KEY PRINCIPLES OF DATA VISUALIZATION

Strive for **CLARITY** & **SIMPLICITY**

- *Maximize **impact**, minimize **noise***
- *If it doesn't **add value** or **serve a purpose**, get rid of it*

Focus on creating a **NARRATIVE**

- *Don't just show data, **tell a story***
- *Communicate key insights **clearly, quickly** and **powerfully***

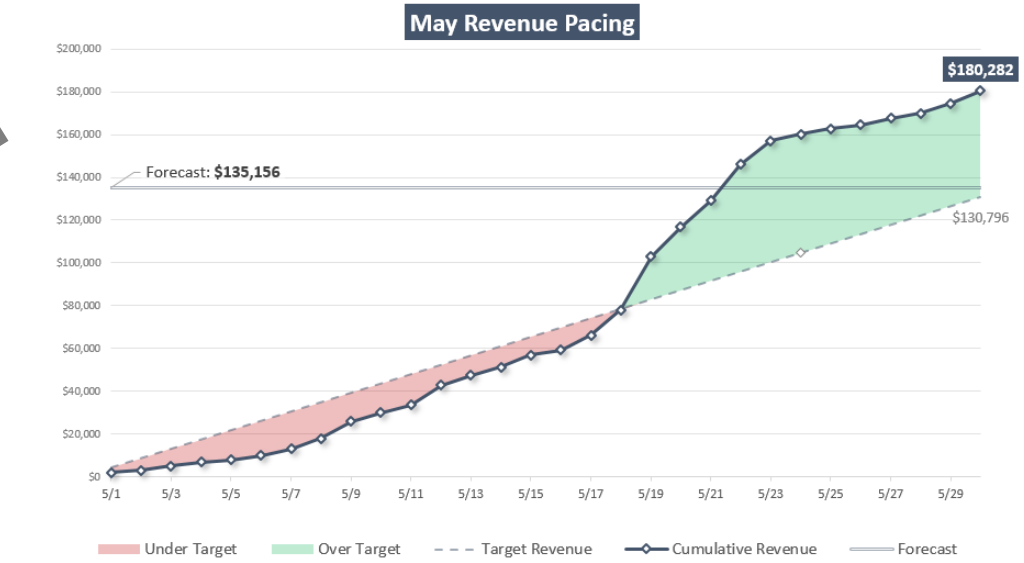
Strike a balance between **DESIGN** & **FUNCTION**

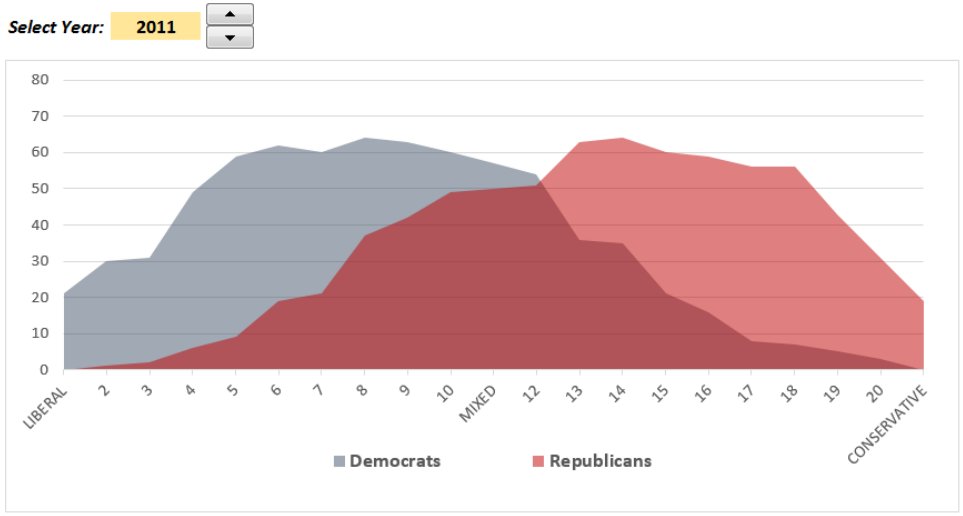
- *Selecting the right type of chart is **critical***
- ***Beautiful** is good, **functional** is better, **BOTH** is ideal*

THE GOOD, THE BAD, AND THE UGLY

THE GOOD

Dynamic formatting helps to strengthen the story





Clean, simple visualization with animation over time

Simple, intuitive custom chart design

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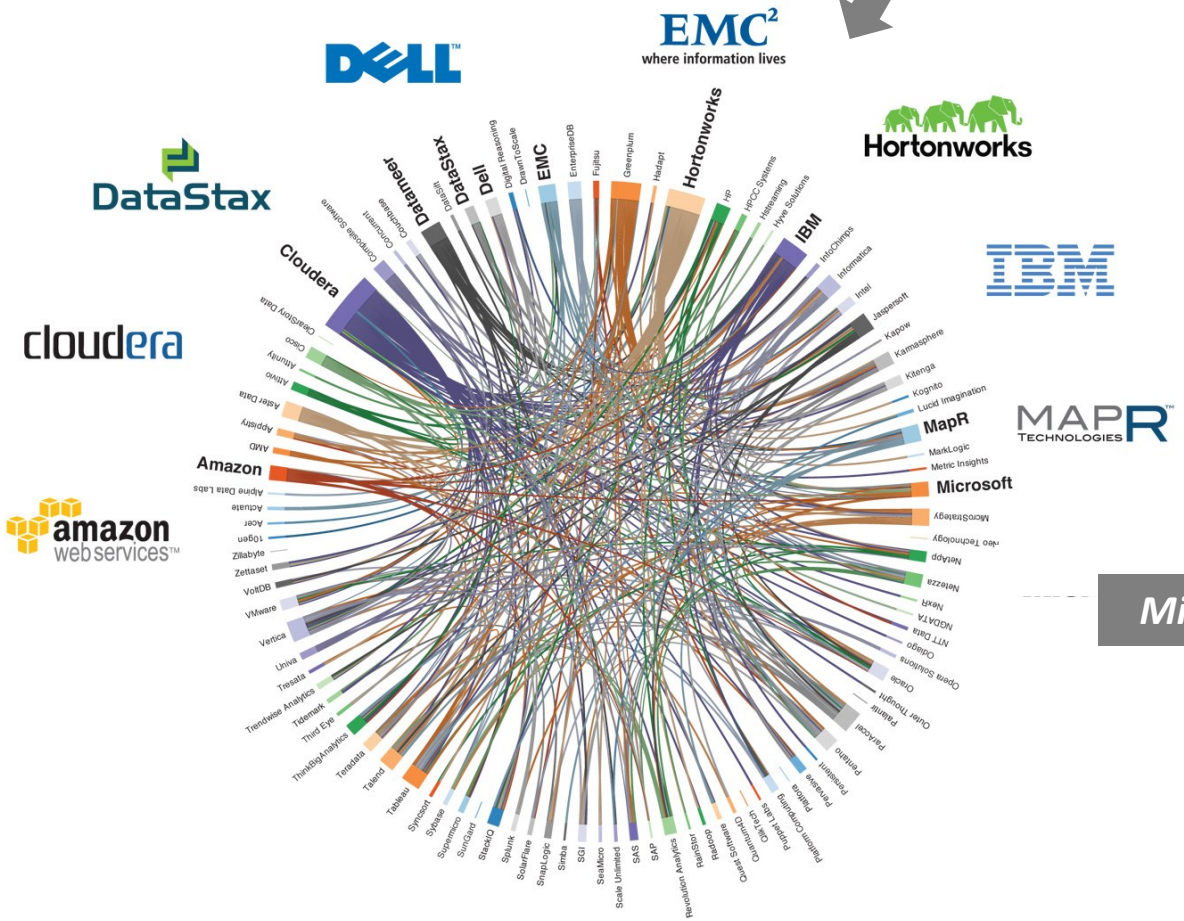
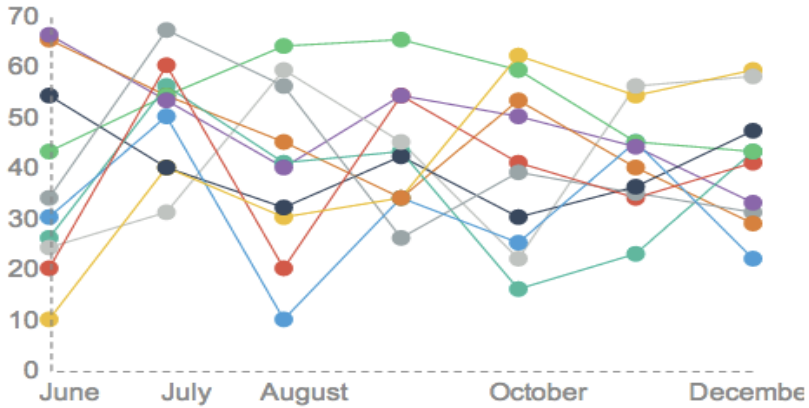
THE GOOD, THE BAD, AND THE UGLY

