Word Count: 988 words
(excluding references)

University of St Andrews

Visualising Illegal Cheetah Trade

CS5044: Information Visualisation

Matriculation Numbers: 200030212 & 190031409
April 2021

The visualisation presents data from ten years (2010-2019) of illegal cheetah trade. The dataset records trades of live cheetahs and cheetah body parts, such as skin and skulls. More information about the dataset can be found at https://doi.org/10.1016/j.dib.2021.106848.

We recommend using **Mozilla Firefox v87.0** or **Google Chrome v89.0** to access the visualisation from: https://sp259.host.cs.st-andrews.ac.uk/D3/P2/cheetahs.html.

Contents

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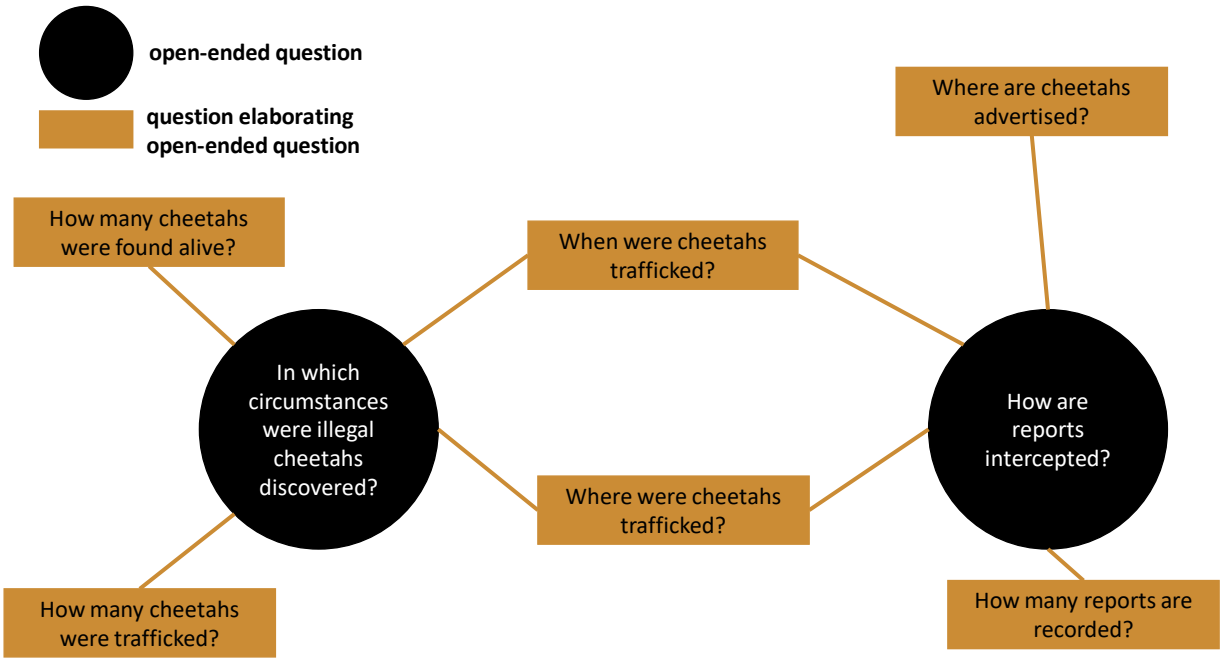
Open-Ended Questions



Description of Visualisation

The visualisation enables the user to explore the data to answer the above questions amongst others. Various attributes are visualised in three main interactive areas as below.

Location of Reports

ATTRIBUTE	ATTRIBUTE TYPE	ENCODING OF VISUAL VARIABLE
Number of reports	Quantitative (ordered)	Bar length
Region	Categorical	Position on x-axis
Country	Categorical	Position on circular x-axis

This is visualised as a bar chart because it contains one categorical and one quantitative attribute. Judgement is facilitated by this since comparing values by length supports the process. For an accurate reading of the number of reports, the user can hover over the bars for a tooltip showing the exact number of reports.

