CODE-ALONG WITH US

Data Science Edition

Data Viz

Paul Tsagaroulis & Matt Albucher

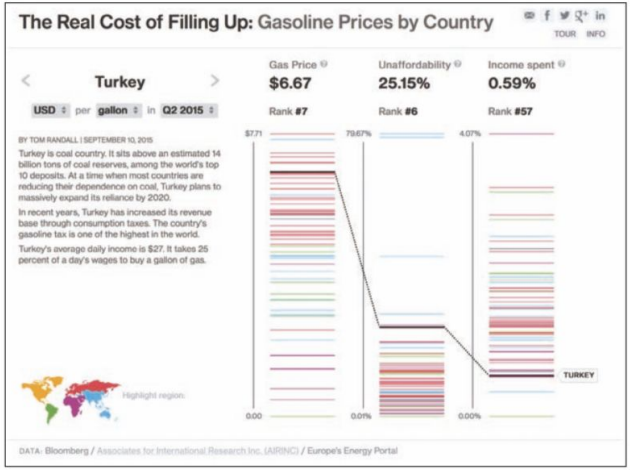
Data visualization
Introduction

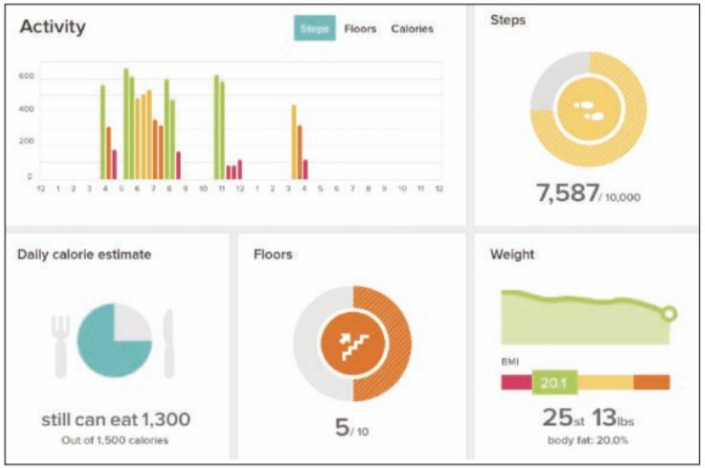
Graphs & charts
For comparison, distribution,
composition, and relationships

Visual analytics using  & 

Open data demo

Data visualization is everywhere





From ***Good Charts: The HBR guide to making smarter, more persuasive data visualizations*** by Scott Berinato

Benefits of data visualization

Having pictures in the analytic story is key to effective communication

We process graphs and images faster than text, which is why visualization is so effective

Good Charts: The HBR guide to making smarter, more persuasive data visualizations by Scott Berinato

Visual information representation

Graphical excellence

The greatest number of ideas, in the shortest time, using the least amount of ink, in the smallest space

Visual integrity

Neither distort the underlying data nor create a false impression or interpretation of that data

Data-ink ratio

Pay attention to how a visualization is compiled: Unnecessary elements should be removed

Aesthetic elegance

Simplicity of the design evoking the complexity of the data clearly

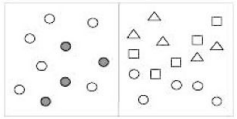
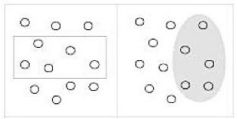
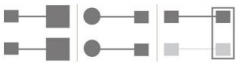
The visual display of quantitative information by Edward Tufte

Gestalt principles of perception

We organize what we see to make sense

The whole is other than the sum of the parts

To understand visual perception in the underlying processes are organized to help us make sense of the world.

Proximity		Objects are close together
Similarity		Objects sharing similar attributes (e.g., color or shape)
Enclosure		Objects with a boundary around them (e.g., formed by a line or area of common color)
Closure		Open structures are perceived as closed, complete, and regular
Continuity		Objects aligned together or appear to be a continuation of one another
Connection		Objects that are connected (e.g., by a line)

