SAS® Visual Analytics 8.2: What's New in Reporting?

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ABSTRACT

SAS® Visual Analytics 8.2 extends the unified SAS® user experience to data exploration and reporting, adds new features to report content, and introduces exciting new report objects. The user experience is built on a familiar and intuitive user interface at the report, page, and object levels. New features in report content include improvements in handling data, enhancements in graphs and tables, and more geographic capabilities. New report objects in the release are the Key Value object for infographic-like presentations, the Parallel Coordinates Plot object for more analytical visualization, and the Data-Driven Content object to manipulate externally created content within the point-and-click interface of the report.

INTRODUCTION

SAS® Visual Analytics provides a single interface for the workflow from exploration to analysis and then to reporting and sharing insights. SAS Visual Analytics 8.2 is a major step in the evolution of the combined HTML-based interface introduced in SAS Visual Analytics 8.1. SAS set out to create beautiful software with an effortless user experience. We placed emphasis on design upfront, enriched the report experience, and added exciting new report objects. In addition to new features, this release combines the best of the previous versions of SAS® Visual Analytics Designer and SAS® Visual Analytics Explorer. This paper provides an overview of the major enhancements in user experience and reporting for the software released in December 2017.

DESIGN

SAS Visual Analytics 8.2 is an integral part of the unified user experience that makes it easy to move between SAS applications. The user interface builds on the clean and robust three-pane layout, balances white space to enhance visual clarity and ease of use, uses modern typography, provides new theme options and adds improvements to the user workflow.

UNIFIED USER EXPERIENCE

This release introduces a new navigation label for the application, **Explore and Visualize Data**. This label is consistent with the function based labels of other applications and together, highlight the logical workflow connecting them. Figure 1 shows the label in the application switcher and on the banner.
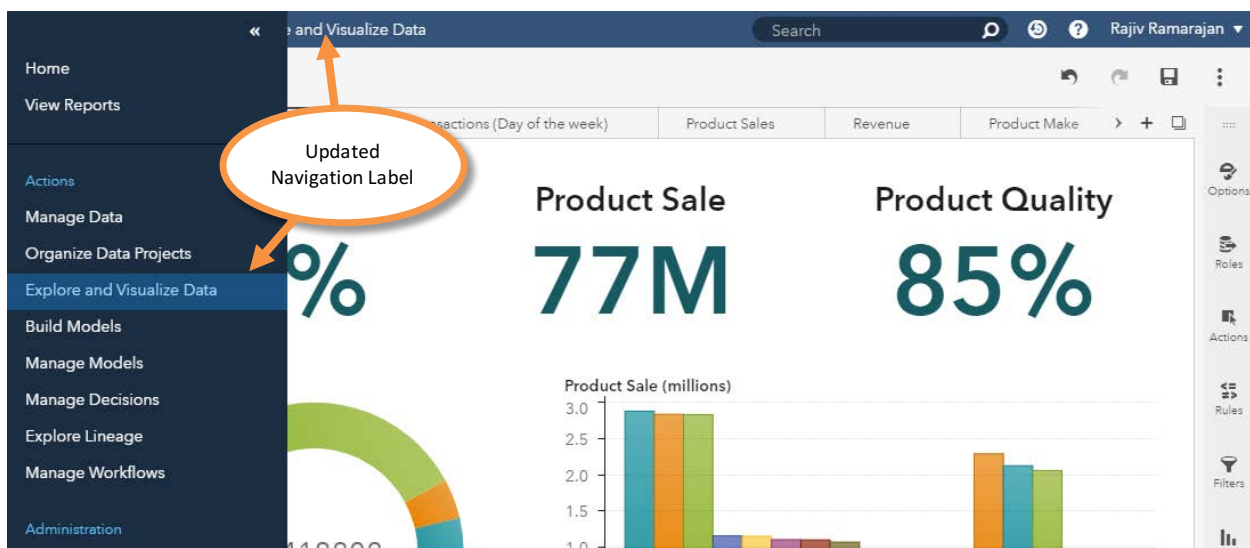

Figure 1. Navigation Label: Explore and Visualize Data

A new button in the banner accesses a list of recently opened objects across applications. This button provides a quick way to return to a previous point in the analytical workflow no matter which SAS application, including SAS Visual Analytics, is currently active. The Recent Items list has a setting to display only those objects valid for the open application. Figure 2 shows the Recent Items list and indicates the icon on the banner to access it.
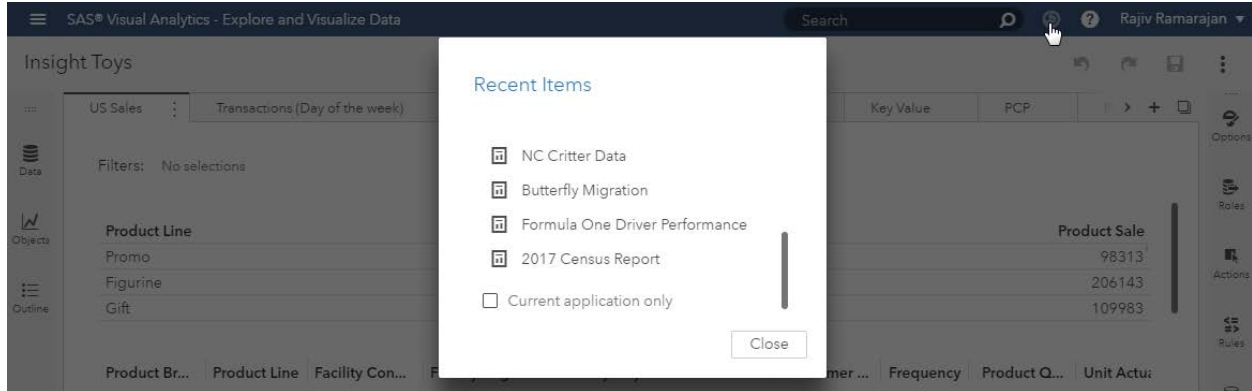

