Immersion Analytics
a Virtual Cove company

Immersion Analytics Visualizer

Getting Started
Use Examples

Software Version v2022.x

Available integrations include Tableau, Qlik Sense Enterprise, Google Sheets, CSV, Python 3.x & MATLAB. This document focuses on simpler columnar datasets imported using CSV files and use of the .viz format files for reproducing more complex data experiences with ease.

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Key Concepts

Immersion Analytics software enables you to comprehend more complex datasets and tell compelling data stories to educate others.

Big Data refers to the size of a dataset (e.g. # records / rows in a spreadsheet). Much academic and commercial work has gone into advancing the management & analysis of Big Data, typically by machine learning, AI techniques or by dimensional reduction. Now there is another way with great benefits: immersive data visualization. Research demonstrates that experiencing data immersively enables one to achieve equal task efficacy with 3x as many records as those viewing the same dataset using traditional flat screens.

Wide Data refers to the number of dimensions of a dataset (e.g. # of variables / columns in a spreadsheet). Little progress has been made for addressing this data problem, yet it is pervasive. Consider an everyday scatter plot with X & Y axes, size & color to encode four variables of data. If you have a spreadsheet with only 18 columns, you'd need 3,060 unique scatter plots (aka pair plots) to reveal all the interactions. That complexity grows geometrically with each additional column. This intractable problem motivated Immersion Analytics to invent the patented Dimensional Engine™ technology for rendering more dimensions of a dataset on a single plot. Values of each added dimension are visually encoded using intensity of various special effects about each data point e.g. glowing outline, bumpiness of surface, opacity, vibration and more. As a result, those 3,060 unique plots are distilled as one intuitive visualization.

This mind-expanding combination enables you to See the Whole Picture™ your dataset can tell, often for the first time ever, and tell impactful data stories and improve comprehension.

Data Quality refers to the condition of data including its accuracy, completeness, consistency, reliability and being up to date. High quality data is essential for useful visualization. It's important to review your dataset and ensure no values are missing. Also, please ensure there are a consistent number of rows for each column, and a consistent number of columns for each row. This document introduces basic use of Immersion Analytics Visualizer for creating dimensional scatter plots and bar charts from columnar CSV data. Visualizer's .CSV importer creates immersive experiences for dimensional scatter plot and bar chart data visualizations using simple columnar datasets. Datasets must be formatted as CSV (comma-separated values); we also recommend a named header row noting which variable is provided by each column. Please note that the .csv file of interest must not be open in other software such as MS Excel while being loaded into IA Visualizer.

Datasets for this document are obtained on https://www.kaggle.com/, a free website now owned by Google which curates datasets and challenges for data scientists. You will need to Register with Kaggle to access the linked datasets below,
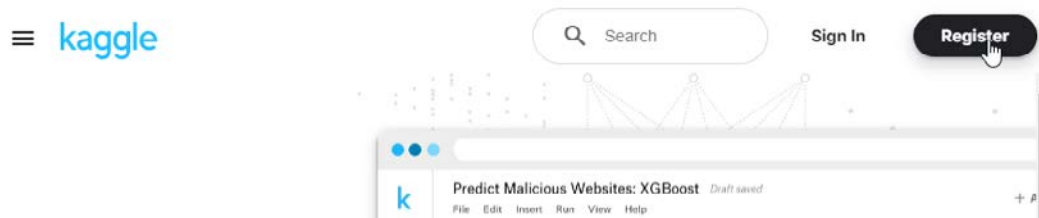
Example 1: Nutritional Information

Objective: This example familiarizes the user with the Immersion Analytics Visualizer interface and .CSV data import capability using an external sourced dataset to create a dimensional bar chart. The following steps should take less than ten minutes to complete.

For this example, please visit https://www.kaggle.com/datasets/crawford/80-cereals and download "cereal.csv"
(may need to sign up or login to Kaggle first, there is no fee required).

This dataset contains approximately 80 cereal products (as rows) with their nutritional characteristics (as columns).

Next, extract archive.zip & place cereal.csv on your desktop

Upon launching Visualizer, you should see the Main Menu. If this does not appear or if you wish to open it later, press "m." From here, select Data. Within the Data menu, select Local CSV file.

From the Local CSV screen, enter C:\Users <enter>
Next, navigate to your username \ Desktop and select cereal.csv

