SAS® Visual Analytics 8.3: Reference

Keyboard Shortcuts for SAS Visual Analytics

The following table contains the keyboard shortcuts for SAS Visual Analytics:

Table 1 *Keyboard Shortcuts*

Action	Keyboard Shortcut
Open the Landmarks window.	Ctrl+F6
Zoom in.	Ctrl+numeric keypad plus sign
Zoom out.	Ctrl+numeric keypad minus sign
Reset the zoom state.	Ctrl+numeric keypad zero (0) key
Invert or revert application colors.*	Ctrl+`
Save the current report.	Ctrl+S
Open another report.	Ctrl+O
Print to PDF.	Ctrl+P
Undo a change in a report.	Ctrl+Z
Redo a change in a report.	Ctrl+Y or Ctrl+Shift+Z
Add a new page.	Ctrl+M
Delete the selected object or the selected page.	Delete
Duplicate the selected object or the selected page.	Ctrl+D

Action	Keyboard Shortcut
Navigate the pages in a report.	Alt+PageUp or Alt+PageDown
Toggle maximize mode on or off when an object is selected.	Alt+F11
Select the next object in the document order.	Tab
Open the pop-up menu.	Shift+F10
Select the previous object in the document order.	Shift+Tab

* You can use the **Invert application colors** accessibility setting to change application colors. For more information about accessibility settings, see *General Usage Help for SAS Viya Web Applications*.

Gallery of Objects

Tables

Crosstab

A *crosstab* (also known as a crosstabulation table) shows an aggregate metric for the intersections of two or more categories. Crosstabs often have two or more categories assigned to both the rows and columns, forming a matrix. Crosstabs can be easier to read than list tables because they often use less space, and they always collapse repeating values for outer category data items into one unique value, which is known as grouping. A crosstab can use a hierarchy.

Product Brand ▲	Product Line ▲	Product ▲	Expenses	Revenue
Novelty		›	$223,822,373.76	813,699,290
		.	$126,051,936.57	0
		Athlete	$22,282,489.38	37,607,425
		Firefighter	$22,383,218.09	37,830,429
		Movie Star	$22,256,456.08	37,466,062
	‹ Action Figure	Musician	$22,201,223.75	37,400,758
‹ Toy		Police	$21,939,853.19	37,365,735
		Soldier	$22,046,587.69	37,054,862
		Super Hero	$22,228,489.07	37,593,488
		.	$99,209,012.37	0
	‹ Game	Board	$193,961,649.02	802,655,795
		Card	$67,173,844.50	396,722,440

List Table

A *list table* is a two-dimensional representation of data in which the data values are arranged in unlabeled rows and labeled columns. List tables can use any data items from a data source. A list table cannot use a hierarchy.

You can add sparklines to a column (if the data source contains a date data item) when aggregated data is displayed in the list table.

Product Line ▲	Revenue	Expenses	Profit	Profit Trend
Action Figure	262,318,761	$281,390,253.83	-19,071,493	
Game	1,671,890,035	$477,809,928.69	1,194,080,107	
Promotional	813,699,290	$223,822,373.76	589,876,916	
Stuffed Animal	276,990,966	$159,548,680.44	117,442,285	

Graphs, Charts, and Plots

Bar Chart

A *bar chart* consists of vertical or horizontal bars that represent quantitative data. Use bar charts to compare data that is aggregated by the distinct values of a category.

You can apply grouping and create data-driven lattices. You can filter or rank your data based on a specified number of top or bottom values.
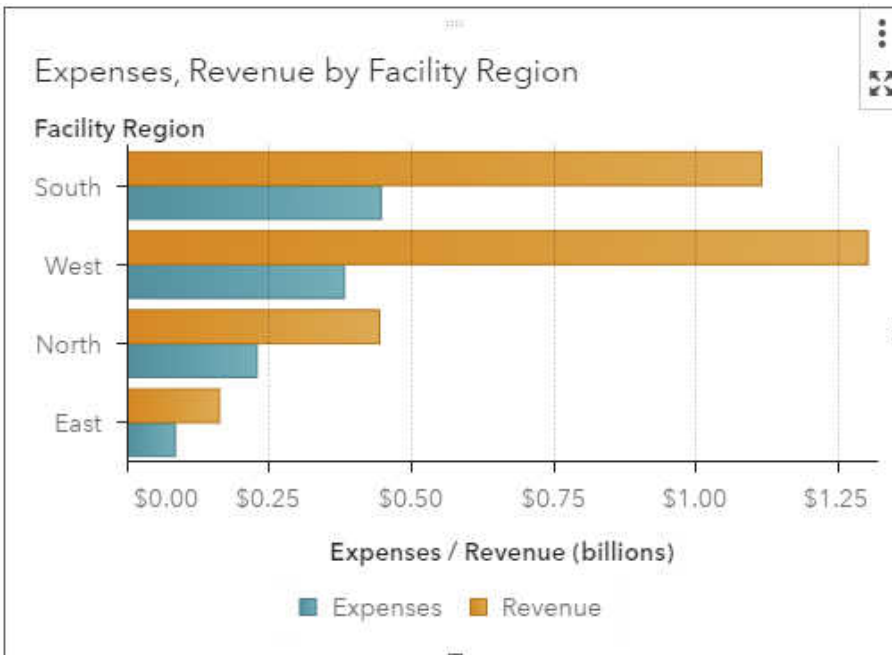

Box Plot

A *box plot* displays the distribution of values for a single measure using a box and whiskers. The size and location of the box indicate the range of values that are between the 25th and 75th percentile.

Facility Age by Product Line

Facility Age
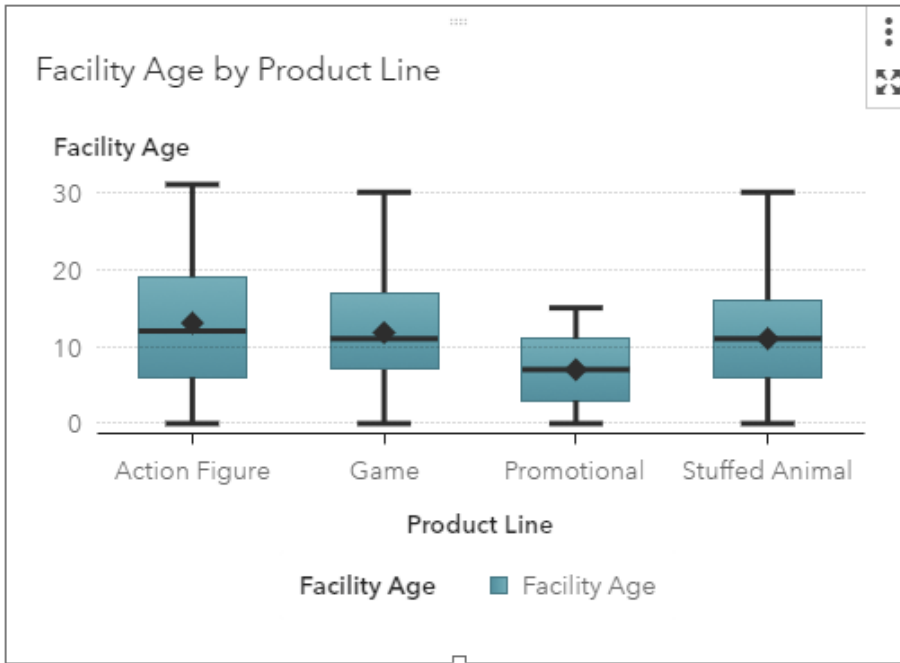
Bubble Change Plot

A *bubble change plot* displays the difference between two sets of measures by using bubbles that are connected by lines. For example, you can use a bubble change plot to compare data from two different time periods.
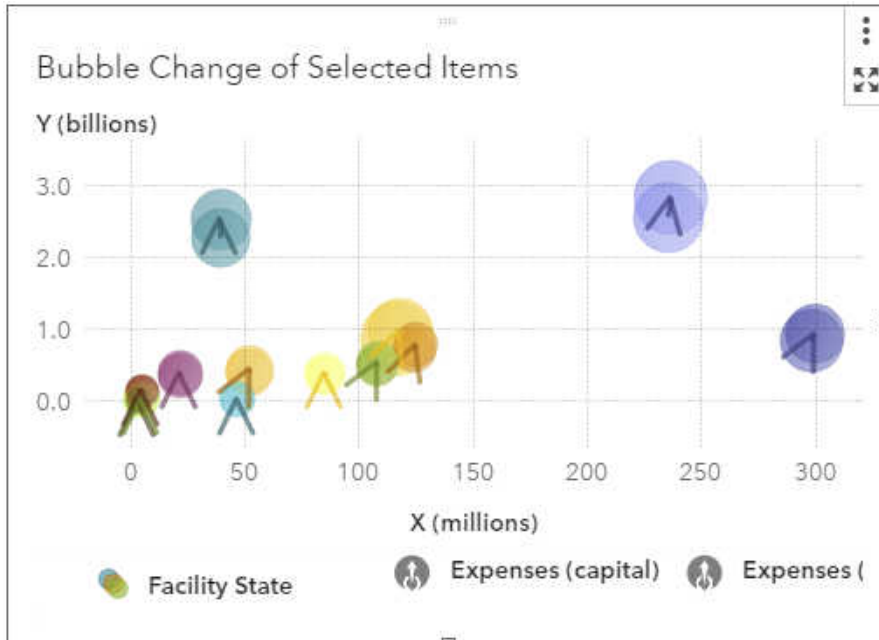

Bubble Plot

A *bubble plot* is a variation of a scatter plot in which the markers are replaced with bubbles. A bubble plot displays the relationships among at least three measures. Two measures are represented by the plot axes, and the third measure is represented by the size of the bubbles. A bubble plot is useful for data sets with dozens to hundreds of values. You can add categories to the **Grouping** and **Lattice** roles.

Note: A bubble's size is scaled relative to the minimum and maximum values of the size variable. The minimum and maximum sizes are illustrated in the plot legend. The actual value for each bubble is displayed as a data tip.
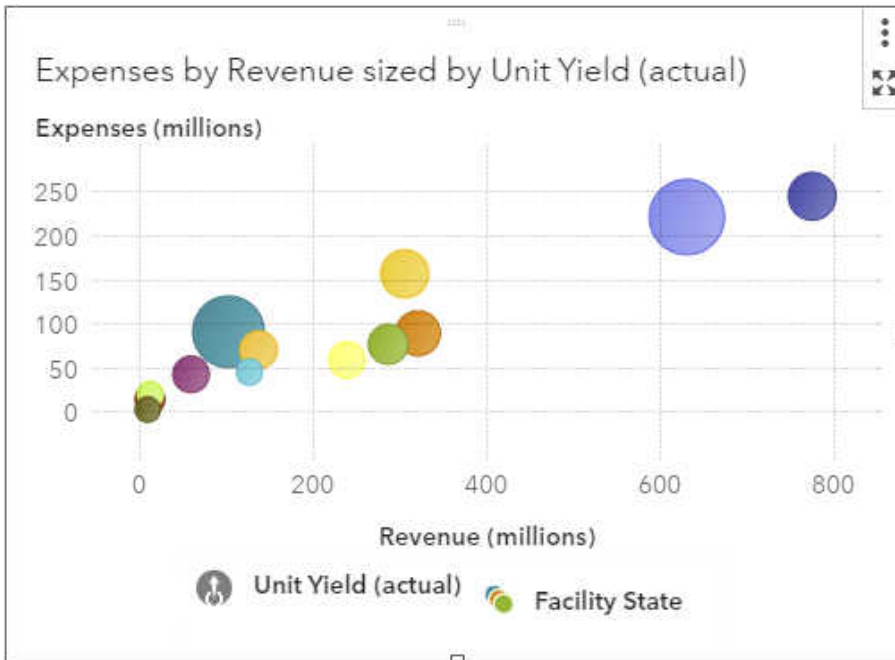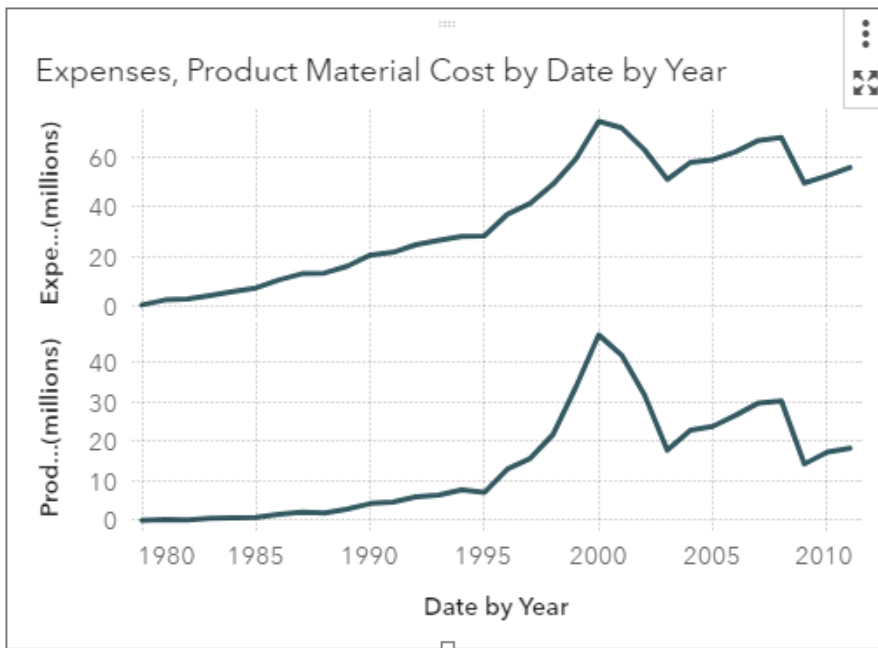

Butterfly Chart

A *butterfly chart* displays two bar charts with a shared category axis. The baselines of the two bar charts are located in the center of the chart.
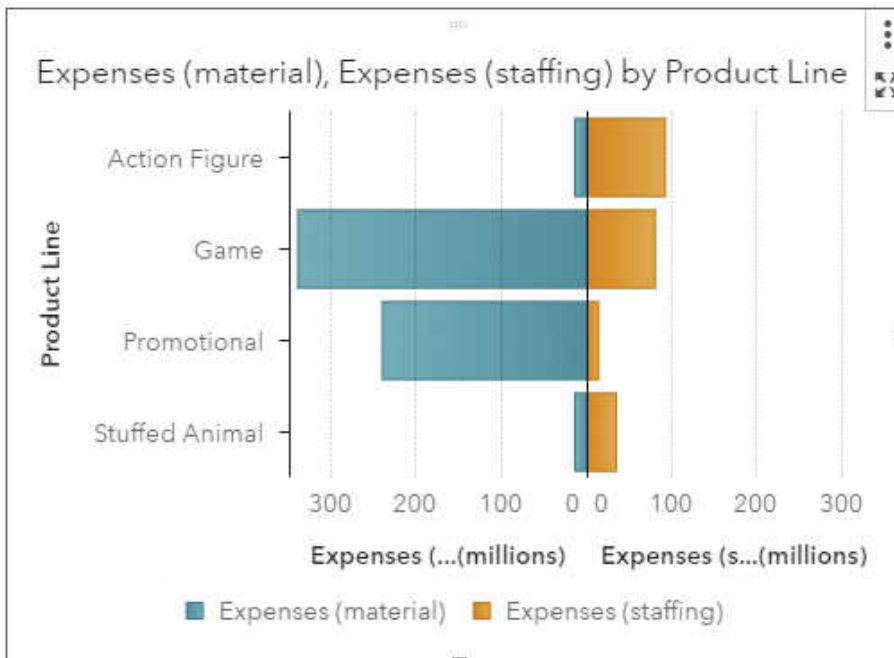

Comparative Time Series Plot

A *comparative time series plot* displays two time series in parallel with a shared time axis and separate Y axes.

Correlation Matrix

A *correlation matrix* displays the degree of correlation between multiple intersections of measures as a matrix of rectangular cells. Each cell in the matrix represents the intersection of two measures, and the color of the cell indicates the degree of correlation between those two measures.
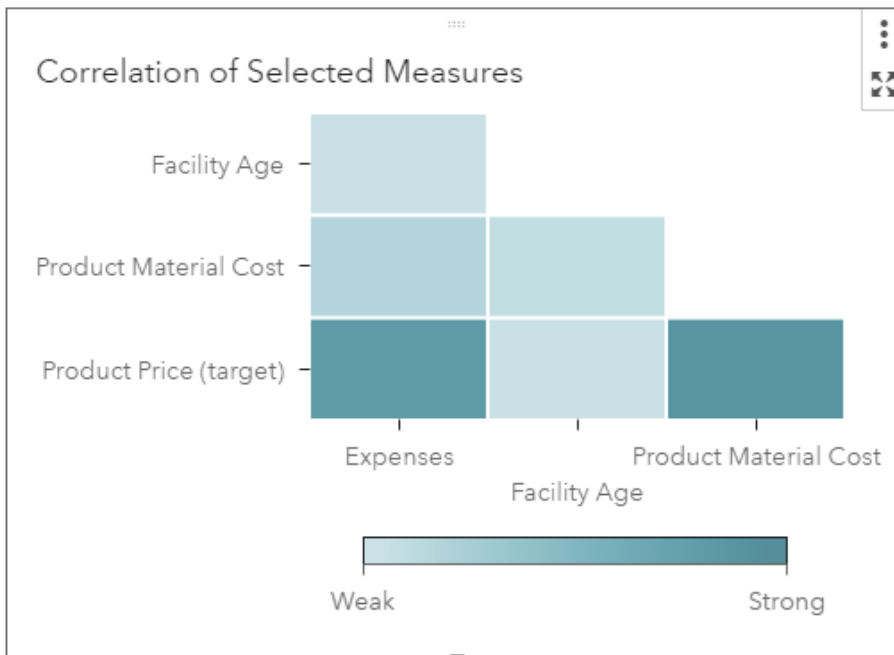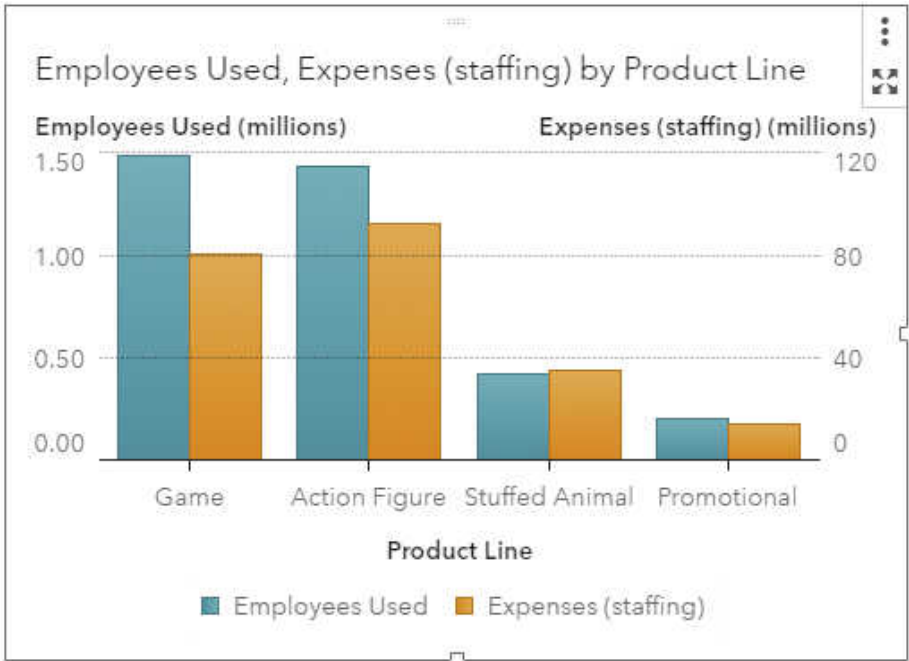

Dot Plot

A *dot plot* displays the data for each value of a category data item by using dots. The position of each dot on the Y (response) axis represents the value.
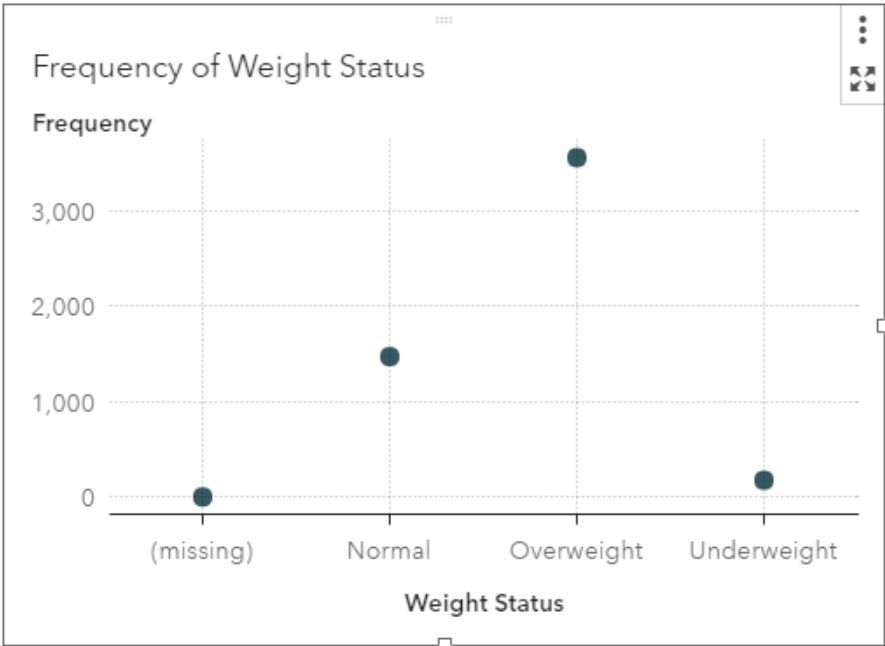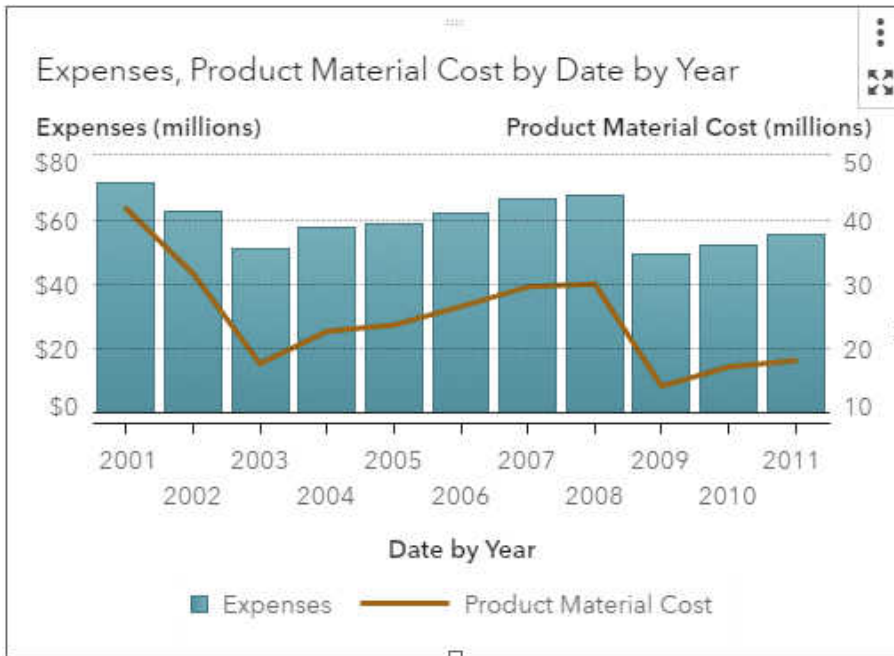
Dual Axis Bar Chart

