

Chicago Crimes: 3D-AR Visualization (Visualizing Cities)

Our Goal

We wanted to explore new ways of visualizing vast amounts of data in a meaningful and possibly also in an engaging & beautiful way. We wanted to explore how AR and 3D could be used for the purpose of seeing and discussing data.

In general big datasets can be quite a challenge to really understand, even more so, when the results or insights need to be communicated to stakeholders that are not used to scientific or mathematical visualizations. AR-3D (sometimes also called "Mixed Reality") can help to create visualizations that are easier to grasp or just more engaging to non-tech-people.

Another possible advantage we wanted to explore is the potential of 3D to allow for more data to be shown at the same time.

The Process

Step 1 - Exploring appropriate data

There are different starting points for data-driven projects. Sometimes you start from a given dataset and sometimes you have a specific idea or you want to generate a specific kind of insight and you wonder what the right data would be to gain that insight. Mostly it is a combination of both.

In this project there was no given dataset, but therefor a domain for the the data-driven insight: cities.

Another criteria was, that the dataset should have significant size (10.000+ datapoints per city). The idea was to challenge ourselves and also to experiment whether 3D and AR can provide advantages in this regard.

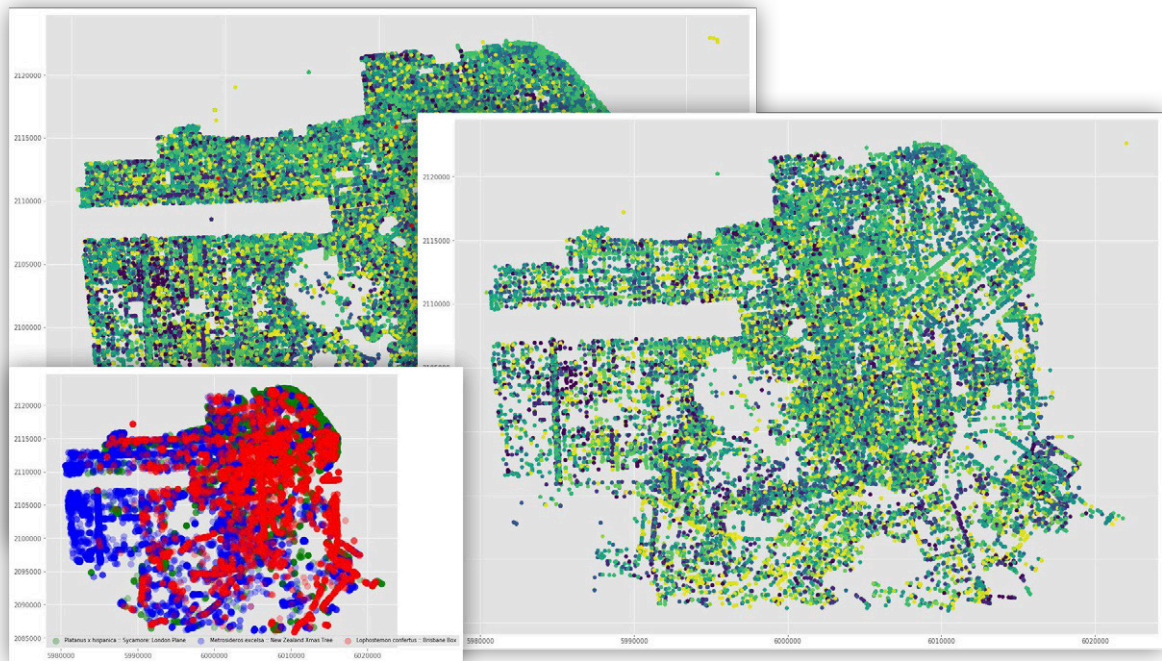
Since we had only limited time we decided to hack the workflow a bit. So we started with a dummy-dataset that suffice our criterias: A dataset that incorporates all the Street-trees in San Francisco.