Figure 2. Recent Items

In SAS Visual Analytics 8.2, there are new global and application level settings. The global settings now enable you to add a profile picture, select a new application theme, and use options to increase accessibility of the application. Figure 3 shows the **General** section in the Settings window. The mouse pointer indicates how to open the Settings window from the banner. New settings for SAS Visual Analytics enable users to set defaults for new reports. For example, you can choose between three options for report theme, automatic actions between report objects, and object titles
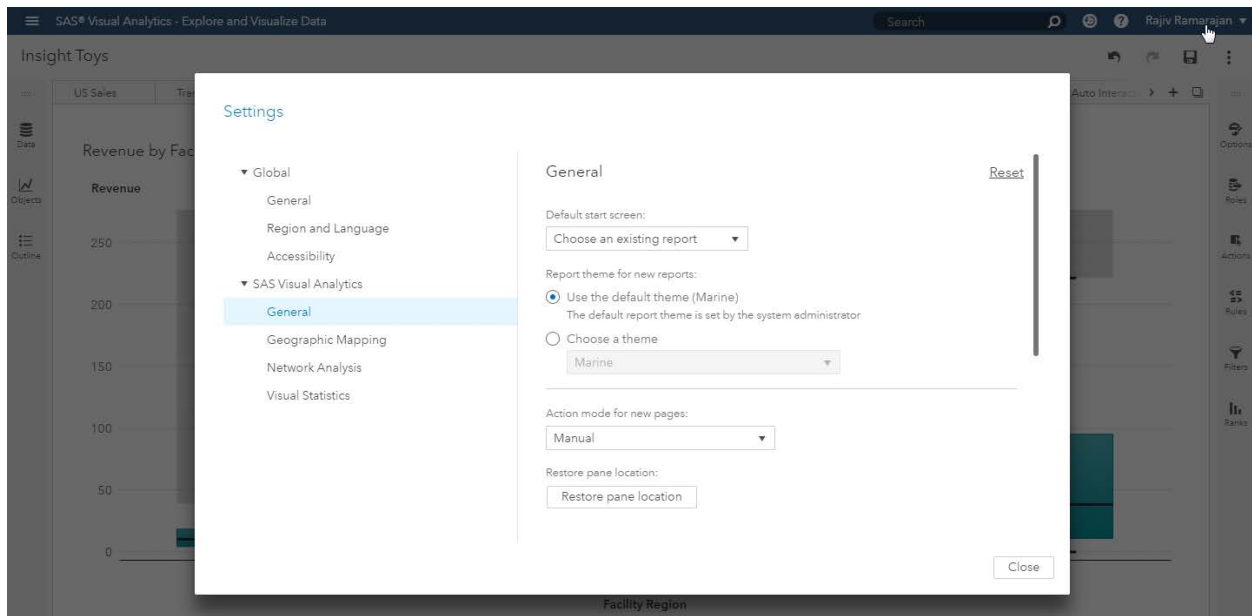