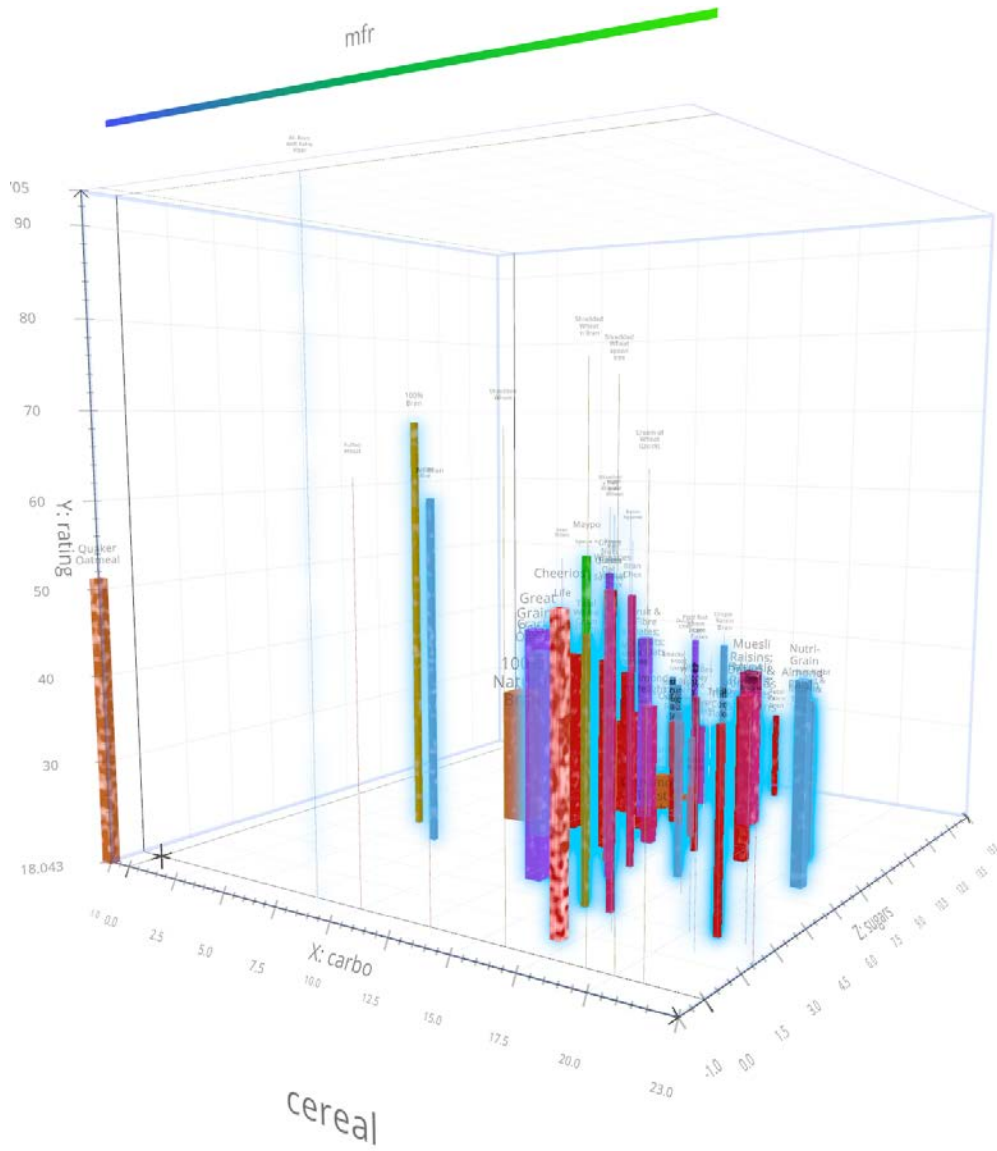At the Import Settings screen, select Bar Chart and accept the other settings, click LOAD

Click Add... next to each variable of interest & select how you'd like it shown, e.g.


To map both X Width and Z Width to fat, simply Add... one then use the green + to add the other.

Note, you can always revisit the Assign Axes & Effects screen via Main Menu → Assign Axes.

You can press < and > keys to make data points or bars comparatively smaller or larger, respectively. The overall plot can be made larger or smaller using the + and - keys which will feel similar to zooming in & out. These actions are independent of your viewing location in space controlled with the mouse wheel or WSADQE keys.

Explore the dataset with your mouse or trackpad. Change your viewing position with three degrees of freedom by holding the left mouse button and dragging or using two fingers on the trackpad. Zoom in or out with the mouse scroll wheel. Alternatively, use the keyboard shortcuts:
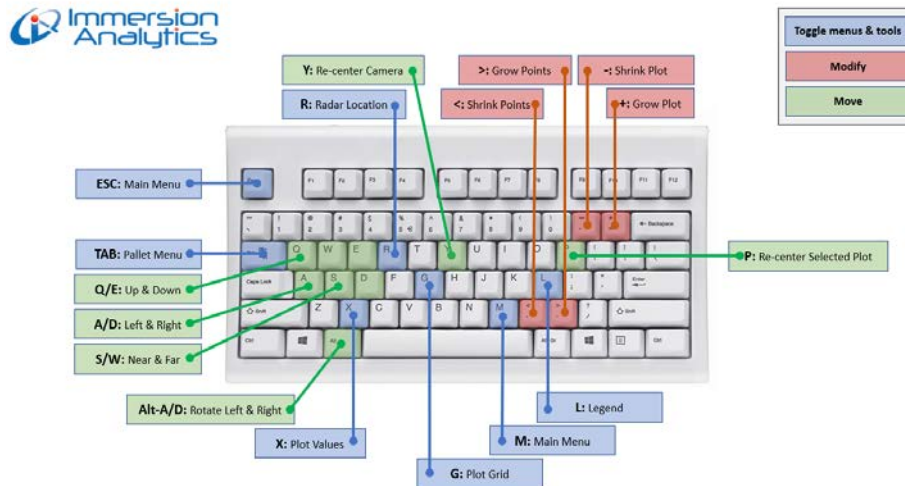
Next, try Main Menu → Manage Variables,
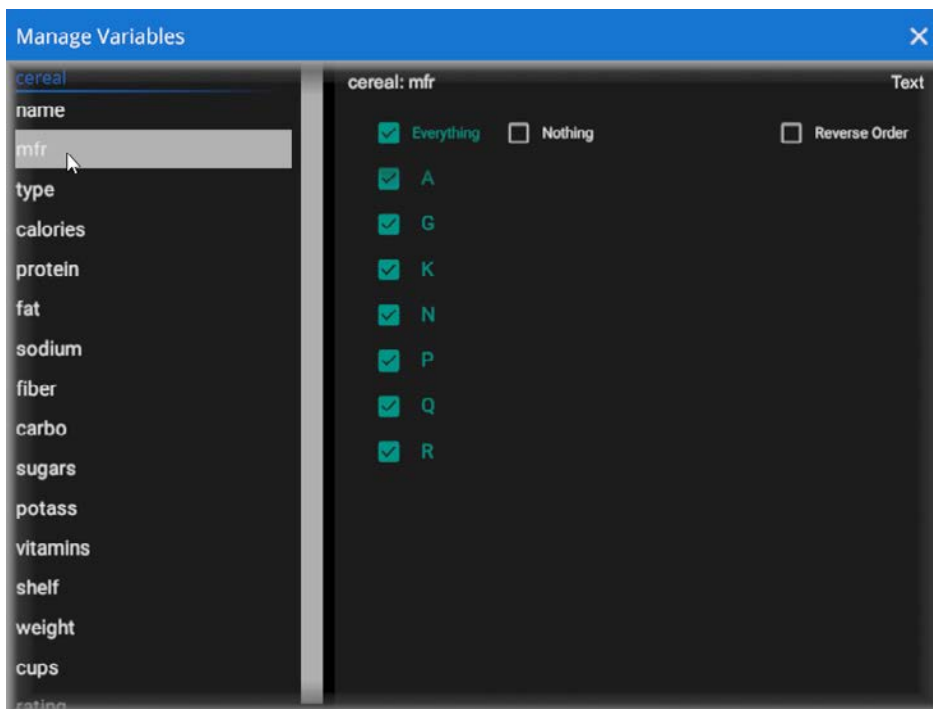
and select mfr (manufacturer) then deselect letters N, P, Q & R to filter out these four manufacturers. Click the "X" (upper right) to revisit the plot with these modifications.