THE BAD

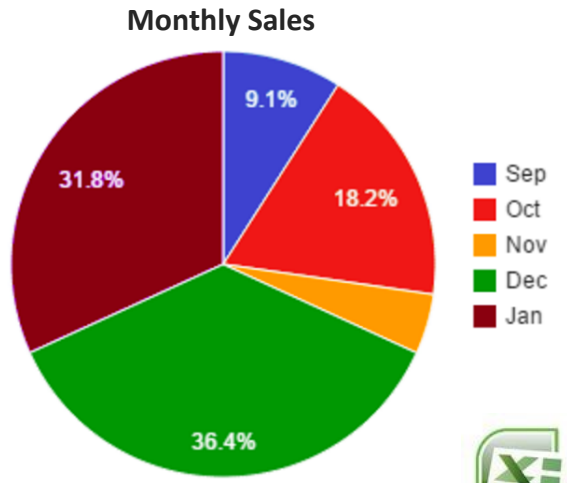
All design, no function



Busy, no clear narrative



Misleading chart type



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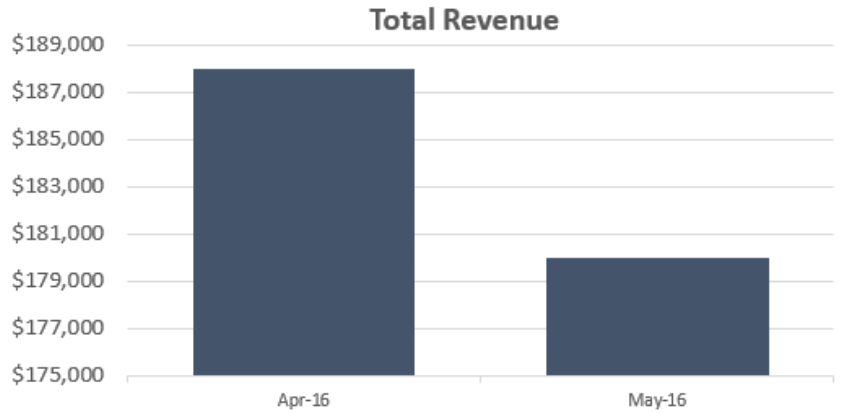
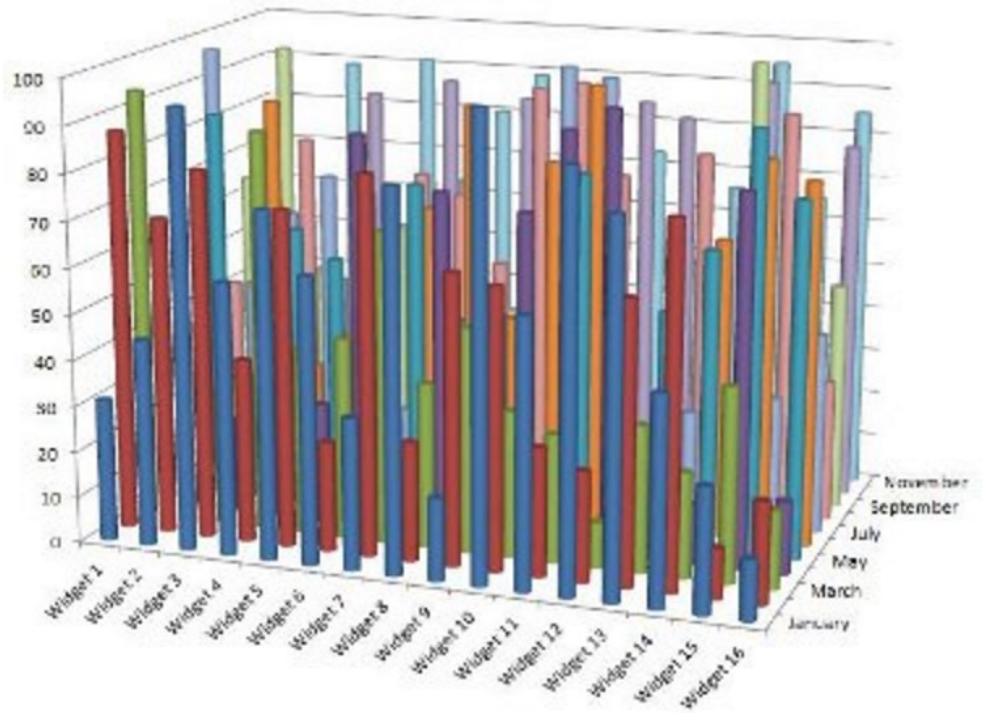
THE GOOD, THE BAD, AND THE UGLY