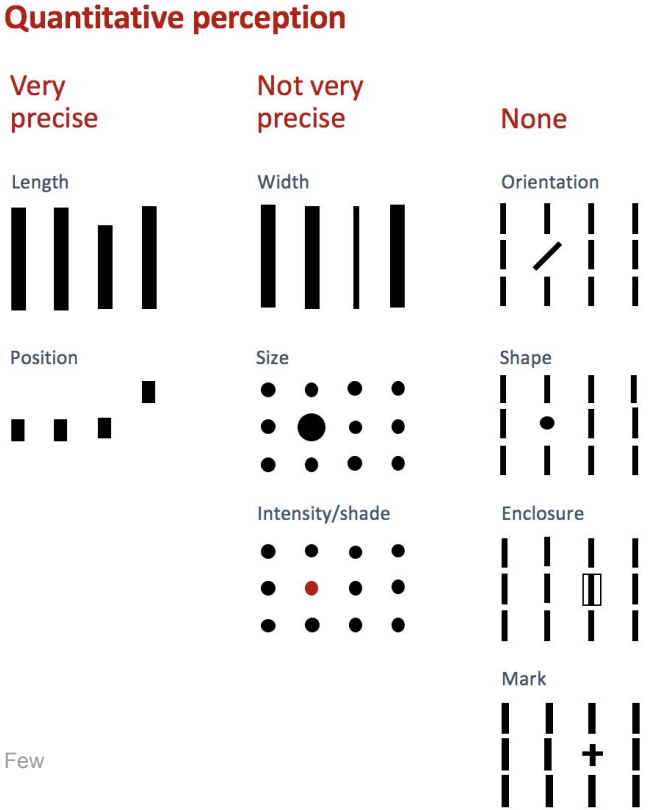
Preattentive visual properties

Preattentive attributes are properties which are detected almost immediately without effort or extra processing by the brain

Quick, effortless, and in parallel; without any attention being focused on the display

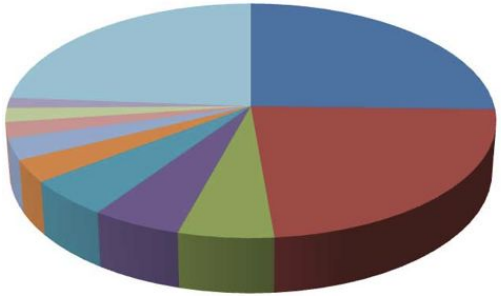
Color, form, movement, and space

Length, position, width, size, intensity/shade, orientation, shape, enclosure, position, mark