More detailed information is obtained by clicking on a button to view the number of reports by country. Since there are a lot of countries, these are presented in a circular bar plot for better readability. Furthermore, the green colour hue is only encoded in the bar charts to show location.

Media Source of Reports

ATTRIBUTE	ATTRIBUTE TYPE	ENCODING OF VISUAL VARIABLE
Number of reports	Quantitative (ordered)	Lollipop length
Medium	Categorical	Position on x-axis

The total number of reports can be further explored by seeing the frequency over different media where the illegal cheetahs were reported. This information is presented as a lollipop chart because many of the media had low frequency and the lollipop dot is noticed better than a bar when it sits on the x-axis. Again, hovering on the dot gives the exact frequency of reports for that media.

Date of Reports

ATTRIBUTE	ATTRIBUTE TYPE	ENCODING OF VISUAL VARIABLE
Year (can be zoomed for month and day)	Interval (ordered)	Position on x-axis
Total cheetahs found	Quantitative (ordered)	Line + Colour hue (black
Cheetahs reported alive	Quantitative (ordered)	Area + Colour hue (blue)
Cheetahs reported dead	Quantitative (ordered)	Area + Colour hue (red)

A line graph is highly effective to show the progression of the total number of cheetahs found. The attributes for dead and living cheetahs are encoded in an area chart to represent them as a proportion of the total number found. However, they are not stacked to avoid the misunderstanding that the bottom attribute frequency (alive) is part of the top one (dead) or that the top frequency is higher than it is. The use of the area colours also makes the distinction between the two more visible.

The visualisation makes use of brushing to zoom into the graph, going from the year to months and days. This aids in visualising crowded areas better. Apart from this, clicking on the legend can show/hide the corresponding graph. The user can also hover over a point to see the corresponding month, year and number of cheetahs reported.

Implementation

We followed the live tutorials and their corresponding slides to build a first layer for our visualisation using d3.js v5. Other external resources were used to meet our visualisation demands. The D3 Graph Gallery (https://www.d3-graph-gallery.com/)was helpful

throughout, especially for new types of graphs, where we adapted their v4 code for d3 v5. The complete list of all used resources can be found in the References section.

Insights from the Visualisation

Countries in the Middle East had the majority of reports of illegal cheetah trading (Figure 1). In fact, going into the Country view of the visualisation shows that the top 3 countries with the highest number of reports were recorded in the Middle East (Figure 2). Both bar charts clearly show the wide variance in the number of reports.

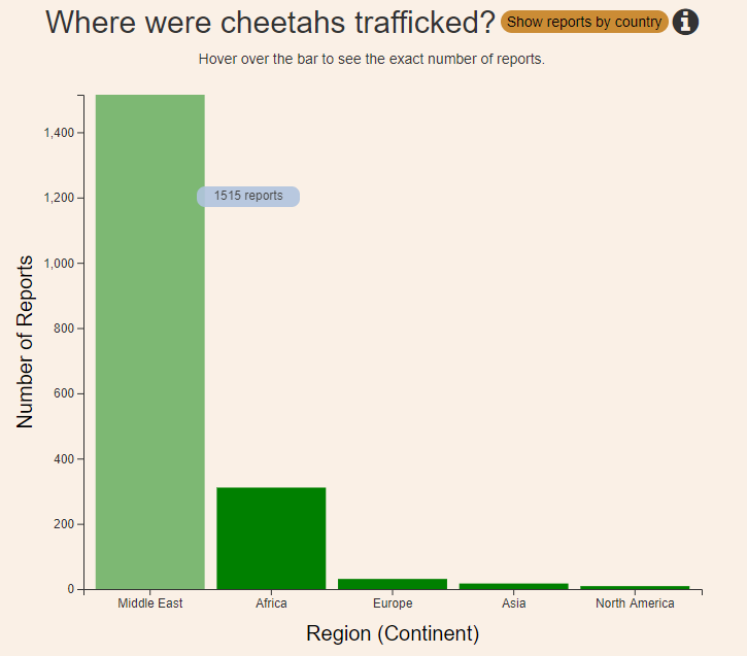


Figure 1: Bar Chart showing the frequency of reports by Region.

