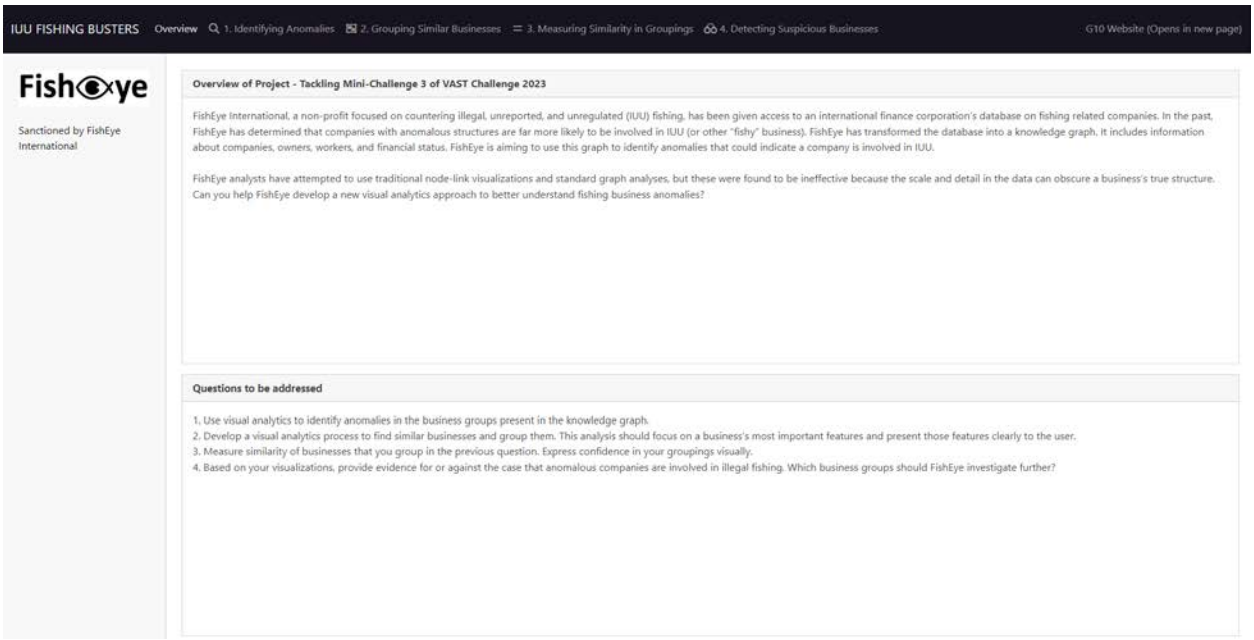
Application User Guide

VAST CHALLENGE 2023

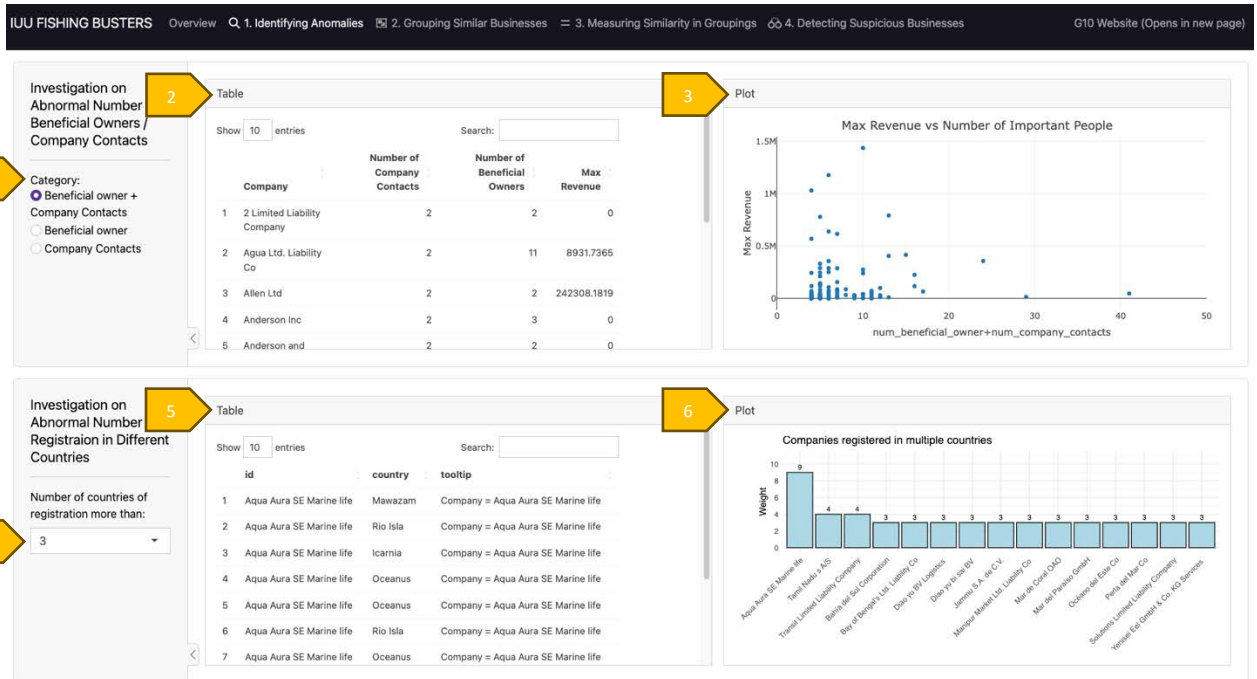
"ILLEGAL, UNREPORTED AND UNREGULATED FISHING BUSTERS"