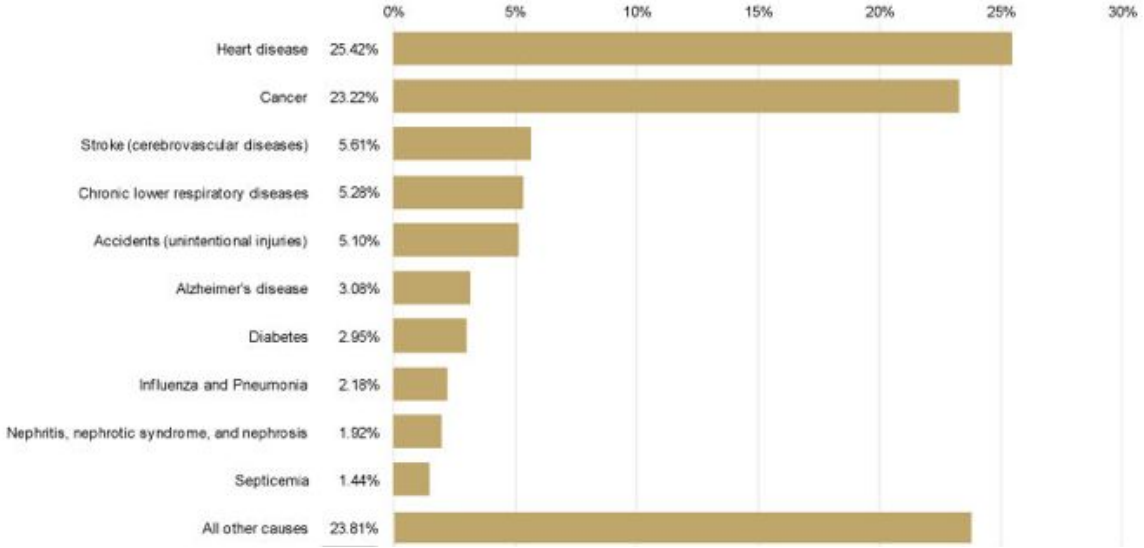


Data visualization for human perception by Stephen Few

Design principles in action



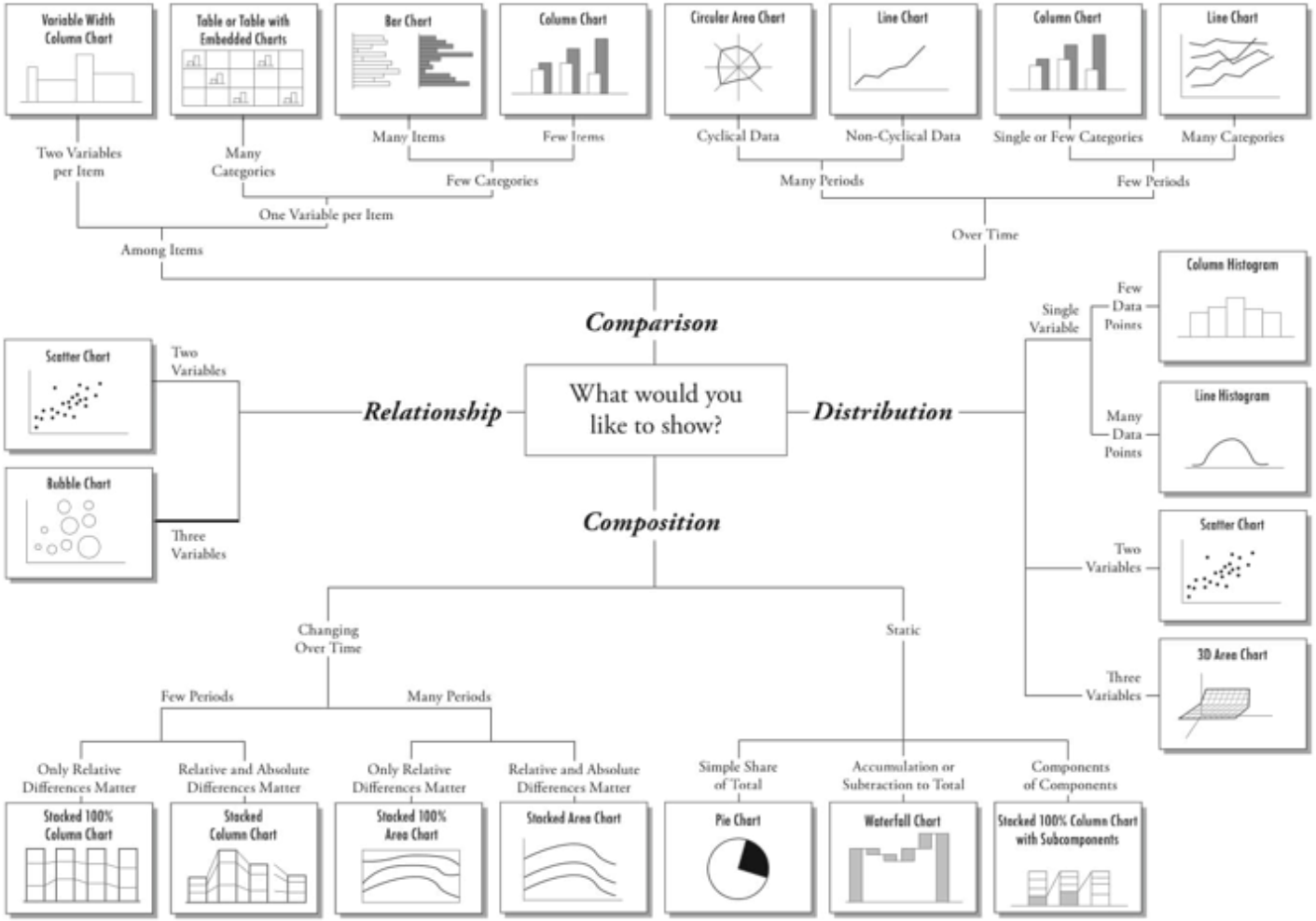
- Heart disease
- Cancer
- Stroke (cerebrovascular diseases)
- Chronic lower respiratory diseases
- Accidents (unintentional injuries)
- Alzheimer's disease
- Diabetes
- Influenza and Pneumonia
- Nephritis, nephrotic syndrome, and nephrosis
- Septicemia
- All other causes



Total Deaths in America by Cause in 2007 via IDF

Graphs & charts

Chart Suggestions—A Thought-Starter



Comparisons

Bar/column charts can be used for analyzing data happening at a static point in time. Bar charts are easily evaluated by examining the length of the bars; column charts are vertical.

Line graphs can be used to display data or information that changes continuously, and allow us to compare how the data for different attributes changes over a period of time.

Pie charts are used to compare the parts of a whole. The graph is divided into several sectors, and the area in each sector shows the proportion they represent from the whole.

Distributions

Histograms allow you to quickly assess shape, centering, and spread of distribution for a continuous data set. For categorical (nominal or ordinal) variables, bar charts are often used.

Line charts are the most frequently used charts and are used for continuous data sets. They are well accommodated for trend-based visualizations of data when the number of data points is very high.

Composition

Line charts can accommodate the time component in an axis; it is useful for analyzing the trends of data over a period and useful for facilitating trend analyses.

Dual-axis is a special category of line charts. There are two independent axes that are layered on top of each other. These are useful when you have two measures that have different scales.

Area chart are the same as line charts however, the area below the plotted lines is filled with color.

Relationships

Scatter plots show how much one variable is affected by another. The relationship between two variables is called their correlation.

Bubble charts are a variation of a scatter plot in which the data points are substituted with bubbles. The size of the bubbles can form a new dimension of the data.

Line charts can also be used for analyzing the relationships over a period of time.

Visual analysis in R / Python with open data demo

Using R / Python for Data Vis

A picture says more than a thousands words

Visualized data can often be understood more efficiently and effectively than the raw numbers alone.

R and visualization are a perfect match.