The Manage Variables interface also supports filtering out data ranges, inverting axes, applying exponential scaling and more.

Example 2: Weather

Objective: This example introduces Immersion Analytics' patented Dimensional Engine™ technology and Stepwise Storytelling™ for rendering more dimensions of a dataset. Values of each added dimension are visually encoded using intensity of various special effects such as glowing outline, bumpiness of surface, opacity, vibration and more. The following steps should take less than ten minutes to complete.

For this example, please visit https://www.kaggle.com/datasets/zaraavagyan/weathercsv and download "weather.csv" (may need to sign up or login to Kaggle first).

This dataset contains data for each US county (as rows) with their weather characteristics (as columns).

Next, extract archive.zip & place weather.csv on your desktop

Upon launching Visualizer, you should see the Main Menu. If this does not appear or if you wish to open it later, press "m." From here, select Data. Within the Data menu, select Local CSV file.

From the Local CSV screen, enter C:\Users <enter>
Next, navigate to your username \ Desktop and select weather.csv

At the Import Settings screen, you must indicate which datatypes are used in the .CSV file
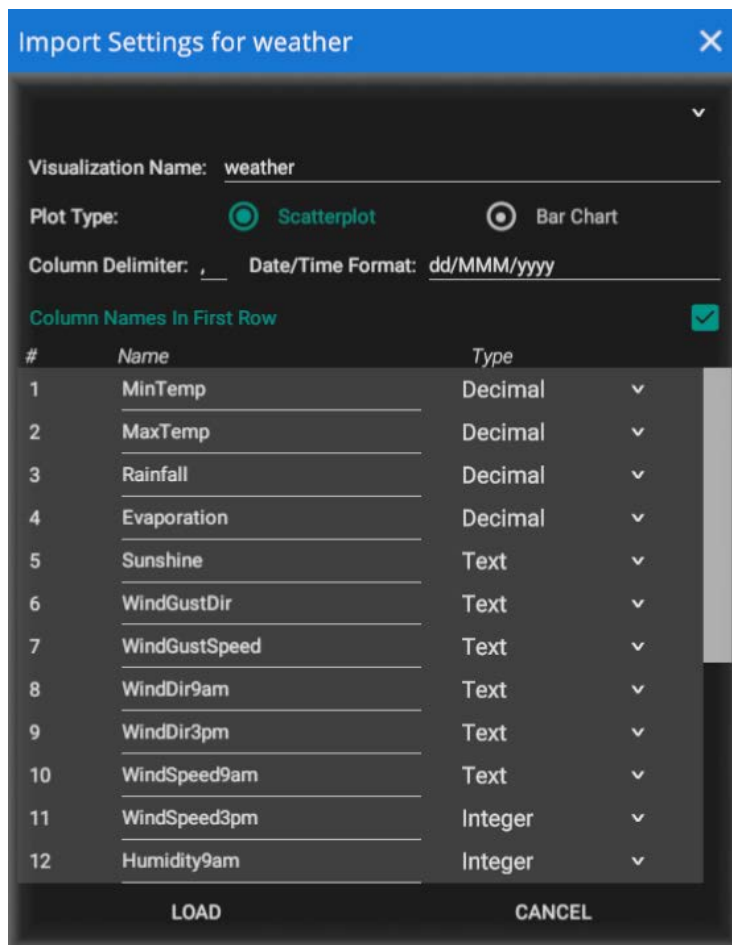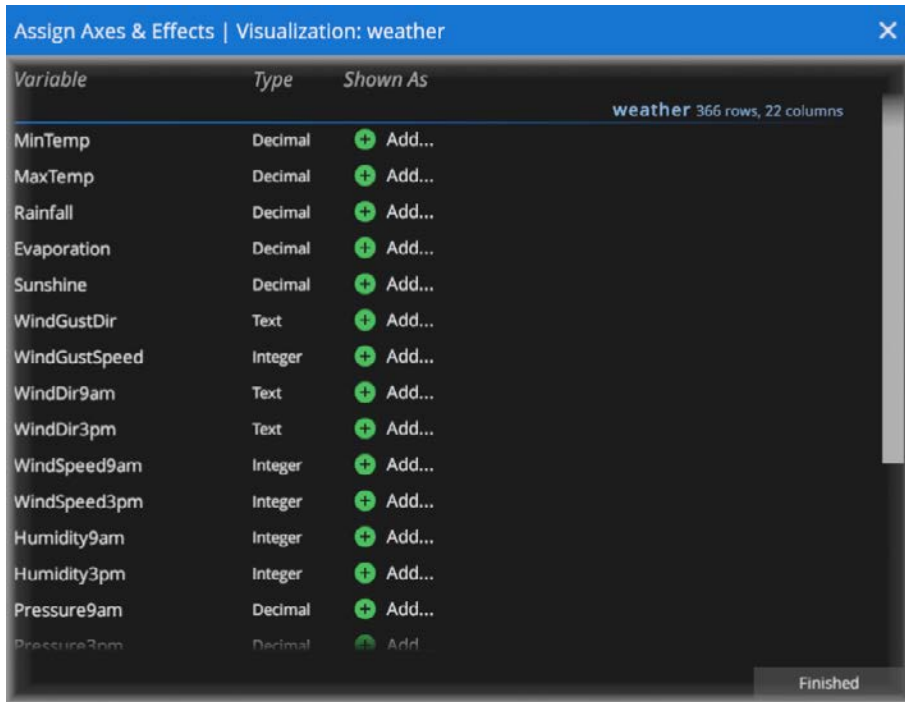