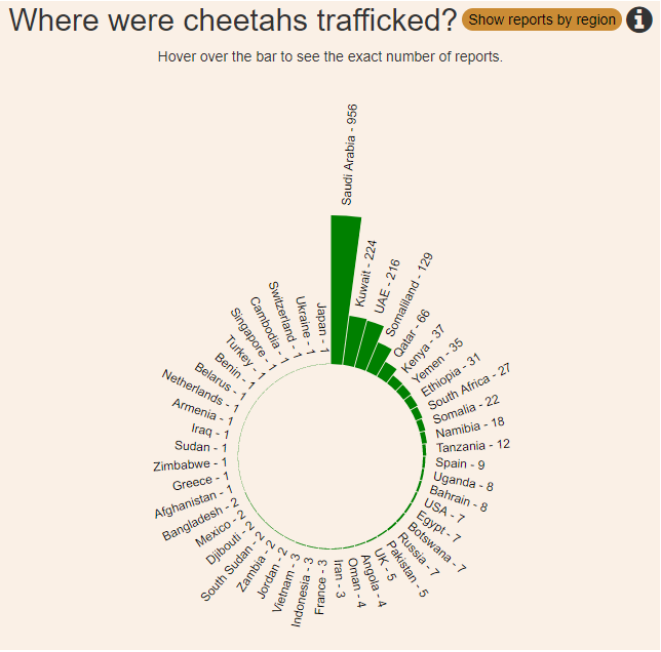


Figure 2: Circular Bar Chart showing the frequency of reports per Country.

The sources of reports were also heavily concentrated with most trades found through the internet in which social media plays the major role, followed by eCommerce, email and phone apps (Figure 3). Ultimately, this reflects the nature of trade and advertisement of sales for illegal cheetahs and suggest that illegal cheetah owners tend to show off their animals on their social media, implicating themselves.

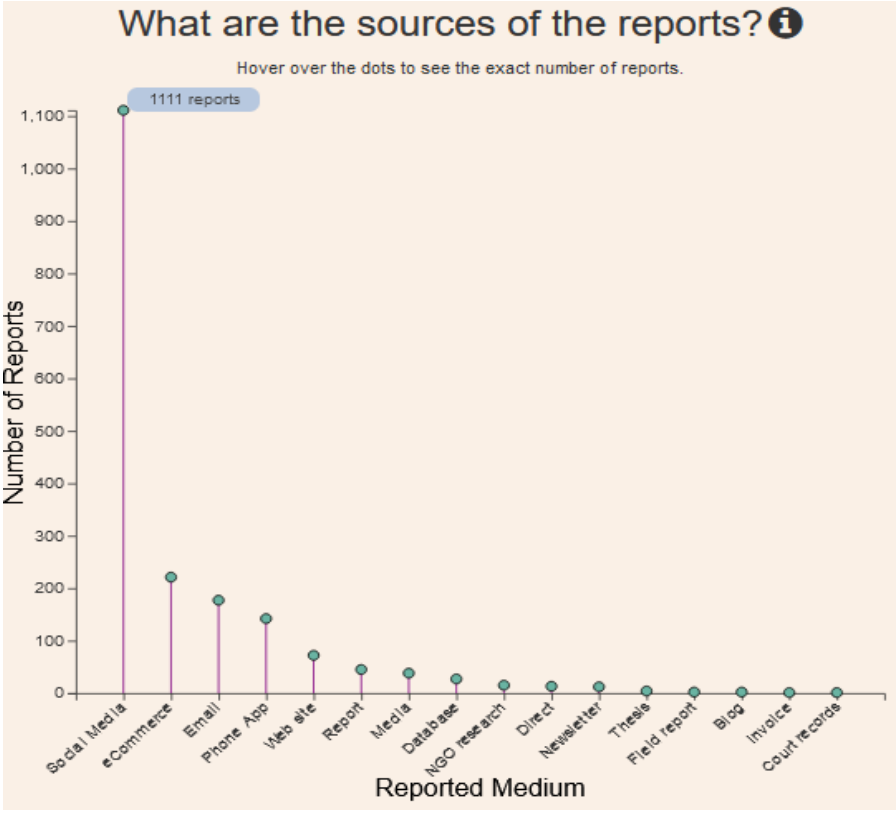


Figure 3: Lollipop Chart showing the frequency of reports by Source.