Some must-see visualization packages are ggplot2, corrplot, ggvis, googleVis and rCharts.

Visualizations are an important criteria when choosing data analysis software.

Although Python has some nice visualization libraries, such as Seaborn, Bokeh and Pygal, there are maybe too many options to choose from.

CRAN hosts an exponentially growing number of data visualization packages posted by worldwide users for a wide array of visualization applications.

R vs Python for Data Science: The Winner is… by Martijn Theuwissen

Data | GSA Open Technology

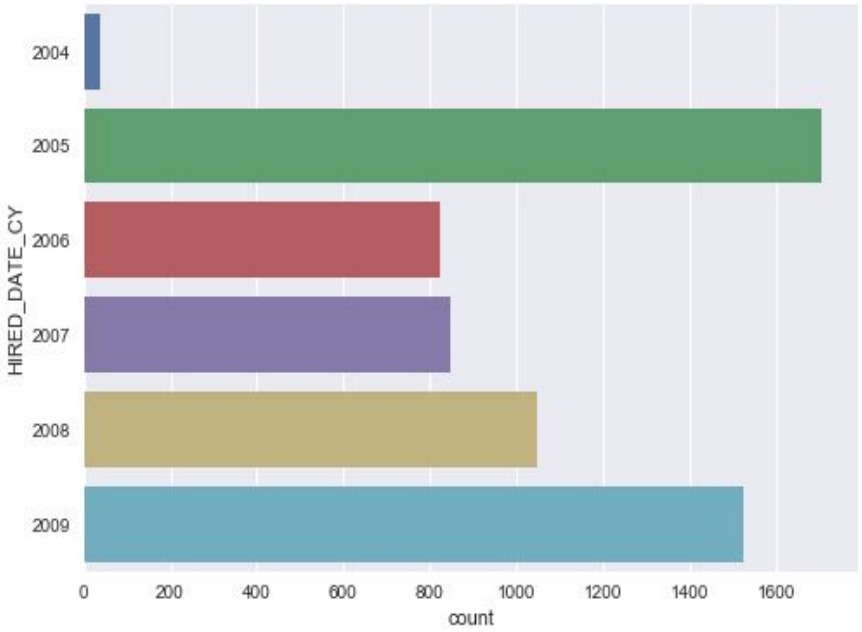
Time to Hire

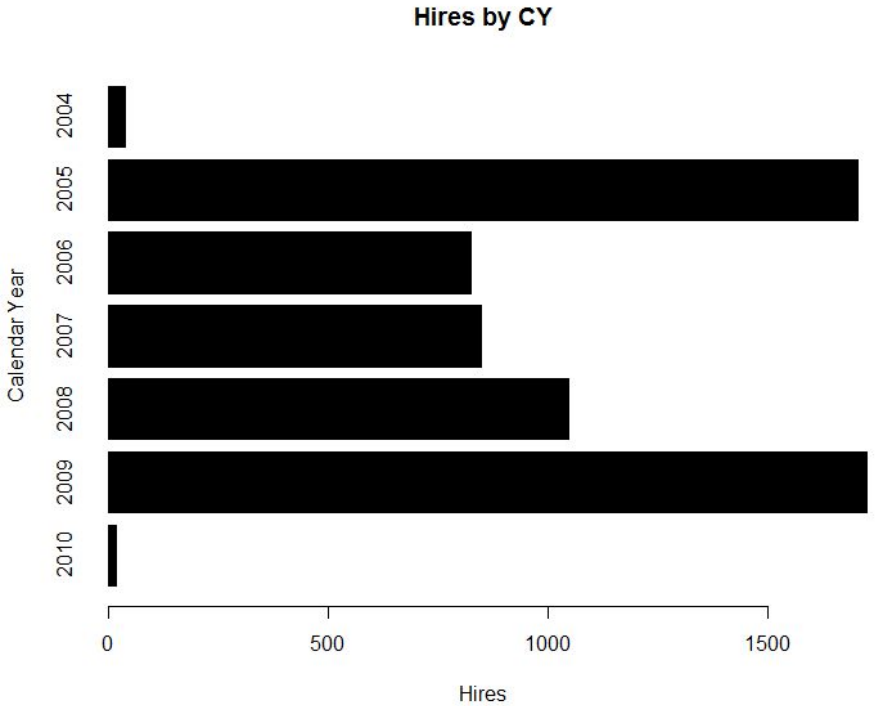
This dataset represents time taken to hire a GSA employee from the internal request to hire through the entry on duty of the of the selected individual.