THE UGLY

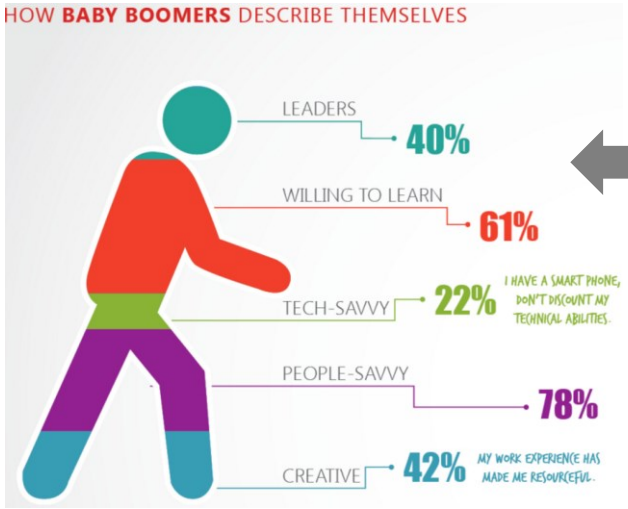
Misleading y-axis scale



Too many elements, distracting 3D design



Improper use of percentages & inconsistent scaling



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THE 3 KEY QUESTIONS

1. What **type of data** are you working with?
   - *Integer, real, categorical, time-series, geo-spatial, etc.*

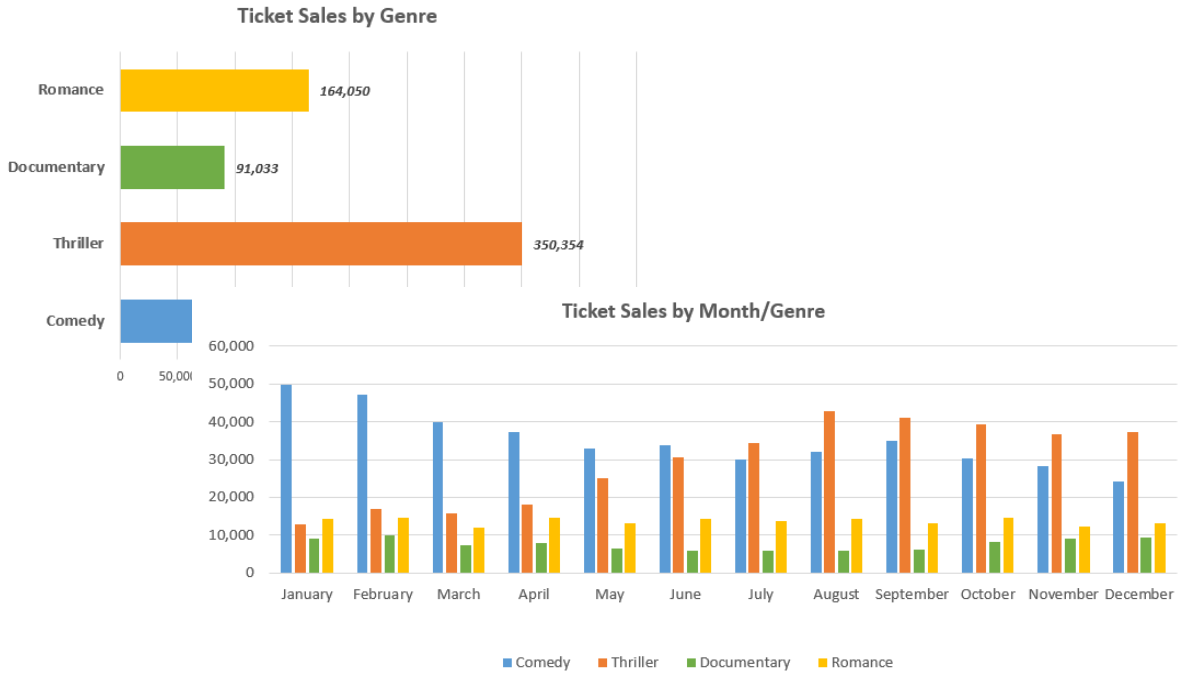
2. What are you trying to **communicate**?
   - *Relationship, comparison, composition, distribution, trending, etc.*

3. Who is the **end user** consuming this information?
   - *Analyst, CEO, client, intern, etc.*

BAR & COLUMN CHARTS

COMMONLY USED FOR:

- **Comparing numerical data across categories**



EXAMPLES:

- *Total sales by product type*
- *Population by country*
- *Revenue by department, by quarter*

PRO TIPS:

Use **stacked** or **clustered** bars/columns to group by subcategory or compare multiple metrics

Create **custom formatting rules** to color-code bars/columns based on their values

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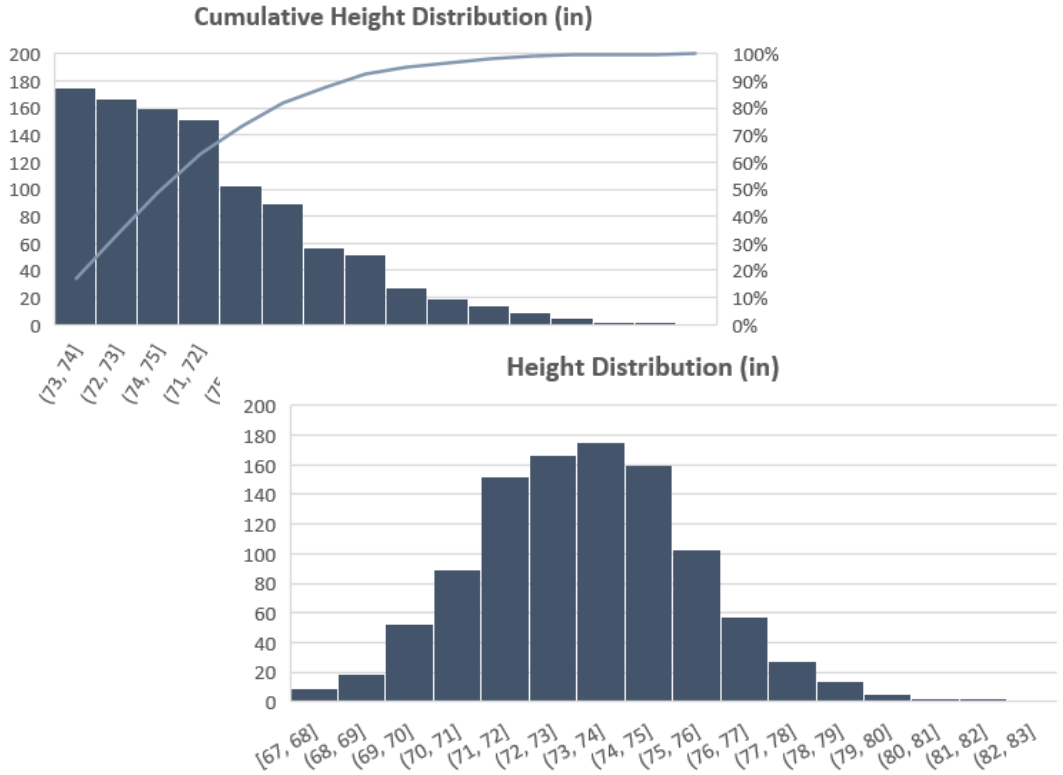
HISTOGRAMS & PARETO CHARTS

COMMONLY USED FOR:

- **Showing the distribution of a continuous data set**



EXAMPLES:

- *Frequency of test scores among students*
- *Distribution of population by age group*
- *Distribution of heights or weights*

PRO TIPS:

- Adjust the bin size to customize the grouping of values
- Use Pareto Charts to show the cumulative impact of each bin, ordered by significance

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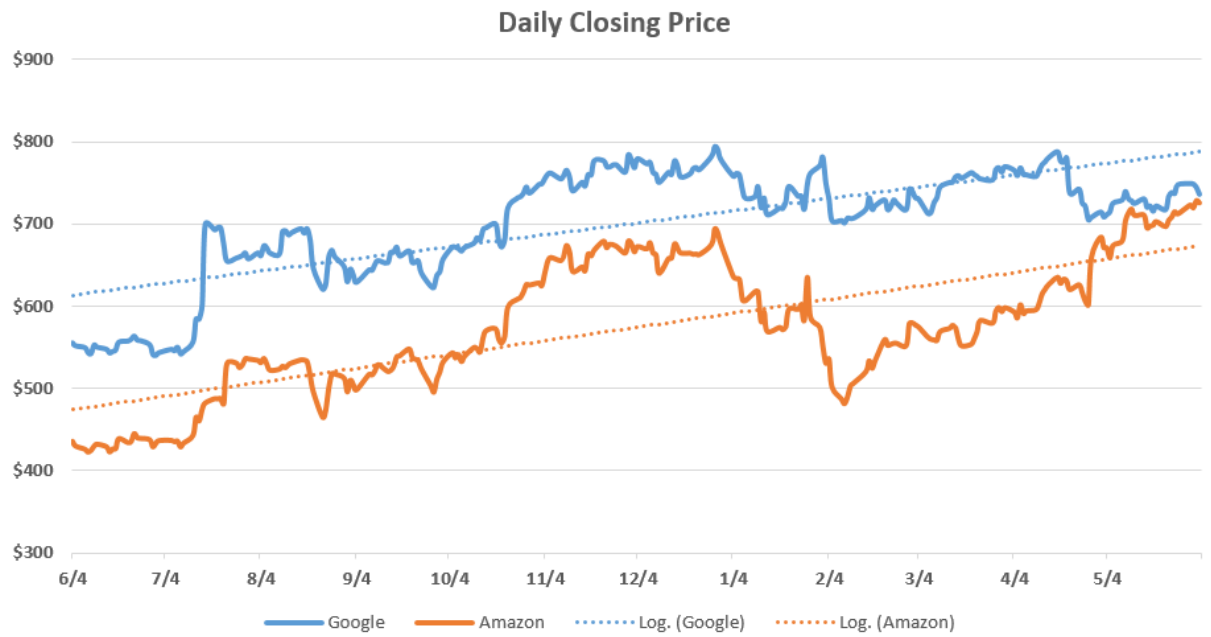
LINE CHARTS