While Visualizer uses standard automatic detection of data types, you must verify and correct as needed, for example when the file contains extra text characters. Decimal data are numerics with a decimal place, Integers are whole numbers (positive and negative), whereas Text is used for categorical data and Date/Time are according to the indicated Date/Time format string. You can learn more about Date/Time format strings here.

When you reviewed the dataset, you'll have noticed that Sunshine is a numeric value with a decimal point. Therefore, on this screen, click the down caret for Sunshine and change its Type from Text to Decimal.
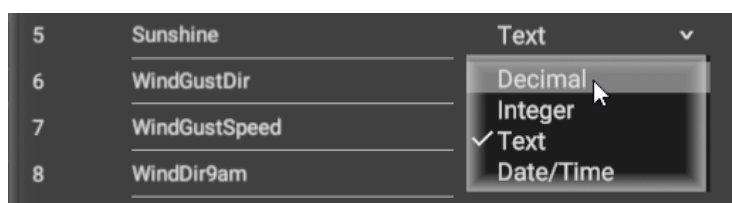
Similarly, you'll have noticed that WindGustSpeed & WindSpeed9am are whole numbers without a decimal, so change Type of both to Integer

Next, click LOAD

Click Add… next to each variable of interest & select how you'd like it shown, we recommend starting with the following "Shown As" values,

Assign Axes & Effects	Visualization: weather		✕

weather 366 rows, 22 columns

| Variable	Type	Shown As	
MinTemp	Decimal	Z	⊕ ⊖
MaxTemp	Decimal	X	⊕ ⊖
Rainfall	Decimal	Satellites	⊕ ⊖
Evaporation	Decimal	Opacity	⊕ ⊖
Sunshine	Decimal	Glow	⊕ ⊖
WindGustDir	Text	⊕ Add...	
WindGustSpeed	Integer	Y	⊕ ⊖
WindDir9am	Text	⊕ Add...	
WindDir3pm	Text	⊕ Add...	
WindSpeed9am	Integer	Height	⊕ ⊖
WindSpeed3pm	Integer	Width	⊕ ⊖
Humidity9am	Integer	Color	⊕ ⊖
Humidity3pm	Integer	⊕ Add...	
Pressure9am	Decimal	Shimmer	⊕ ⊖
Pressure3pm	Decimal	⊕ Add...	
Cloud9am	Integer	Bumpiness	⊕ ⊖
Cloud3pm	Integer	⊕ Add...	
Temp9am	Decimal	⊕ Add...	
Temp3pm	Decimal	⊕ Add...	
RainToday	Text	Shape	⊕ ⊖
RISK_MM	Decimal	⊕ Add...	
RainTomorrow	Text	⊕ Add...	