1. Overview Page

On this page, there is a short description of the project (VAST challenge 2023), the questions to be addressed and an overview of the application navigation.



2. Identifying Anomalies



[1] The user can choose to explore the plot of the company's maximum revenue against either the number of beneficial owners, the number of company contacts, or the sum of both, which are selectable as the x-axis in Plot [3].

[2] Users have the option to refer to and search for specific companies of interest, enabling them to access information on the number of beneficial owners, number of company contacts, and their respective maximum revenue.

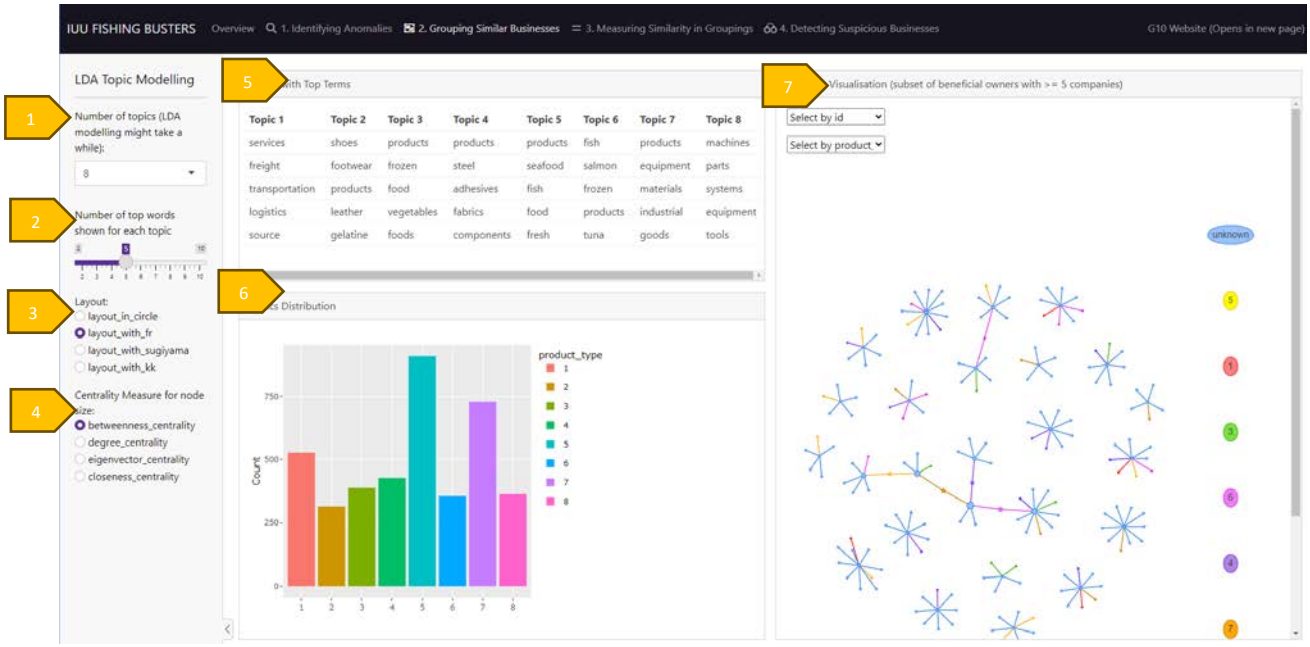
[3] Plot [3] presents a dot plot depicting the maximum revenue of companies against the selected x-axis from [1].