View Project

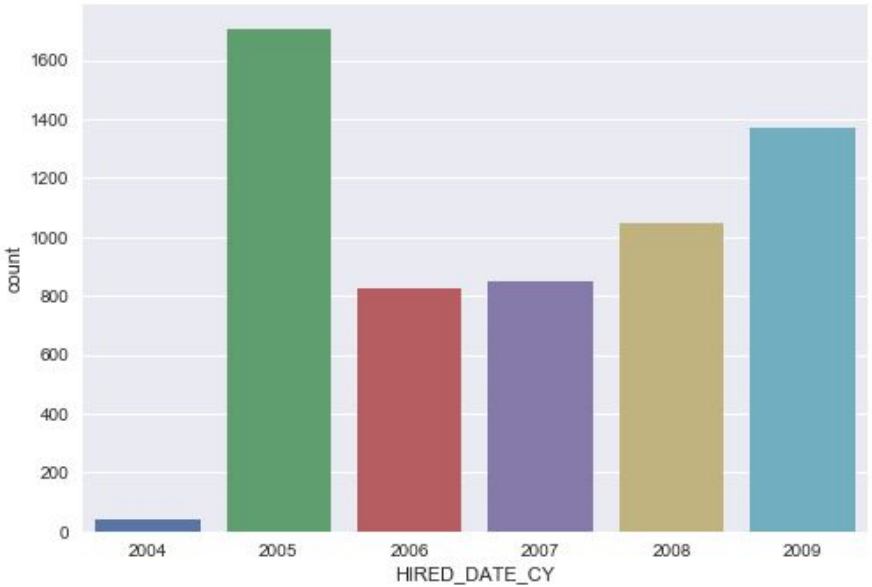
https://open.gsa.gov/data/

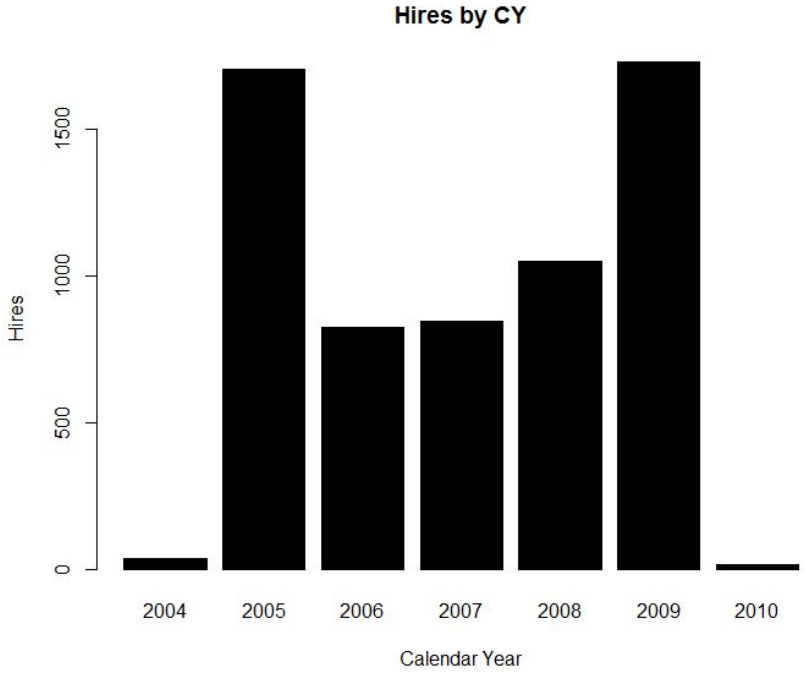
Comparisons: Column graph



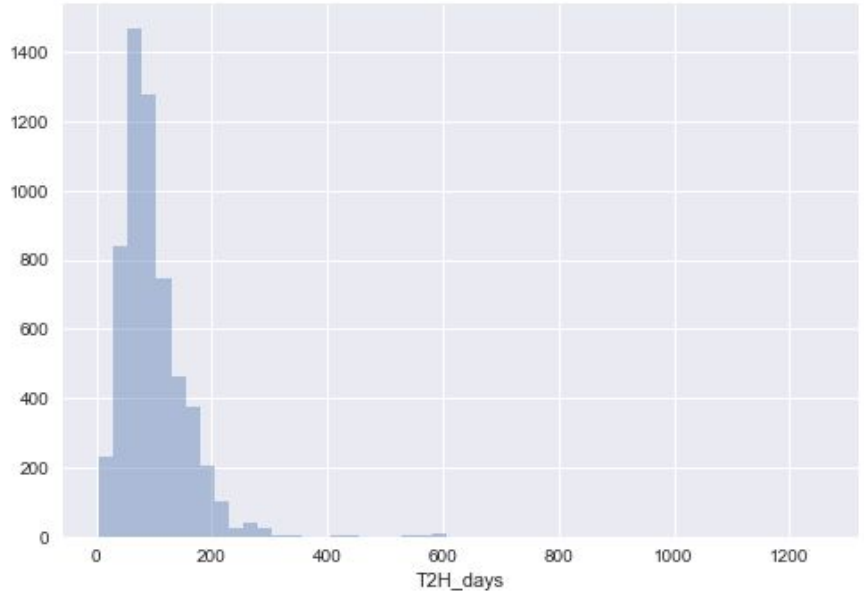


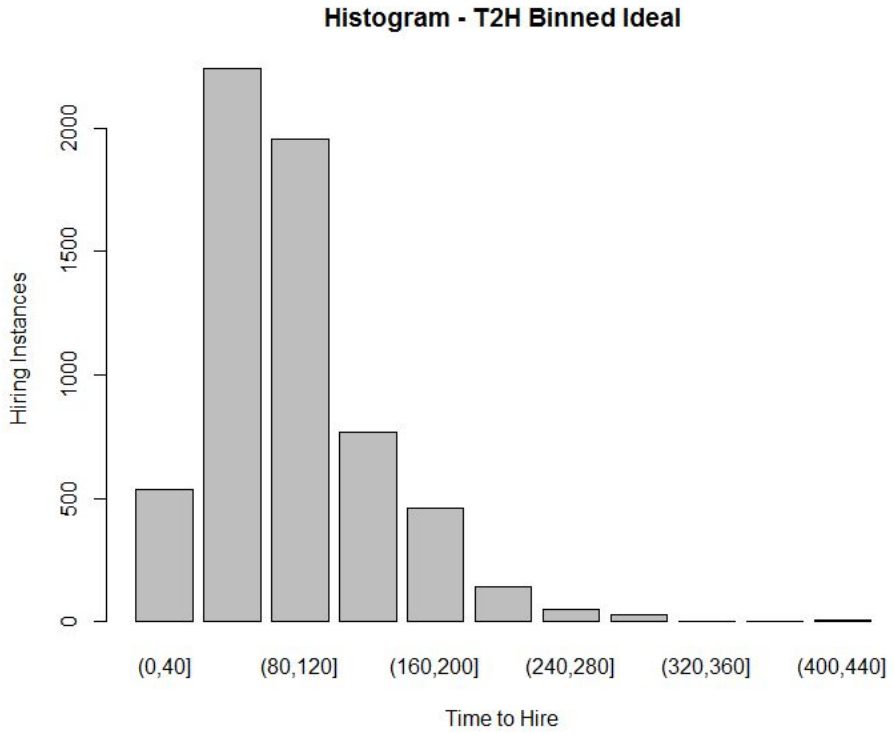
Comparisons: Bar graph



