**Background Literature**

Contributor: Vikas Thiramdas.

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# **What is the major contribution of this paper?**

This work contributes significantly through its analysis and presentation of the VAST Challenge 2023 datasets. This was conducted in an effort to identify patterns, anomalies, and issues across a network of companies relating to illegal fishing. This project describes how to investigate and interpret complex data sets using a variety of visual tools and techniques. With the aid of visualisations and other methods of data analysis, it is possible to identify nodes (entities) with an unusually high degree (number of linkages) and doubtful patterns that may indicate illegal fishing. The paper discusses on the methods of data cleansing and preparation, emphasising their significance in ensuring the research's credibility. Consequently, the analysis can be limited to only the most significant entities, and the connections between nodes can be modified accordingly. The structure and connections of a network can be comprehended by examining the various levels and types of elements and links between them. By analysing the distribution of degrees and link weights, this project aims to determine which nodes and linkages in the network require additional research to rule out the possibility of illicit fishing operations. It also discusses the possibility of integrating additional elements that can aid in identifying illegal patterns of fishing and irregularities. This project makes a major contribution by employing visual analytics techniques to investigate the provided dataset, identify anomalous relationships and trends, and establish the groundwork for future investigations into suspected instances of illegal fishing.

# **How did they analyze the effects of their work?**

FishEye's visual analytics work can be evaluated in a number of ways to determine how well it helps analysts understand the bigger picture of earnings from illegal fishing. Some of the critical effects could include the following:

**Table 1 Key effects of the work**

|  |  |
| --- | --- |
| **Effects** | **Description** |
| User feedback and expert evaluation | FishEye can gather feedback from their analysts who have been using the visual analytics tool. They can conduct interviews, surveys, or focus group sessions to understand the analysts' perspectives on the effectiveness, usability, and usefulness of the tool. The analysts' insights and suggestions can provide valuable feedback on the impact of the visual analytics approach. |
| Task performance measures | FishEye can define specific tasks that analysts must perform using the visual analytics tool, such as identifying connections between entities, exploring relationships, or detecting patterns. The analysts' performance in completing these tasks can be measured, for example, by recording the time taken to accomplish a task, the accuracy of their findings, or the number of relevant connections identified. Comparing the task performance with and without the visual analytics tool can help assess its impact. |
| Case study analysis | FishEye can conduct case studies where analysts are given real or simulated scenarios of illegal fishing tips. They can track and document the analysts' use of the visual analytics tool during the investigation process. By analyzing these case studies, FishEye can gain insights into how the tool has influenced the analysts' decision-making, identification of relevant information, and overall effectiveness in escalating investigations. |
| Comparative analysis | FishEye can compare the investigations conducted using the visual analytics tool with investigations carried out using traditional methods. They can analyze the efficiency, accuracy, and depth of analysis achieved with the visual analytics approach compared to traditional approaches. This comparative analysis can highlight the added value of the visual analytics tool in facilitating investigations. |
| Collaborative evaluation | FishEye can involve the analysts in the iterative development and refinement of the visual analytics tool. By working closely with the analysts and incorporating their feedback into the tool's design and functionality, FishEye can ensure that the tool aligns with their needs and enhances their investigative processes. |

By integrating multiple evaluation strategies, FishEye can obtain a more complete picture of the visual analytics tool's utility in their investigations and identifying illegal fishing.

# **What 2 questions do you have for the Authors?**

When discussing the visual analytics tool that FishEye has developed, the following are some questions that I will ask the author to obtain more insight into the topic at hand:

1. In designing the visual analytics tool for FishEye, what were the most important aims, goals, and considerations that were taken into account? How does the tool solve the issues analysts experience while investigating illicit fishing tips, and what specific features or capabilities were created to facilitate this process? Those are the questions that need to be answered. In addition, could you share some insight into the approach used to evaluate the tool, as well as any discoveries obtained from testing the tool's efficiency and usability?
2. Can you provide an overview of the technical aspects of the tool, such as the extraction of entity names and relationships from news articles utilising techniques associated with natural language processing? How is the collected information turned into a knowledge graph, and what kinds of data structures or representations are used to organise and store the graph once it has been created? In addition, how does the tool use various visualisation approaches to provide the context around each hint, ensuring that the pertinent information is presented while concealing the extraneous particulars? In addition, I wondered whether the possibility of enhancing the tool's capabilities by integrating it with external data sources or other systems was considered at any point.