A *dual axis bar chart* is a variation of the bar chart that has measures on two Y axes.
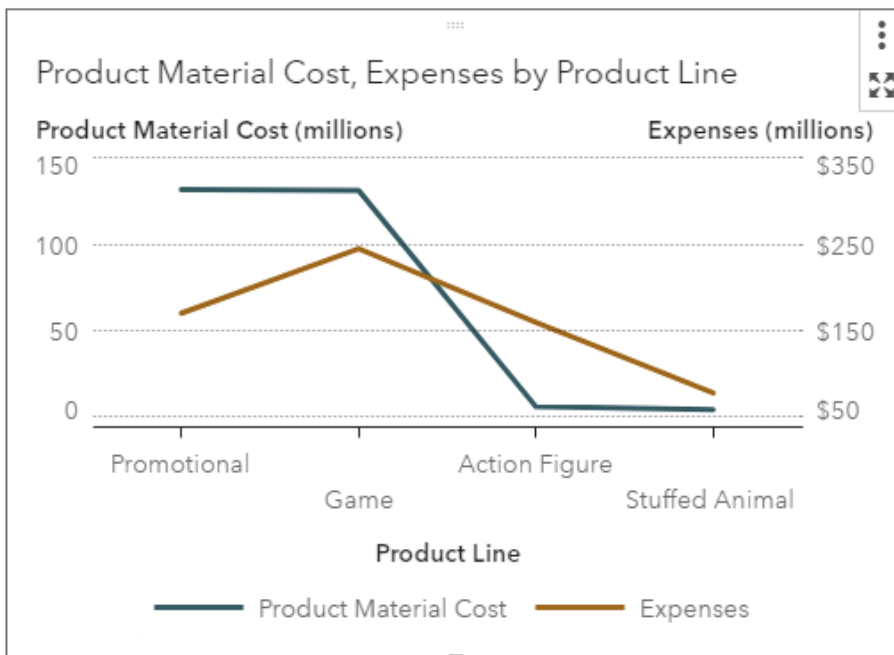

Dual Axis Bar-Line Chart

A *dual axis bar-line chart* is a variation of the bar chart that is overlaid by a line chart. The two measures in a dual-axis bar-line chart have separate Y axes.

Expenses, Product Material Cost by Date by Year

Expenses (millions)   Product Material Cost (millions)

[Chart: Dual axis bar/line chart showing Expenses (bars) and Product Material Cost (line) by Date by Year from 2001 to 2011. Left Y axis: $0 to $80. Right Y axis: 10 to 50.]

Legend: Expenses (bar), Product Material Cost (line)

Dual Axis Line Chart

A *dual axis line chart* is a variation of the line chart that has two measures. A measure is displayed on both the left and right side of the Y axis. The relationship between two measures can be examined on two different scales in a dual axis line chart.

Product Material Cost, Expenses by Product Line

Product Material Cost (millions)   Expenses (millions)

[Chart: Dual axis line chart showing Product Material Cost and Expenses by Product Line. Categories: Promotional, Game, Action Figure, Stuffed Animal. Left Y axis: 0 to 150. Right Y axis: $50 to $350.]

Legend: Product Material Cost, Expenses

Dual Axis Time Series Plot

A *dual axis time series plot* is a variation of the time series plot that has two measures. A measure is displayed on both the left and right side of the Y axis.

For example, a dual axis time series plot can be useful when you need to display two measures that have the same unit of measurement and different scales, such as expenses and revenue, or when you need to display two measures that have different units of measurement, such as sales and quantity ordered.
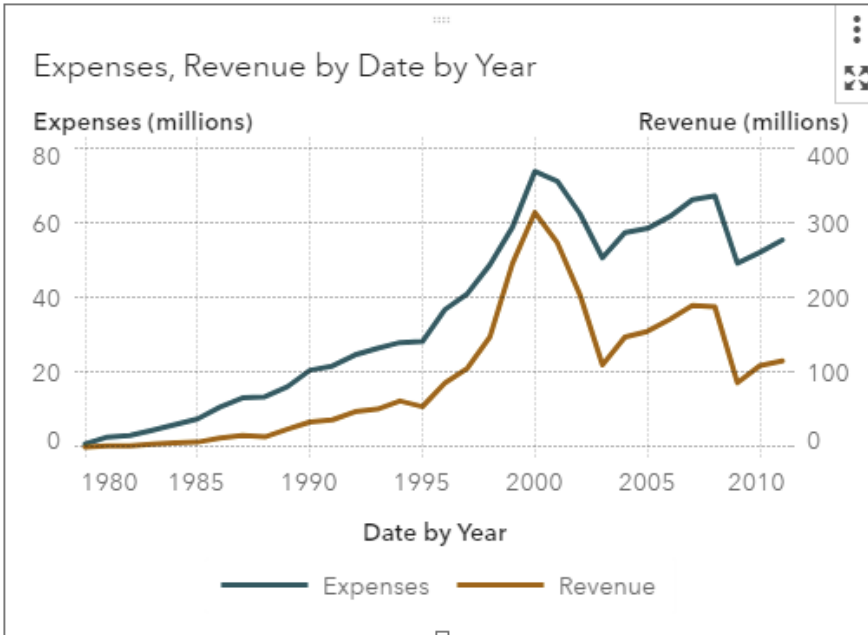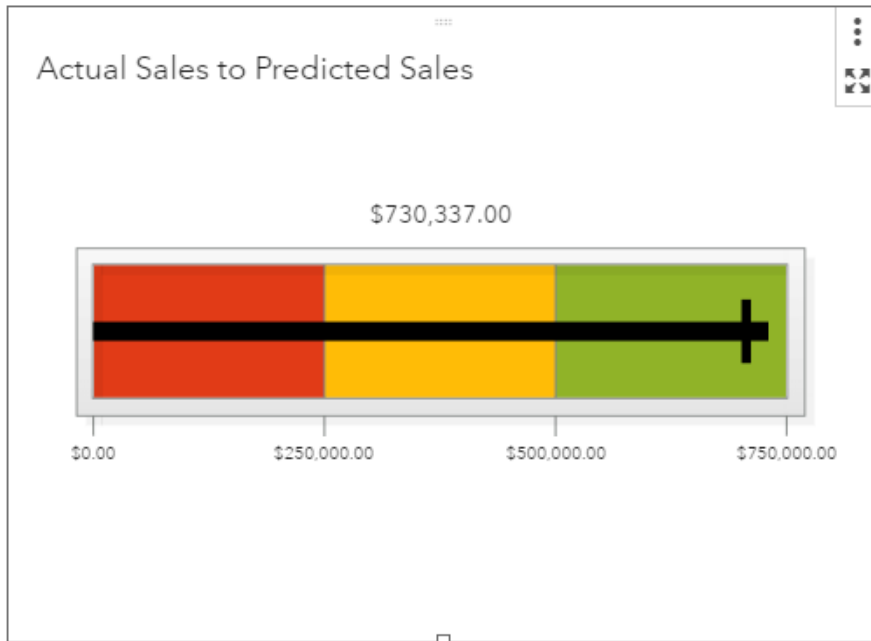

Gauge

A *gauge* is a dashboard indicator that compares an actual value to a target value. The scale of the gauge and the colored data ranges on the gauge are controlled by display rules. To change these properties, edit the display rules for the gauge.

Several types of gauges are available:

Bullet

displays a linear gauge. The target value is indicated by a line and the actual value is indicated by a narrow bar.

Note: The scale of a bullet gauge often begins at zero, but it can contain both positive and negative values if both types of values apply to the primary measure, such as profit. The inset horizontal bar should always begin at zero so that comparing multiple bullet graphs is not confusing.
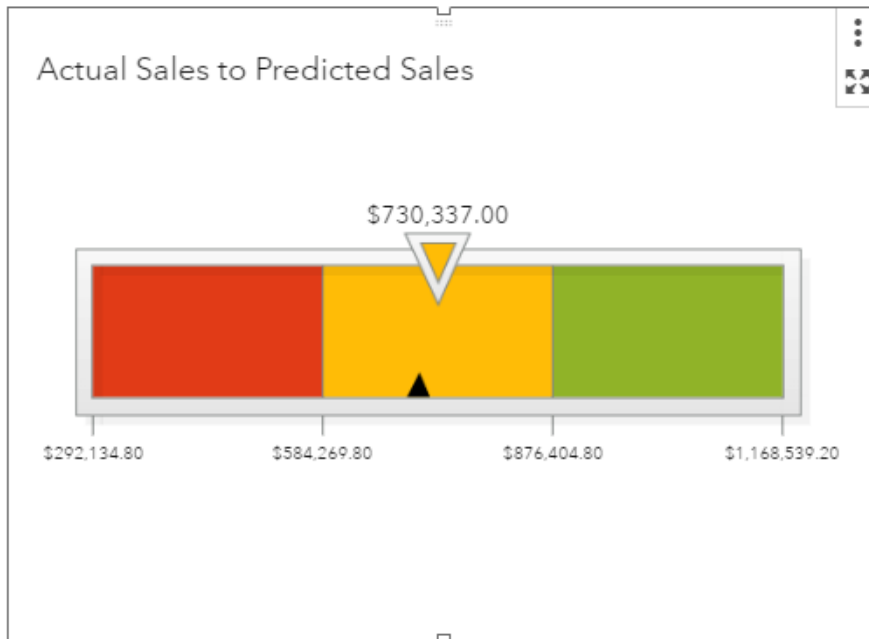
Dial

displays an arc-shaped gauge. The target value is indicated by a small black arrow pointing inward. The actual value is indicated by a large arrow pointing outward.
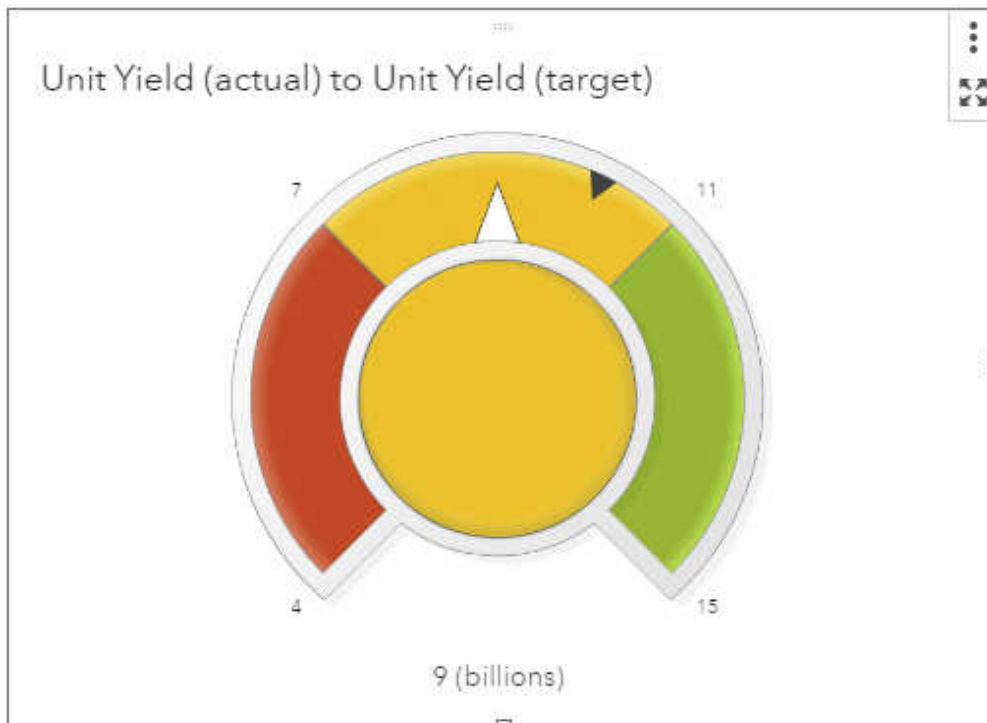
Slider

displays a linear gauge. The target value is indicated by a small black arrow. The actual value is indicated by a large arrow.

Note: Like a bullet gauge, a slider gauge is oriented horizontally by default, but you can change the gauge's orientation to vertical. You should use a slider gauge when the numeric scale does not start at zero.

Actual Sales to Predicted Sales

$730,337.00

$292,134.80 $584,269.80 $876,404.80 $1,168,539.20

Speedometer

displays an arc-shaped gauge. The target value is indicated by a small white triangle pointing outward. The actual value is indicated by a black pointer pointing outward.

Unit Yield (actual) to Unit Yield (target)

9

(billions)

Thermometer

displays a linear gauge. The target value is indicated by a line. The actual value is indicated by the background bar.

Note: The base of a thermometer bar should always start at zero. You can set this by defining your first range display rule to begin at zero. SAS Visual Analytics always shows the base of the bar at the bottom of the thermometer.

Actual Sales to Predicted Sales

$750,000.00

$500,000.00

$250,000.00

$0.00

$730,337.00
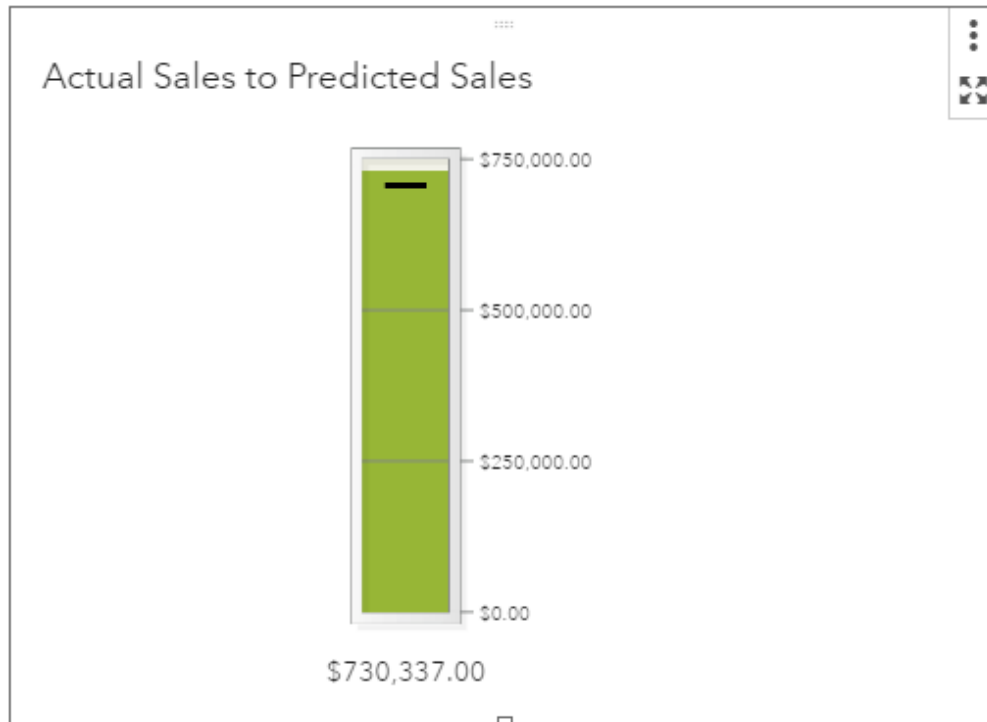
Geo Map

A geo map overlays your data on a geographic map. You can display your data by using the following types of map:

Bubbles

    displays your data as a series of bubbles. Each bubble is located at the center of a geographic region or at the coordinates of a location. The size and color of the bubbles can represent either the frequency of each geographic location or the value of a measure.

Profit, Frequency by Facility State
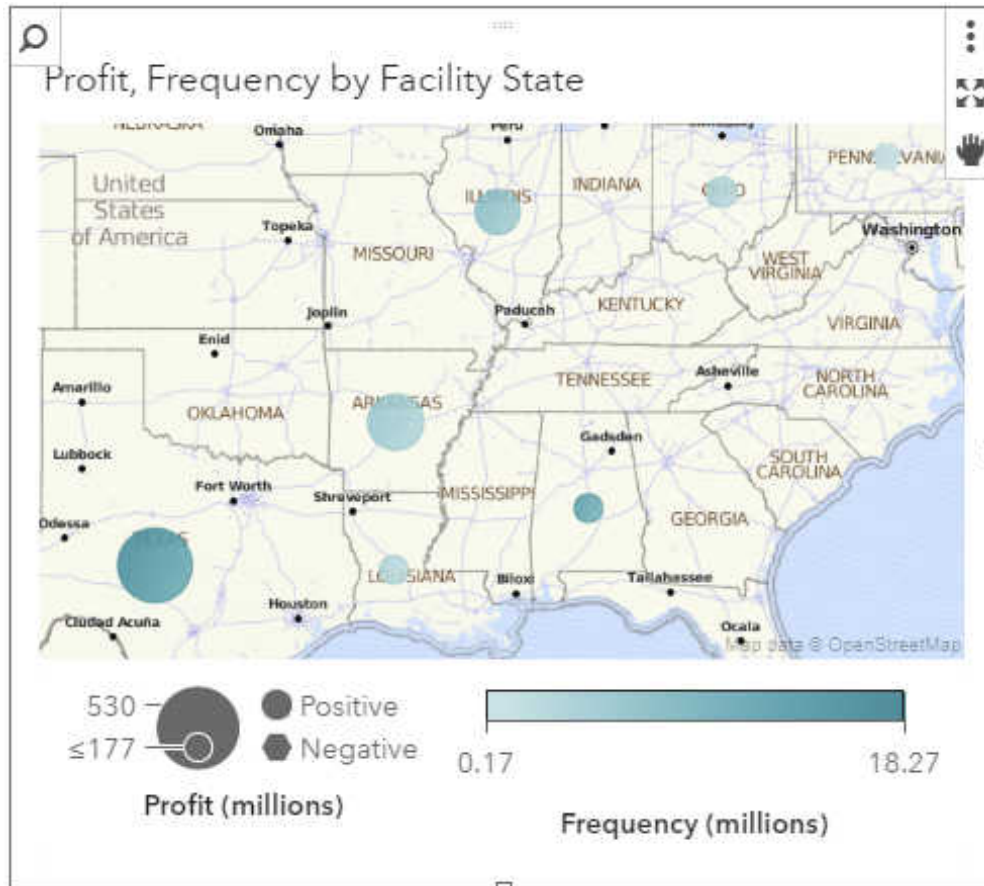
Coordinates

displays your data as a simple scatter plot on the map. Each point is located at the center of a geographic region or at the coordinates of a location.
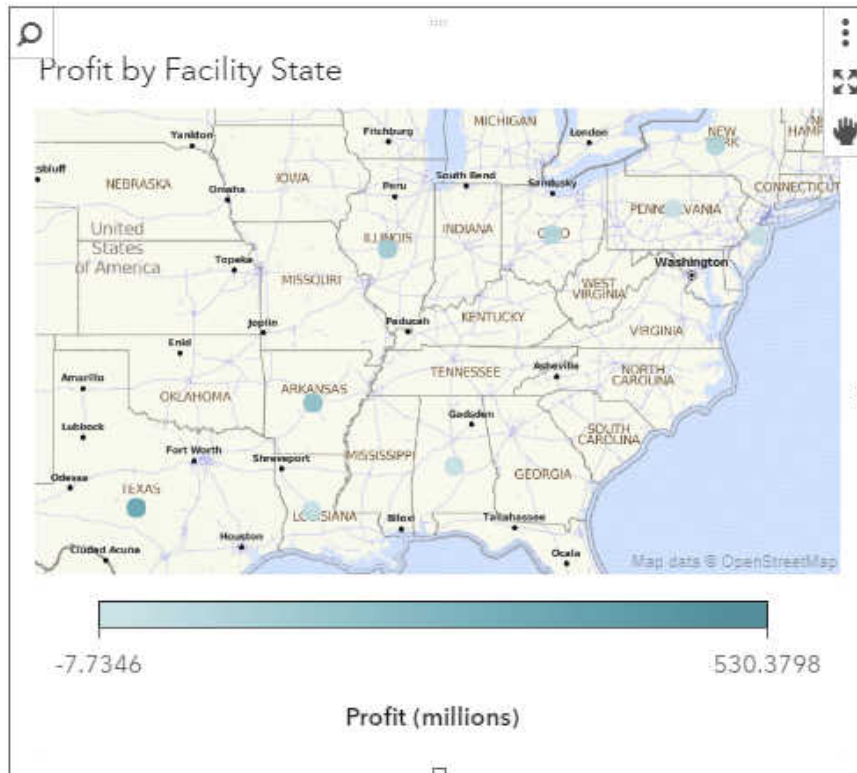
Regions