Finished

(you can always revisit the Assign Axes & Effects screen via Main Menu → Assign Axes)

Notice how many variables / dimensions can be superimposed, this has never been possible before and is powerful for making complex data topics easy to grasp. Prior to this, analysts would attempt to visually examine a geometrically large set of pair plots, the number of unique combinations grows geometrically as dimensions are added making this intractable.
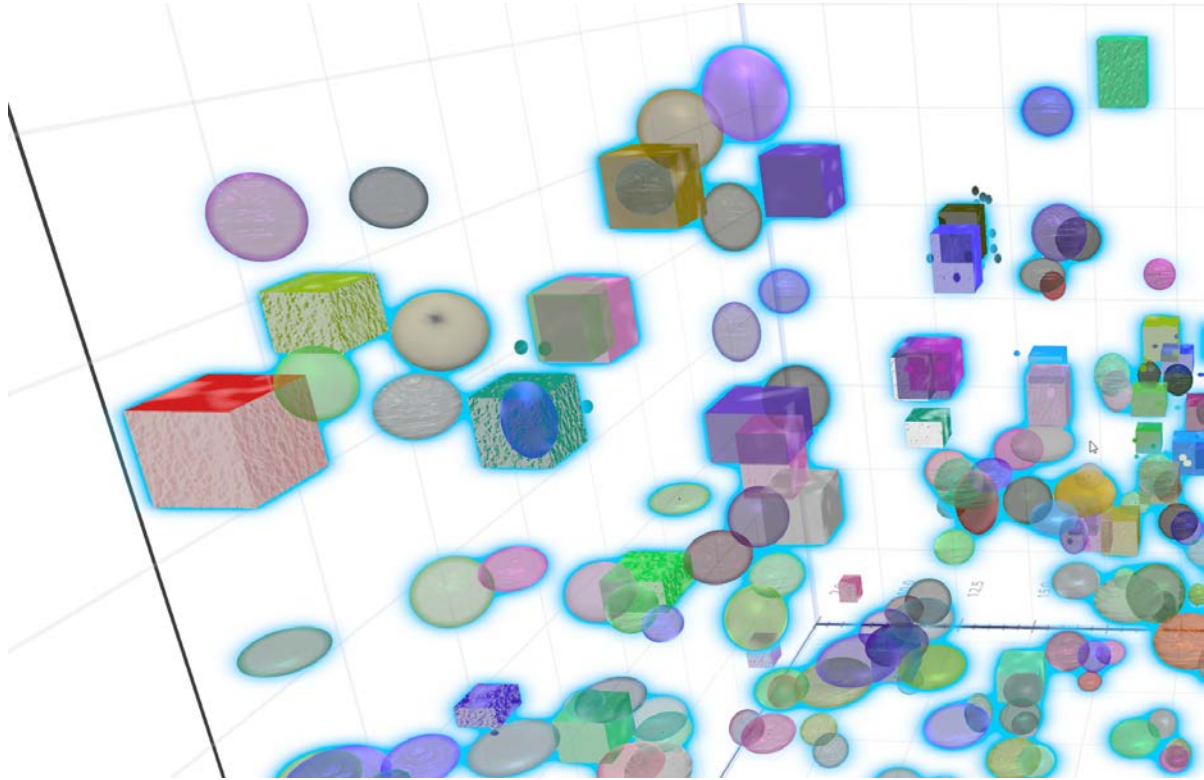
You can press < and > to alter relative point sizes to your preferred scale.
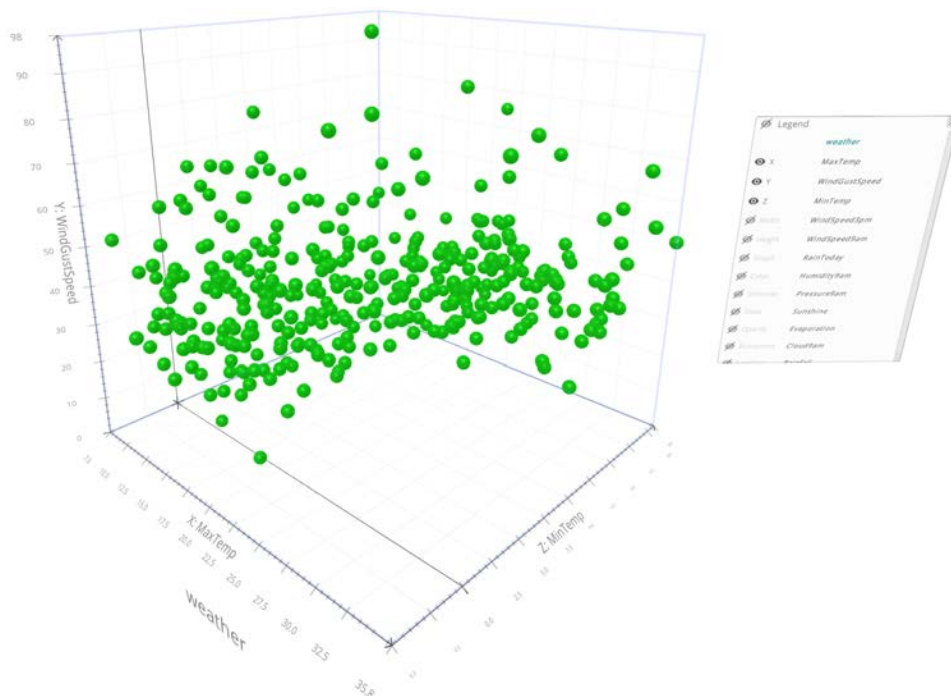
Next, press "L" to bring up the Legend and click the eye icon next to the word Legend (top left)

From the Legend, click the eye icons one at a time. These work as layers, you layer each dimension one at a time to expand perspective on the data. We call the process of revealing these Stepwise Storytelling and this stepwise technique is important for introducing new data topics..

Explore the dataset by moving your mouse or trackpad while holding left button and/or scrolling the scroll wheel to zoom. Alternatively, use the keys W (fwd), S (back), A (Left), D (Right), Q (up) & E (down) to move your viewing position.