Figure 3. Settings

The new application theme, Inspire, shifts emphasis from the user interface of the application to the report content using vibrant and cohesive colors, and sharper contrasts. The application theme is accompanied by a new report theme, Aqua. Figure 4 shows SAS Visual Analytics 8.2 with the Inspire application theme and a report rendered with the Aqua report theme.
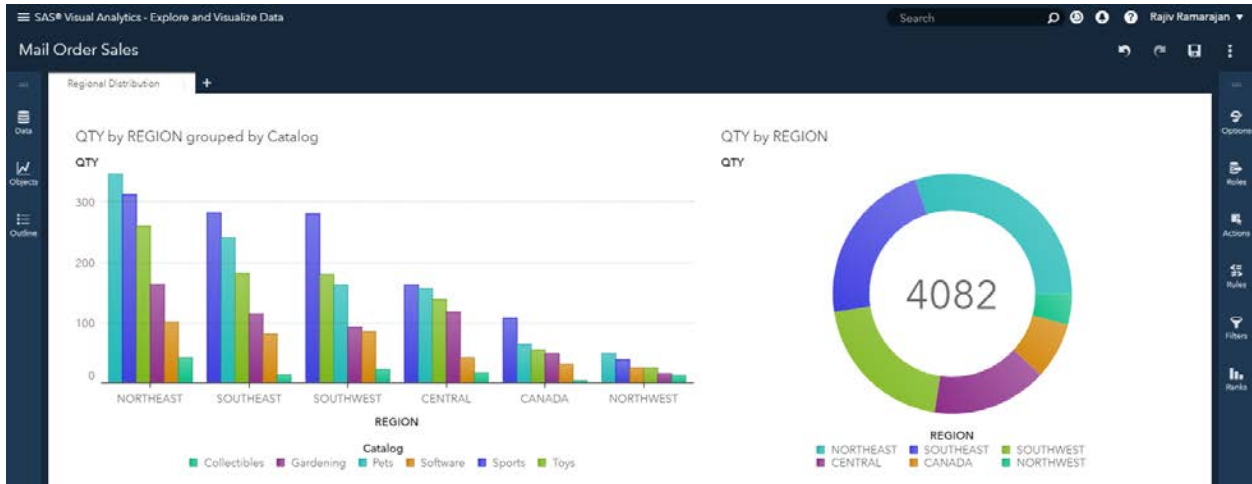
Figure 4. Inspire Application Theme and Aqua Report Theme

The report viewing experience is more accessible. In SAS® Report Viewer, the report theme can be overridden by the SAS High Contrast report theme to provide better contrast. This feature is also available in the SAS Mobile BI applications. SAS Report Viewer integrates with SAS® Graphics Accelerator, a plug-in for Google Chrome browser. The SAS Graphics Accelerator enables users with visual impairments or blindness to create, explore, and share data visualizations using alternate presentations including sonification. For more information, see SAS Graphics Accelerator.

Figure 5 shows a report in SAS Report Viewer with the High Contrast report theme, and the menu item for SAS Graphics Accelerator.
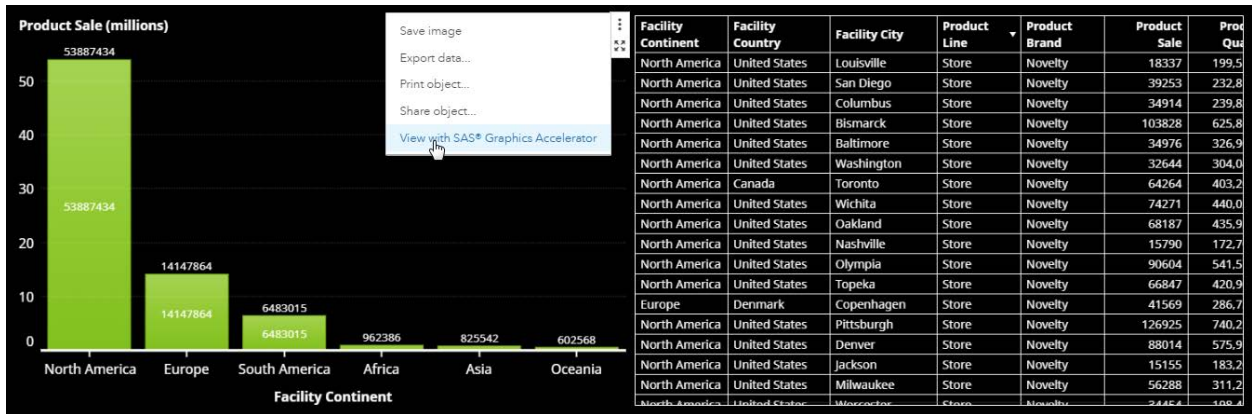

Figure 5. High Contrast Report Theme and Access to SAS Graphics Accelerator

EXTENDING THE THREE-PANE INTERFACE

The familiar and intuitive three-pane user interface is extended with more context-specific functionality while still maintaining the clean and clutter-free aesthetic.

Toolbars have been streamlined. The application toolbar shown in Figure 6 includes only the report title and essential functions. The **Save** menu item has been added to the toolbar based on customer feedback.
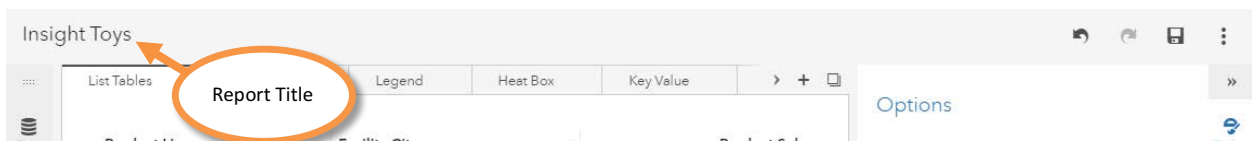