displays your data as colored regions on the map. You can fill geographical boundaries (for example, a country or a state) on a map with color, based on measure values that are aggregated to the level defined by a geographical boundary.
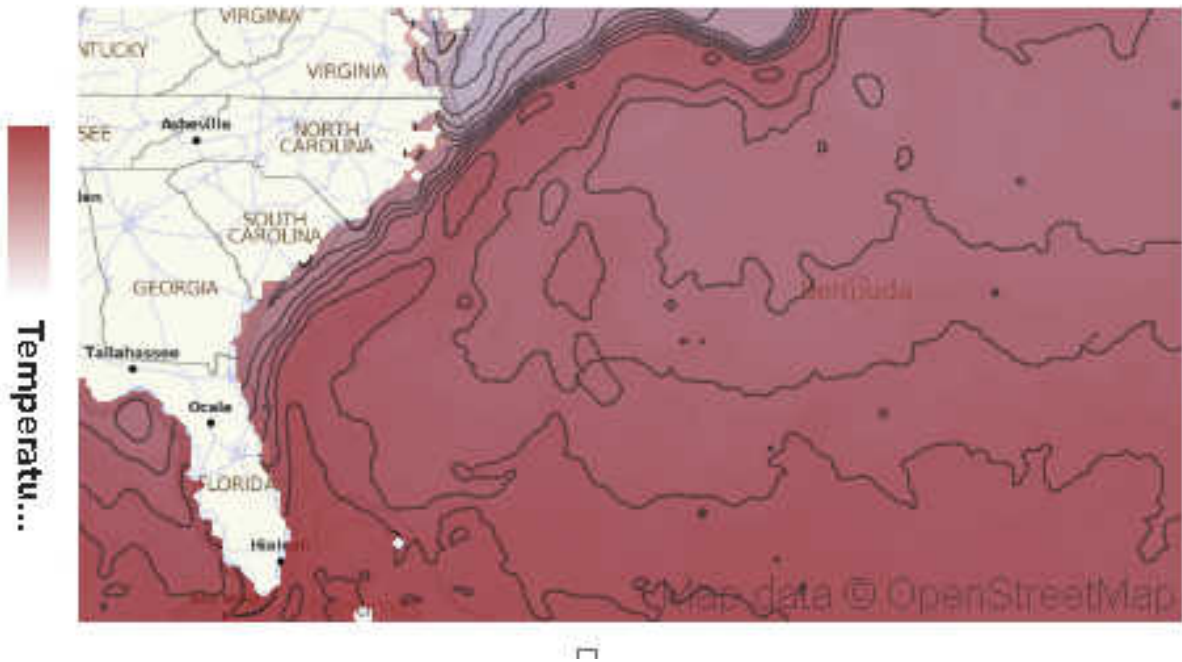
Note: The **Regions** map style is not available for custom geographic roles or for ZIP codes.
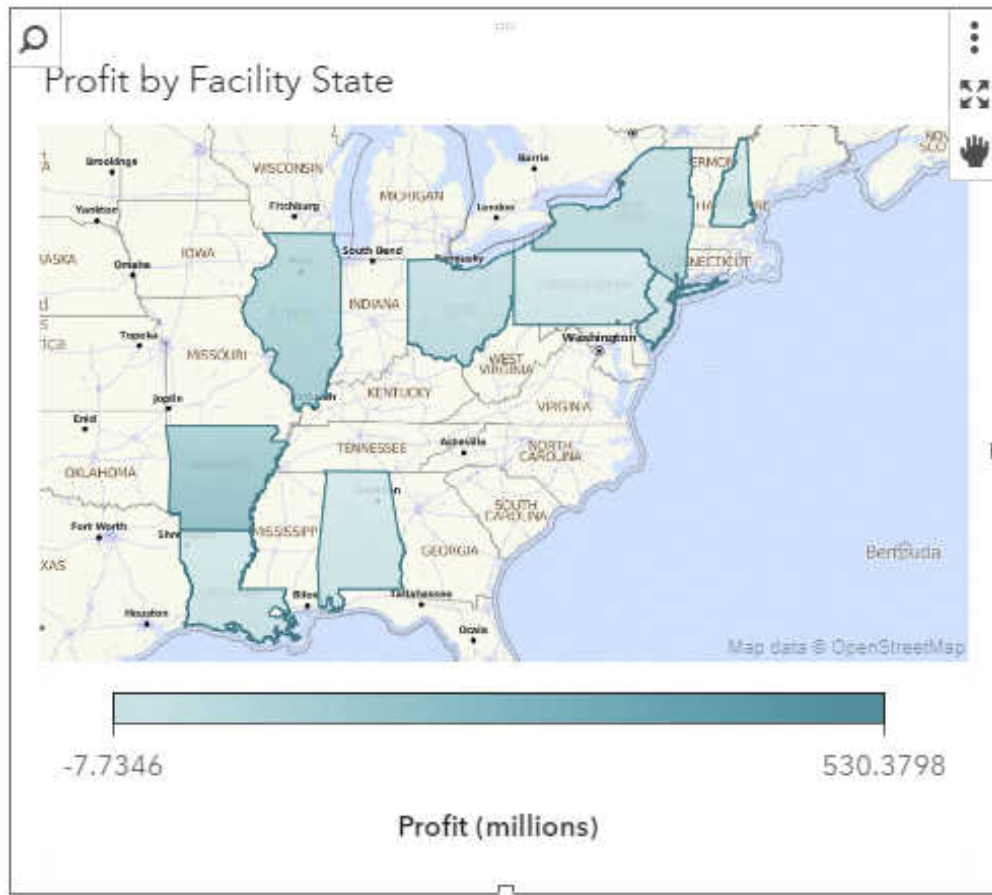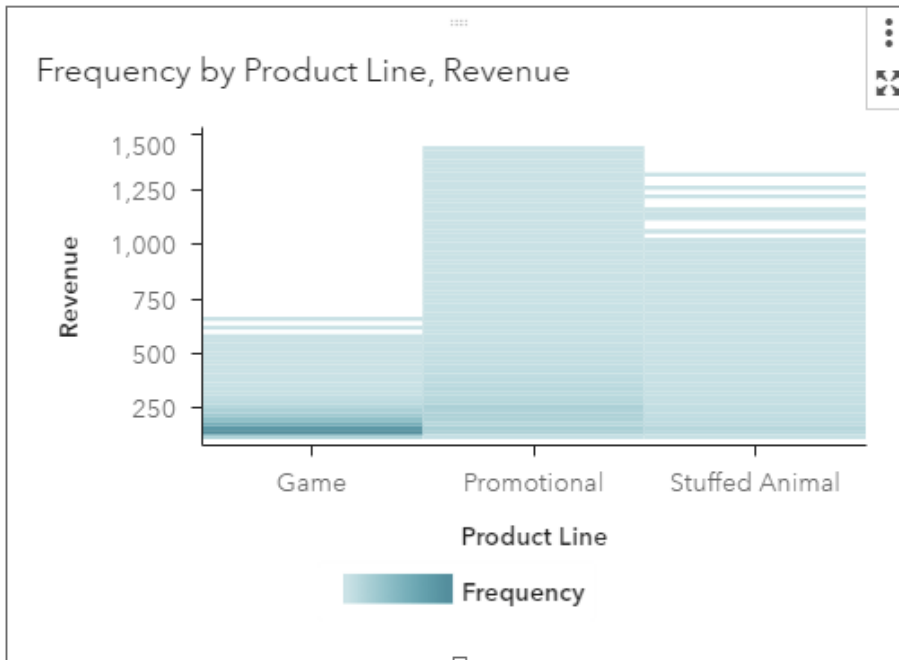
Contour

displays your data as shaded areas or lines on the map that indicate the density of data or the values of a measure.
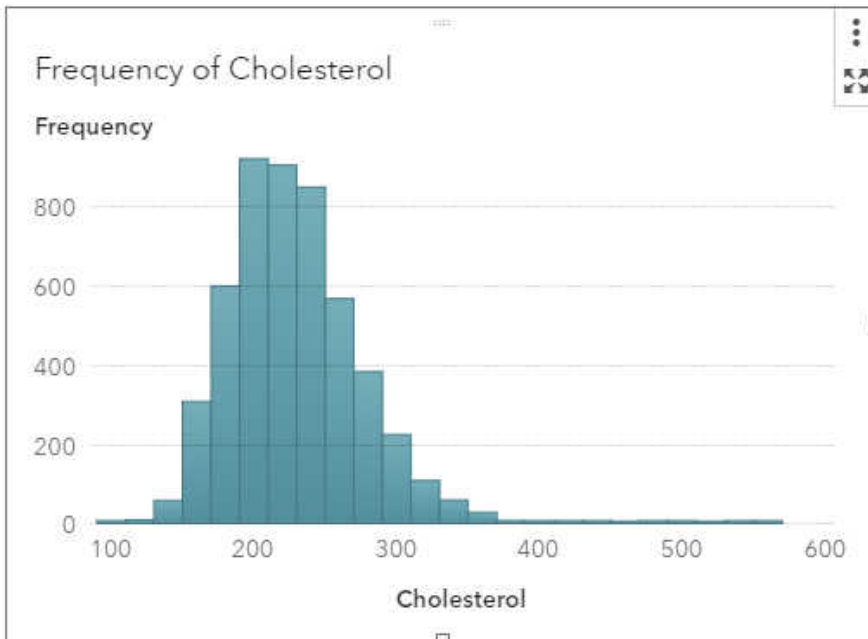
Temperature Fahrenheit by LatLong

Heat Map

A *heat map* displays the distribution of values for two data items by using a table with colored cells.
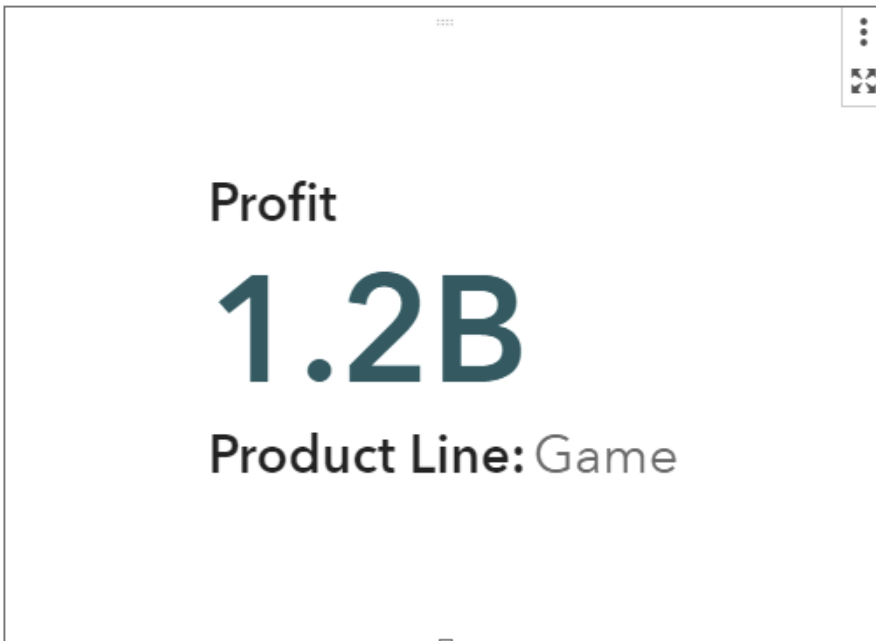

Frequency by Product Line, Revenue

Histogram

A *histogram* displays the distribution of values for a single measure.

Key Value

A *key value* displays a single aggregated value for a measure, a category, or both.


Line Chart

A *line chart* shows the relationship of one or more measures over some interval, such as time or a series of ranges. You can display a single measure (univariate analysis), or you can show the relationships among multiple measures (multivariate analysis), such as the leading or lagging relationship between advertising and sales over time.

You can apply grouping and create lattices.

Expenses, Revenue by Date by Year
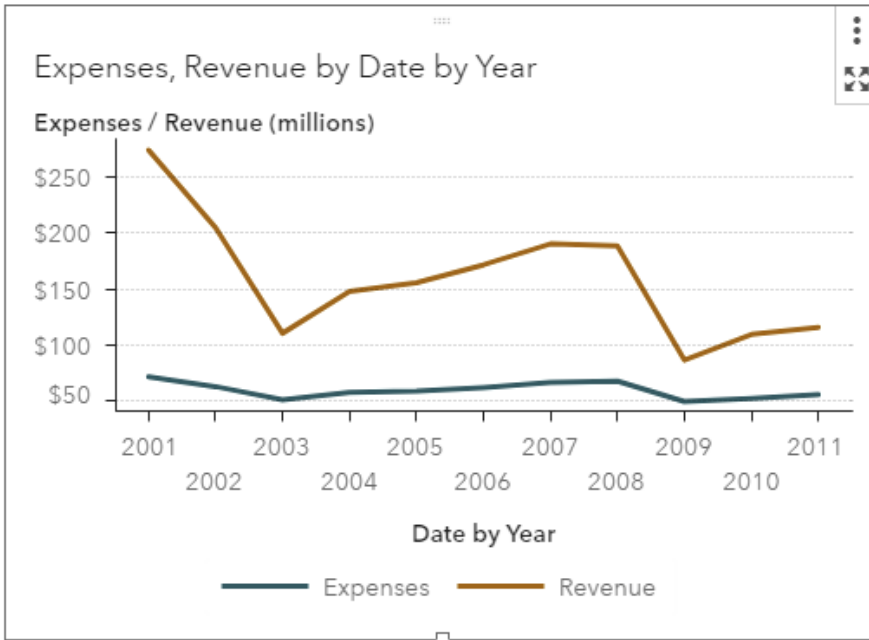
Needle Plot

A *needle plot* displays vertical lines that connect the data points to a horizontal baseline. The baseline intersects the 0 value or the minimum value on the vertical axis.


Profit by Date by Month
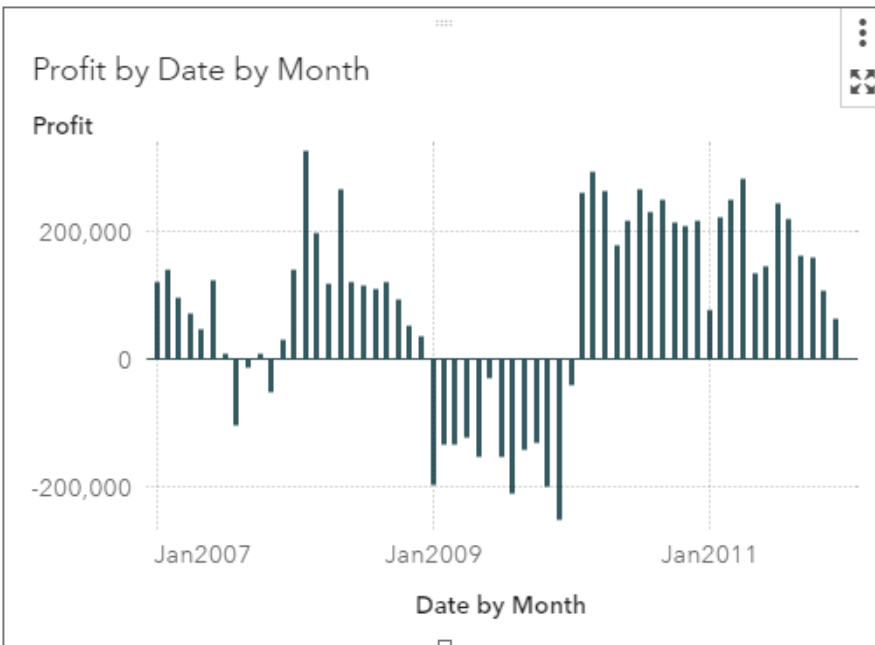
Numeric Series Plots

A *numeric series plot* displays data by using a line that connects the data values for two or more measures. A numeric series plot requires numeric data on the X axis.
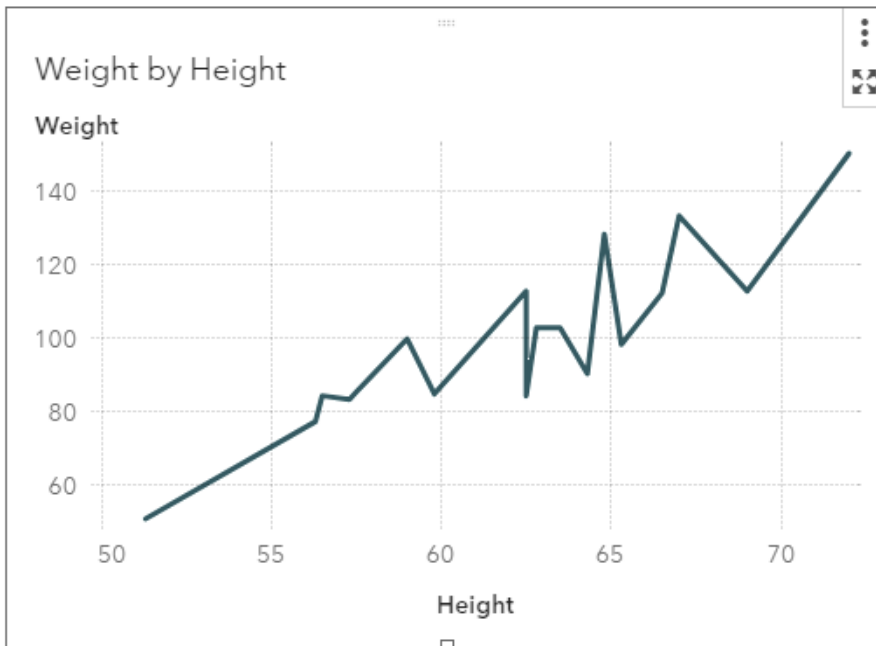
Parallel Coordinates Plot

A *parallel coordinates plot* displays data as lines moving through categories and binned measures. The thickness of a line indicates the relative number of observations in that bin. You can restrict the active lines to one or more bins in order to focus on only the data that interests you.
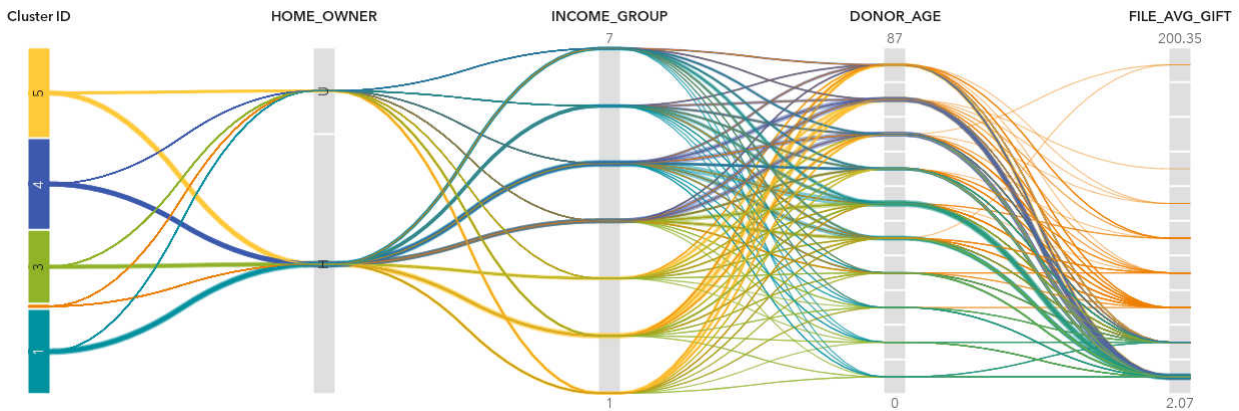
Pie Chart

A *pie chart* is a circular chart that is divided into slices by radial lines. Each slice represents the relative contribution of each part to the whole.
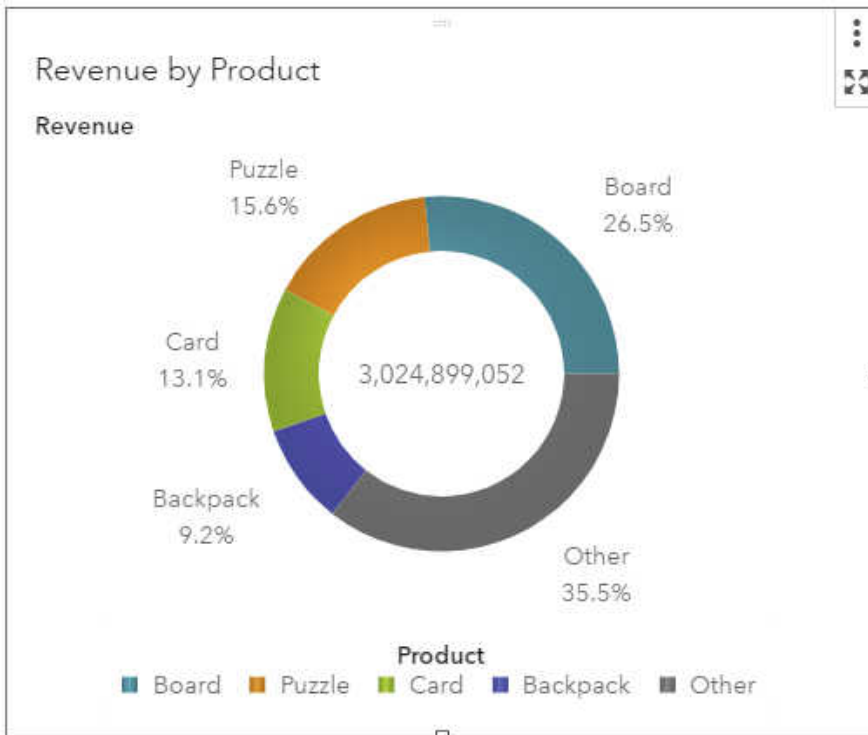
Scatter Plot

A *scatter plot* is a two-dimensional plot that shows the relationship of two measure data items. Each marker (represented by a symbol such as a dot, a square, or a plus sign) represents an observation. The marker's position indicates the value for each observation. Use a scatter plot to examine the relationship between numeric data items.