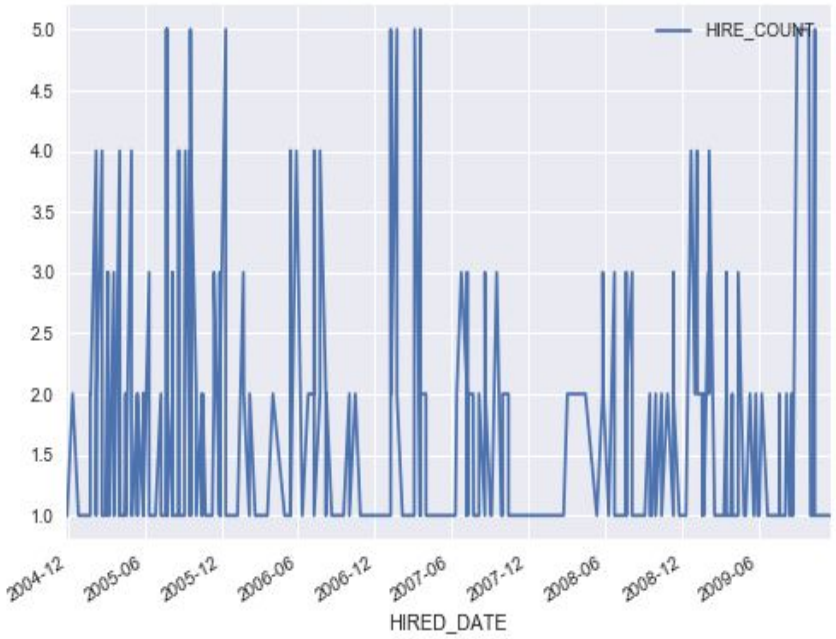


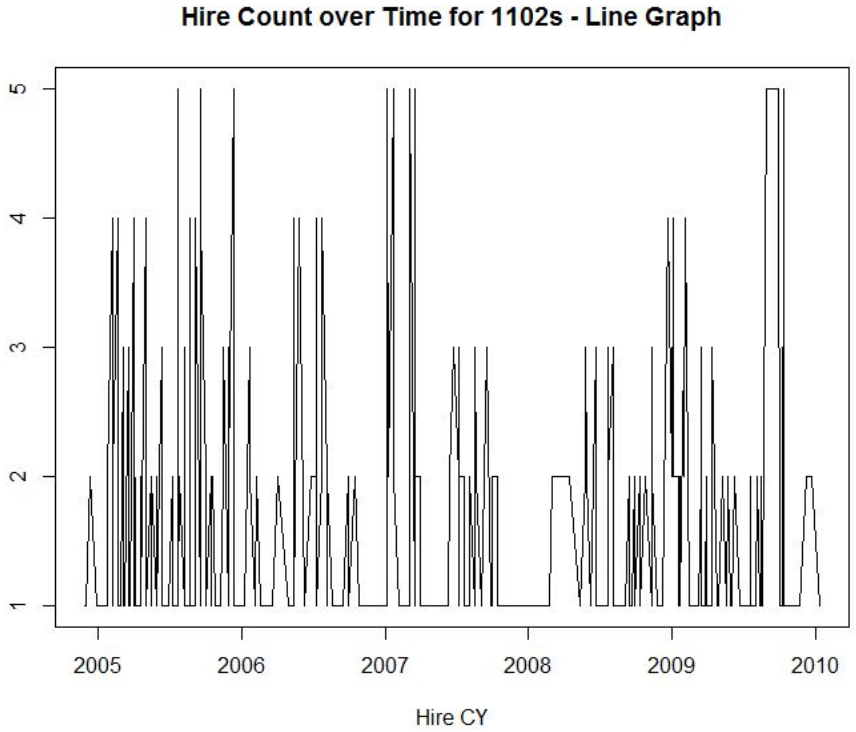
Histogram: Time to hire measure



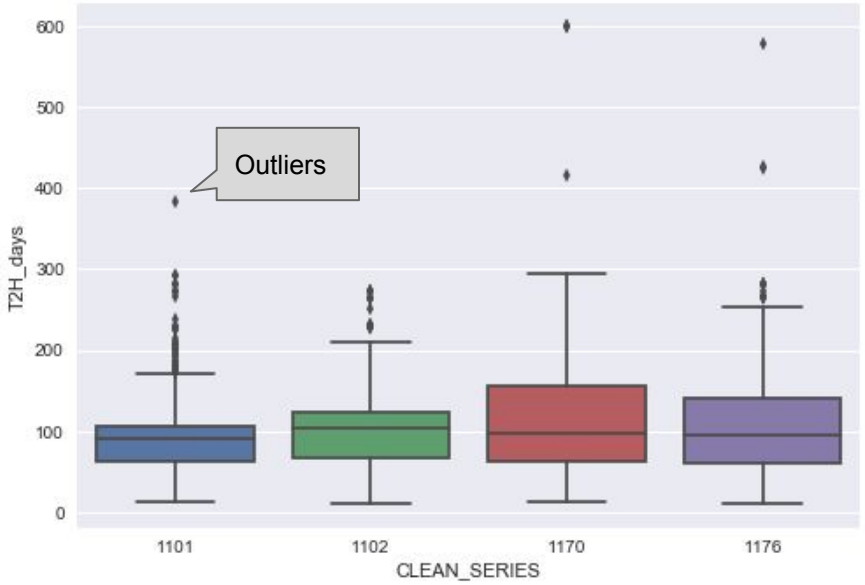


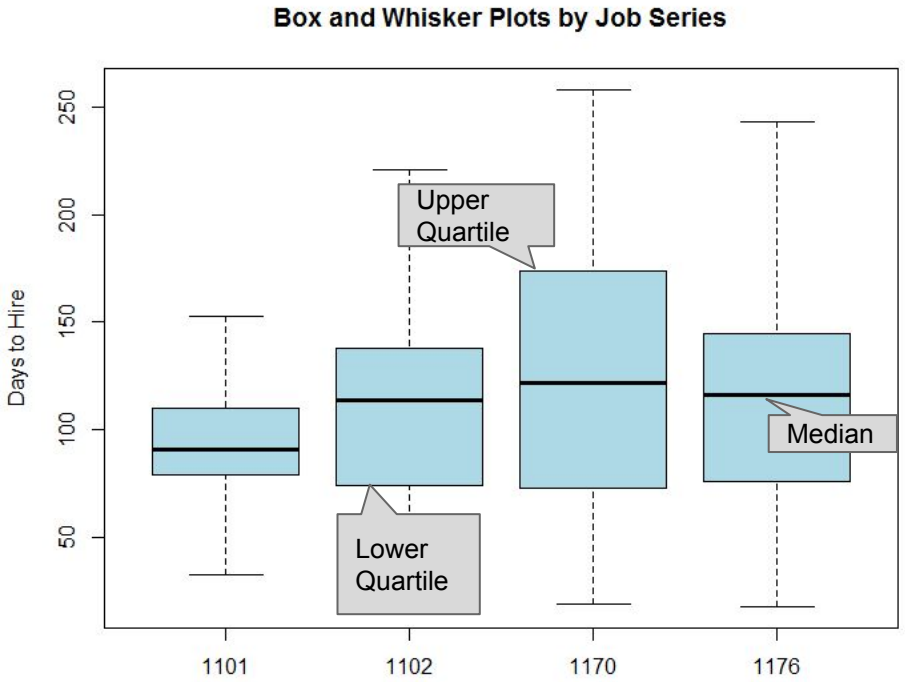
Comparison: Line chart