COMMONLY USED FOR:

- **Visualizing trends over time**

EXAMPLES:

- *Stock price by hour*
- *Average temperature by month*
- *Profit by quarter*



PRO TIPS:

Use **linear** or **polynomial trendlines** to visualize patterns or forecast future periods

Combine **line** & **column** charts to trend two variables on different scales

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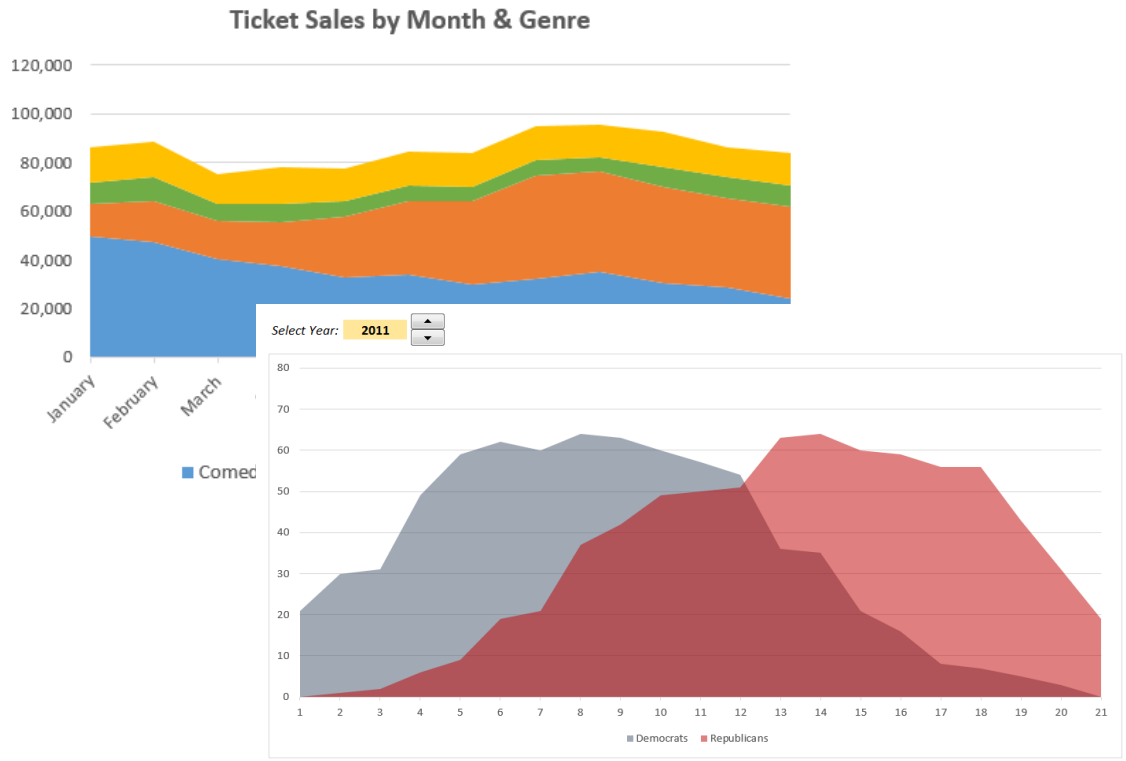
AREA CHARTS

COMMONLY USED FOR:

- **Showing changes in data composition over time**

EXAMPLES:

- *Sales by department, by month*
- *% of total downloads by browser, by week*
- *Population by continent, by decade*



PRO TIPS:

Keep the number of unique categories relatively low **(<6)** to maintain clarity

Use **data validation** and **custom formatting** to dynamically highlight specific data series

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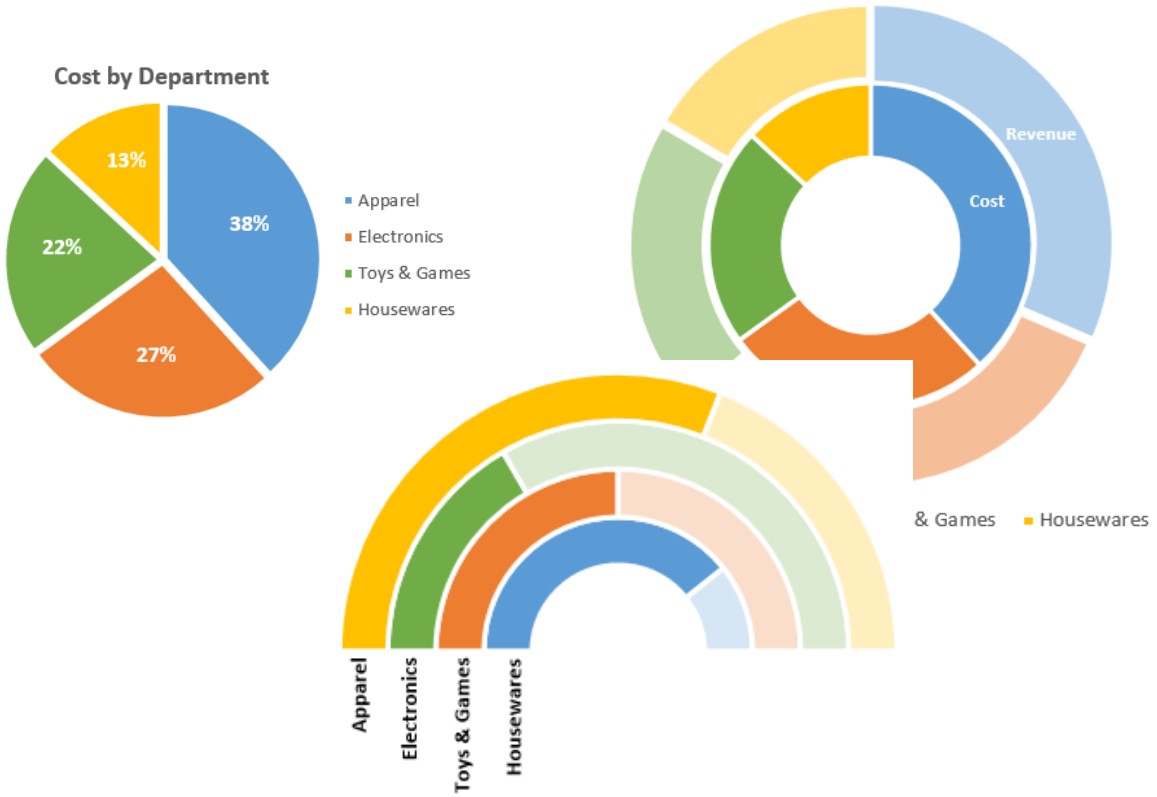
PIE & DONUT CHARTS

COMMONLY USED FOR:

- **Comparing proportions totaling 100%**



EXAMPLES:

- *Percentage of budget spent by department*
- *Proportion of internet users by age range*
- *Breakdown of site traffic by source*

PRO TIPS:

Keep the **number of slices small (<6)** to maximize readability

Use a **donut chart** to visualize more than one series at once, or use transparent segments to create a custom “race track” visualization