Scatter plots do not use aggregated data.
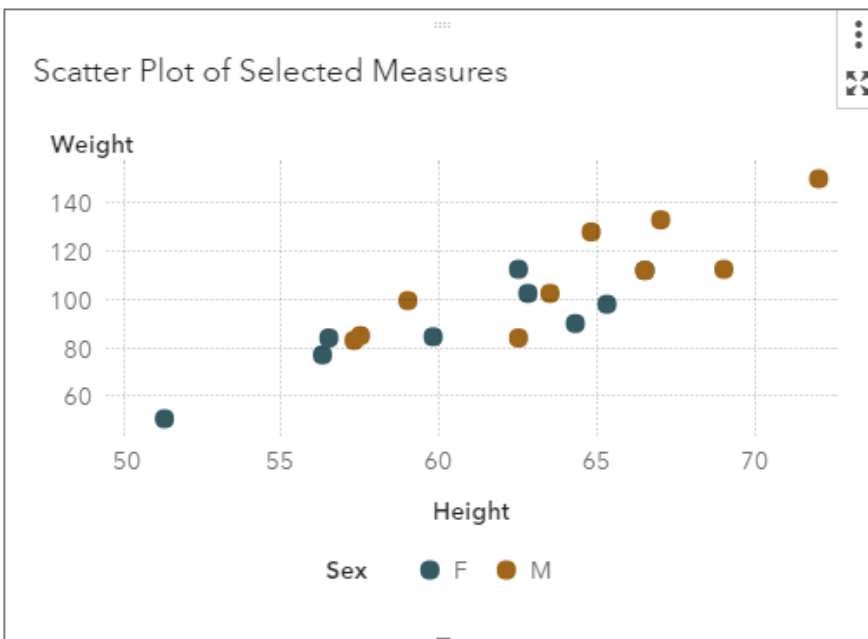
Schedule Chart

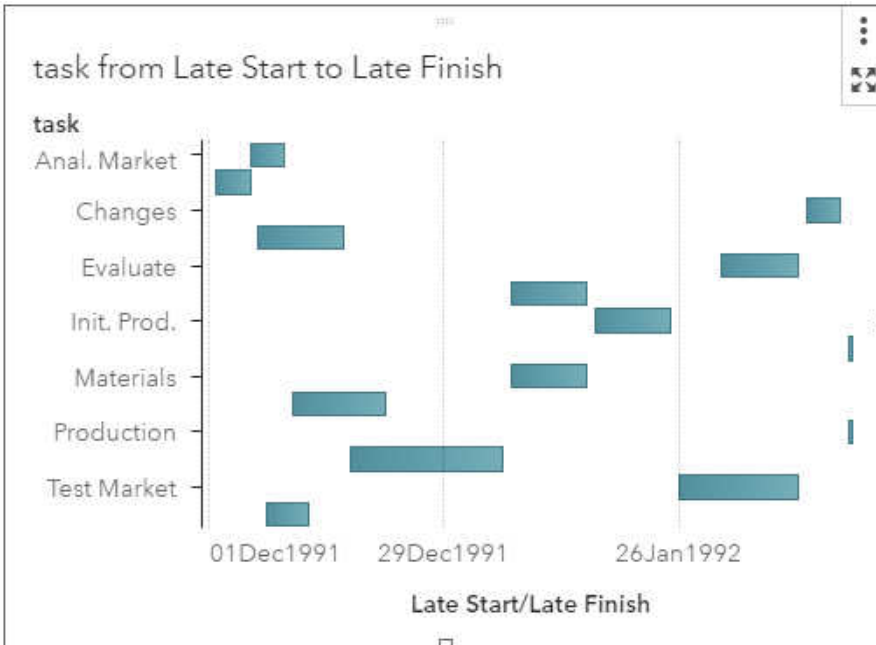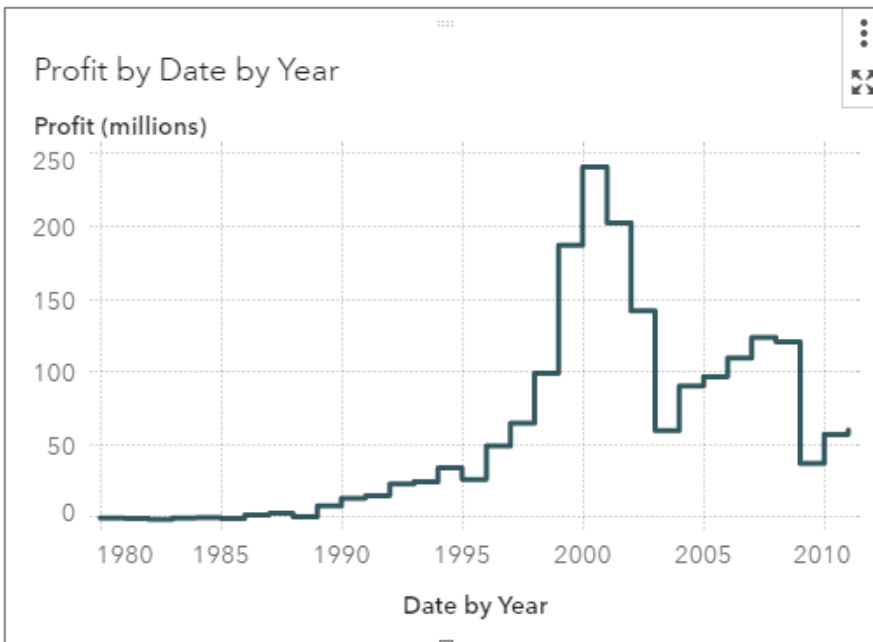A *schedule chart* displays the duration of events by using bars. The edges of each bar indicate the start and end times of an event.

Step Plot

A *step plot* displays vertical lines that connect the data points to a horizontal baseline. A step plot enables you to see the exact point on the X axis when a change in the Y-axis measure occurs.

Targeted Bar Chart

A *targeted bar chart* is a variation of the bar chart that has target values. A target value is represented as a triangle with a line at the target value that is determined by the target role.
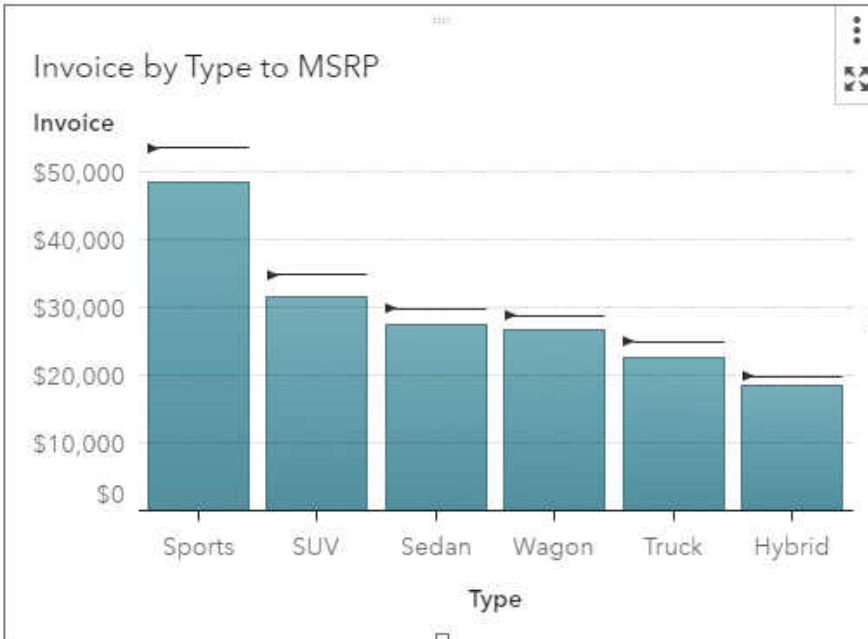
Time Series Plot

A *time series plot* shows an ordered sequence of values that are observed at equally spaced time intervals. A time series plot requires a date, datetime, time, or date hierarchy data item that is continuous on the X axis.
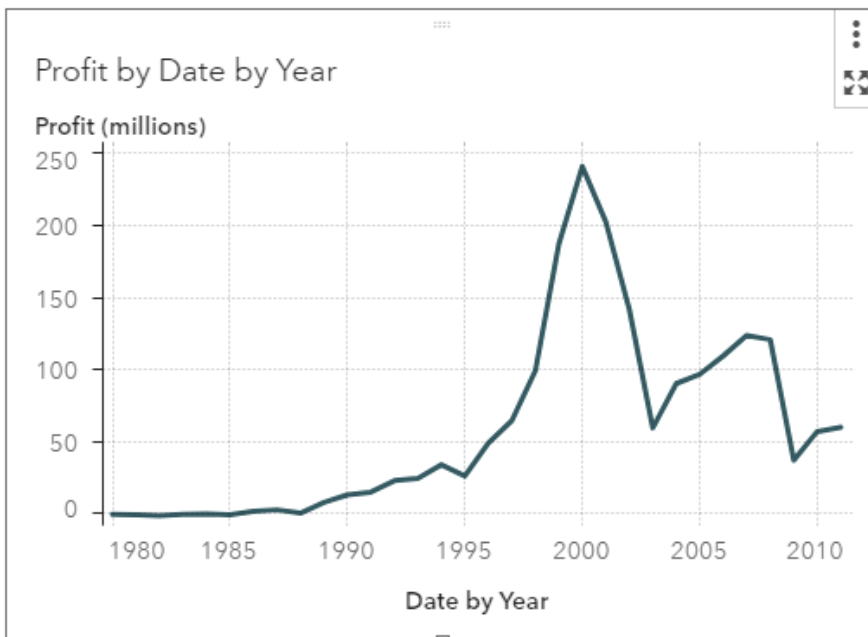
Treemap

A *treemap* displays your data as a set of rectangles (called tiles). Each tile represents a category node or a hierarchy node. The color and size of the tiles can both represent the value of a measure.

The layout of the tiles in the treemap is dependent on the size of the display area because it uses a space-filling algorithm to lay the tiles out. This means that the same treemap might appear slightly different in SAS Visual Analytics than it does in the report viewer or on a mobile device because the aspect ratio and size available in those viewers might be different from what the original report designer sees in SAS Visual Analytics.
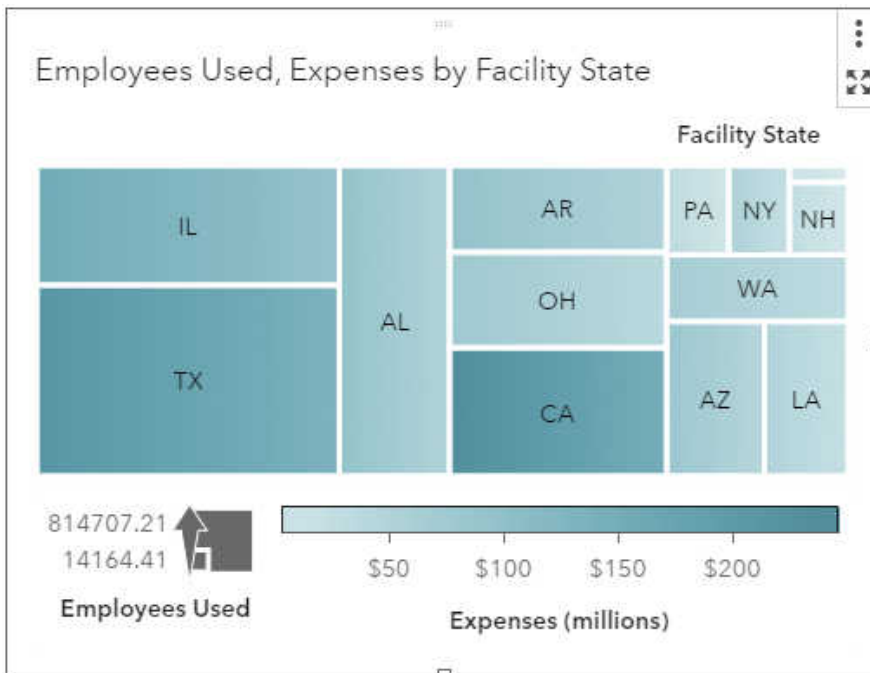
Vector Plot

A *vector plot* displays the change in data by using directed line segments or vectors to represent both direction and magnitude at each point.

Waterfall Chart

A *waterfall chart* (also known as a progressive bar chart) shows how the initial value of a measure increases or decreases during a series of operations or transactions. The first bar begins at the initial value, and each subsequent bar begins where the previous bar ends. The length and direction of a bar indicate the magnitude and type (positive or negative, for example) of the operation or transaction. The resulting chart is a stepped bar showing how incremental changes lead to the final value of the measure.
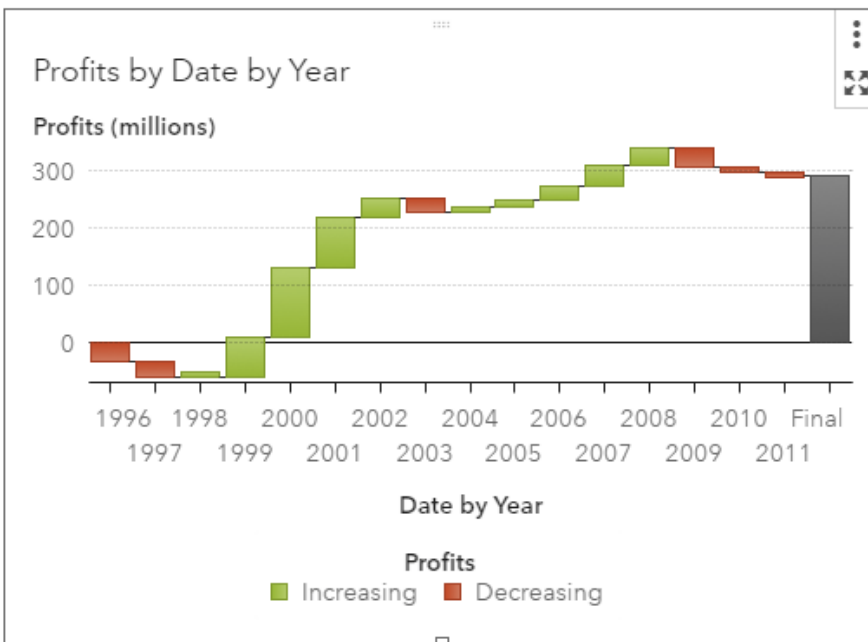
Word Cloud

A *word cloud* displays a set of category values as text, grouped in a cloud-like shape. Depending on the word cloud data roles, the size of the text indicates the frequency of a category value or the value of a measure that corresponds to a category value.

Controls

A control is an object that filters or narrows the scope of the data that the user is viewing. A control enables a report designer to select a value or set of values that he or she wants the report user to see.

Button Bar

A *button bar* control displays buttons, which represent a narrowed scope of data, in a horizontal or vertical layout. A report user can select a button to filter a list of category values.

Drop-Down List

A *drop-down list* control enables a report user to select an item from a list of category values.

Facility Region	▼
Clear filter	
East	
North	
South	
West	

List

A *list* control enables a report user to select one or more category values from a list.

☐ East

☐ North

☐ South

☐ West

Slider

A *slider* control enables a report user to move a selector horizontally or vertically to select a single data item or range of data items.

1996 to 2008

1980　　　　　　　　　　　　　　　　　　　　2011
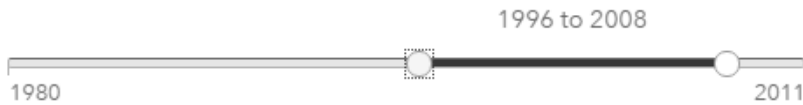
Text Input

A *text input* control enables a report user to enter text in a field to narrow the list of category values.

Enter Facility Region...

Analytics

Automated Analysis

An *automated analysis* object determines the most important underlying factors for a specific response variable. The results include proportional importance, greatest and smallest groups, and explanatory plots.

Explaining BAD

0

80.05% Overall, **BAD** has a 80.05% chance (4.8K out of 6K cases) of being **0**. DEBTINC, DELINQ, VALUE, DEROG, CLAGE, NINQ and six other predictors best explain **BAD**.
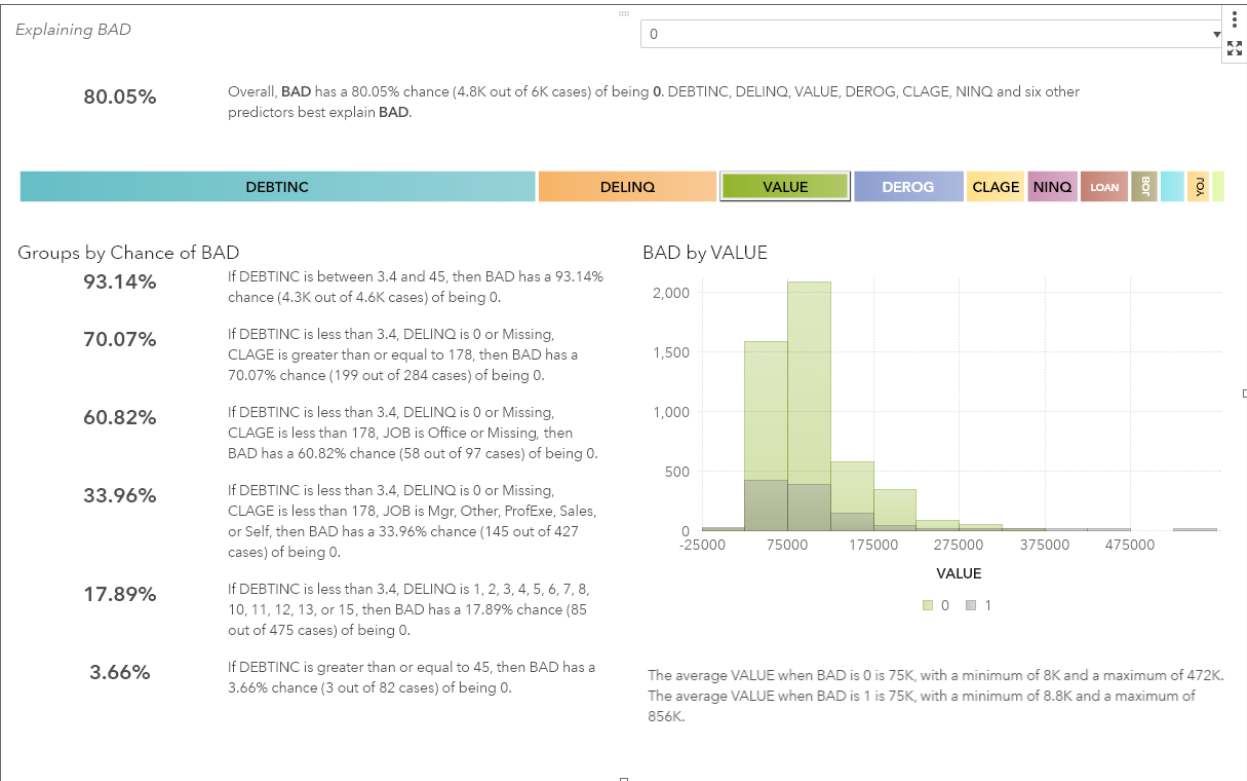
DEBTINC	DELINQ	VALUE	DEROG	CLAGE	NINQ	LOAN	JOB	YOJ

Groups by Chance of BAD

93.14% If DEBTINC is between 3.4 and 45, then BAD has a 93.14% chance (4.3K out of 4.6K cases) of being 0.

70.07% If DEBTINC is less than 3.4, DELINQ is 0 or Missing, CLAGE is greater than or equal to 178, then BAD has a 70.07% chance (199 out of 284 cases) of being 0.

60.82% If DEBTINC is less than 3.4, DELINQ is 0 or Missing, CLAGE is less than 178, JOB is Office or Missing, then BAD has a 60.82% chance (58 out of 97 cases) of being 0.

33.96% If DEBTINC is less than 3.4, DELINQ is 0 or Missing, CLAGE is less than 178, JOB is Mgr, Other, ProfExe, Sales, or Self, then BAD has a 33.96% chance (145 out of 427 cases) of being 0.

17.89% If DEBTINC is less than 3.4, DELINQ is 1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13, or 15, then BAD has a 17.89% chance (85 out of 475 cases) of being 0.

3.66% If DEBTINC is greater than or equal to 45, then BAD has a 3.66% chance (3 out of 82 cases) of being 0.

BAD by VALUE

The average VALUE when BAD is 0 is 75K, with a minimum of 8K and a maximum of 472K. The average VALUE when BAD is 1 is 75K, with a minimum of 8.8K and a maximum of 856K.