Example 3: Health Science

Objective: This example introduces concepts for importing & navigating larger datasets with Visualizer. It also introduces external academic research demonstrating the immersive experience helps users understand 3x as many records of data as is possible using a flat screen or video. The following steps should take less than ten minutes to complete.

For this example, please visit https://www.kaggle.com/datasets/dannellyz/cancer-incidence-totals-and-rates-per-us-county and download the dataset (may need to sign up or login to Kaggle first).

Next, extract archive.zip & place cancer_incidence_by_county.csv on your desktop

Upon launching Visualizer, you should see the Main Menu. If this does not appear or if you wish to open it later, press "m." From here, select Data. Within the Data menu, select Local CSV file.

From the Local CSV screen, enter C:\Users <enter>
Next, navigate to your username \ Desktop and select cancer_incidence_by_county.csv

At the Import Settings screen, you must indicate which datatypes are used in the .CSV file

Import Settings for cancer_incidence_by_county ✕

Visualization Name: cancer_incidence_by_county

Plot Type: ⦿ Scatterplot ⦿ Bar Chart

Column Delimiter: , Date/Time Format: dd/MMM/yyyy

Column Names In First Row ☑

#	Name	Type	
1	Column 1	Integer	∨
2	county	Text	∨
3	incidence_rate_per_100k	Text	∨
4	avg_annual_count	Text	∨
5	recent_trend	Text	∨
6	five_year_incidence_change_rate	Text	∨
7	stateFIPS	Integer	∨
8	incidence_rate_per_100k_low_95	Decimal	∨
9	incidence_rate_per_100k_high_95	Decimal	∨
10	five_year_incidence_change_rate_l	Decimal	∨
11	five_year_incidence_change_rate_h	Decimal	∨

LOAD   CANCEL

On this screen, click the down caret for incidence_rate_per_100k and change its Type from Text to Decimal.
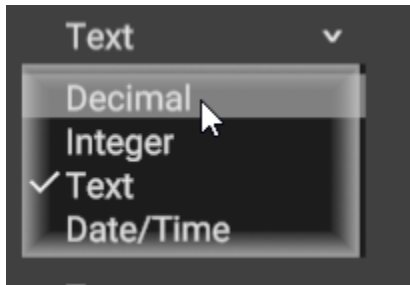
Similarly, change five_year_incidence_change_rate to Decimal and avg_annual_count to Integer.

Next, click LOAD

At the Assign Axes & Effects screen, Click Add... next to each variable of interest & select how you'd like it shown, we recommend starting with the following "Shown As" values,
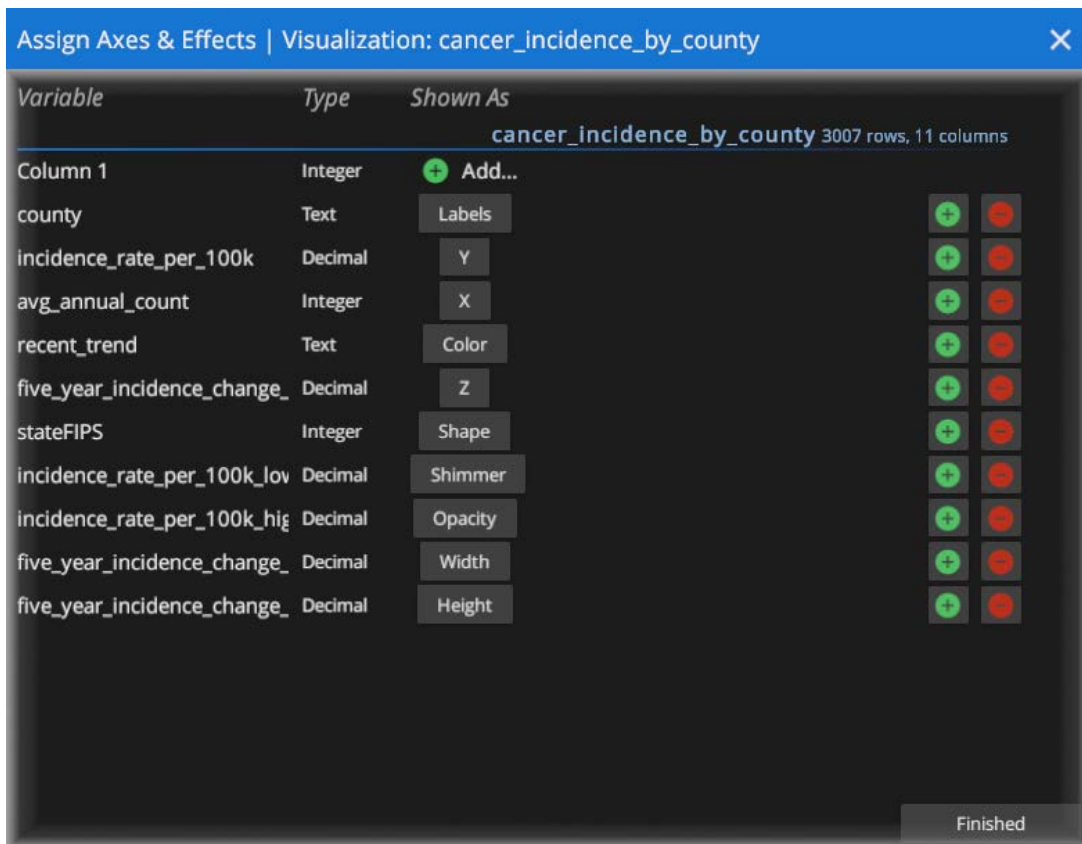