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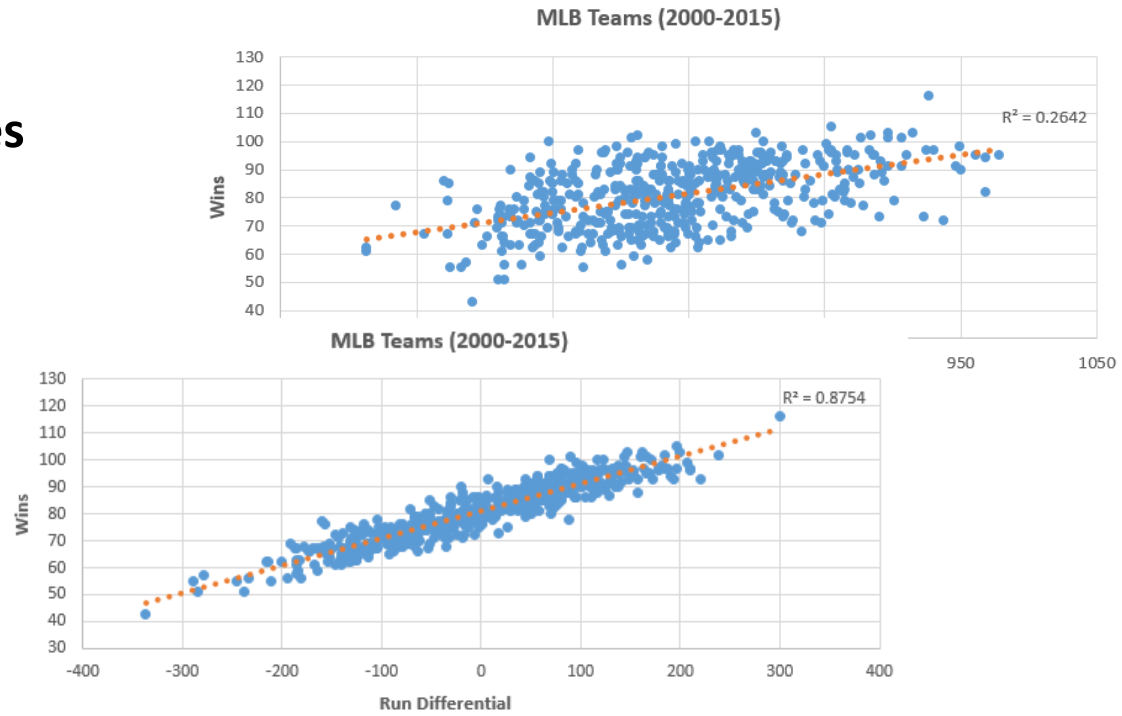
SCATTER PLOTS

COMMONLY USED FOR:

- **Exploring correlations or relationships between series**

EXAMPLES:

- *Number of home runs and salary by player*
- *Ice cream sales and average temperature by day*
- *Hours of television watched by age*



PRO TIPS:

Add a **trendline** or **line of best fit** to quantify the correlation between variables

Remember that **correlation *does not* imply causation**

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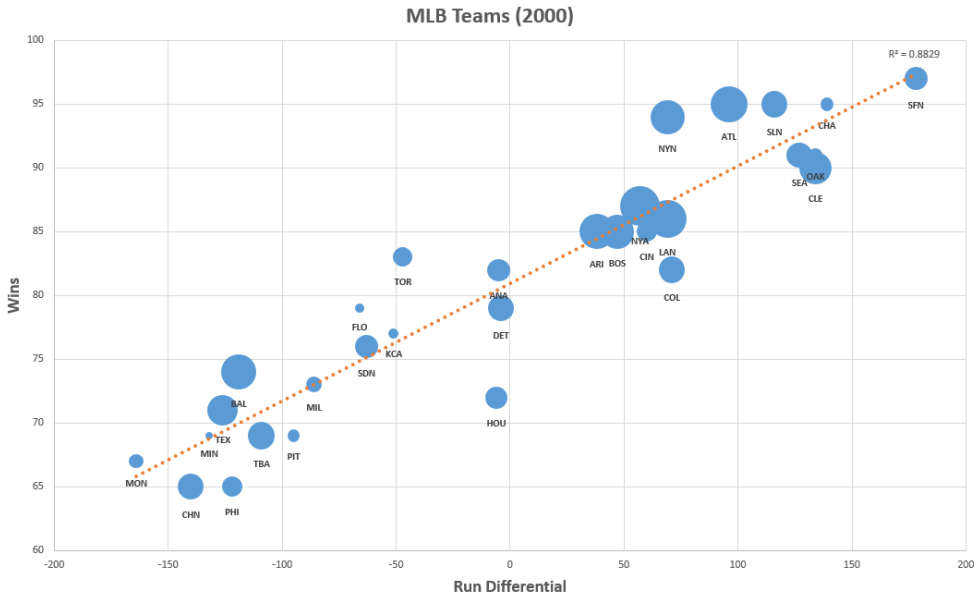
BUBBLE CHARTS

COMMONLY USED FOR:

- **Adding a third dimension (size) to a scatter plot format**

EXAMPLES:

- *Product sales (**X**), Revenue (**Y**), and Market Share (**size**) by Company*
- *Income per Capita (**X**), Life Expectancy (**Y**) and Population (**size**) by Country*



PRO TIPS:

Use **color** as a fourth dimension to differentiate between categories

Use **cell formulas** and **form controls** to create a dynamic, animated bubble chart

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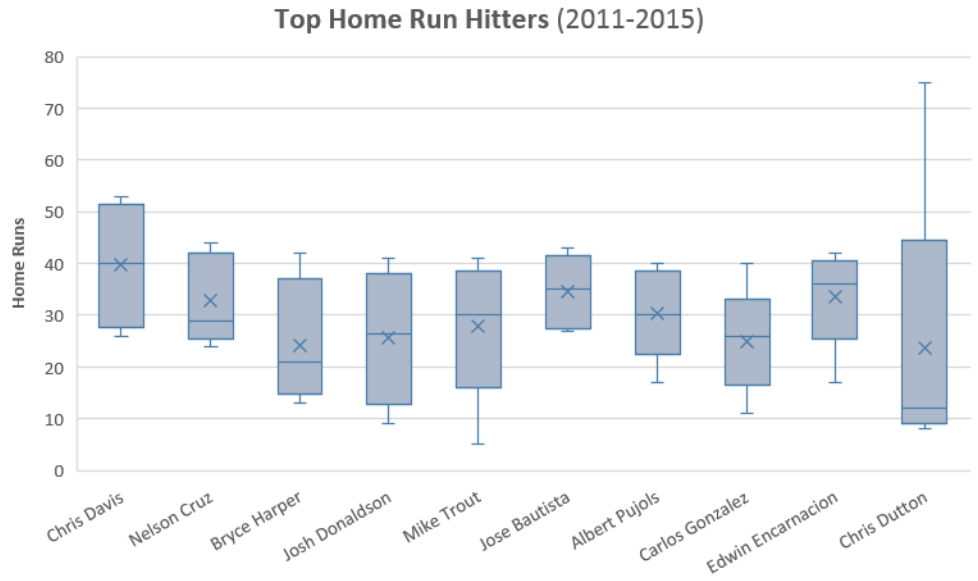
BOX & WHISKER CHARTS

COMMONLY USED FOR:

- **Visualizing statistical characteristics across data series**



EXAMPLES:

- *Comparing historical annual rainfall across cities*
- *Analyzing distributions of values and identifying outliers*
- *Comparing mean and median height/weight by country*

PRO TIPS:

By default, quartiles are calculated by **excluding the median**; this calculation can be adjusted to **include** the median, but may significantly change the result (particularly for smaller data samples)