Decision Tree

A *decision tree* displays a series of nodes as a tree, where the top node is the response data item, and each branch of the tree represents a split in the values of a predictor data item. The splits enable you to see which values of the predictor data item correspond to different distributions of values in the response data item.
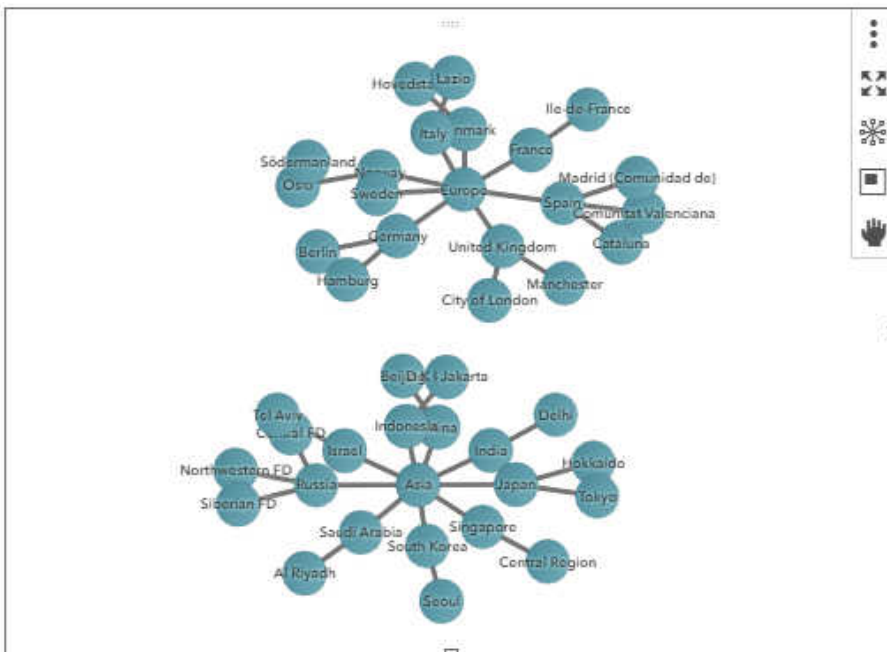
Decision Tree **Cause of Death**   Observations Used **1,968**
Unused **3,241**
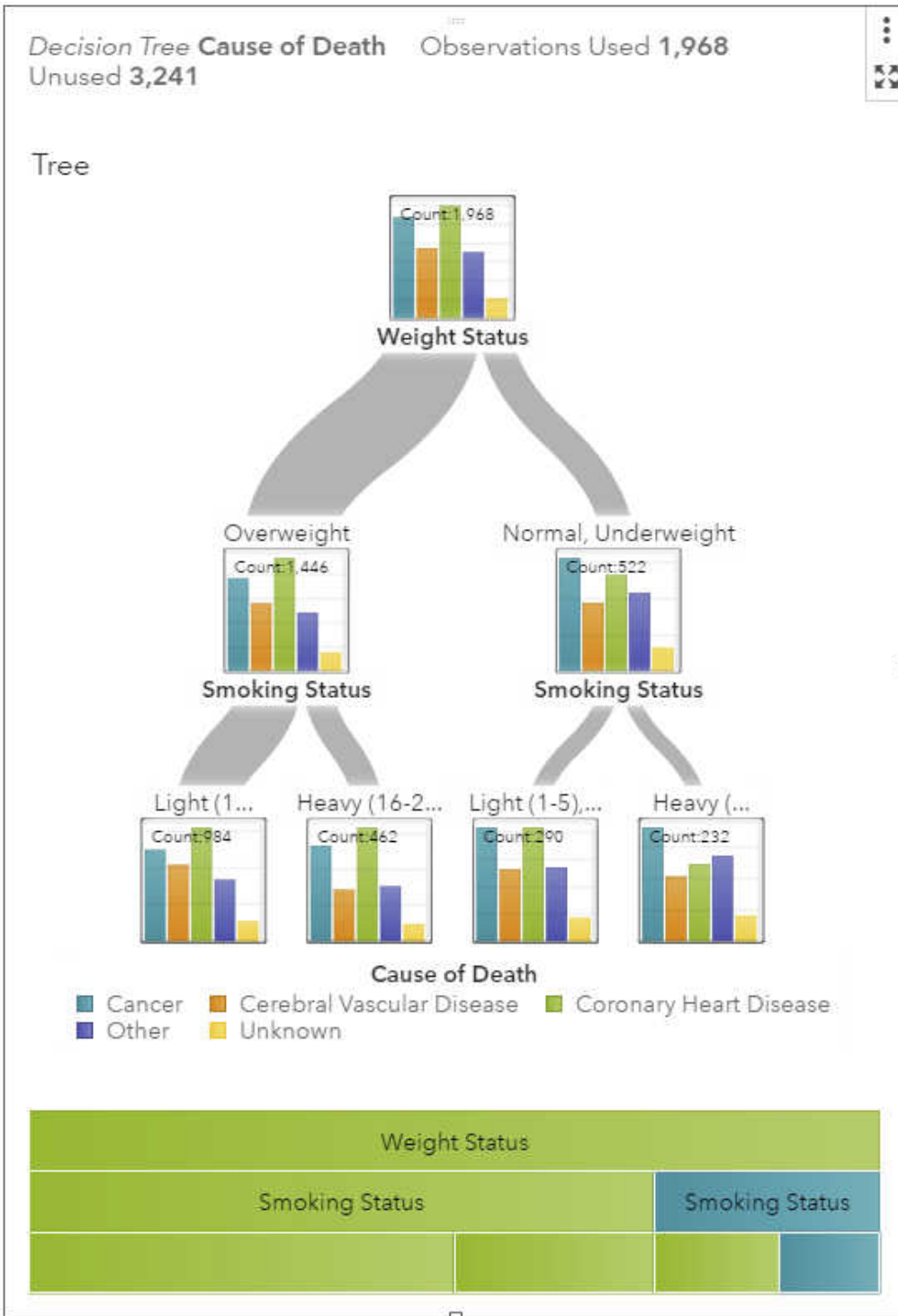
Forecasting

A *forecasting* object uses the statistical trends in your data to predict future data values.
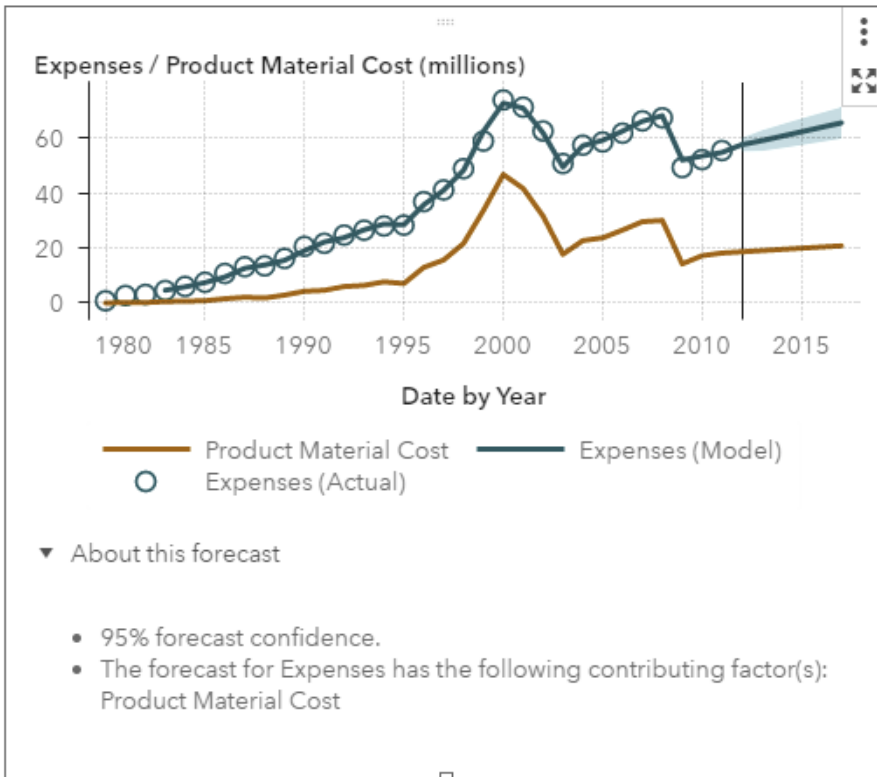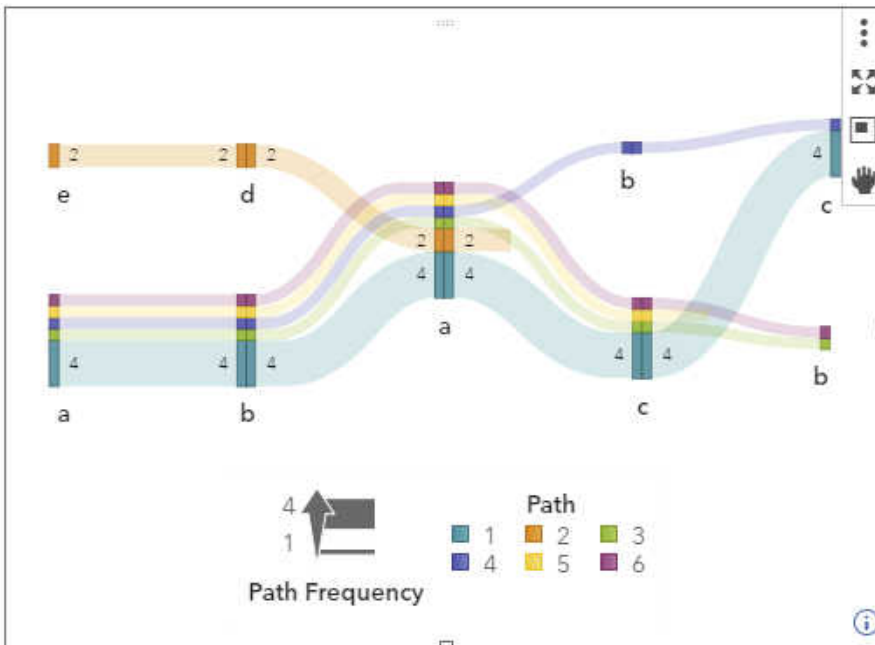
Network Analysis

A *network analysis* object displays the relationships between the values of categories or hierarchy levels by using a series of linked nodes.

Path Analysis

A *path analysis* object displays flows of data from one event (value) to another as a series of paths.


Text Topics

A *text topics* object analyzes each value in a document collection as a text document that can contain multiple words. Words that often appear together in the document collection are identified as topics. For the selected topic, the text topics object displays the terms with the greatest topic term weight values. The topic term weight indicates the importance of the term within the topic.

A text topics object displays a set of words from a character data item. The size of each word in the cloud indicates the importance (topic term weight) of the word.

A text topics object can also display whether the documents in a topic express positive, negative, or neutral sentiment.
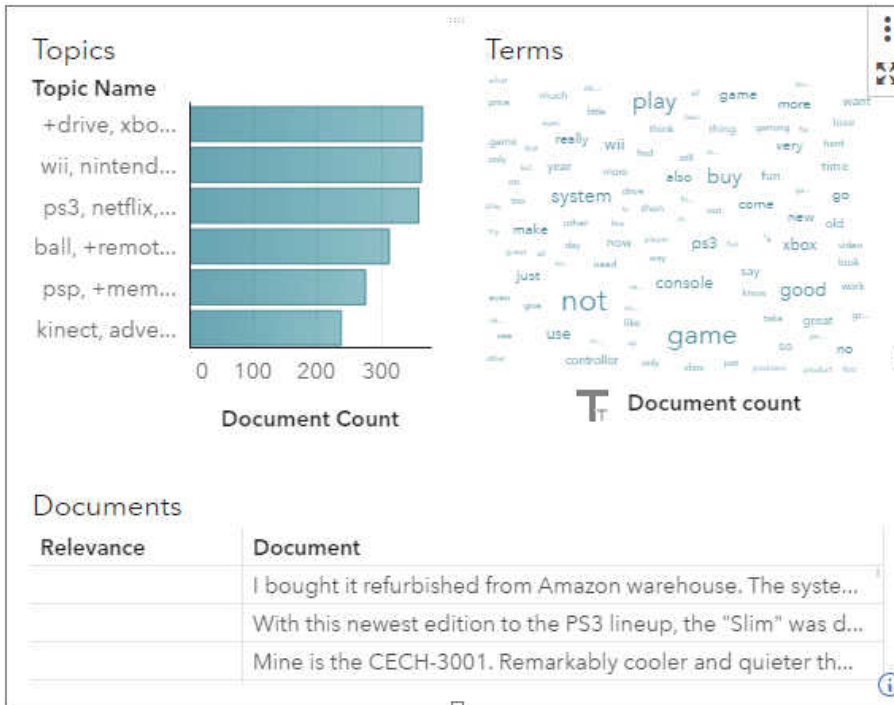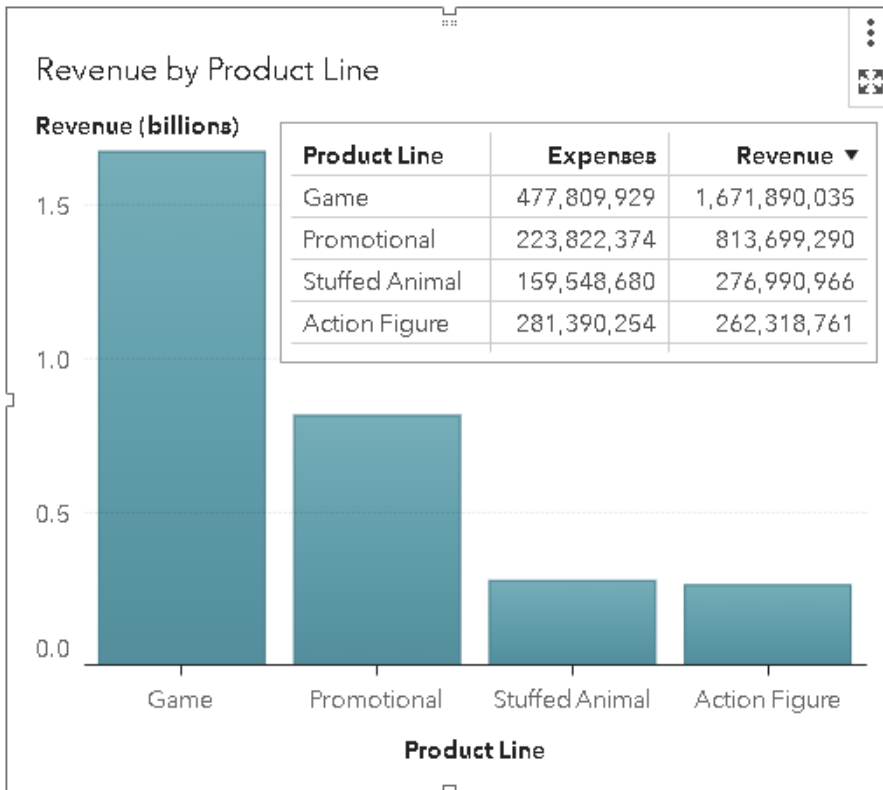
Containers

A container enables you to group other objects or prompts in your report.

Precision Container

A *precision container* enables you to place, align, and size the objects within the container. The precision type allows objects to overlap.

Note: Precision containers are not recommended if your report is viewed on mobile devices.

Prompt Container

A *prompt container* groups prompt controls. Only objects that are controls can be placed inside a prompt container. Objects inside prompt containers are filtered by the same rules as other objects.

Prompt containers can be added to the report prompt area and page prompt area on the canvas. They can also be added to the content area of the canvas.
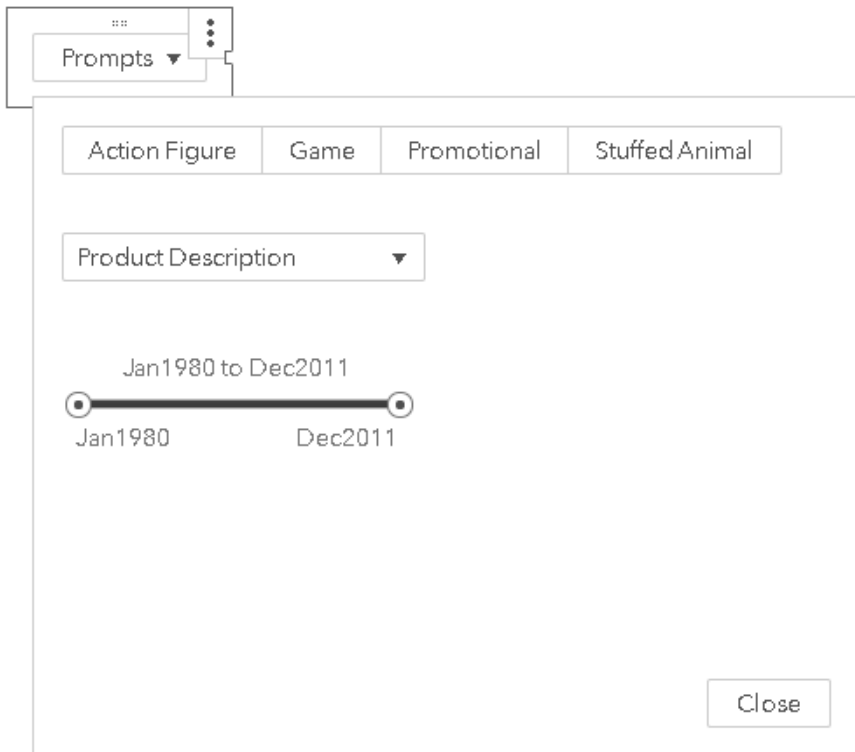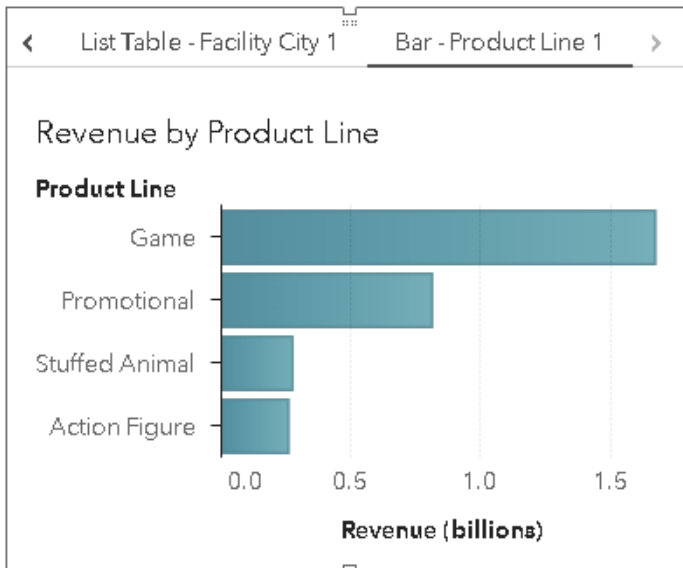
Scrolling Container

A *scrolling container* displays content in a scrolling layout, where each object fills the entire container area and you scroll to see other objects. You can select either a vertical layout or a horizontal layout.
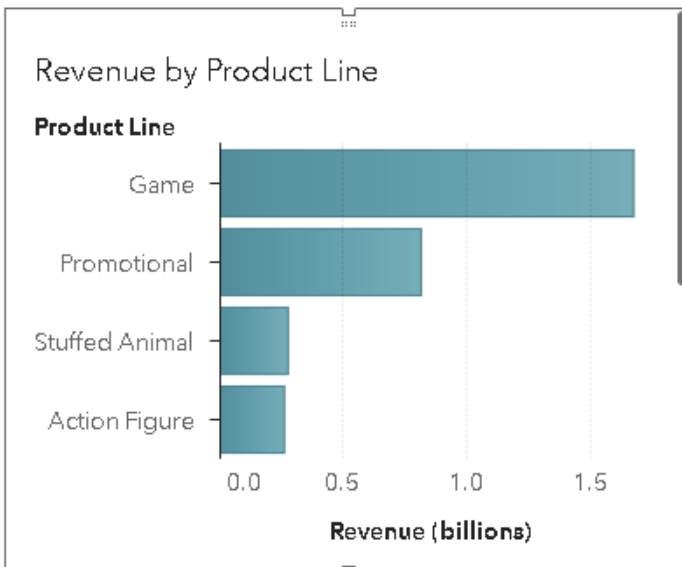

Stacking Container

A *stacking container* displays the objects as if they are in a slide deck. Only one object is displayed at a time. A stacking container has a control bar that lets you move between objects.

Standard Container

A *standard container* lays out the content horizontally or vertically. Where it is possible, the content is resized so that multiple objects can be displayed together without scrolling.
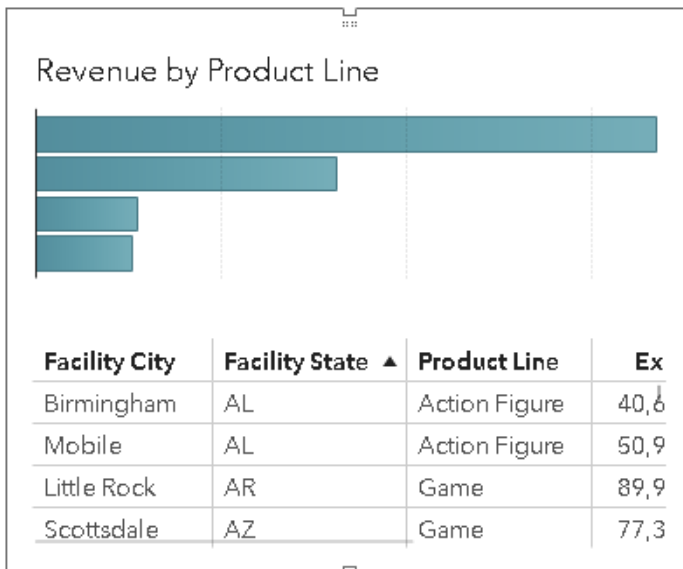
Content

Data-Driven Content

A *data-driven content* object enables you to display your data in a custom third-party visualization within your SAS Visual Analytics report. The third-party visualization can be authored in any JavaScript charting framework, such as D3.js, Google Charts, or CanvasJS. The visualization in a data-driven content object receives its data from SAS Visual Analytics and interacts with filters, ranks, and actions in the same way as other objects in your report.