The timeline shows an overview of the number of cheetahs reported over ten years. At a glance, one can see that there is an apparent spike every year (Figure 4).

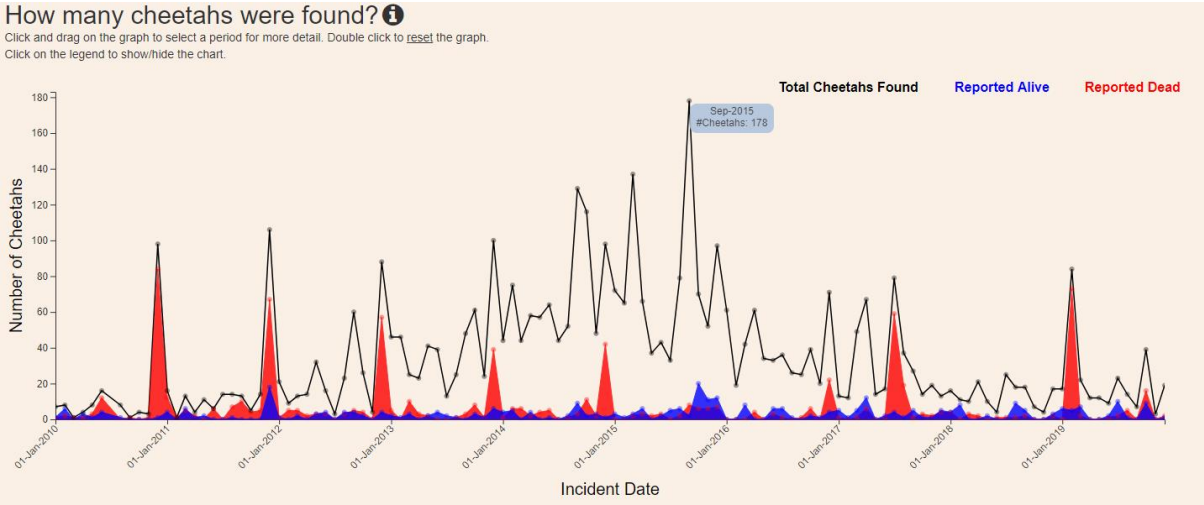


Figure 4: Timeline showing the number of cheetahs found and how many were reported Dead and Alive.

Zooming into these spikes, one can see that these always happen in the last quarter of the year, before December, possibly indicating a surge in buying cheetahs or cheetah products for the winter holidays. Furthermore, positive upswings in found cheetahs is often linked to an upswing in cheetahs reported dead, suggesting cases with many dead cheetah body parts reported (Figure 5) .

