

PROBLEM

Many data visualization software like Tableau only produce static visualizations, yet a key aspect of a good data visualization is interaction. Interactivity is typically custom built through code into the visualization, taking significant effort and time.

How can interaction in a data visualization be incorporated automatically and algorithmically?

MOTIVATION

Most of info vis research centers on *representation* of data on a display instead of methods of *interaction* with the data¹. Nevertheless, for meaningful analysis is often aided by interaction tools; thus automated interaction design is a ripe ground for innovation.

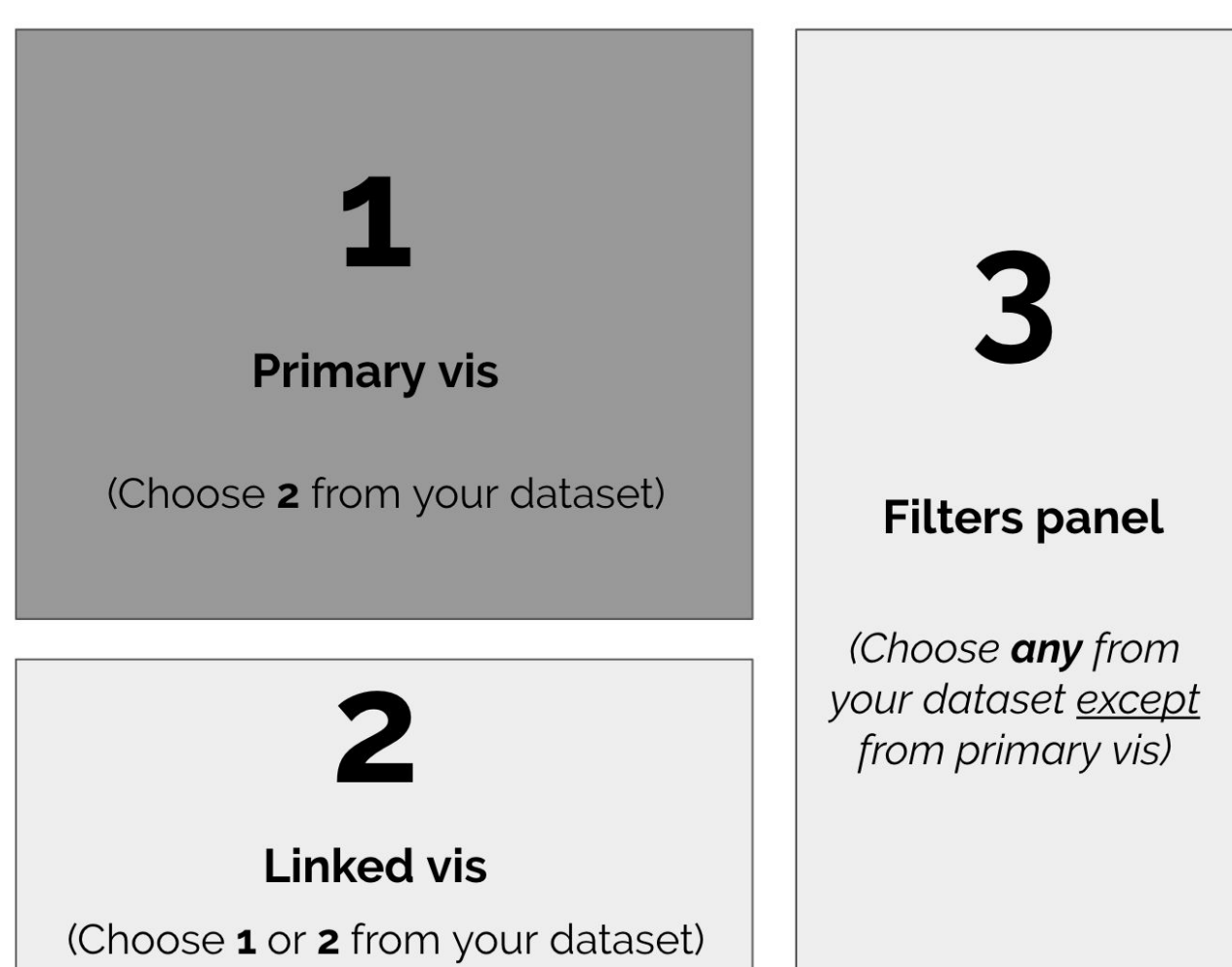
Creating a system that can automatically design interaction for a generic dataset is difficult because assumptions about the data cannot be made or hard-coded. Mapping data types to interaction widgets can lead to unexpected results if the data is not well-understood. For example, an equal-step range slider works well for evenly distributed data, but leads to problems for data distributed unevenly: subranges in the slider can have no data bound to it.

Another challenge in automating interaction is choosing a data representation that supports efficient search and filtering for dynamic queries. For example, time strings in a dataset need to be converted to a discrete, quantitative scale like seconds since 1980. Nevertheless, there still exists the problem of recognizing time formats.