The data-driven content object enables you to incorporate your own content, like a calendar object, into a SAS Visual Analytics report.

	Facility City	Unit Yield (actual)	Revenue
☐	Birmingham	929269567	47823282.21822265
☐	Chicago	433590511	227715290.96053994
☐	Cincinnati	333896134	89745321.60402142
☐	Cleveland	70177513	48154290.72321804
☐	Corpus Christi	1158581527	52229408.3807718
☐	Dallas	585447386	269153887.50115013
☐	Elgin	3769062	51125210.592067845
☐	Houston	823300727	309863920.53582513
☐	Joliet	434331265	27327231.79238484

Image

An *image* object enables you to include your corporate logo or other graphics in your report.


Text

A *text* object displays static text, which can contain links, in your report. A text object can also display dynamic text, such as measure and parameter values, or tokens such as the most recent update to the data source and a description of the current interactive filters.

Web Content

A *web content* object displays a web page or embedded video content in an inline frame (IFrame).
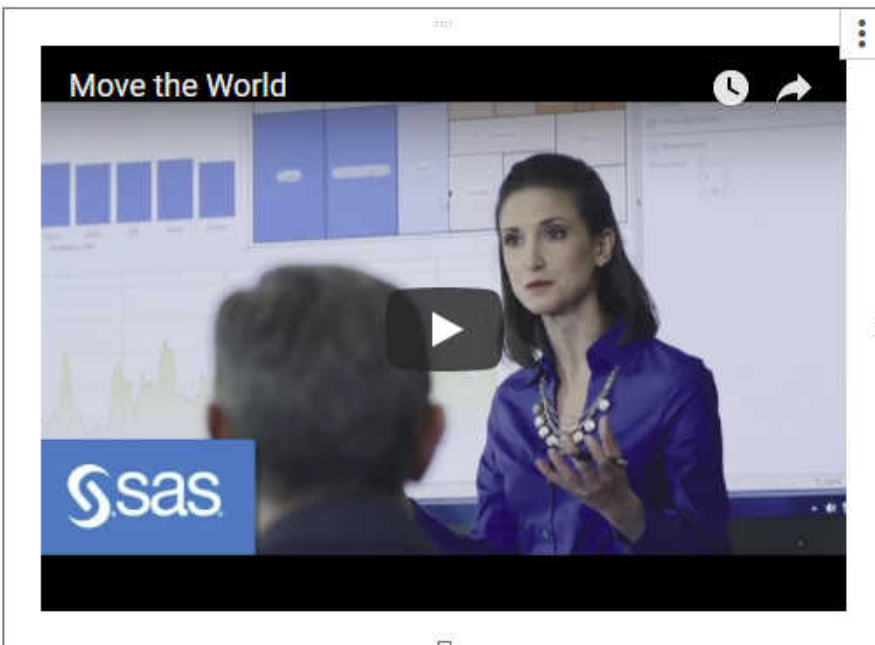
SAS Visual Statistics

About SAS Visual Statistics Objects

If SAS Visual Statistics is licensed at your site, then these plots are available.

Assessment Plot

The *assessment plot* displays how well the model predicts the value of the dependent variable against the true value of the dependent variable.
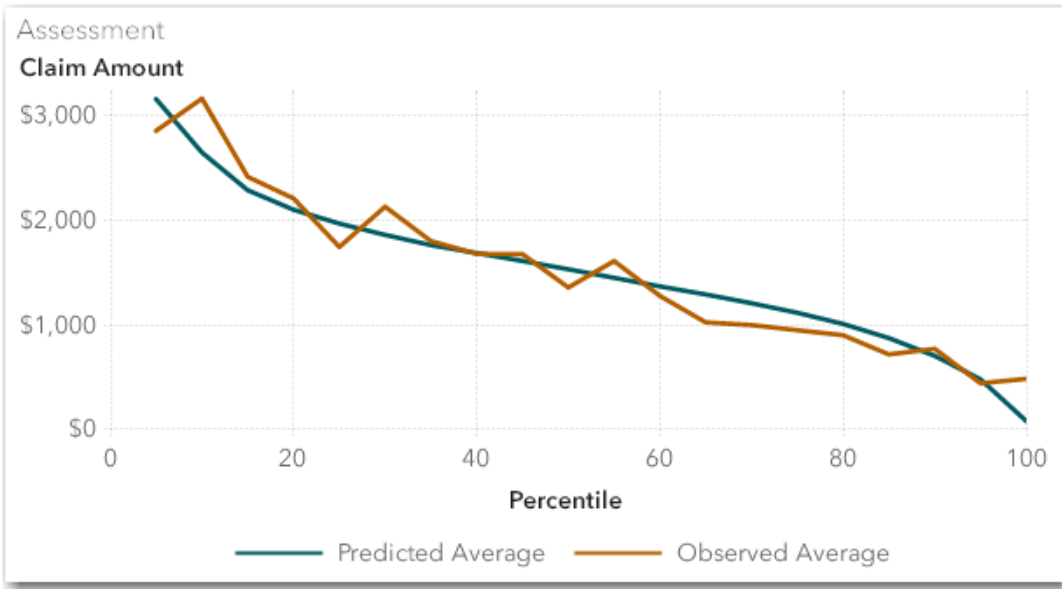
Cluster Matrix Plot

The *cluster matrix* displays a two-dimensional projection of each cluster onto a specified number of effect pairs.
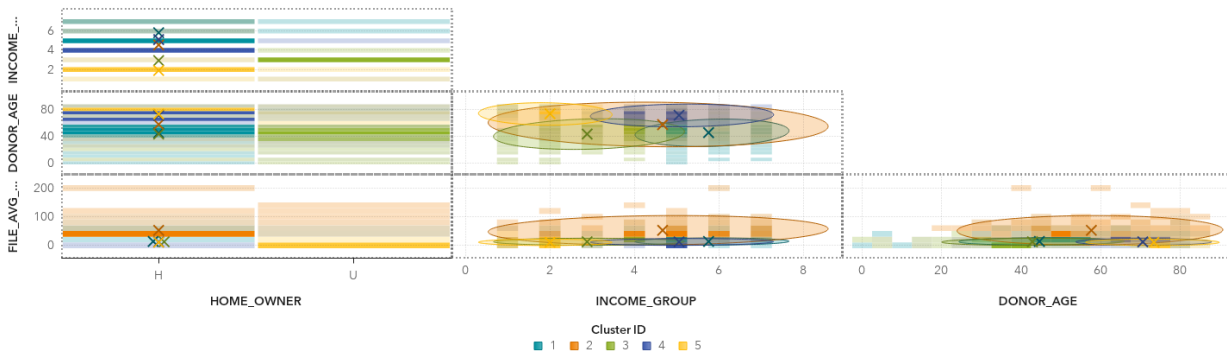
Fit Statistic

The *fit statistic* plot compares a selected model statistic across all models included in a Model Comparison object. In the image below, the event level misclassification rate is plotted. The statistics that are available for selection depend on the models that are being compared.

Fit Statistic

Misclassification Rate (Event)
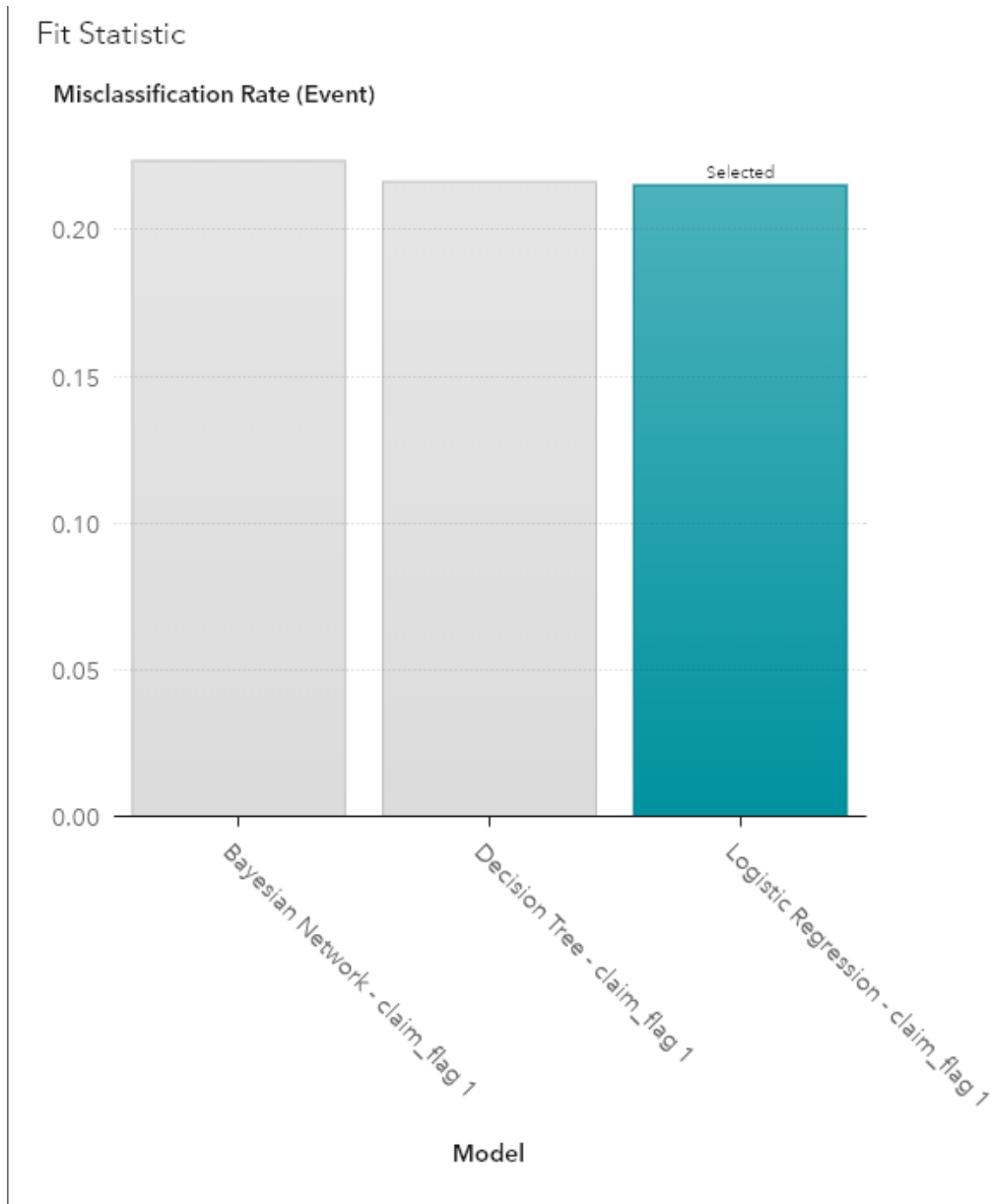
Fit Summary Plot

The *fit summary plot* ranks each input variable based on importance to the model as determined by its p-value.
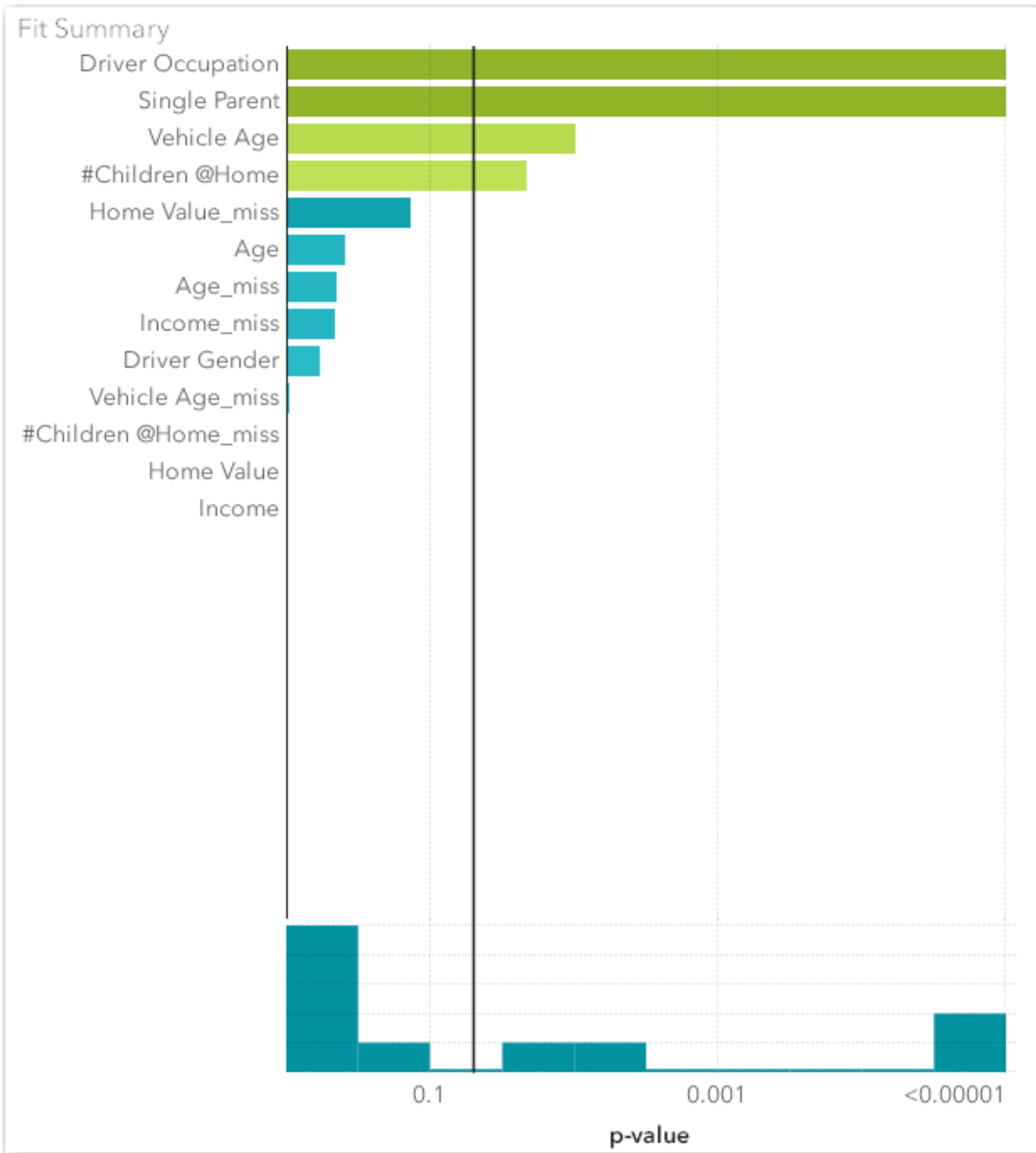
Icicle Plot

An *icicle plot* is an alternative way to view a decision tree. The width of each item in the plot indicates what percentage of the data is contained in that item. The root node spans the entire width of the plot because it contains 100% of the data, although each leaf node contains only a fraction of the data and is thus much smaller.
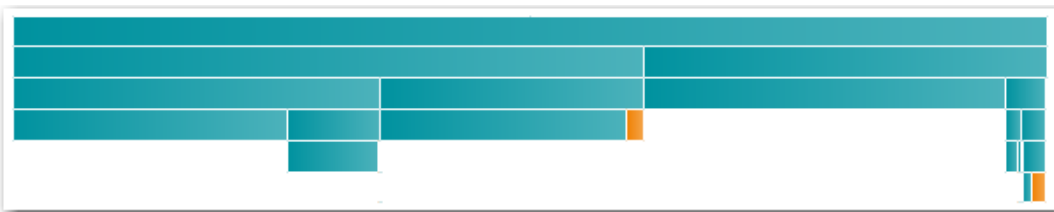
Influence Plot

The *influence plot* displays the relative influence of each observation on the model parameters based on a specified statistic.

Iteration Plot

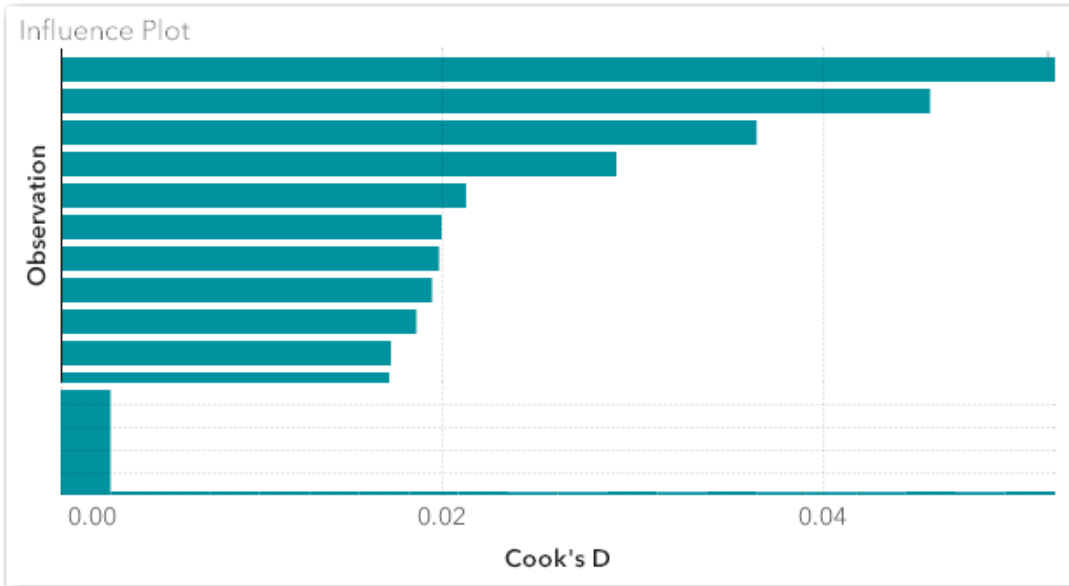For the generalized additive model and nonparametric logistic regression model, the *iteration plot* displays the change in the value of the objective function at each step of the model creation algorithm.
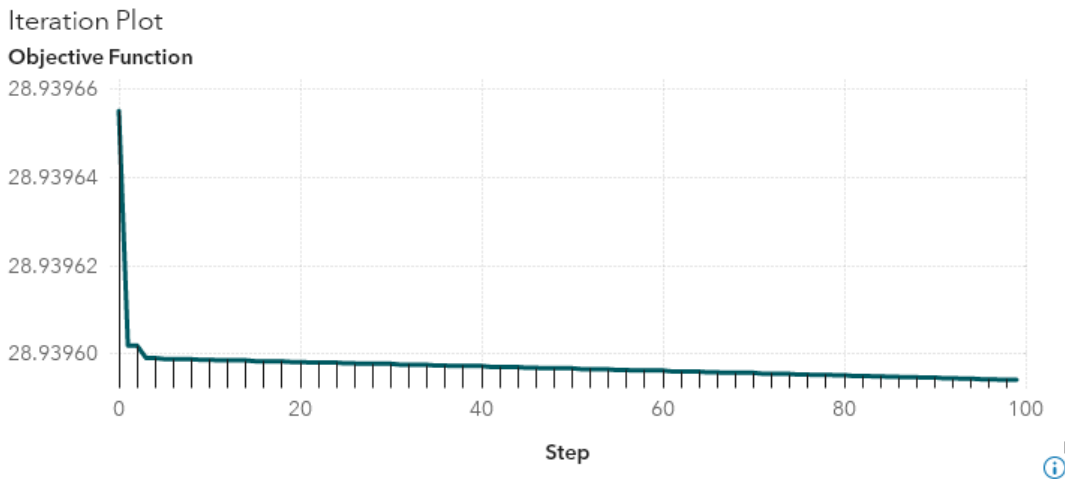
Lift Plot

Lift measures the ratio of percent captured response within each decile to the baseline percent response.
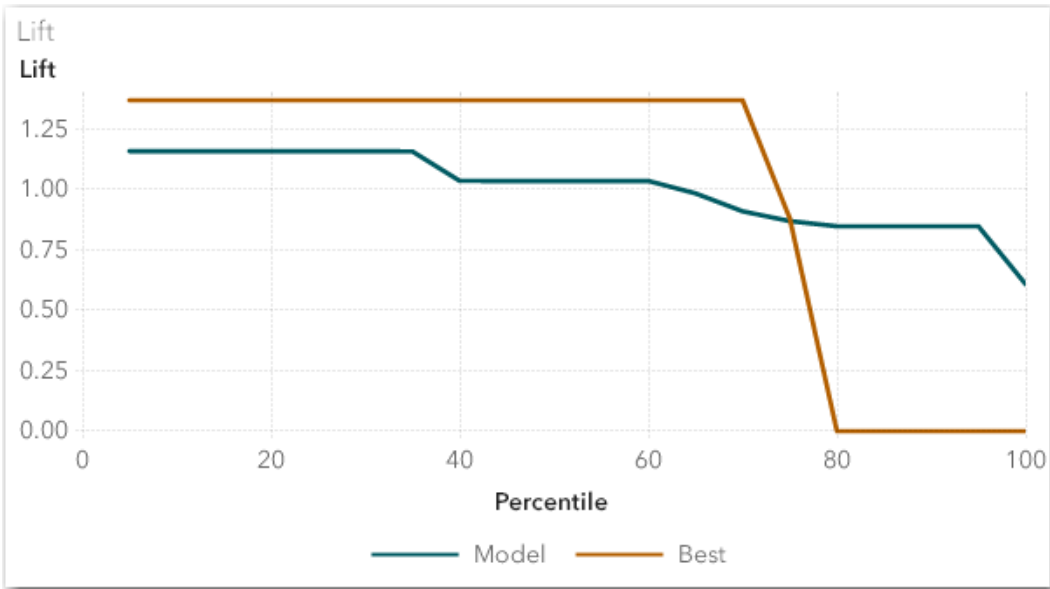
Cumulative lift measures the ratio of percent captured response within each decile, up to and including the current decile, to the baseline percent response.
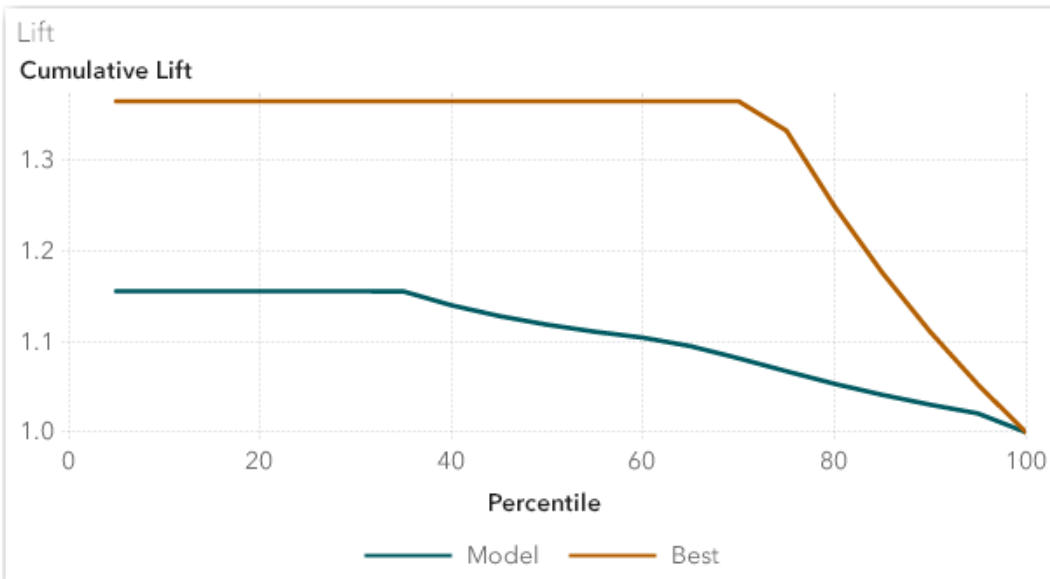
Misclassification Plot