- It was related to a city
- It had a vast amount of datapoints with geo-location
- It had different categories of trees

A perfect starting point to work on the visual domain and on the technological pipeline, while at the same time continuing to ideate and search for a more impactful dataset.

Step 2

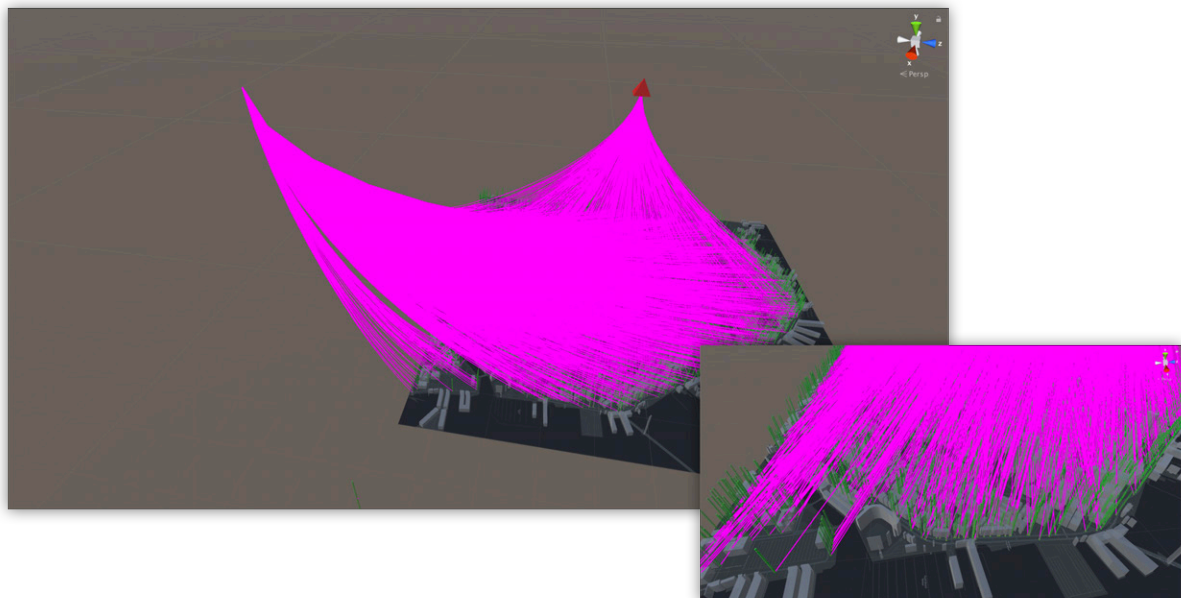
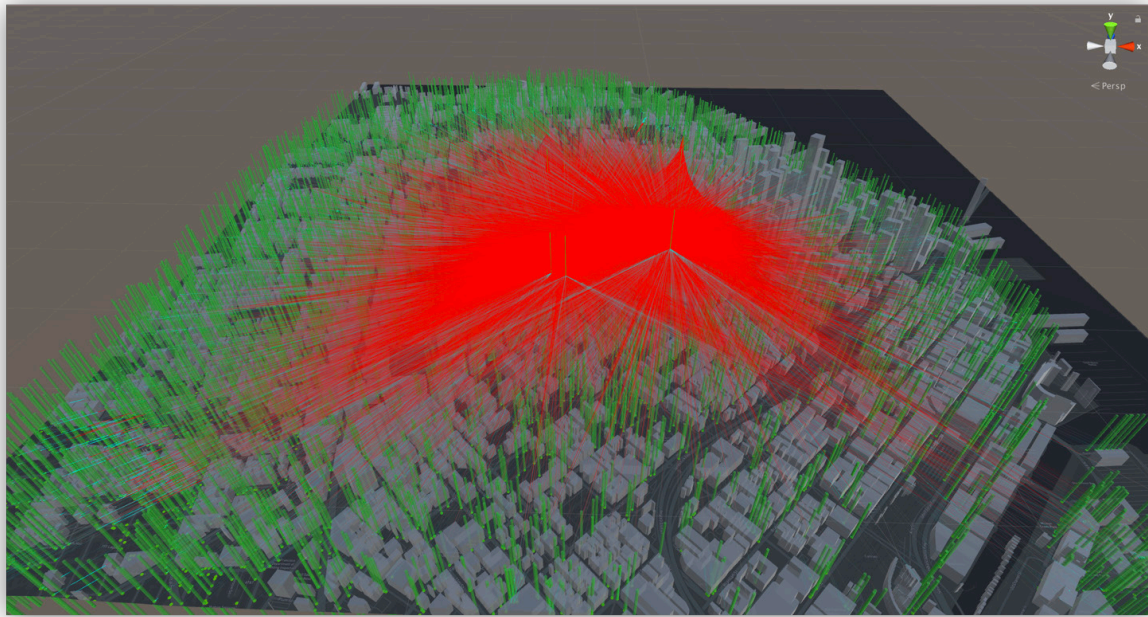
We started to work on our dummy-dataset and created first visualizations to gain insights and generate ideas, but also to try different visualization techniques.