(you can always revisit the Assign Axes & Effects screen via Main Menu → Assign Axes)

This is a larger dataset (has more rows than traditional plotting packages can visualize). As there are many records, the dataset will load with many data points overlapping (i.e. clumped together)
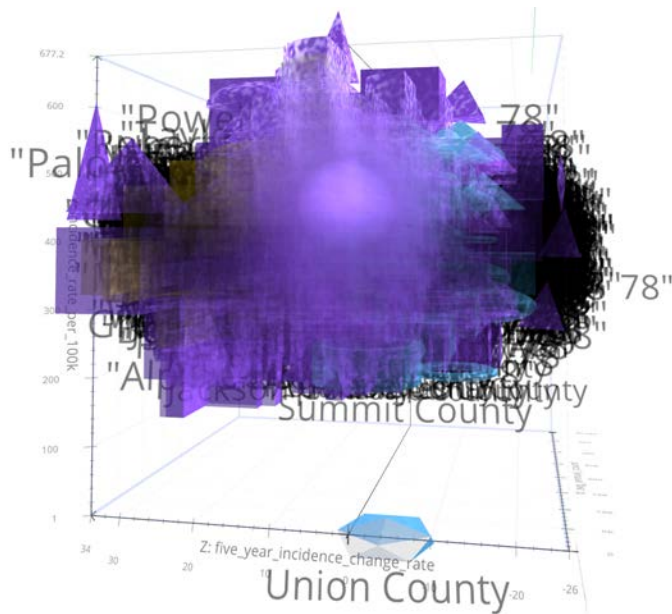
To resolve this, press the < key multiple times to alter relative point size to your preference e.g.
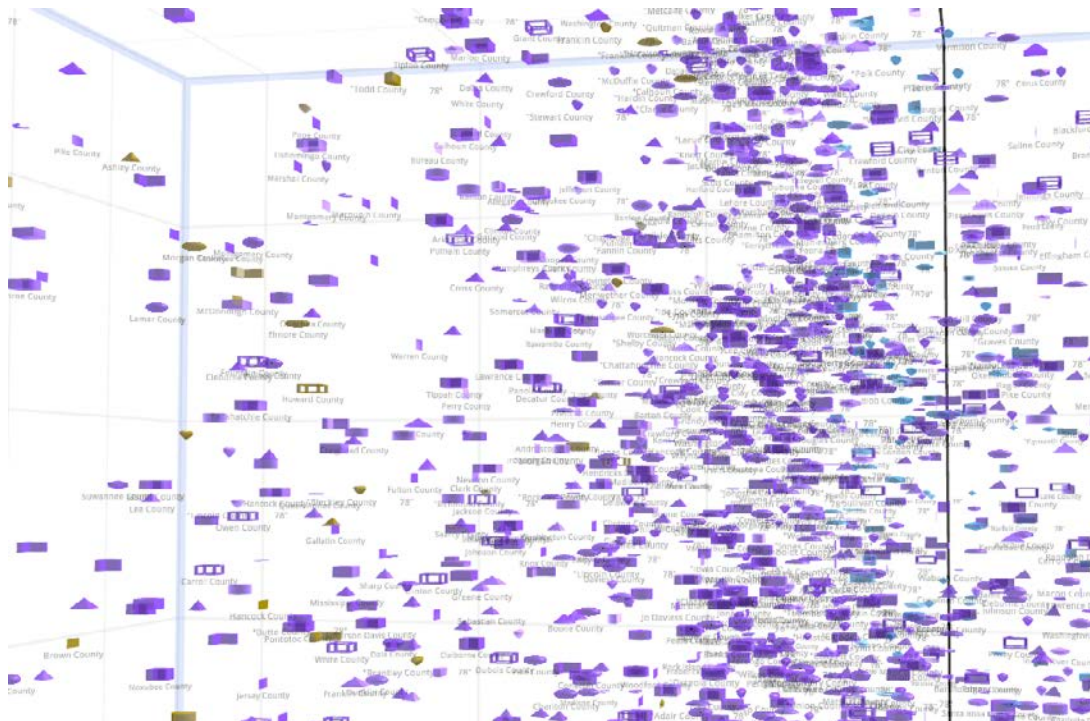
As you'll see, navigating into the data to examine sections in detail is key. Mouse & scroll wheel, WSADQE keys and stylus/pointer are helpful here.

Example 4: Population Dynamics

Objective: This example introduces visualizing time series data as an animation created using our Python integration for data scientists via the portable .viz file provided to help non data scientists reproduce this data experience for others. The following steps should take less than ten minutes to complete.

For this example, we have used our more advanced Python integration to prepare a self-contained file to replicate an animated time series data experience based on data from the World Bank. Immersion Analytics encapsulates immersive data experiences in a .viz file – these are analogous to what .pdf files are for documents.

For this example, please download the World Bank Income-Life.viz file here.

As configured, this dataset examines size, income, life expectancy, agriculture industry, sanitation, mean years in school and cell phones per 100 people.