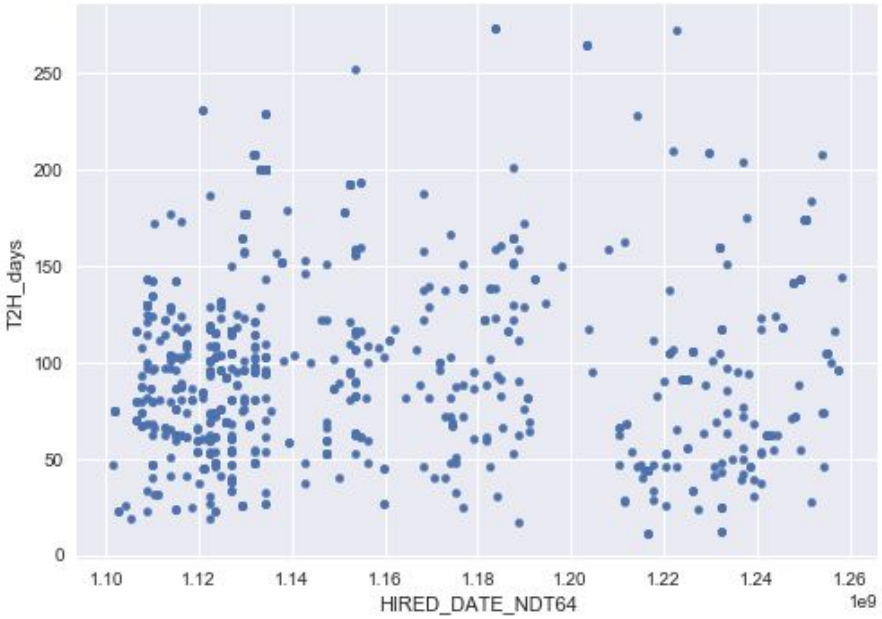


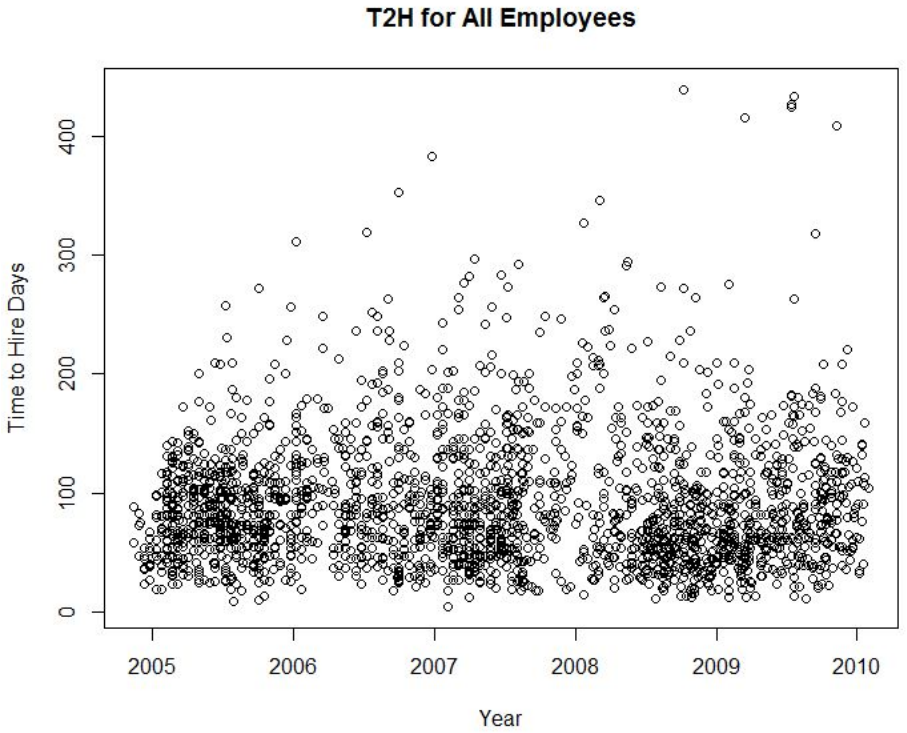
Box & whisker: T2H by job series





Scatterplot: T2H vs Hire Date





Resources

Python

matplotlib.org/gallery
seaborn.pydata.org
pbpython.com/simple-graphing-pandas.html
github.com/ukgovdatascience/Python-for-Analysts

R

ggplot2.org
ggplot2.tidyverse.org/reference

Data visualization links

google.com/site/showmethedatasessionnotes
github.com/GSA/training-pathway-data-practitioner/tree/master/specialization-data-visualization