We realized quite fast that we would need to visually cluster the data in some way, due to the vast amount of data-points. The dataset contains around 130.000 street-trees and even if we only looked at a fraction of San Francisco there were thousands of trees on the map.

Well luckily the dataset provides also the kind of the trees. We color-coded the trees by their kind and already it started to be more insightful.

We then started to bring this data into the 3-D space and combine it with further visual cues like a 3-D map. Needless to say that this alone came with quite some challenges. From our first insight that we would need to visualize clusters, we experimented on how we could visualize the centroids of different kinds of trees in 3-D.

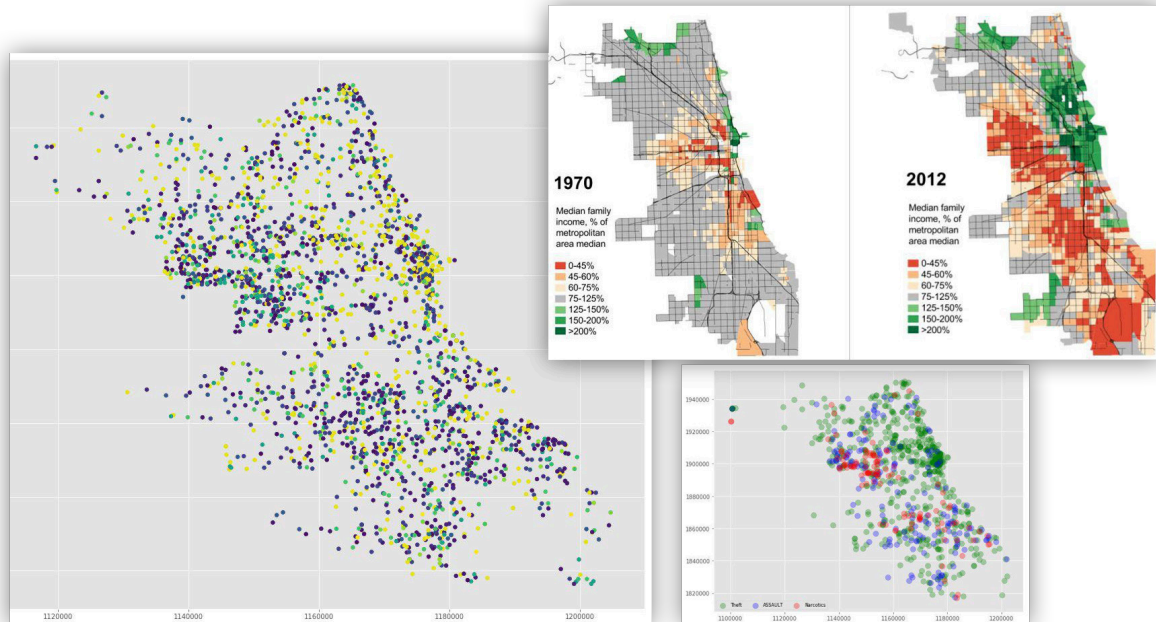