This *misclassification plot* displays the number of true positives, false positives, true negatives, and false negatives in a bar chart.
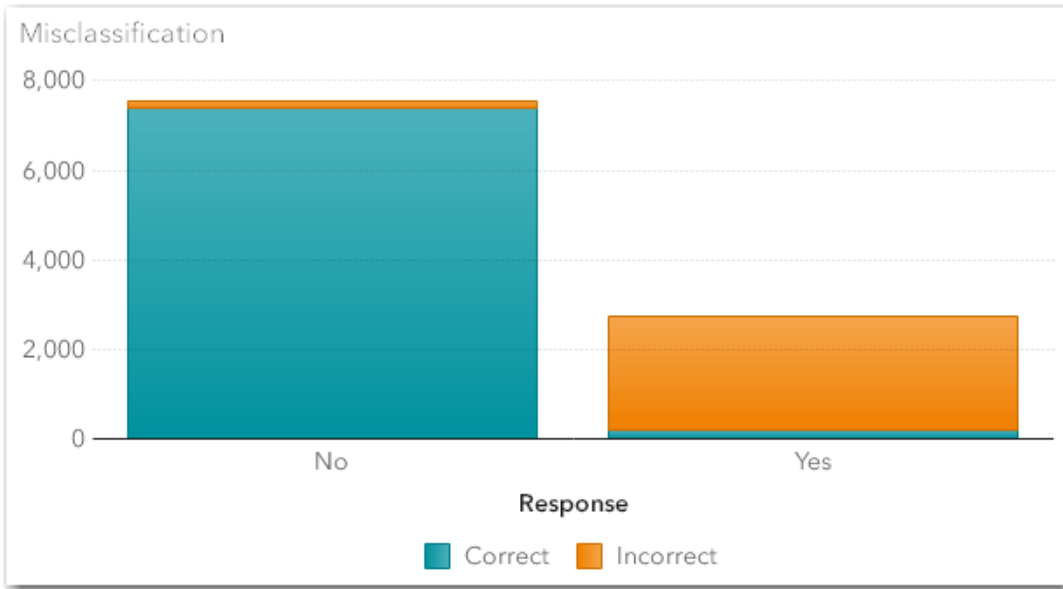
Parallel Coordinates Plot

The *parallel coordinates plot* displays how each cluster interacts with the effect variables.
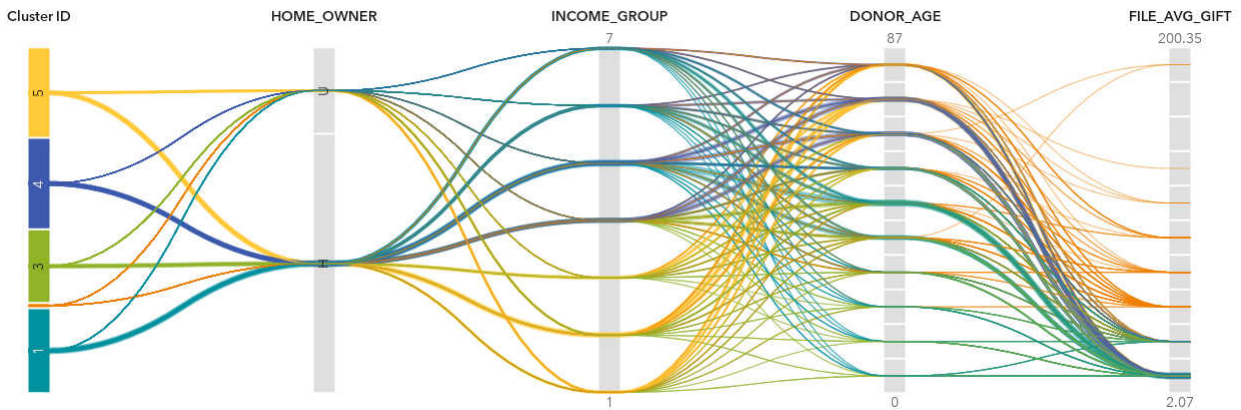
Residual Plot

The *residual plot* displays a specified residual value for each observation in the input data set.
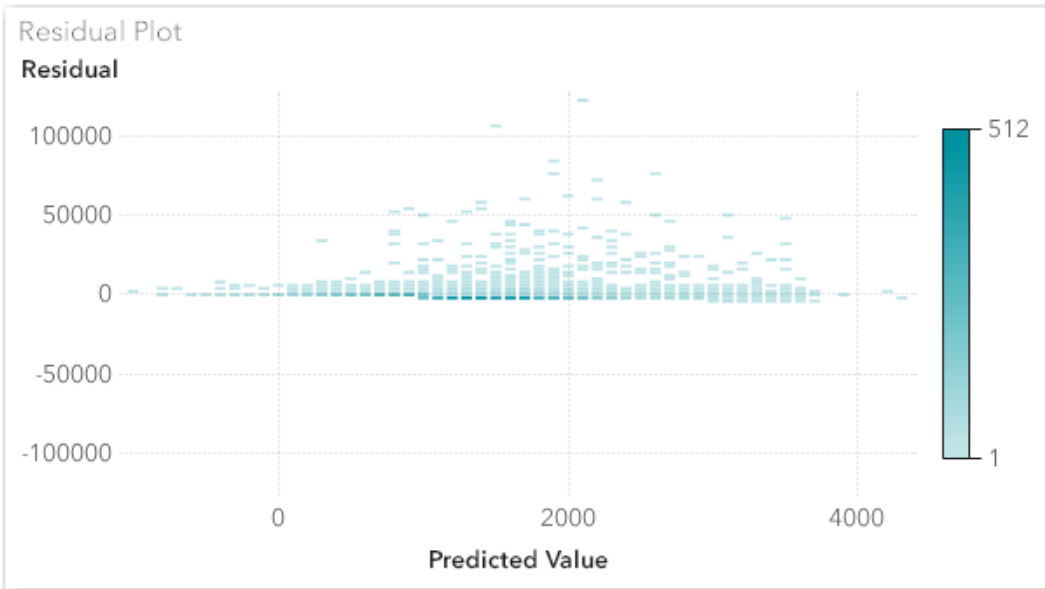
ROC Plot

The *Receiver Operator Characteristic (ROC) plot* displays the sensitivity and 1–specificity measures for a model over a range of cutoff values. Sensitivity is defined as the number of true positives divided by the sum of true positives and false positives. Specificity is defined as the number of true negatives divided by the sum of true negatives and false negatives. One minus specificity is the number of false positives divided by the number of nonevents.
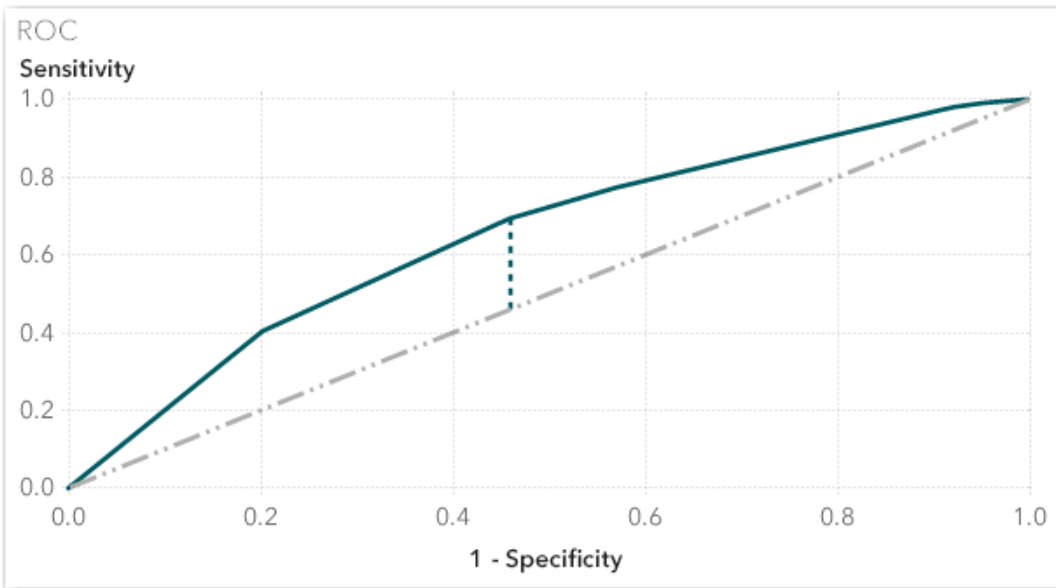
Spline Plot

The *spline plot* displays the spline created for use in the generalized additive model and nonparametric logistic regression model. A one-dimensional spline plot includes a confidence band around the spline.

Spline Plot
Spline(MEDIAN_HOME_VALUE)   DF = 8
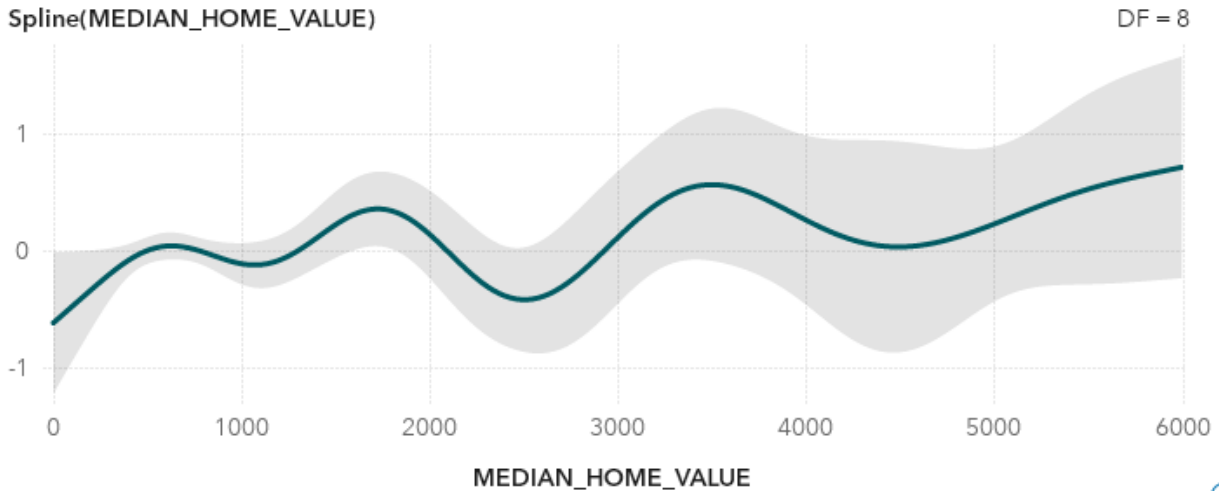
A two-dimensional spline is plotted as a contour plot.

Spline Plot
Facility Efficiency   DF = 19
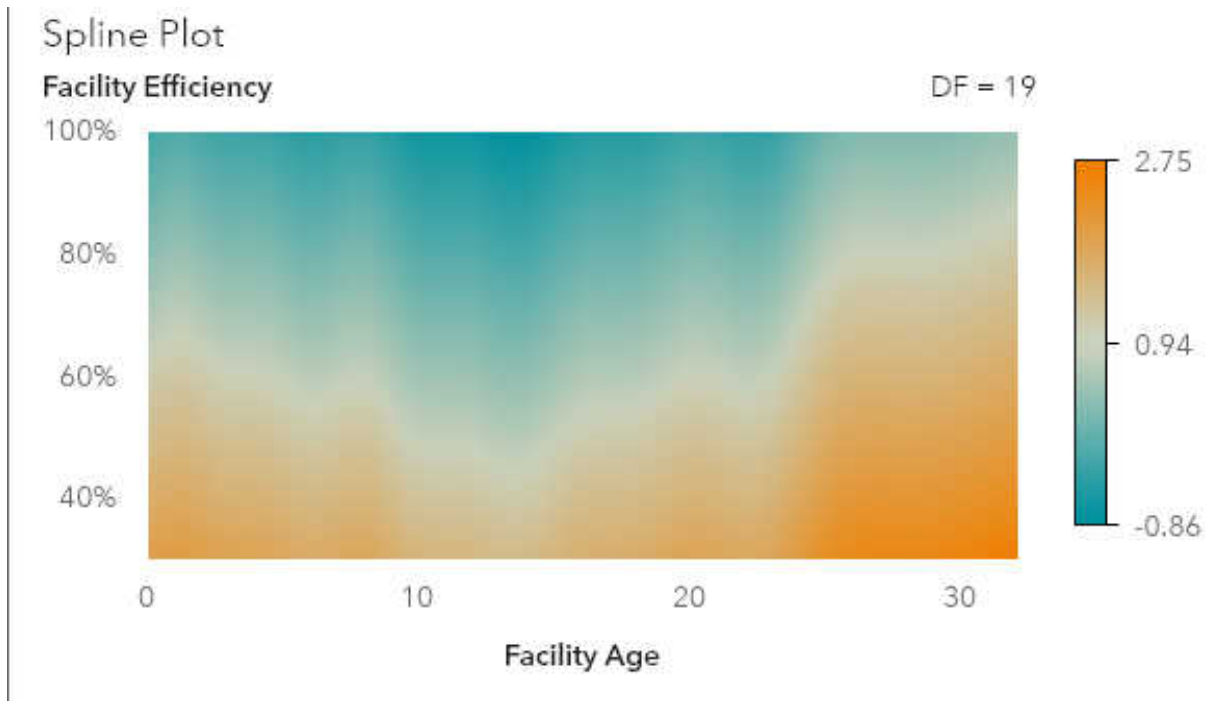
Tree Plot

See "Decision Tree" on page 27 for more information.

Variable Importance Plot

A *variable importance plot* ranks each input variable based on its relative contribution to the model.
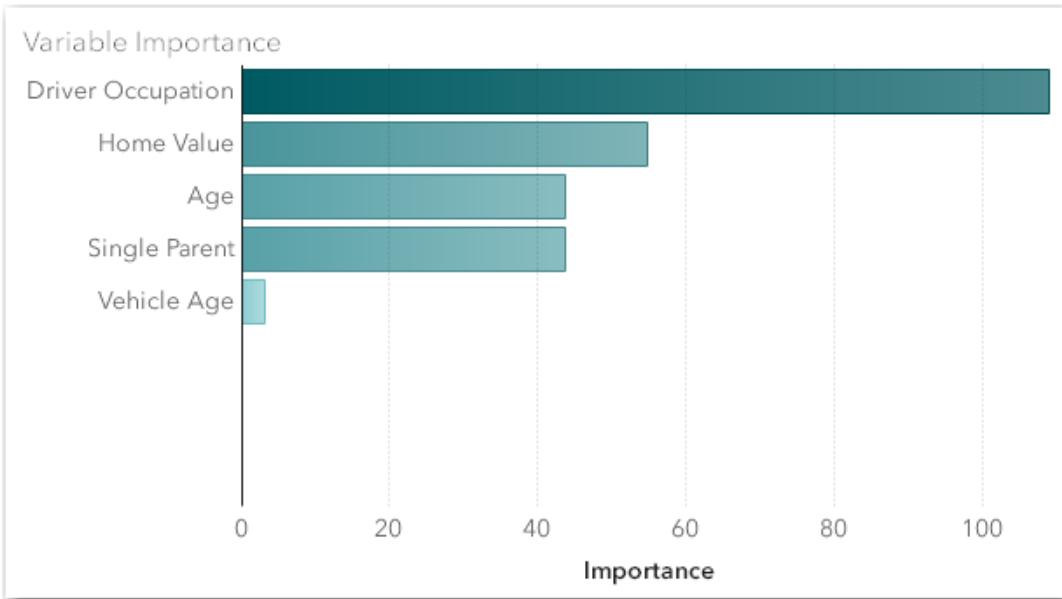
SAS Visual Data Mining and Machine Learning

About SAS Visual Data Mining and Machine Learning Objects

If SAS Visual Data Mining and Machine Learning is licensed at your site, then these plots are available.

Bayesian Network

The *Network* plot displays the network that was selected by the Bayesian Network object. The model with the best misclassification rate is selected.
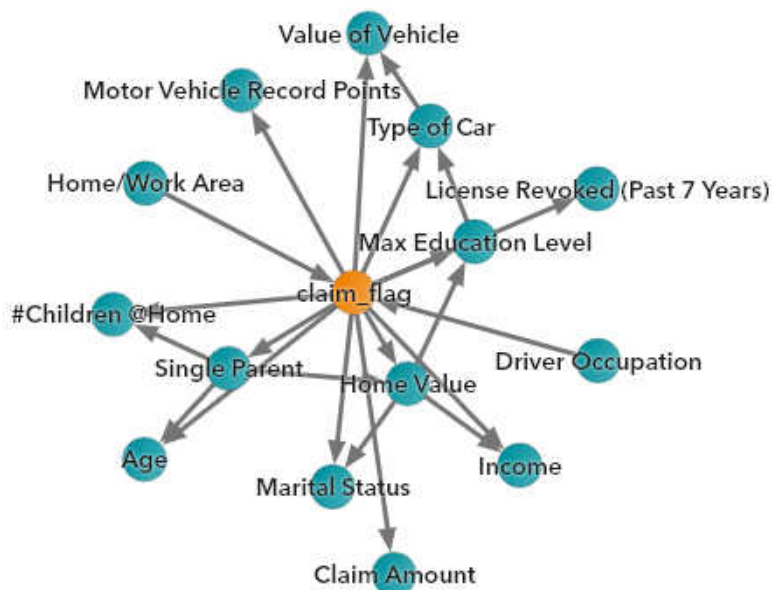
Iteration Plot