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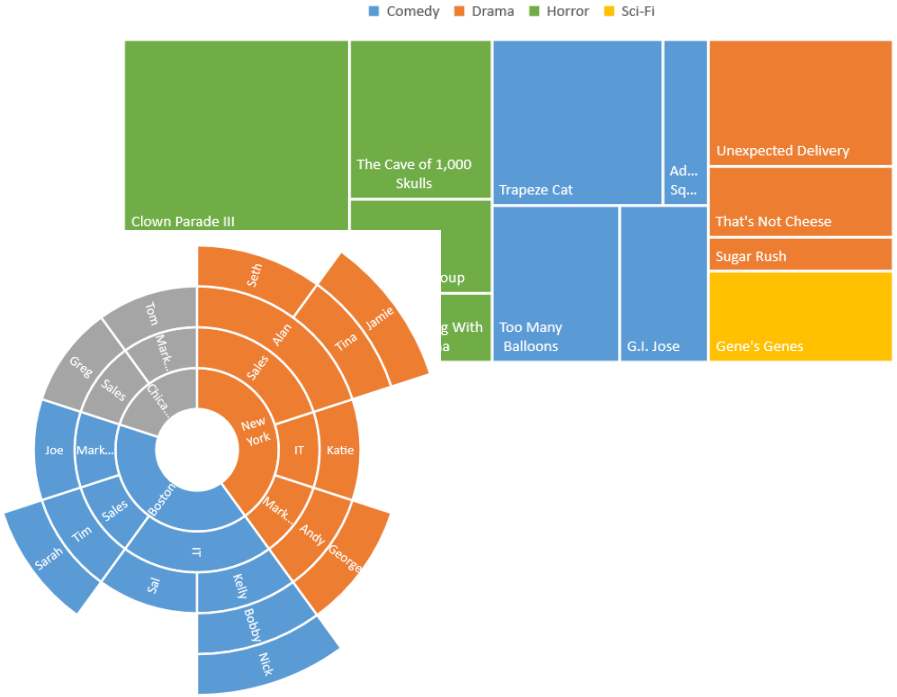
TREE MAPS & SUNBURST CHARTS

COMMONLY USED FOR:

- **Visualizing hierarchical data with natural groups/sub-groups**



EXAMPLES:

- *Revenue by Book Title, Sub-Genre, and Genre*
- *Number of Employees by Department and Office*
- *Population by City, State, and Region*

PRO TIPS:

Use **Tree Maps** when you are only visualizing 1 or 2 hierarchical levels (i.e. topic & sub-topic) or when relative sizes are important, and **Sunburst charts** to visualize the depth of multiple hierarchical levels

Make sure your raw source data is **grouped** and **sorted** before creating hierarchical charts

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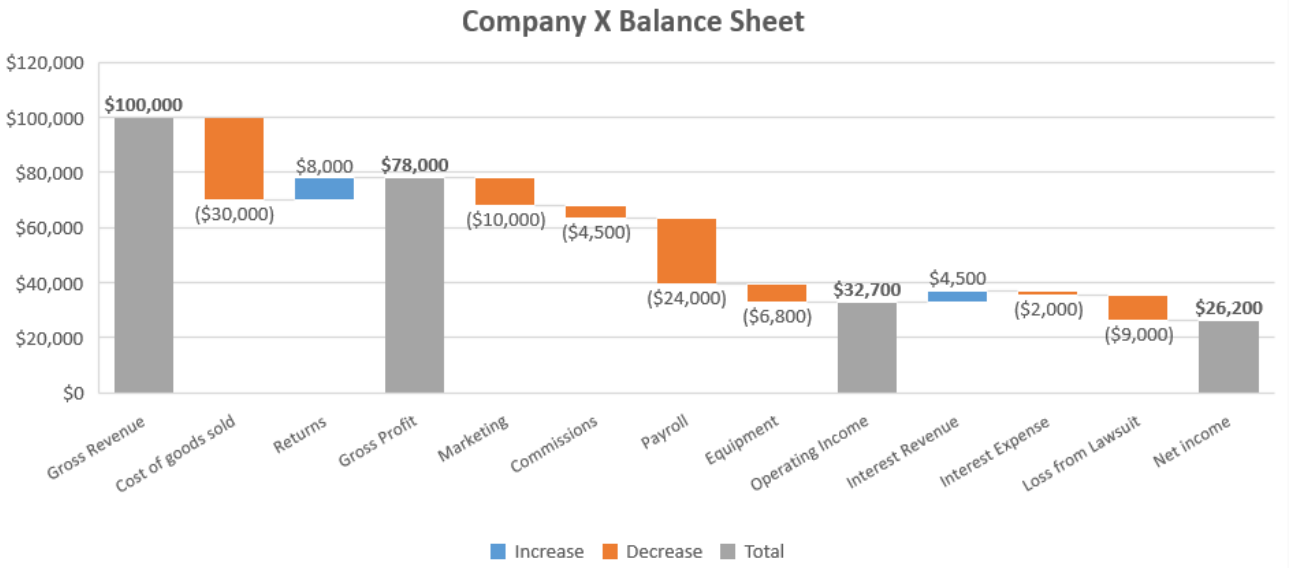
WATERFALL CHARTS

COMMONLY USED FOR:

- **Showing the net value after a series of positive and negative contributions**



EXAMPLES:

- *Corporate balance sheet analysis*
- *Personal income and spending*

PRO TIPS:

Use **sub-totals** to create "checkpoints" and split up certain types of gains/losses (i.e. **Gross Revenue** - Cost of Goods Sold = **Gross Profit**, Gross Profit - Operating Expenses = **Operating Income**, etc.)

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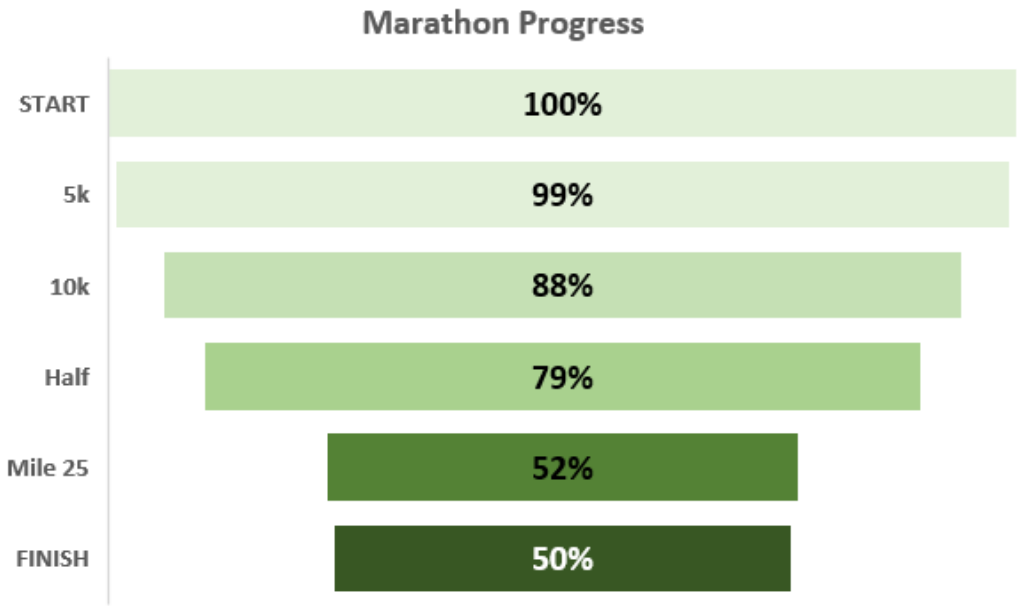
FUNNEL CHARTS

COMMONLY USED FOR:

- **Showing progress through the stages of a funnel**



EXAMPLES:

- *Volume of views, clicks, and sales on an ecomm site*
- *Number of runners who reach each checkpoint in a marathon (5k, 10k, half, etc.)*