Figure 6. Application Toolbar

The toolbars for the data, objects, and outline panes have an improved layout and more functionality. Figure 7 shows the toolbars for the three panes. The Search feature is emphasized.
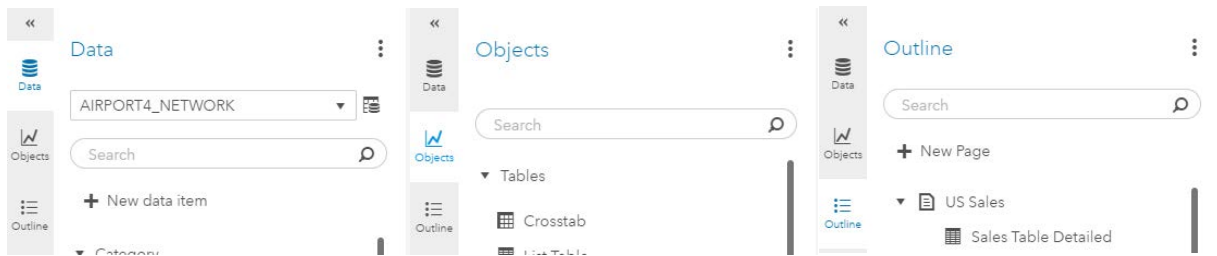

Figure 7. Data, Objects, and Outline Toolbars

Menu items in the **Data** pane are enhanced with new functionality and more clearly organized into separate menus for the pane. The pane shows the existing data source and enables you to add new data items as shown in Figure 8. The new functionality adds the ability to show or hide items in the pane (also available in the **Objects** pane), change a data source, map data sources, create a new partition data item, and create a new spline effect.
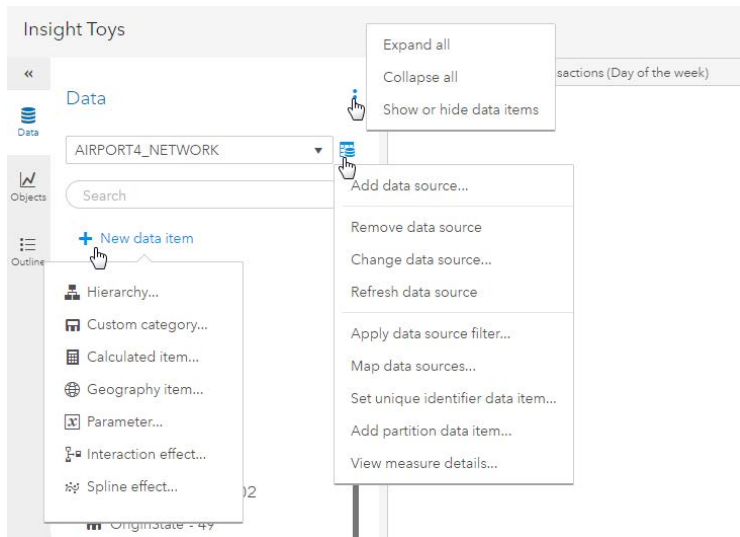

Figure 8. Data Pane Menus

Actions that affect the report, page, or object are organized into three contextual menus. These menus can be accessed from the standard ellipsis icon in the report toolbar, page tab, and object toolbar. See Figure 9.
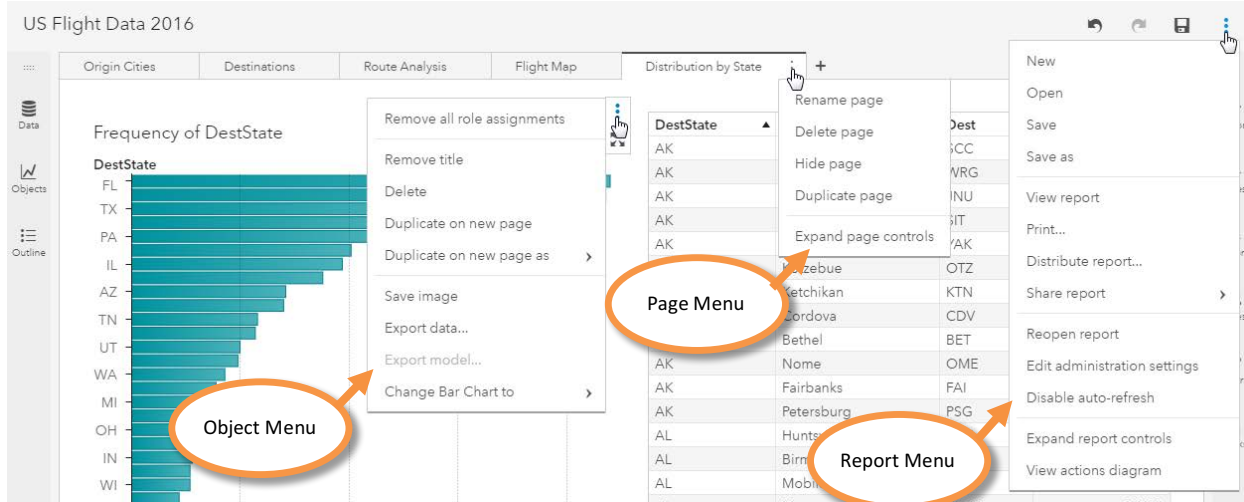
Figure 9. Object, Page, and Report Menus

The new report layout mechanism abstracts the report layout as an ordered tree of objects within containers that guides the rendering of report content across different consuming screen sizes. The order and structure is reflected in how the content is listed in the **Outline** pane.