For tree-based models with a categorical response, the *iteration plot* displays the change in misclassification rate at each iteration during model training. For tree-based models with a measure response, the *iteration plot* displays the change in average squared error.
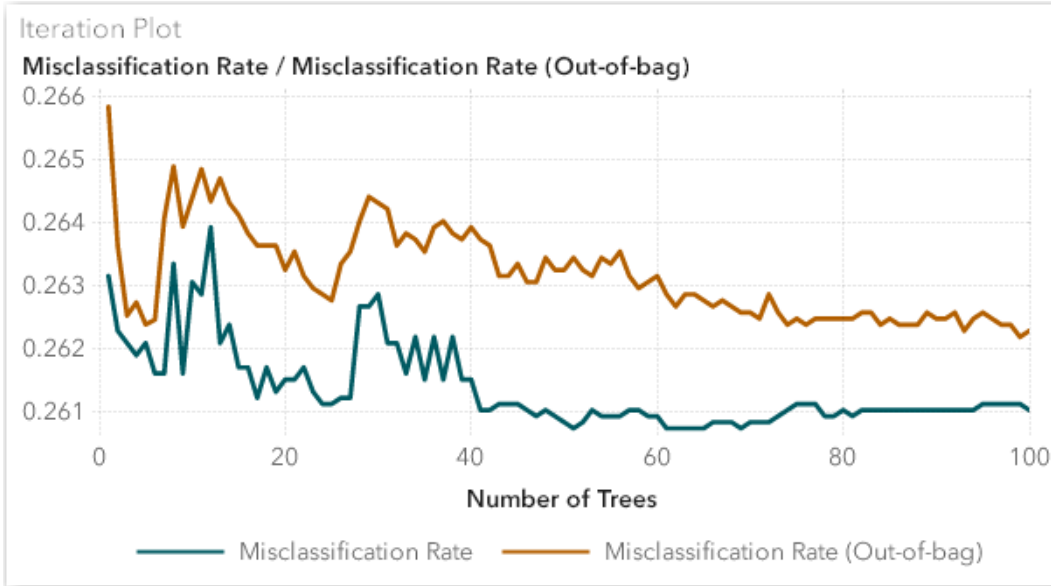
For other models, the *iteration plot* displays the value of a specified model convergence criterion at each iteration during model training.
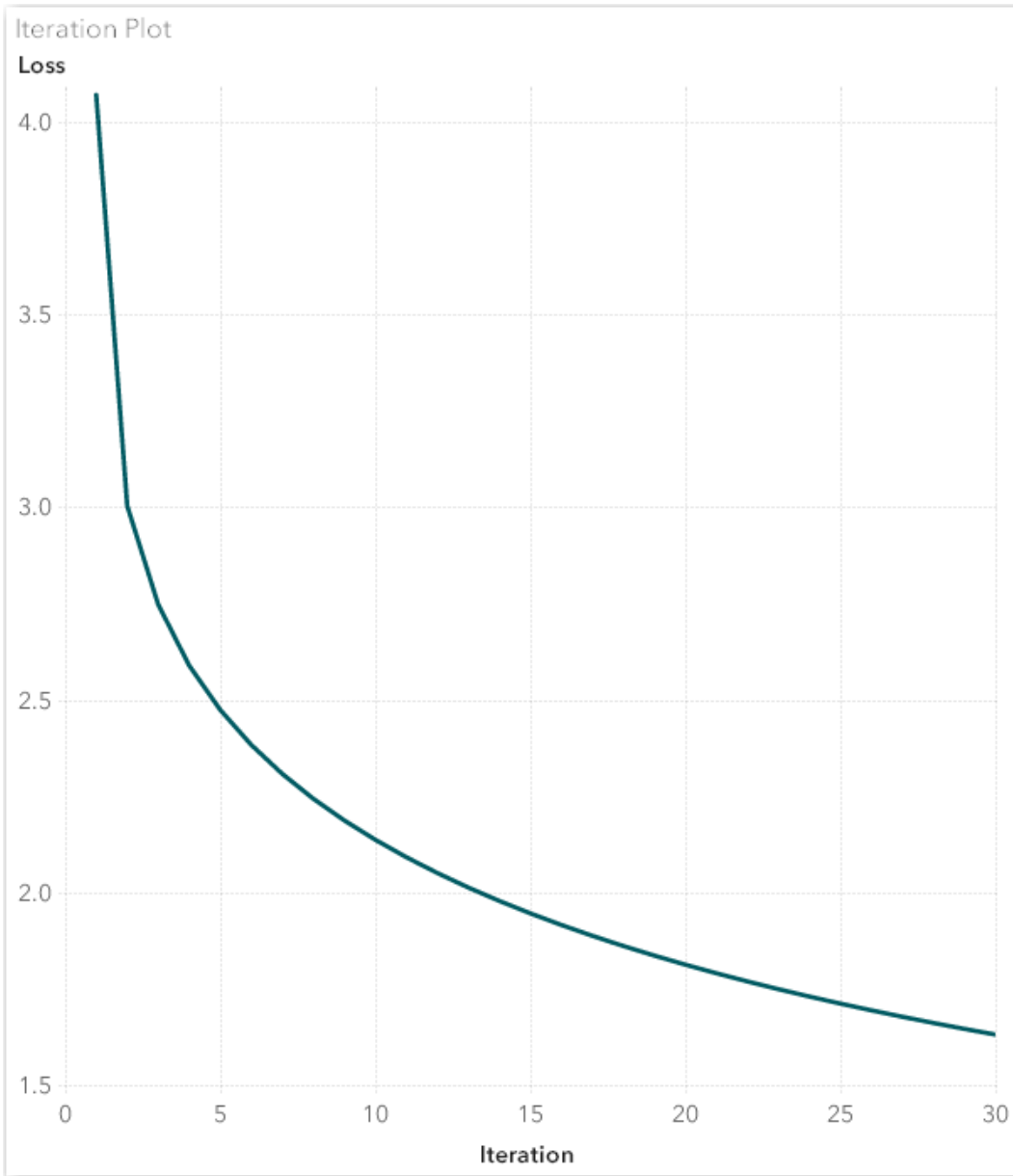
Model Selection — Bayesian Network

The *model selection* plot for a Bayesian network shows how the misclassification rate of the model changes as the number of parents changes. For each type of Bayesian network, a network is created with the number of parents iterating from 1 to the value of the **Maximum number of parents** property. By definition, the Tree-augmented naive Bayesian network always contains exactly two parents, so only one point is plotted. The misclassification rate of each network is plotted, and the network with the best misclassification rate is indicated with a star icon.
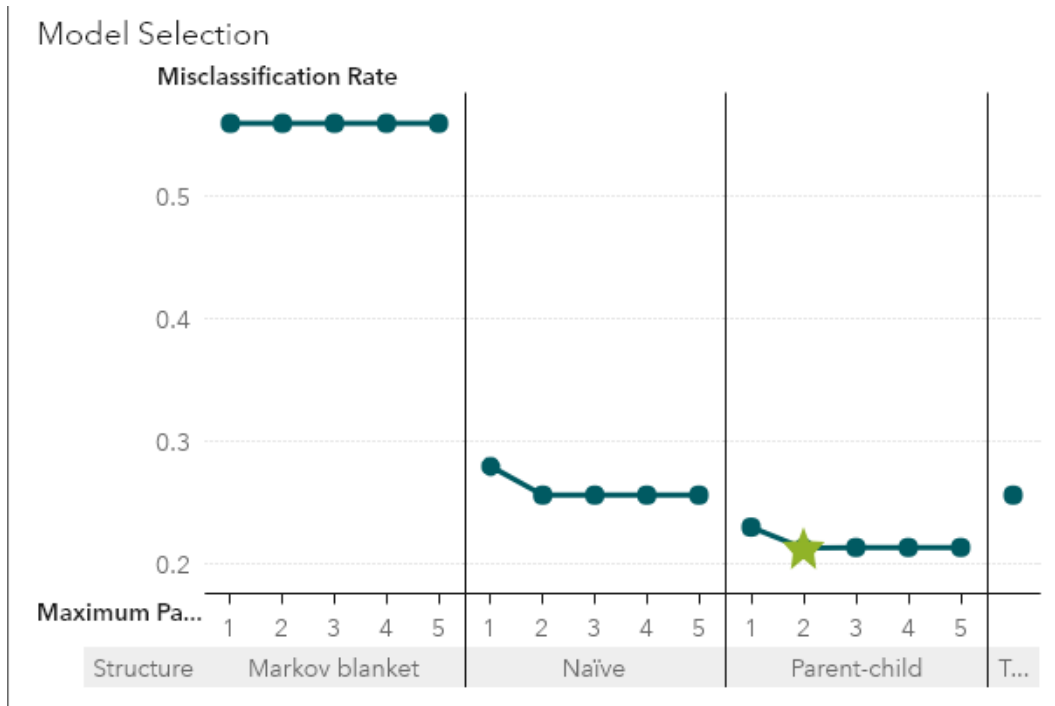
Network Diagram

The *network diagram* displays the input nodes, hidden nodes, connections, and output nodes of a Neural Network.
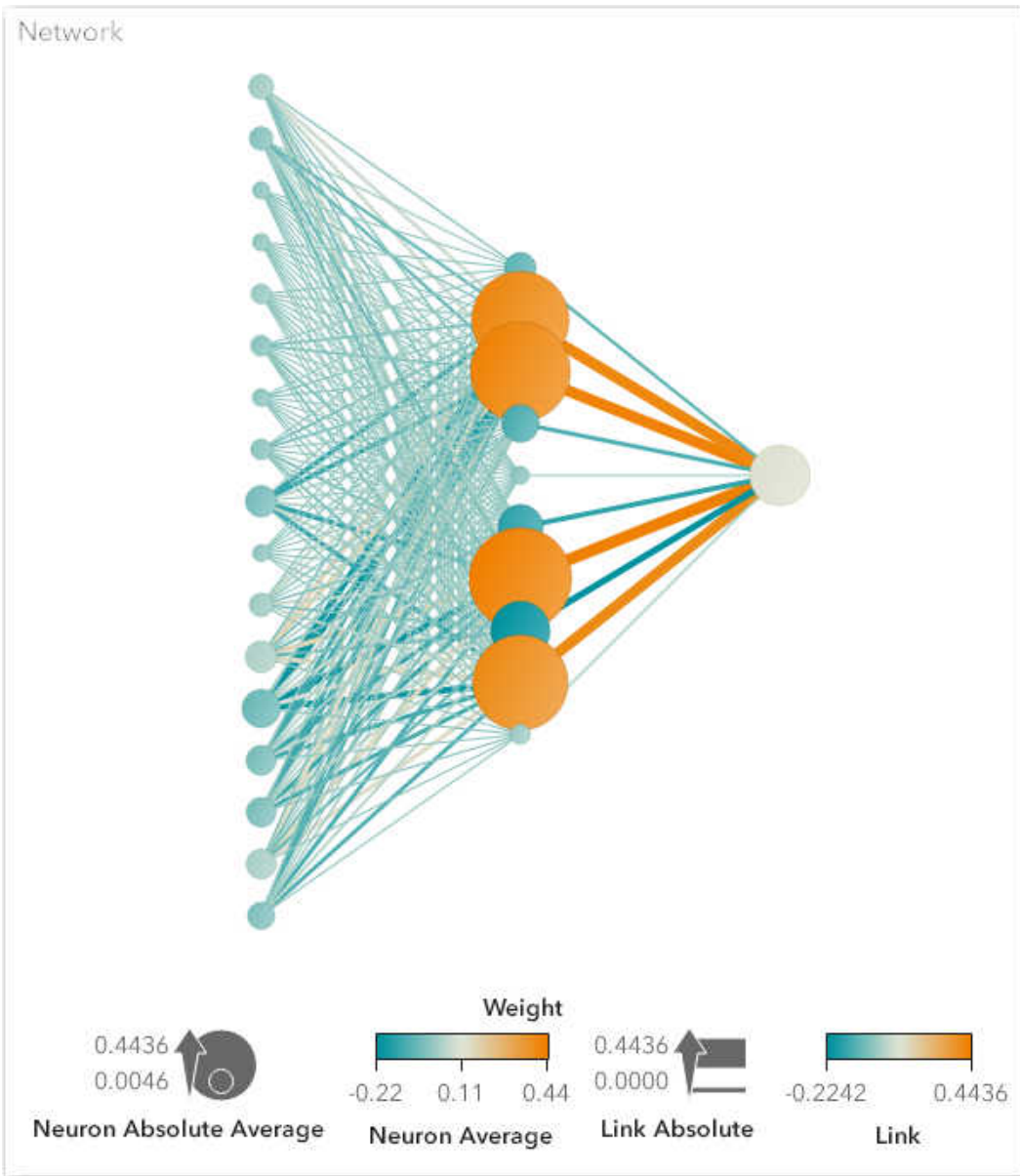
Rankings Plot

The *rankings plot* is used by the factorization machine to display the top or bottom ranked event levels for category variables.

Top Recommendations

CLUSTER_CODE	Rank
01	1
.	2
13	3
23	4
03	5
15	6
14	7
19	8
34	9
24	10

Bottom Recommendations

CLUSTER_CODE	Rank
33	1
53	2
48	3
47	4
16	5
29	6
45	7
51	8
39	9
38	10

Relative Importance Plot

The *relative importance plot* ranks each input variable based on its relative contribution to the model. This plot is similar to the variable importance plot, but the results are computed differently.

Relative Importance Plot
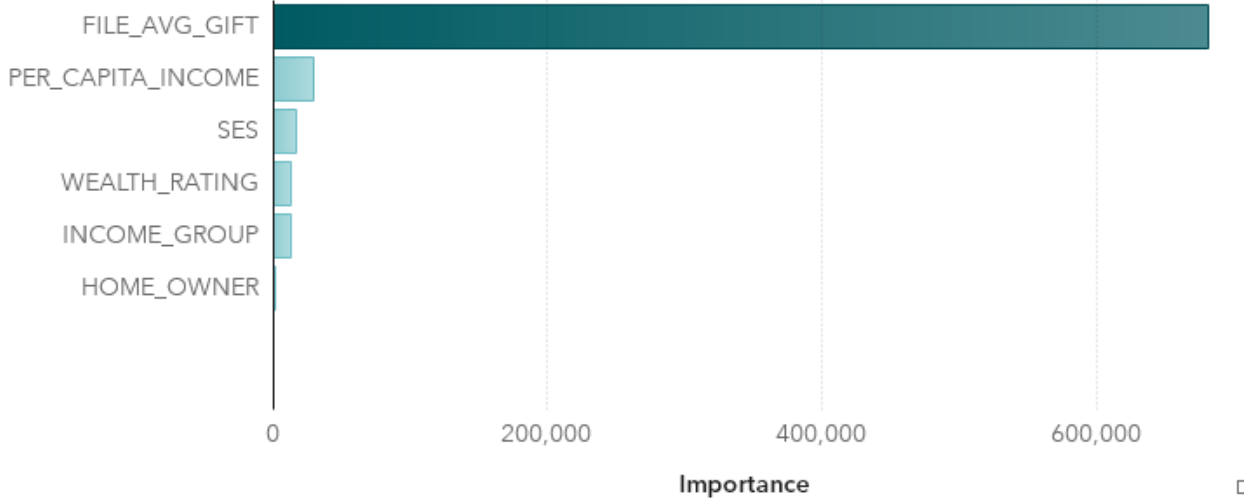
High-Cardinality Thresholds for Objects

Default client-side thresholds for objects are documented in the following table. These thresholds affect SAS Visual Analytics and all of the viewers. The second column indicates the maximum number of unique values.

Note: You can use the **Override system data limit** option to specify a different system data limit for an object. See "Specify Options for an Object" in *SAS Visual Analytics: Working with Report Content*.

Table 2 Client-Side Thresholds for Objects

Object	Rows
Crosstab	displays an error message if the server returns more than 40,000 rows.
List table	truncates the data after 40,000 rows.
Bar chart (regular, targeted, and dual axis)	truncates the data after 3,000 rows.
Box plot	displays an error message if the data would create more than 800 boxes.
Bubble change plot	displays an error message if the server returns more than 3,000 rows.
Bubble plot	displays an error message if the server returns more than 25,000 rows.
Butterfly chart	displays an error message if the server returns more than 3,000 rows.
Correlation matrix	allows only 60 measures to be assigned.

Object	Rows
Dual axis bar-line chart	displays an error message if the server returns more than 3,000 rows.
Gauge	with the **Group** role assigned, truncates the data after 500 rows.
Geo map	for the region map style, displays an error if the server returns more than 5,000 rows. An error is displayed if a request to the polygon provider returns more than 250,000 vertices.
	for the bubble map style, displays an error if the server returns more than 25,000 rows.
	for the coordinates map style, displays an error if the server returns more than 40,000 rows.
Heat map	when category values are assigned, displays an error if the server returns more than 3,000 rows.
Histogram	has no client or server cardinality limits.
Line chart (regular and dual axis line)	truncates the data after 3,000 rows.
Needle plot	displays an error message if the server returns more than 3,000 rows.
Numeric series plot	displays an error message if the server returns more than 3,000 rows.
Pie chart	displays an error message if the server returns more than 3,000 rows.
Scatter plot	displays an error message if the server returns more than 40,000 rows.
Schedule chart	displays an error message if the server returns more than 3,000 rows.
Step plot	displays an error message if the server returns more than 3,000 rows.
Time series plot (regular and dual axis)	displays an error message if the server returns more than 10,000 rows.
Treemap	truncates the data after 1,500 rows.
Vector plot	displays an error message if the server returns more than 3,000 rows.
Waterfall chart	displays an error message if the server returns more than 3,000 rows.
Word cloud	truncates the data to the value of the **Word display limit** option. The maximum value is 100.

Object	Rows
Button bar	truncates the data after 100 rows
Drop-down list	truncates the data after 500 rows
List	truncates the data after 50,000 rows
Decision tree	displays an error if the server returns more than 100,000 rows for the response values, or more than 10,240 rows for the predictor values.
Forecasting	displays an error message if the server returns more than 10,000 rows.
Network	displays an error message if network contains more than 25,000 nodes and links.
Path analysis	displays an error if the data set contains more than 2,000,000,000 paths.
	displays an error if the number of transaction IDs is greater than 10,000.
	truncates the number of links to 4,000.
	ignores any paths that are longer than 2,000 links.
Text topics	displays an error message if the data source contains more than 10,000,000 rows.
	truncates the number of topics to 13.
	truncates the number of terms to 100.
	truncates the number of documents to 1,000.
Data-driven content	truncates the data after 40,000 rows.
Custom graph	displays an error message if the server returns more than 3,000 rows.

Programming Considerations for Data-Driven Visualizations

Overview of Programming for Data-Driven Visualizations

The third-party visualization for a data-driven content object can be authored in any JavaScript charting framework, such as D3.js, Google Charts, and CanvasJS. The content must be capable of being displayed in an IFrame.

To find and share samples of third-party visualizations, see the SAS Software GitHub repository: .

For a third-party visualization to receive data in a data-driven content object, you must add a listener as described in .

If you want your visualization to serve as the source of an action, then see .

If you want your visualization to participate in linked selections (data brushing), then see .

You can provide an instructional message to users of your custom visualization. See .

Receiving Data

SAS Visual Analytics shares data with the data-driven content object by using the HTML5 window.postMessage() API. (See https://developer.mozilla.org/en-US/docs/Web/API/Window/postMessage.) For a third-party visualization to receive the data, it needs a listener. The following example code adds a listener:

```
if (window.addEventListener) {
    // For standards-compliant web browsers
    window.addEventListener("message", onMessage, false);
} else {
    window.attachEvent("onmessage", onMessage);
}

// Retrieve data and begin processing
function onMessage(event) {
    if (event && event.data)
    {
        //process event.data
    }
}
```

The `onMessage` function is called each time the data for the data-driven content object is updated. The `event.data` object is a JSON object. Here are some of its attributes:

resultName
The name of the associated query result. This name is needed for communicating any messages from the data-driven content object back to SAS Visual Analytics.

data
The query results stored in a two-dimensional array. The data is in row-major order. So, `event.data.data[0]` is the first row of data and `event.data.data[0][0]` is the first column in the first row. The data in this array is unformatted for measures. Specifying a format for a measure has no impact on the data returned. Dates and datetimes are formatted, so the data reflects the format that is specified on any date or datetime variable.

rowCount
The number of rows of data returned. If all the data has been filtered out or no data items are assigned to the object, then the row count is 0.

columns
An array of column objects that let the author determine the type of data and other attributes such as format and label.

parameters
An array of parameter objects that the data-driven content object consumes when executing the query. This array of parameter objects enables the author to access the current value of the parameters and other parameter attributes. Only the parameters that are used by the query are returned in this array.

Note: Numeric data is exchanged as unformatted values. If you want to display formatted numeric values, then you must apply the formatting in the code for your third-party visualization.

Selection Handling

If you want the third-party visualization to serve as the source of an action in SAS Visual Analytics, then the visualization must communicate back to SAS Visual Analytics whenever a selection is made.

The message that is sent must include the `resultName` attribute (retrieved from the data which SAS Visual Analytics sent to the visualization). SAS Visual Analytics needs to know which rows of data were selected, so the message needs a `selections` attribute that contains an array of the objects that specifies the selected row indices (where 0 is the first row of data). Each entry in the `selections` array needs to have an attribute of `row` with a value of the selected row. Here is a JavaScript example that creates two functions for handling selections:

```
function sendSelection(selectedRows, resultName) {
    var selections = [];
    if (selectedRows)
    {
        selectedRows.forEach(function (row) {
            selections.push({row: row});
        });
    }
    var message = {
        resultName: resultName,
        selections: selections
    };
    sendMessage(message);
}

function sendMessage(message)
{
    var url = (window.location != window.parent.location)
        ? document.referrer
        : document.location.href;
    window.parent.postMessage(message, url);
}
```

When calling postMessage, the code needs to call it on the parent and needs to pass in the target origin as the second argument.

Linked Selection Handling

If the data-driven content object is the target of a linked selection (data brushing action), then the data that is sent to the object contains an additional column of data. This column informs the visualization which rows of data are to be selected. In the `<columns>` array, if a column has a `usage` attribute that has a value of `brush`, then this column of data controls selection and should not be processed with the rest of the data.

If the data-driven content object author wants the visualization to honor the linked selection, then it is the author's responsibility to make the selections in the visualization. If a row is selected, then the `brush` column has a value greater than 0. If the row is not selected, then the `brush` column has a value of 0. In the sample data, the first row and third row of data is to be selected. The second row should not be selected.

```
{
  "version" : "1",
  "resultName" : "dd40",
  "rowCount" : 3,
  "availableRowCount" : 3,
  "data" : [ [ "Finch", 95000.0, 0.42857142857142855 ], [ "Jones", 26000.0, 0.0 ],
```

```
      [ "Smith", 108000.0, 0.5 ] ],
  "columns" : [ {
    "name" : "bi184",
    "label" : "dealer",
    "type" : "string"
  }, {
    "name" : "bi258",
    "label" : "sales",
    "type" : "number",
    "usage" : "quantitative",
    "aggregation" : "sum",
    "format" : {
      "name" : "BEST",
      "width" : 12,
      "precision" : 0,
      "formatString" : "BEST12."
    }
  }, {
    "name" : "ri1",
    "type" : "number",
    "usage" : "brush",
    "format" : {
      "name" : "COMMA",
      "width" : 12,
      "precision" : 2,
      "formatString" : "COMMA12.2"
    }
  } ]
}
```

Custom Instructional Message

The data-driven content object supports displaying a custom instructional message to the report author. The instructional message is displayed in the report designer interface only. The message is sent when the data that is assigned to the **Variables** role does not meet the requirements of the visualization.

The instructional message is sent in the same way as a selection message, but instead of sending a `selections` attribute, a `message` attribute is sent.

```
    function sendNoDataMessage(resultName) {
        var message = {
            resultName: resultName,
            message: "No data items are assigned.\nThis visual requires 1 category and 2 measures."
        };
        sendMessage(message);
    }
```

§sas.
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