PRO TIPS:

Use "**percent of total**" calculations to show the % of users (rather than #) at each funnel stage

Customize colors to emphasize progression towards an end goal

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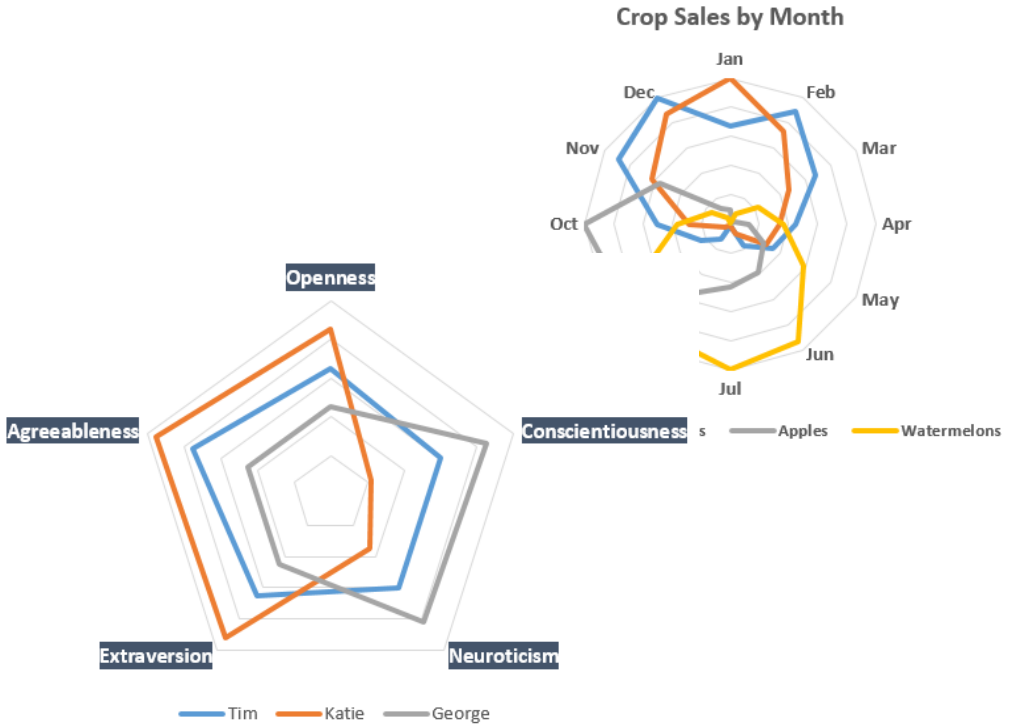
RADAR CHARTS

COMMONLY USED FOR:

- **Plotting three or more quantitative variables on a two-dimensional chart, relative to a central point**

EXAMPLES:

- *Comparing test scores across multiple subjects*
- *Sales of different types of vegetables, by month*
- *Visualizing personality test results across subjects*



PRO TIPS:

Normalize each metric to the same scale (i.e. *0-1*, *1-10*, *1-100*) to improve readability and create more intuitive comparisons across data series

Limit the number of categories or data series to minimize noise and maximize impact

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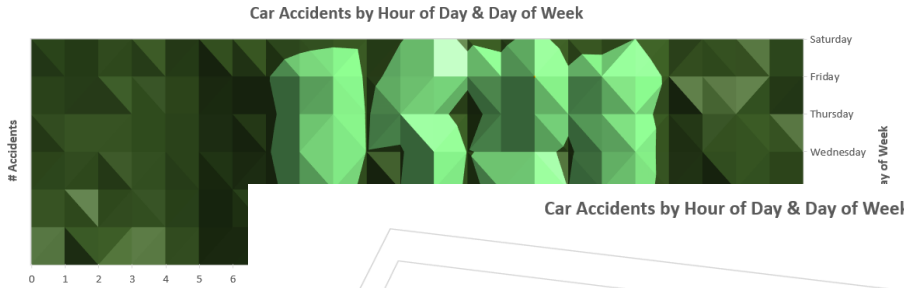
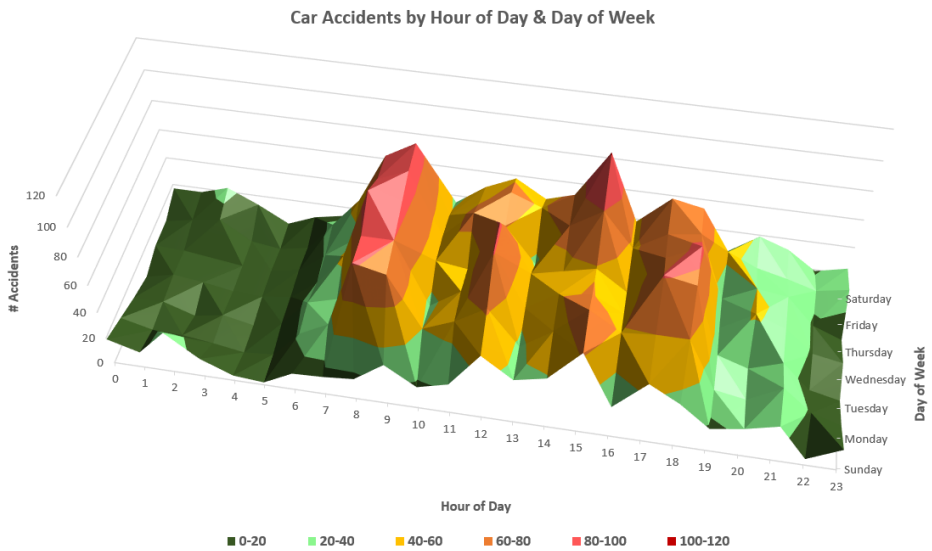
SURFACE & CONTOUR CHARTS

COMMONLY USED FOR:

- **Plotting data in three dimensions to find optimum combinations of values**





EXAMPLES:

- *Accident rates by hour of day and day of week*
- *Elevation by latitude and longitude*
- *Cookie deliciousness by oven temp and baking time*

PRO TIPS:

Don’t use surface charts if a simple **heat map** will tell the same story

Avoid using **wireframe** chart types when possible, as they can be difficult to interpret

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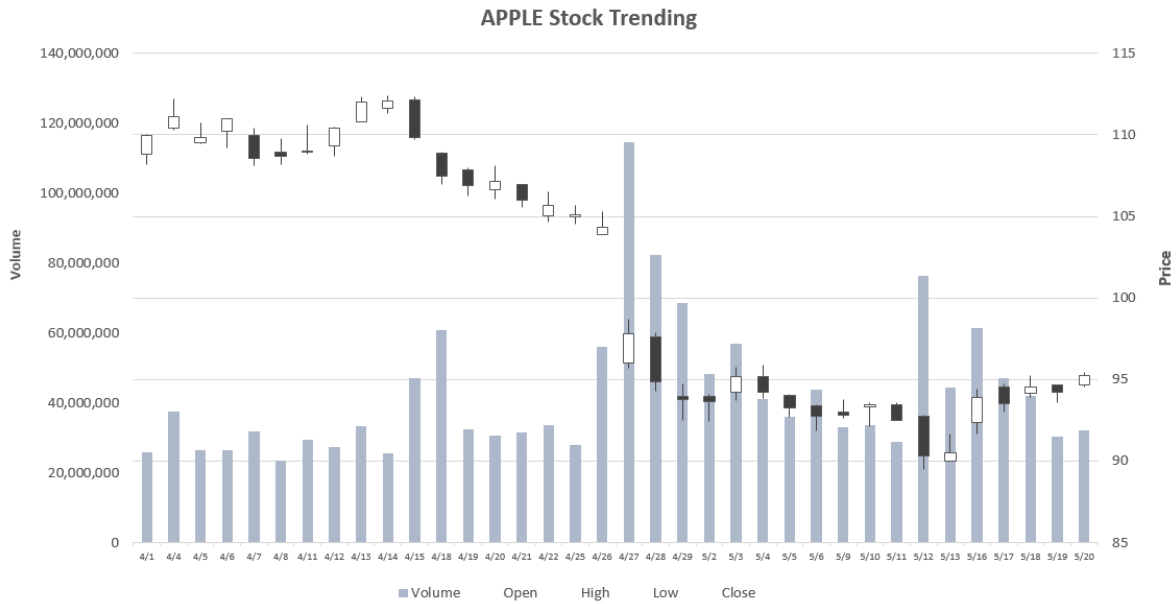
STOCK CHARTS