Once downloaded, place the World Bank Income-Life.viz file into
c:\users\<<username>>\Immersion Analytics\

This will now appear in Main Menu → Experiences → Open. Selecting it recreates the following immersive data visualization,
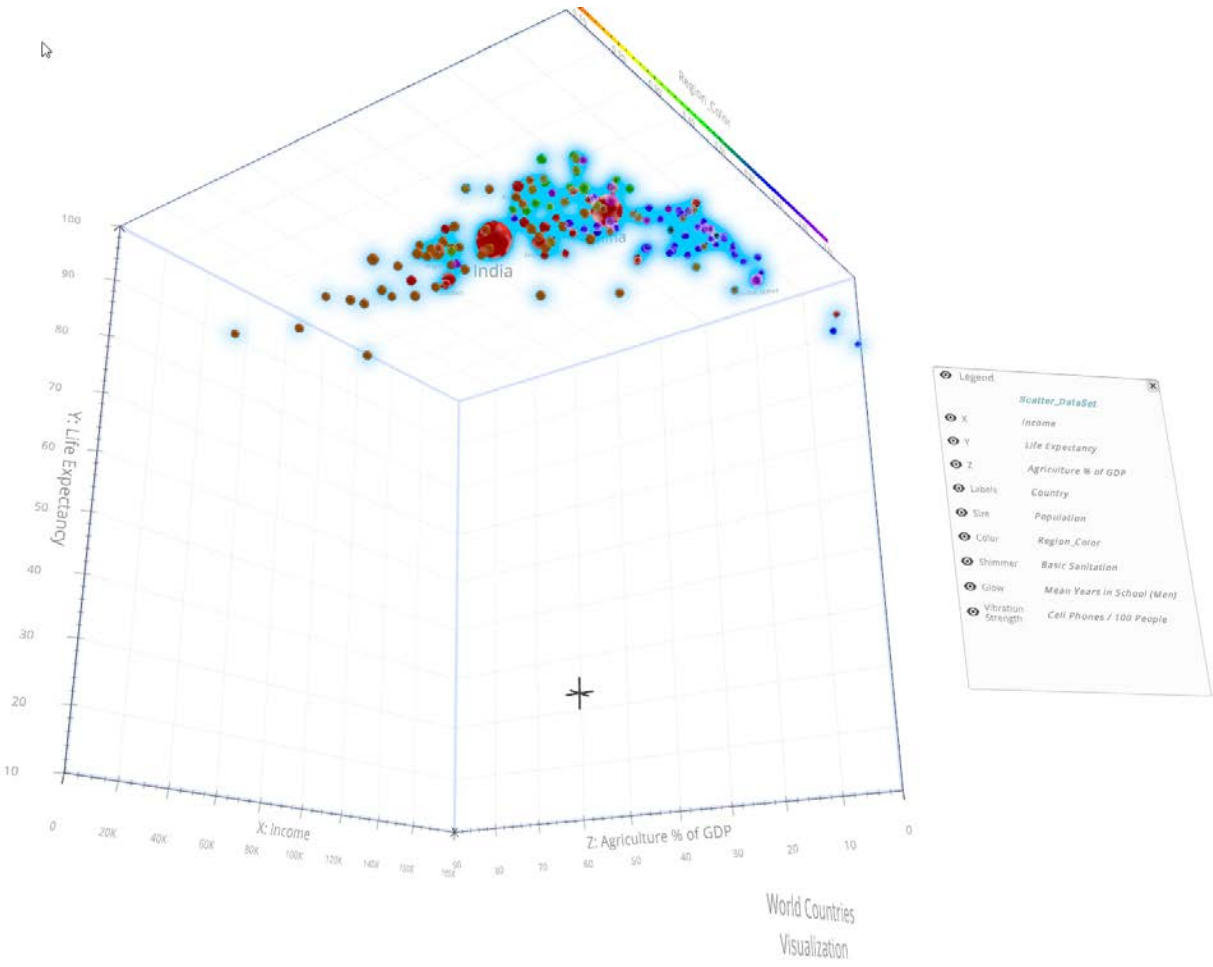
On the bottom of the display you will see a playbar. Unlike playing back videos, this will recreate a timeseries animation of the actual dataset you are able to interact with in realtime.

Click the play button (bottom left),

and notice the many countries in this dataset now move about over time.

You can alter how quickly Visualizer animates the dataset using Main Menu → Settings → sliding the "Animation Duration" slider (left = faster, right = slower)

Creating Reproducible Immersive Data Experiences

You may wish to create repeatable immersive data experiences for your audience. With your visualization as you want it seen, open the Main Menu ("m" key) and click Experiences. From this menu, select Save Visualization As… (and give it a name). This name will now appear in Main Menu → Experiences → Open. This will reproduce the visualization at the state you had saved it.

On some devices, Main Menu → Experiences → Record New Experience will also let you narrate verbally via device microphone and control laser pointer and interactions for replay. This capability is useful for creating guided data experiences and data storytelling.

Each saved immersive data experience is saved as a .viz format file on your hard drive at c:\users\<<username>>\Immersion Analytics\. You can email .viz files or copy to others' workstations where Visualizer has been licensed to reproduce your immersive data experience.

Advanced Visualizations

This document has introduced basic usage of the Immersion Analytics product line for creating dimensional scatter plots and bar charts from columnar CSV data.

Advanced Visualizations. Due to limitations on data types CSV files are able to represent, Immersion Analytics also offers advanced integrations including our Python & Runtime APIs. These are required to create data visualizations including time series (DataTube™, historical animations and real-time streaming data feeds), dimensional network graphs and dimensional surface visualizations, since each represent datasets more complex than simple tabular formats like CSV can encode.

These integrations and our APIs are documented elsewhere and are intended for data science users familiar with programming. Additional documentation can be provided on request and is appropriate for those comfortable with programming in Python 3.x and/or for software vendors incorporating Immersion Analytics technology into products they already offer.

Legal

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