[4] Users can investigate companies based on the number of countries they are registered in. The selectable range for this parameter is from 3 to 5, representing the minimum number of registrations. For example, selecting 3 will display companies registered in 3 or more countries in both Table [5] and Plot [6].

[5] Table [5] displays the companies along with the countries in which they are registered, based on the selection made in [4].

[6] Plot [6] presents a bar chart illustrating the number of registrations of companies in different countries, corresponding to the selection made in [4].

3. Grouping Similar Businesses



[1] User can choose the number of topics to be generated from product_service from the drop down list, which will be used by LDA topic modelling. Available topics range is from 3 to 8. After selection, all tables and charts will be auto-updated accordingly (topic modelling might take a while).

[2] User can select the number of top words shown for each topic by using the slider. The minimum words shown is 2 and maximum is 10, the change will be reflected in table[5].

[3] User can switch to different layout style of the network plot[7] by clicking on the radio button, only single selection is allowed. Four options are available for selection: circle, Fruchterman-Reingold, Sugiyama and Kamada-Kawai.

[4] User can freely select different centrality measures that the node size represents. The higher the value, the bigger the size. Only single selection is allowed. Four measures are available: betweenness, degree, eigenvector and closeness centrality.

[5] Table showing the top words for each topic generated by the LDA model.

[6] Bar chart showing the topics distribution. Each bar represents the count of nodes for that topic. It is an interactive plot, user can know more details by hovering over the bars.

[7] Network plot for beneficial owners who own >= 5 companies. This is a subset of the original knowledge graph provided by Fisheye, which allows users to zoom into the more suspicious portion of the network. Node colour represents the topics generated from topic modelling. Node size represents user-defined centrality measures. Node shape represents node type (company marked by star and person marked by dot). User can select by node ID and topics by using the dropdown list at the left corner too.

4. Measuring Similarity in Groups

[1] The product types under this dropdown list are based on those in the second tab (2. Grouping Similar Businesses). If the number of topics was changed in the second tab, the nodes will refresh and have the updated product types accordingly.

[2] User can filter by percentile of revenue to make the network plots more legible.

[3] Plots are interactive. Mouseover to view tooltip information, click on any node to view only nodes of that particular type.

[4] Supplementary information on the node attributes, i.e., visualizing revenue and country count.

[5] Tabs to filter the network plots differently. This allows the user to view similarities by revenue or by country.

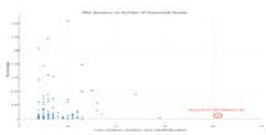
5. Detecting Suspicious Businesses

This page shows our final conclusion derived from the previous analysis. Suspicious companies with evidence support are listed in this panel. This panel is informative and designed for users to understand our team's approach and rationale of deriving the suspicious companies involved in IUU fishing.

Detect Suspicious Company through Anomalies

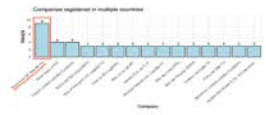
Company:

- **Aqua Aura SE Marine Life**



Approach 1: Identifying Companies with Abnormal Structure.

Companies with an abnormal number of beneficial owners or company contacts relative to their declared revenue are considered suspicious. Such companies may raise red flags for potential involvement in IUU fishing.
Aqua Aura SE Marine Life has emerged as the most suspicious company. It is associated with a total of 33 beneficial owners and 8 company contacts, indicating a significant deviation from the norm.



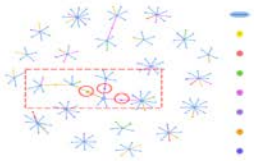
Approach 2: Identifying Companies Registered in Multiple Countries.

Companies that are registered in more than three countries are considered suspicious. The rationale behind this is that companies operating in multiple countries might have complex ownership structures, which could make it easier for them to engage in IUU fishing activities across various jurisdictions.
Aqua Aura SE Marine Life is flagged again in this approach as it has operations in 9 countries.

Detect Suspicious Company through Anomalies

Company:

- **BlueTide GmbH & Co.KG**
- **Mar del Oeste**
- **West Fish GmbH Transport**



Approach 3: Identifying beneficial owners who own multiple companies.

A person who owns multiple companies might be involved in IUU fishing. We plotted network focusing on the beneficial owners who have >= 5 companies. From the network graph, we can observe a big cluster includes several high betweenness companies. Beneficial owner "Jessica Brown" is the essential linkage in this cluster. Therefore her 1-hop neighbour companies are likely to be involved in IUU fishing.