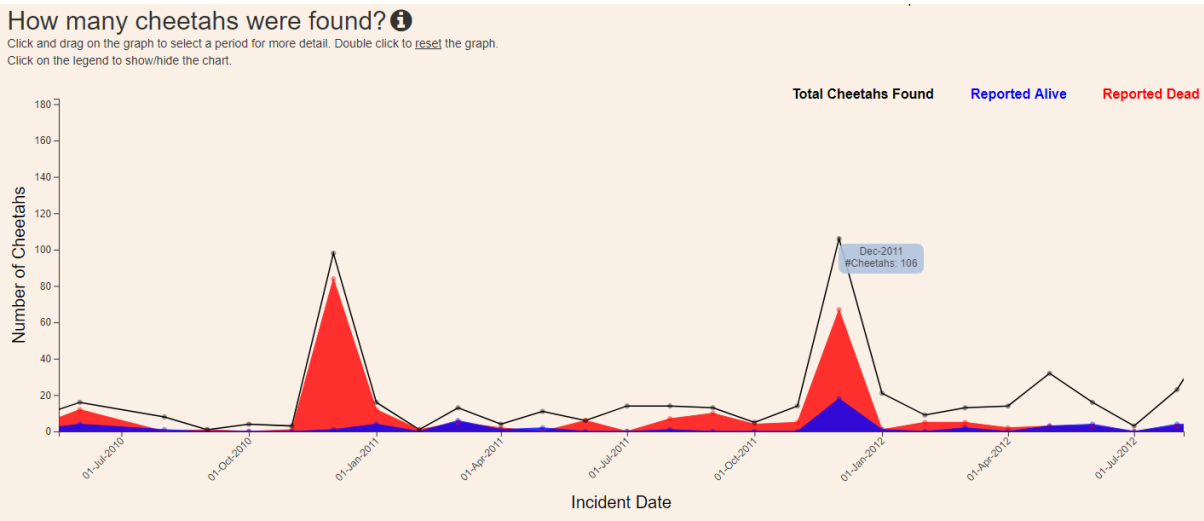


Figure 5: Using D3's brushing to zoom into the 2011/2012 period between spikes.

Critical Discussion

The visualisation provides the user several insights from different perspectives prompted by the defined open-ended questions. There is uniformity between views, such as representative colouring and hovering for additional and exact insights. Indeed, the visualisations follow the principle of overview first, zoom and filter, then details on demand. When the user visits the webpage, a high-level visualisation is presented with an overview of the data. When concentrating their attention on a particular view, the user can filter the data on a country or period they are interested in and then obtain further details on demand by hovering or clicking.

The dataset included more information about the locations such as whether the location of the report was the origin or the destination. We wanted to show this on a map by creating a route map showing the different links between origins and destinations. However, the locations were not given in coordinates, so this was harder to implement. Moreover, few reports had both destination and origin countries so the route map would not have reflected the routes accurately.

References

- Mike Bostock, *D3.js v5*. https://d3js.org/d3.v5.js , last accessed 18/04/2021.
- Phoebe Bright, *D3 Nest Tutorial and examples*. http://bl.ocks.org/phoebebright/raw/3176159/, last accessed 18/04/2021.
- d3noob (2019) *Multiple Line Graph in v5*. https://bl.ocks.org/d3noob/daecba427fed7c2d912d8abbe9f3e784, last accessed 18/04/2021.
- d3noob (2019) *Show / hide elements on mouse click with d3.js*. https://bl.ocks.org/d3noob/5d621a60e2d1d02086bf, last accessed 18/04/2021.
- The D3.js Graph Gallery (2018) *Labels on circular barplot*. https://www.d3-graph-gallery.com/graph/circular_barplot_label.html , last accessed 18/04/2021.
- The D3.js Graph Gallery (2018) *Basic lollipop chart in d3.js*. https://www.d3-graph-gallery.com/graph/lollipop_basic.html, last accessed 18/04/2021.
- The D3.js Graph Gallery (2018) *Line chart with zoom in d3.js*. https://www.d3-graph-gallery.com/graph/line_brushZoom.html, last accessed 18/04/2021.
- Kris Foster, *D3 Bar Chart* https://github.com/kriscfoster/d3-barchart , last accessed 18/04/2021.
- Y. Holtz & C. Healy (2018) *From Data to Viz*. https://www.data-to-viz.com/, last accessed 18/04/2021.
- P. Tricorachea, et al. (2021) *Global dataset for seized and non-intercepted illegal cheetah trade (Acinonyx jubatus) 2010–2019*. https://www.sciencedirect.com/science/article/pii/S2352340921001323, last accessed 18/04/2021.
- P. Tricorachea, et al. (2021) *Dataset: Global dataset for seized and non-intercepted illegal cheetah trade (Acinonyx jubatus) 2010–2019*. https://data.mendeley.com/datasets/84k92j4n3y/2, last accessed 18/04/2021.
- Jim Vallandingham, *Grouping Data* http://learnjsdata.com/group_data.html, last accessed 18/04/2021.
- W3Schools, *How TO - CSS/JS Modal*. https://www.w3schools.com/howto/howto_css_modals.asp, last accessed 18/04/2021.