A rich pop-up menu for each object enables direct manipulation within the report and simplifies the user workflow. To make interactions speedier, actions are also added in pop-up menus for data items and for objects in the left pane and in the report. Pop-up menus are also provided on specific parts of an object, such as column headings and data item labels in charts.

The white space around report objects can now be controlled in the **Options** pane for the page by editing the value of **Padding**.

ENHANCED WORKFLOW

Dragging and dropping data items is more efficient with the addition of a prompt that allows a data item to be assigned to a specific role in the object. Figure 10 shows the prompt that is displayed if you drag and hold the mouse over the object.
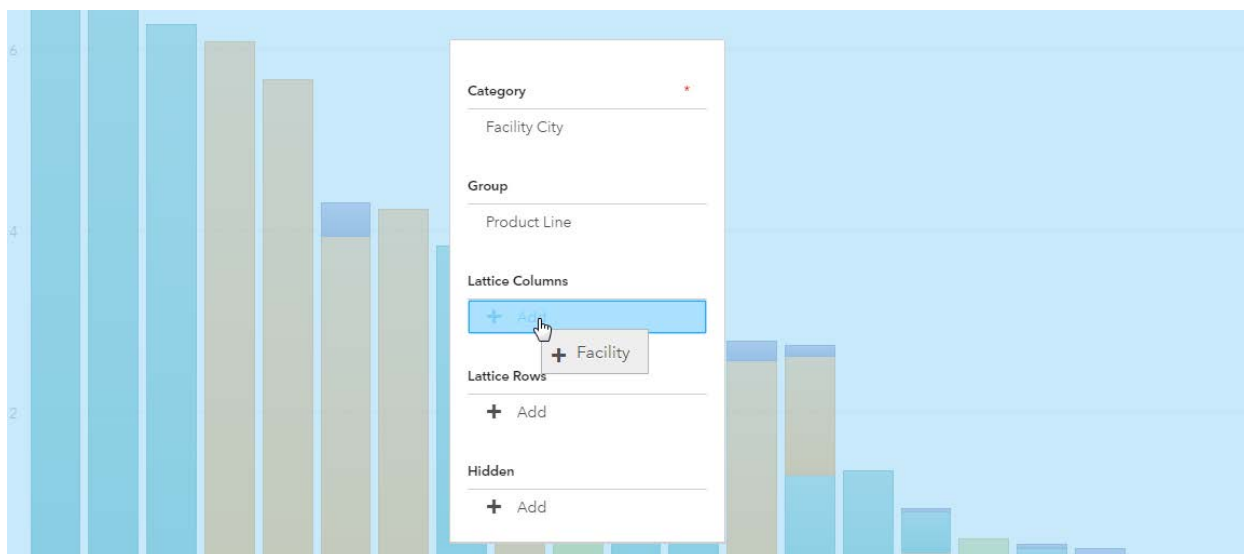

Figure 10. Drag and Hold Prompt

Actions between objects in a page can now be set with a single click. Three types of automatic actions can be defined between objects. One-way filters allow a selection in an object to filter other objects, but selecting data again in another object resets the filter. Two-way filters remove that restriction and allow a chain of filters to be selected across multiple objects. However, you can quickly get to a state with no data, so this type of automatic action might not be effective for all types of data explorations. Figure 11 shows tokens at the top of the page that are used to track filters and reset them.
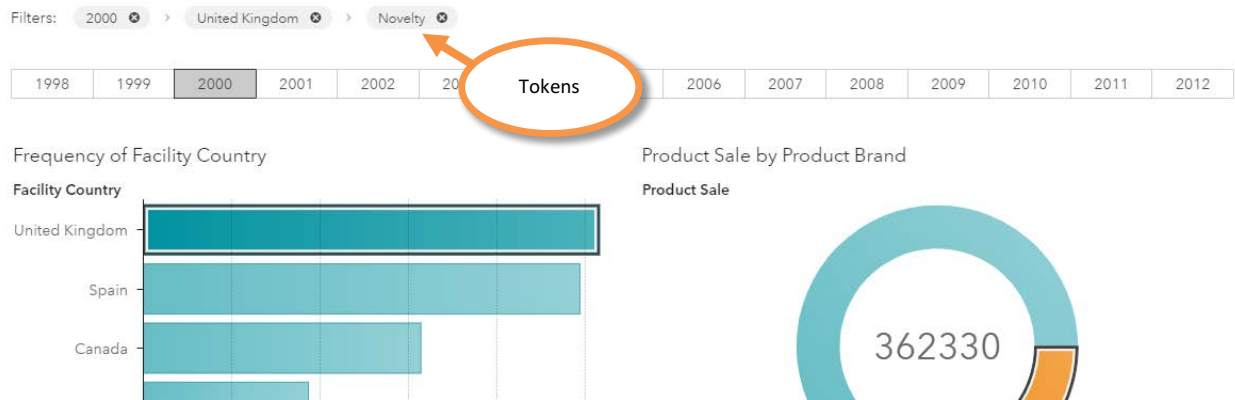

Figure 11. Tokens in Automatic Actions

When automatic actions on the page are set to **Linked Selection**, a selection in an object highlights the related data in all other objects. It does not filter out data in the other objects. Selecting data again in another object resets the previous linked selection.