COMMONLY USED FOR:

- **Visualizing stock market data, including volume, high, low, open, and closing prices**



EXAMPLES:

- *Facebook's daily stock performance in 2015*
- *High, low, and closing prices for Google in Q1*
- *Relative performance across multiple stocks*

PRO TIPS:

- Manually set **axis minimum/maximum values** to enhance readability
- Switch from a **date** to a **text** axis to eliminate gaps when markets are closed

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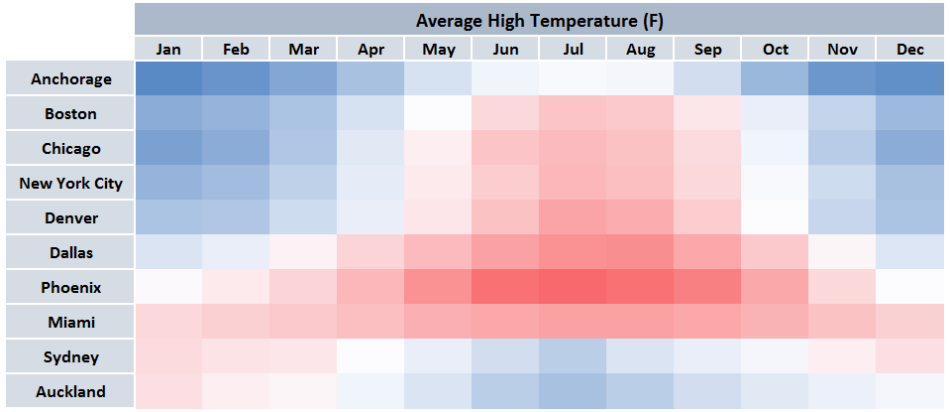
HEAT MAPS

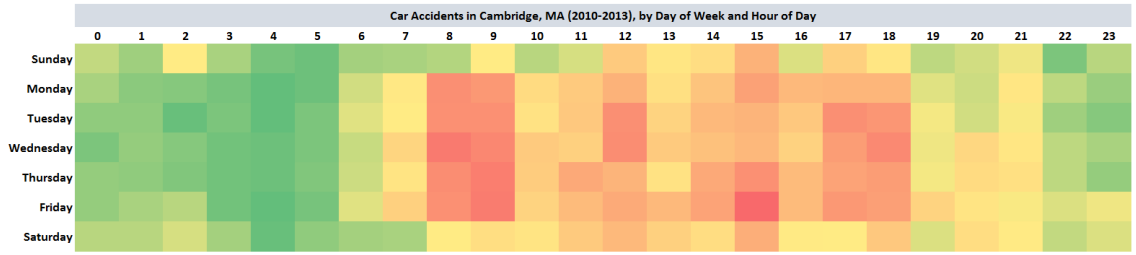
COMMONLY USED FOR:

- **Visualizing trends or relationships using color scales**



EXAMPLES:

- *Accident rates by time of day and day of week*
- *Average temperature by city, by month*
- *Average sentiment by hashtag*



PRO TIPS:

Use intuitive color scales (i.e. **red** to **green**) and apply custom formatting to hide cell values (**;;;**)

Use **data validation** and **cell formulas** to create dynamic heat maps based on user-entered values

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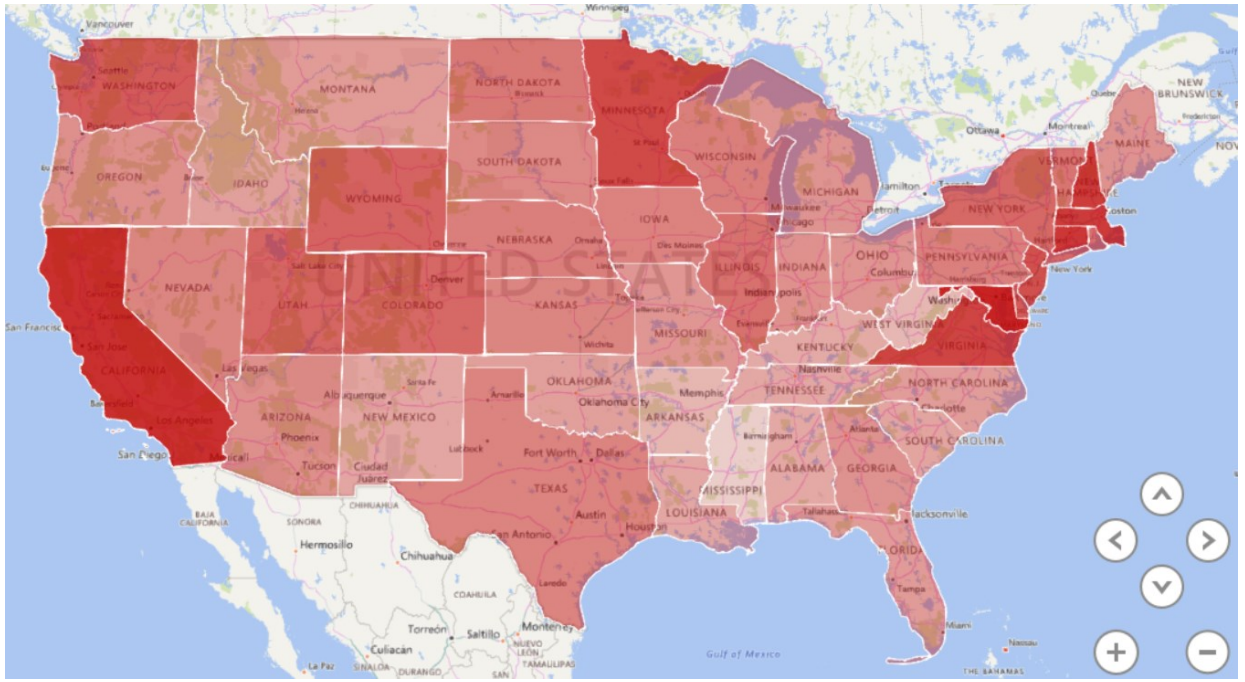
GEOSPATIAL/CHOROPLETH MAP

COMMONLY USED FOR:

- **Visualizing location-based data**

EXAMPLES:

- *Frequency of accidents by street address*
- *Unemployment rate by country*
- *Average rainfall by state*



PRO TIPS:

Use Excel's **Power Map** plug-in to create geo-spatial visualizations and animate changes over time

Utilize attributes like **color** and **size** to visualize multiple attributes at once

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RESOURCES & NEXT STEPS

- Check out **Excel Analytics – Advanced Formulas & Functions** to master advanced Excel formulas and analytics tools
  - *Stats functions, logical operators, conditional statements, text functions, array formulas, lookup/reference functions, formula-based formatting, and more*
- Head to the following blogs/sites for additional support:
  - ***support.office.com*** *for help with the basic (also check out Office 365)*
  - ***stackoverflow.com*** *for advanced forum support*
  - ***https://sites.google.com/site/e90e50charts/*** *for crazy advanced stuff*
- Rating and reviews are what keeps courses like this alive, so **please** share feedback (for better or for worse!)

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