Step 3

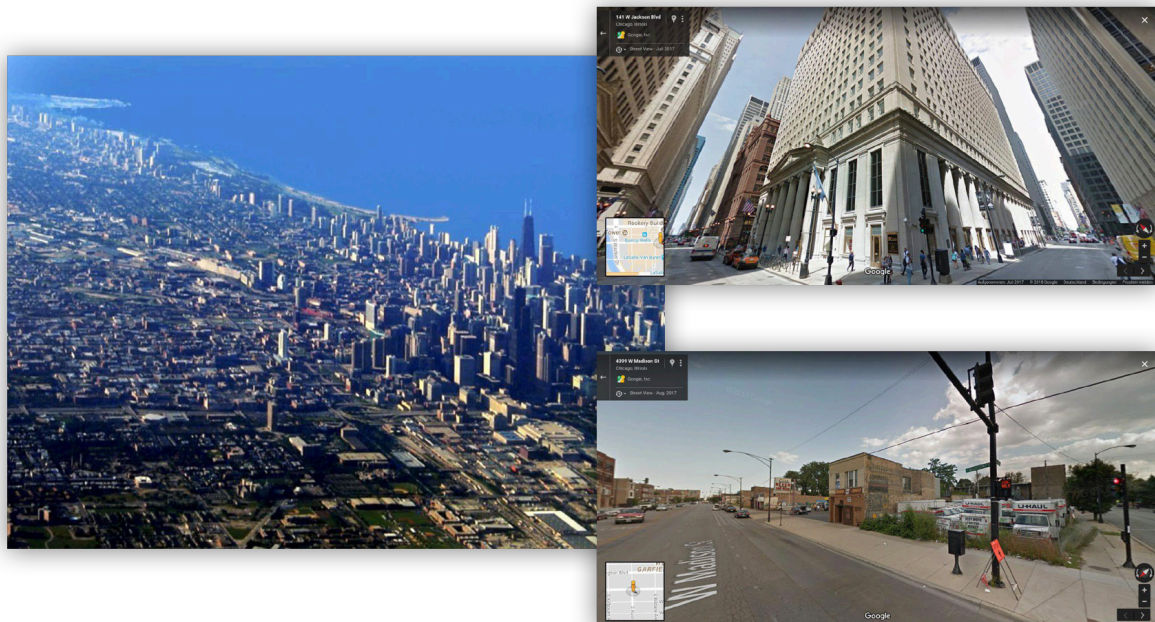
While experimenting with our dummy-dataset we started to understand how this could provide meaningful insights and we also developed an understanding for the criterias, that the dataset should meet.

After quite some research and ideation we found a dataset that shows criminal incidents in Chicago for the past years. We used our so far developed tools and methods to get first

insights into the dataset. Our initial analysis showed, that separating and color-coding the different kinds of incidents immediately showed some astounding insights. In the Picture below you can see how the kind of incidents (especially lower right) corresponds to the median family income from the same area (upper right).