Figure 12 shows the setting in the **Actions** pane for the page. Note that automatic actions work only if objects are using the same data or if their data has valid data mappings created. Manually defining actions and using the actions diagram is disabled while using automatic actions.

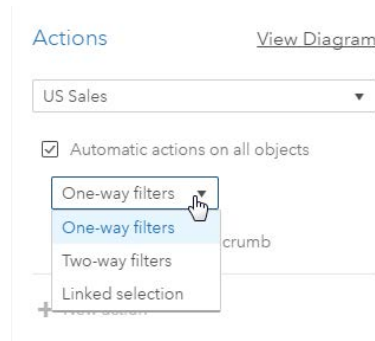Automatic actions can be enabled by default in the settings.

Figure 12. Automatic Actions

Sharing a link to a report is now easy and more flexible. Besides being able to insert into email, report links can now be generated for interactive reports or for a static report image. Links can specify if the application banner, menu bar, or certain panes can be viewed with the report, and whether the report can be printed or shared. Links can also be generated for embedded reports. See Figure 13.
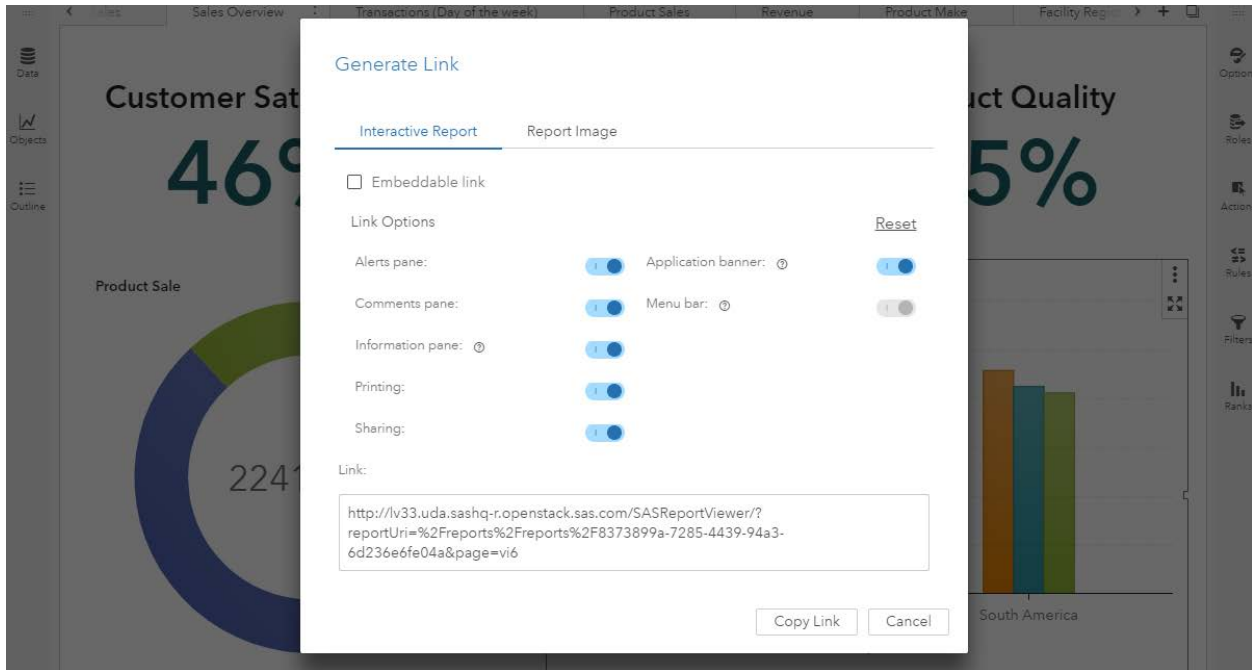
Figure 13. Generate Link

A new feature to rescue report authors is autosaving. For each user, a copy of the report is saved in the background as it is being edited. If a session is terminated and the report is not manually saved, then the next time that the report is opened SAS Visual Analytics will prompt to recover the autosaved version. Figure 14 shows the prompt.
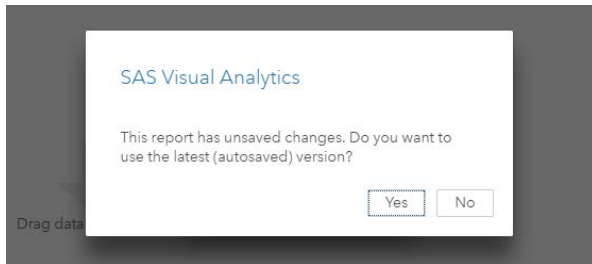

Figure 14. Autosave

These features are only some of the design-related enhancements. There are new features in printing and report distribution. The accessibility of the application has also been improved with keyboard shortcuts and a more accessible report viewing experience.