APPROACH

Blitz is a system that automates interactions in visualizations given a data set (.csv, .json format) where its data fields are labeled (by the user) according to the appropriate data type.

Blitz generates an interactive playground consisting of a primary visualization, a secondary visualization that is linked to the primary, and a panel of filters that affects the primary and secondary visualizations:

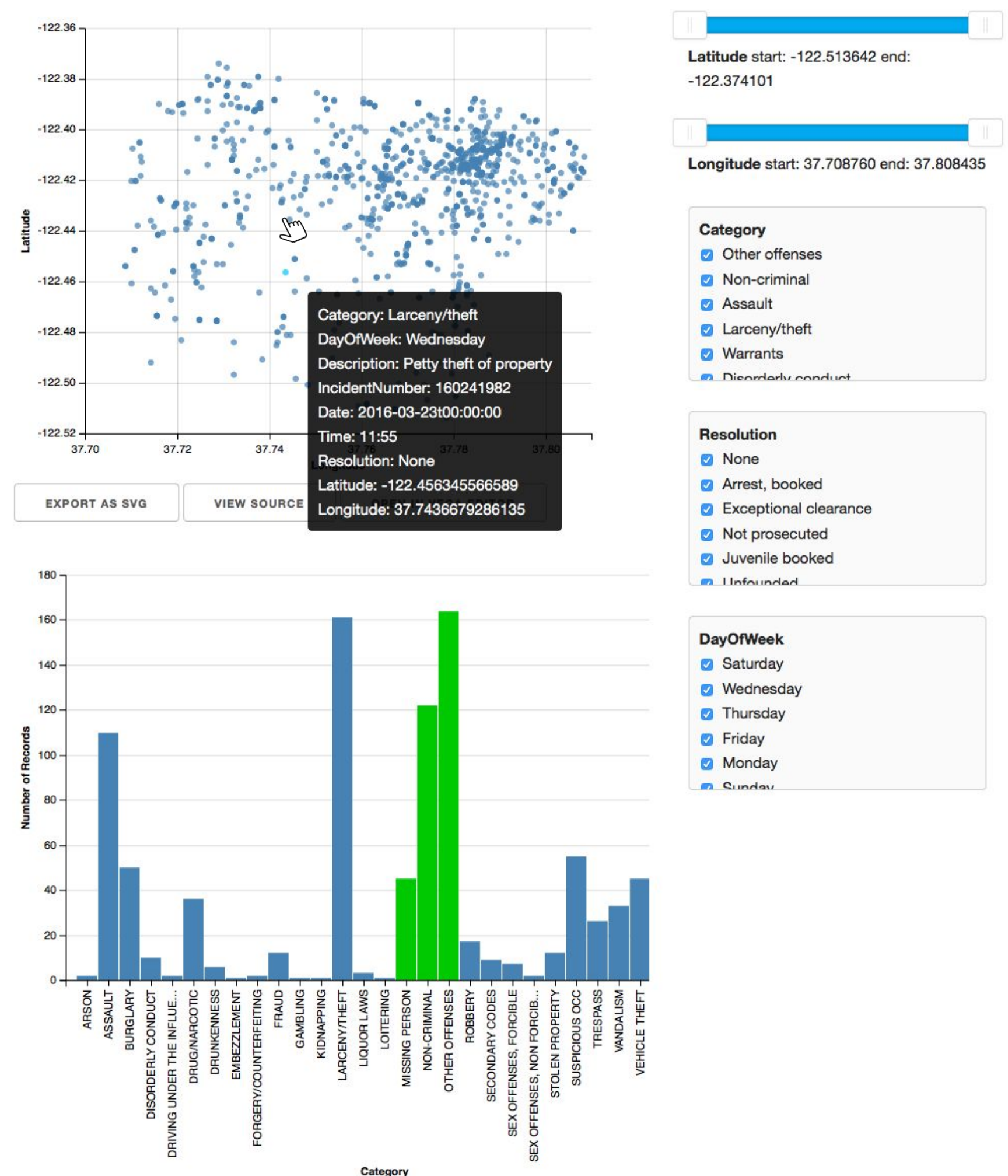


The primary and secondary visualizations are automatically generated; Blitz leverages Vega-lite's implementation of Bertin's visual encodings to chart types to do so.

Note, beforehand, the user must specify where they want their data fields assigned in this layout. This helps Blitz create interactions using a combination of data analysis and preset interaction types associated with each layout section.

RESULTS

Example interactive visualization generated by Blitz:



FUTURE WORK

Blitz can be extended to support a more comprehensive set of interactions by switching the visualization layer from Vega-Lite to Vega. This would allow more interactions including:

- Multiple linked views (dynamically expands according to size of data set)
- Query relaxation
- Pan and zoom (where appropriate)
- Click-and-drag selection
- Animation
- Data sorting

¹Yi JS, Kang YA, Stasko J, Jacko J. Toward a deeper understanding of the role of interaction in information visualization. *IEEE Transactions on Visualization and Computer Graphics* 2007; 13: 1224–1231.