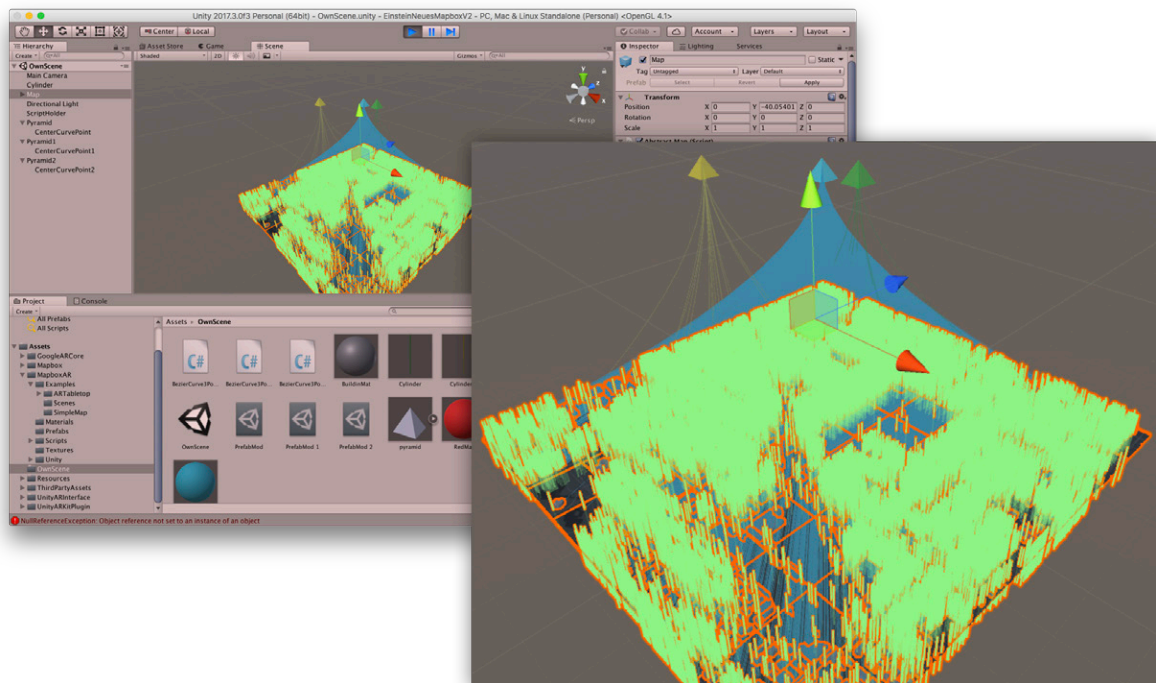
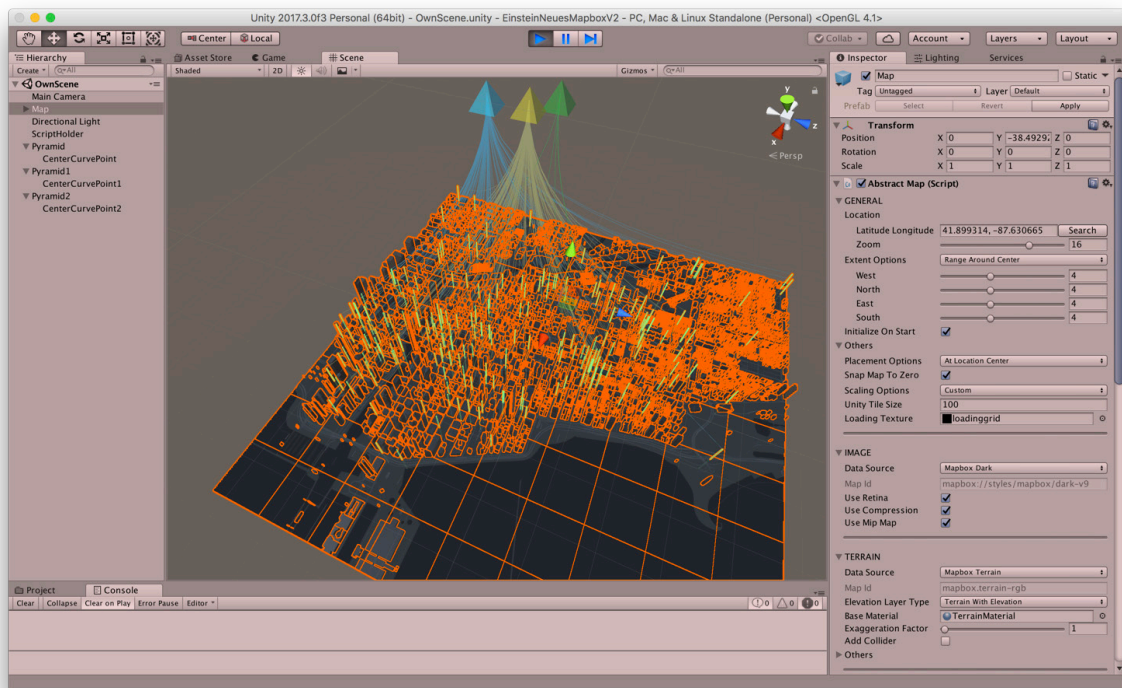


To visualize this even further we went on and used Google's streeviews and picture-search. We also found an areal shot, together with 2 examples of streetviews for the different areas. It is hard to believe, that these are pictures of the same city.