# **How does your work on the mini-challenges related to the paper?**

The Visual Analytics Science and Technology (VAST) competition's mini-challenges are intended to present participants with realistic scenarios and assignments based on real-world problems. In the context of the competition, they are a part of, these activities serve as more manageable exercises overall. Mini-challenges for the FishEye project could be modified to concentrate on various facets of the team's visual analytics tool or the group members' needs.

Start

Load Dataset

Identify Nodes without Associated Types

Remove Nodes without Associated Types

Update Links

Analysis and Visualization

**Figure 1 Flow diagram of the process**

The following are examples of duties that could be performed for the mini-challenges:

* Developing a more streamlined and user-friendly interface for investigating the knowledge tree and its context.
* It is necessary to develop complex algorithms and methodologies to derive entities from online news articles and analyse the relationships between those entities.
* We are developing dynamic visualisations that highlight irregularities in the illegal fishing knowledge graph.
* Data preparation strategies are being implemented to better the accuracy of entity extraction and manage the massive amounts of news articles being collected.
* We are investigating suggestions for illegal fishing using various sources, such as satellite data or vessel tracking information, as examples of these types of sources.
* User studies and/or evaluating the visual analytics tool's impact on detecting and investigating illegal fishing cases can be used to determine the tool's utility. Both of these techniques can be used to evaluate the efficacy of a technology.

This and similar mini-challenges provide participants with concrete goals to pursue. This allows them to zero in on specific aspects of the FishEye project and experiments with new approaches while working within a predetermined structure. If participants accept these tasks, they can contribute to developing and improving a visual analytics tool that can detect and combat illegal fishing.

# **Background literature**

Identifying and preventing IUU (illegal, unreported, and unregulated) fishing poses an imminent challenge for the global community. Numerous efforts have been made to investigate and combat IUU fishing to protect marine species. Data analysis methods, natural language processing (NLP), the construction of knowledge graphs, and visual analytics are only a few of the topics covered in this field's existing literature. Researchers in data analysis have examined techniques for extracting useful information from enormous databases on fishing, the maritime industry, and international maritime trade. Network analysis, anomaly detection, and clustering have all been utilised to identify anomalies and possible instances of illegal fishing.

Natural language processing (NLP) is crucial for data extraction when dealing with unstructured text data such as news reports. Researchers have developed algorithms and models for entity recognition and relationship extraction to automate extracting entity names and their relationships in the context of fishing and marine-related texts. There has been significant interest in developing knowledge graphs in recent years. Knowledge graphs comprehensively comprehend a subject by systematically connecting entities and their properties. Knowledge graphs are valuable for representing connections between people, businesses, ships, and other entities in the context of illegal, unreported, and unregulated (IUU) fishing, thereby facilitating the analysis and investigation of related data.

Knowledge graphs and other complex datasets have benefited from applying visual analytics techniques that facilitate their investigation and comprehension. Visualisation tools, interactive interfaces, and data-driven visualisations support analysts in pursuing insights, pattern recognition, and sound decision-making. When constructing and evaluating visual analytics systems for identifying IUU fishing, it is essential to consider the needs and procedures of analysts in this field. Together, data analysis, natural language processing, knowledge graphs, and visual analytics address IUU fishing from various perspectives. To protect marine ecosystems, these methods aim to reduce squandered time and resources during investigations, make better decisions, and eventually eliminate illegal fishing.

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