The Data Can Be Beautiful website is a resource being developed to assist in creating reports that tell the data story in a clear and effective manner with SAS Visual Analytics.

ENRICHED CONTENT

SAS Visual Analytics 8.2 adds new features that make it easier to tell a compelling story with the report. These features include improvements in handling data, enhancements in graphs and tables, and more geographic capabilities.

DATA

Parameters can drive display rules. This feature will enable more powerful what-if scenario interactions to be built into the report. Figure 15 shows a slider setting parameter that highlights bars in a bar chart and cells in a table using display rules.
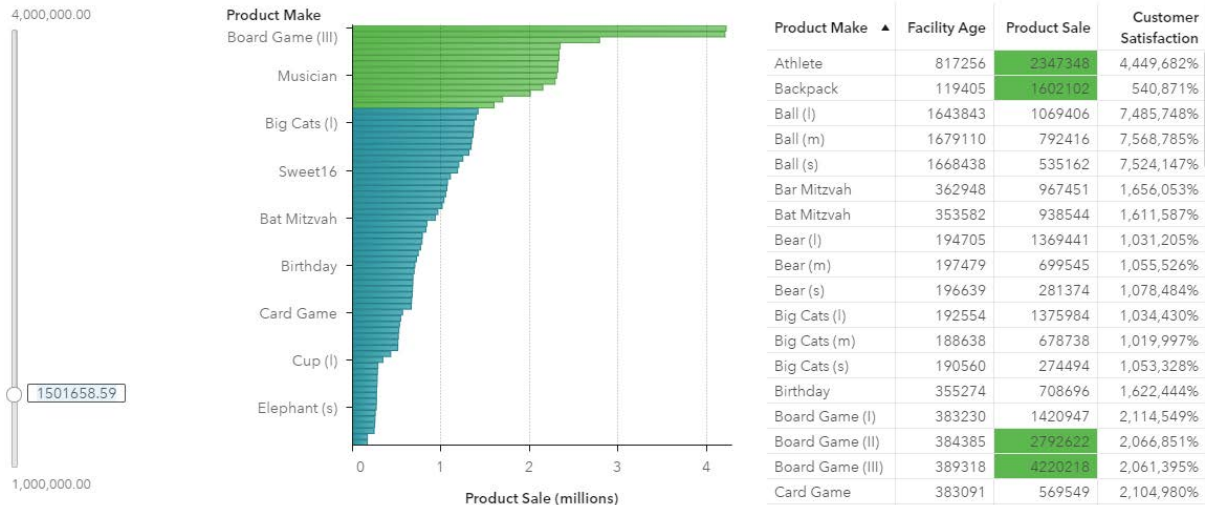
Figure 15. Parameter with Display Rule

Mapping of data sources can be set at the report level. After two data sources are mapped, the mapping will apply to the interactions between objects that use the mapped data sources. Automatic actions will honor the data mapping. Figure 16 shows mapping of data items, Gender and Sex, from data sources FITNESS and HEARTCT respectively.
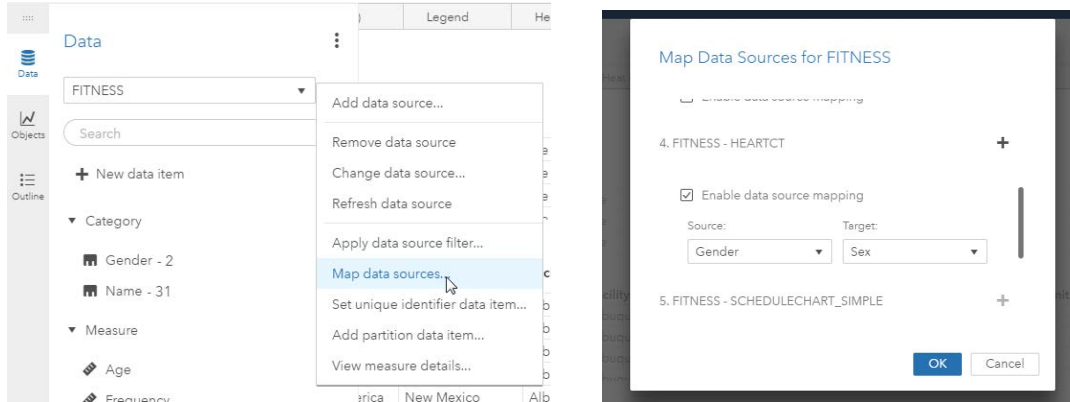

Figure 16. Mapping Data Sources

The system data limit for an object is displayed in the **Options** pane and can be edited. See Figure 17.
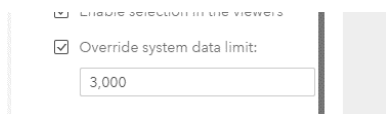

Figure 17. Override Data Limit

New one-click calculations are available in the Create Calculation window. **Cumulative total**, **Moving average**, and **Data suppression** can now be selected as shown in Figure 18.