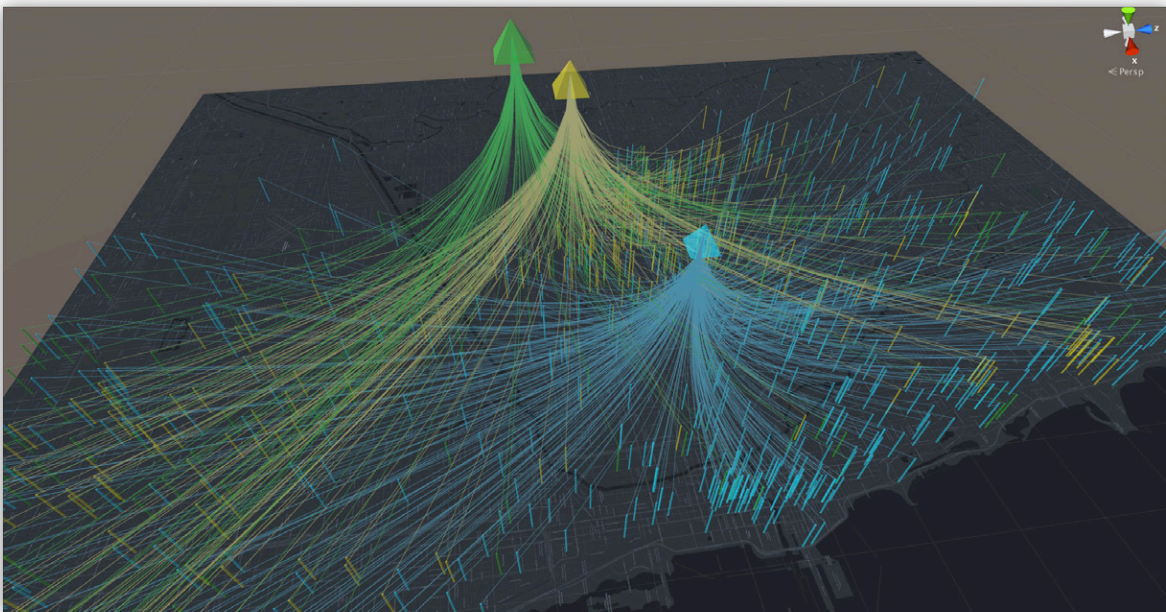
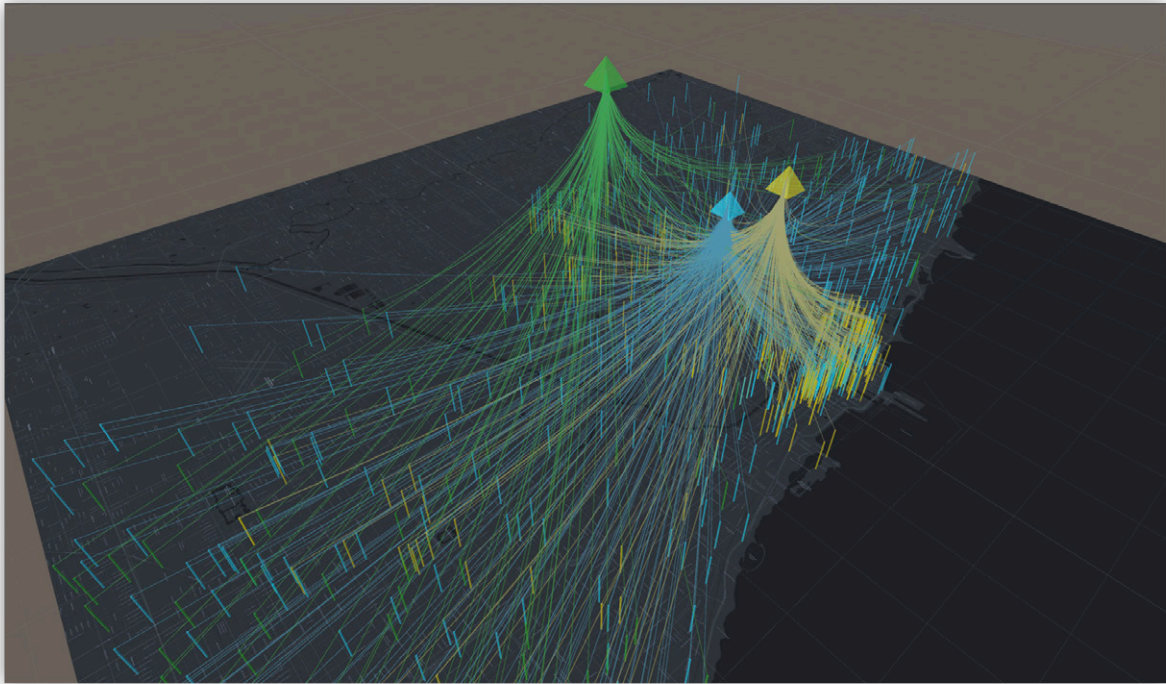
We went ahead with our plan to visualize these in AR-3D. Since we already started to explore this domain with the tree-dataset we didn't have to start from scratch and started

