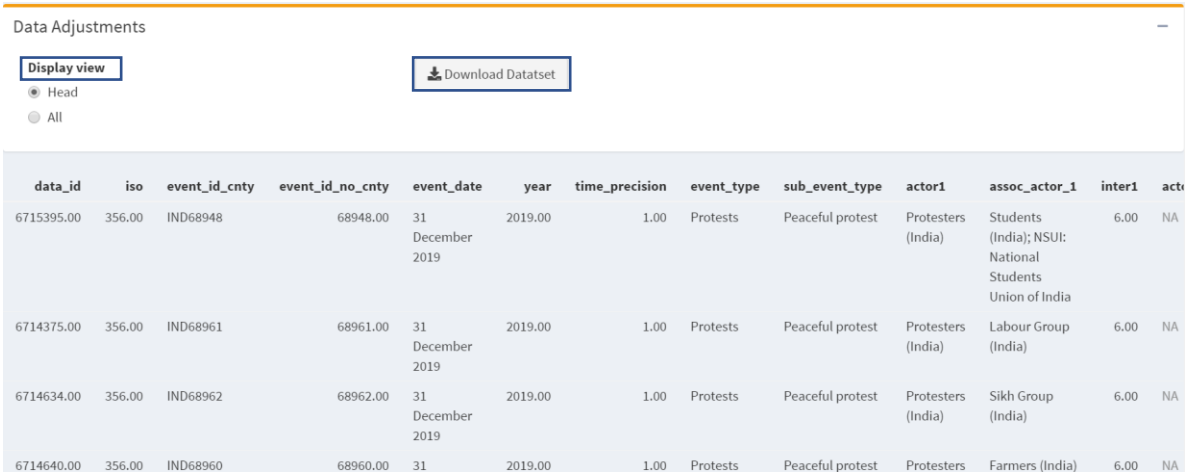


Thereafter if the data view is expanded using the + sign at the corner, data view of the selected points in the map can be seen as below. The functionalities of the data view are similar to the previous data table discussed in the Overview section.

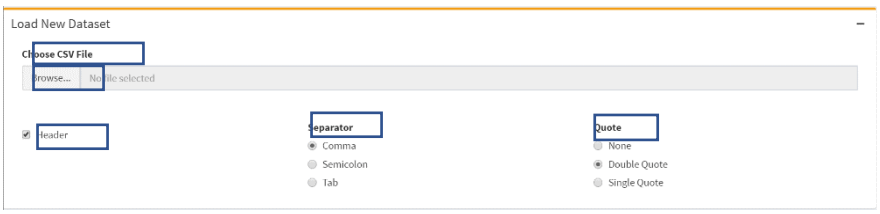


4. Load Data Tab

This part of the app provides the user with the flexibility to explore the dataset that has been used for the analysis. It provides with a preview of the data schema and the various attributes used for the analysis.



There are two user controls in the Data Adjustments section of this page. “Display view” allows the user to view the head or the entirety of the dataset, that is, 6 rows or the entire dataset with all the 100996 rows. ” Download Dataset” allows the user to download a copy of the dataset.



Another functionality with the Data Explore tab is to provide the user with the flexibility to upload a new file based on the parameters shown above. Firstly, the user can browse for the file using the

“Browse” button. Next, the options that can be pre-selected on reading a new file are the type of separator in the file using the “Separator” control, the type of quote in the file using the “Quote” filter and if the file includes a header or not using the “Header” checkbox. With these adjustments, the data view as in the previous figure gets refreshed.