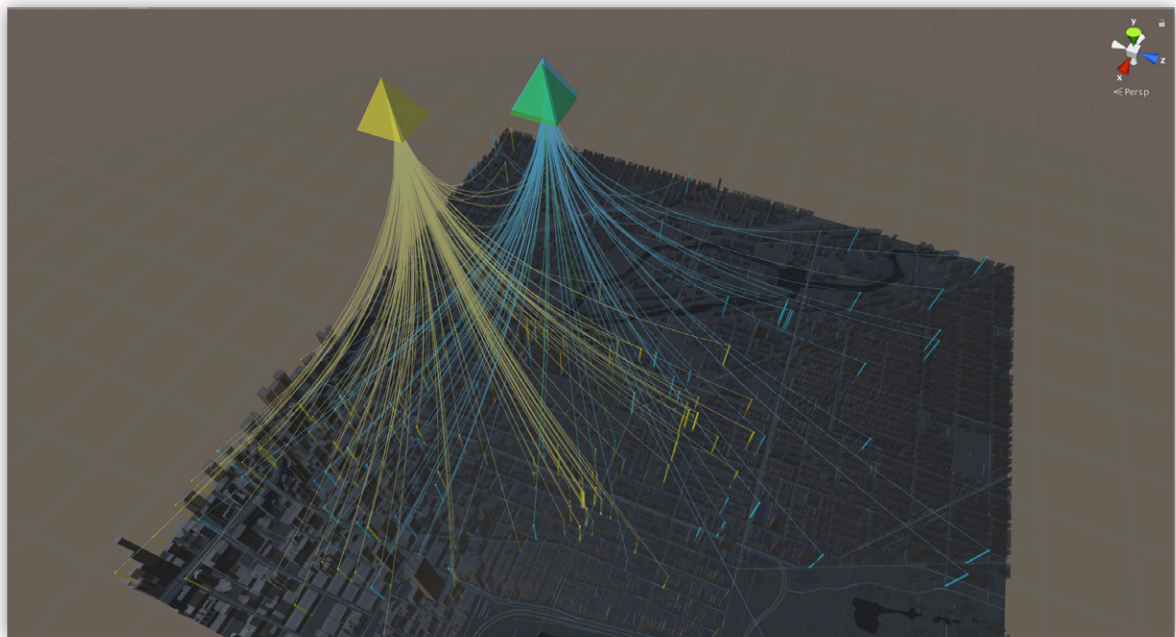
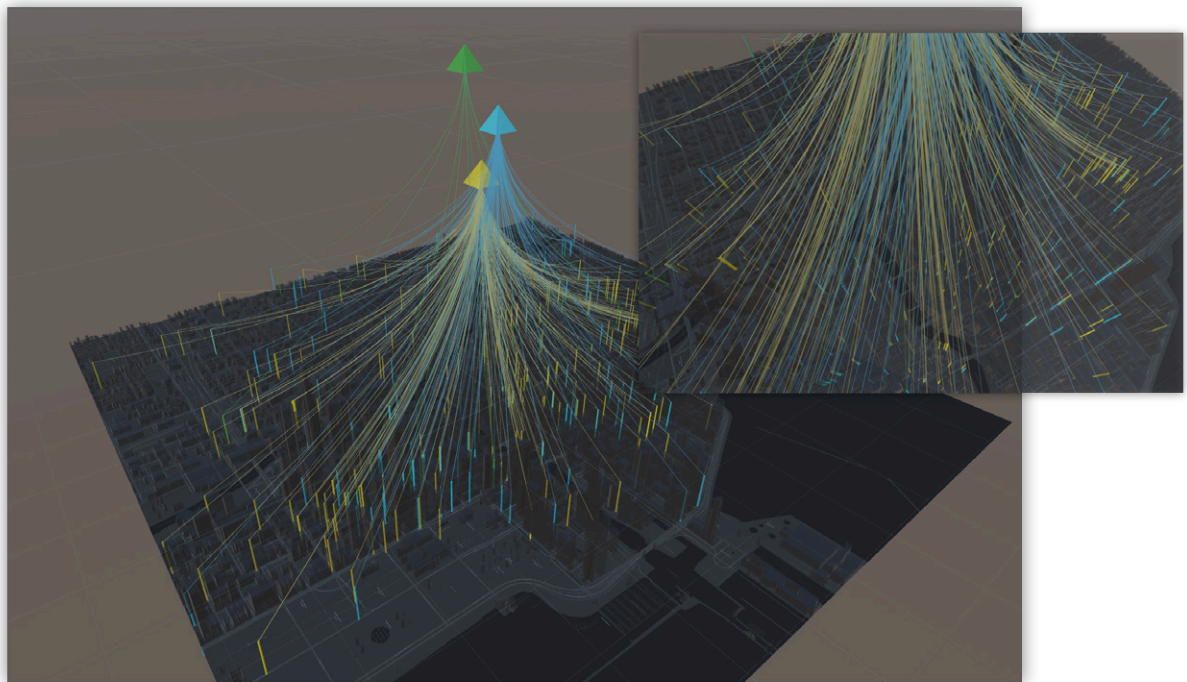
right away with visualizing different clusters (=kinds of criminal incidents) and visualized their centroids. Again there were many other technical challenges involved, but lets not focus on them.



The results showed the three predominant crimes in Chicago. We could see their corresponding centroids and also differentiate them through color-coding. We also mapped the amount of these specific crimes to the height of the centroid-pyramid, but in

a reversed scale. This means, the lower the centroid-pyramid is hovering, the more incidents are connected to it.





Experiencing the visualization in AR



Our Goal was to utilize the quite novel ways one can explore 3-D content through AR on devices like the iPad. It allows for a very natural way of viewing and interacting with a visualisation like that. This is specifically true for the very natural way of zooming, which is very powerful and lets you easily zoom down to the street-names, while still being able to zoom out to see the whole city.

Outview

In the future other potential advantages (that are now still very challenging but will soon be available) might be to share the experience with others in the same room.

Even more interaction could - as it does in interactive 2-D Visualizations - supercharge this even more. It already provides an impressively effective way to view and zoom in on thousands of datapoints. If we now transfer and test our knowledge of interaction, filtering etc. from the 2-D world, there is a lot of potential to improve the accessibility of data.