- Cumulative totals allow aggregation across a time period such as year-to-date calculations.

- Moving average aggregates data over a specified number of observations.

- Data suppression allows suppressing the display of certain values in a table or chart.

Aggregated cells is another new calculated item that aggregates the values of a set of cells in a list table or crosstab.
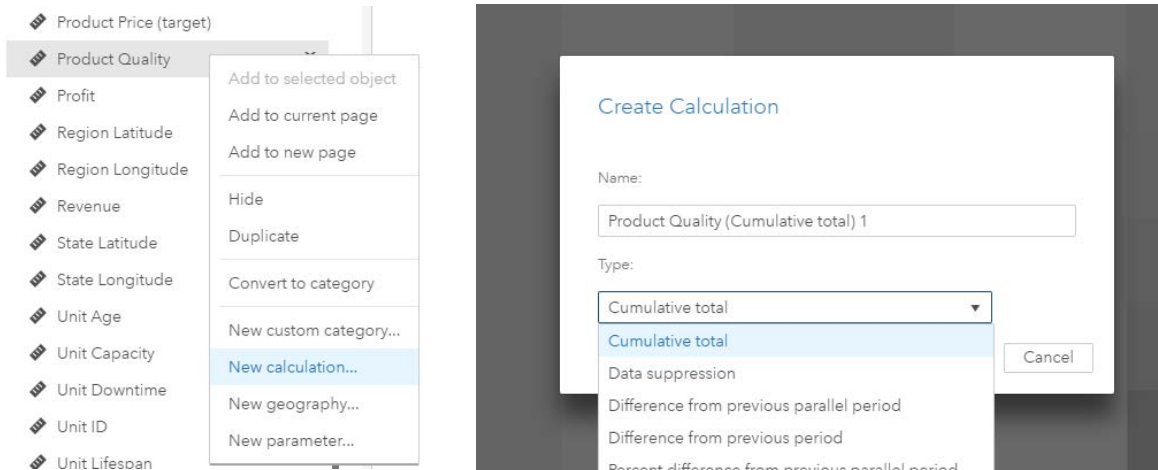
Figure 18. One-Click Calculations

OBJECTS

List tables no longer display an empty column by default. Columns fit to the width of the table. Column widths shrink as more columns are added until it reaches a limit after which the table starts to scroll. See Figure 19.

Figure 19. List Tables Fits Columns to Width

There are improvements in graph objects. Bar charts show labels for individual segments of stacked bars. In graph legends, a smaller version is shown when the graph runs out of space. This is a first step toward responsive legends for visualizations with high cardinality data. See Figure 20.
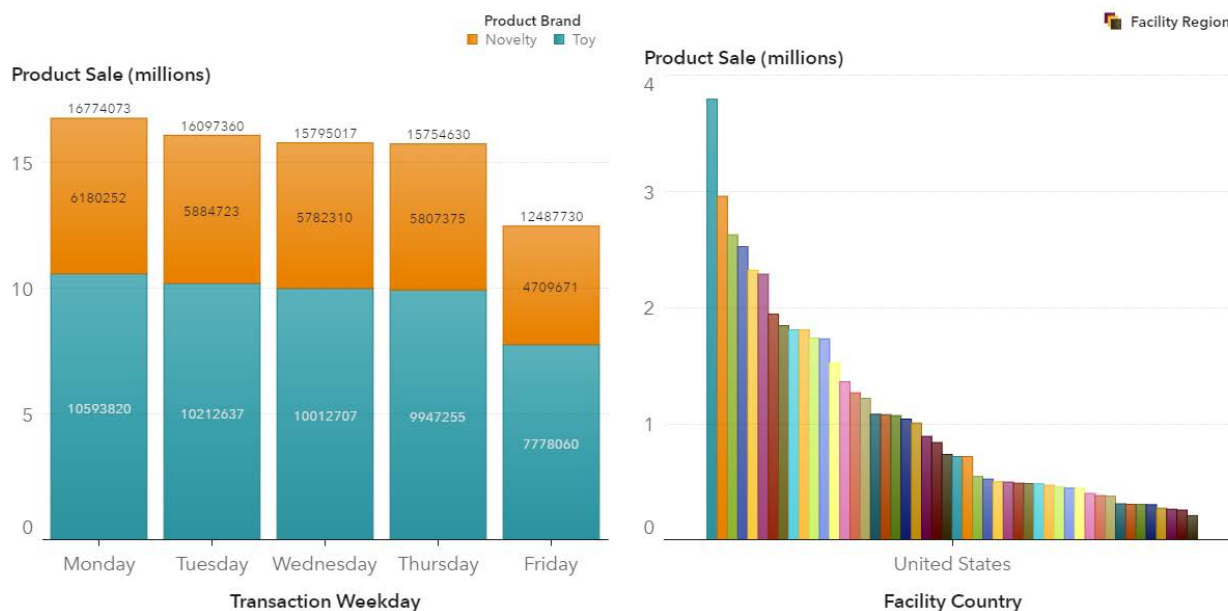

Figure 20. Segment Labels and Collapsed Legend

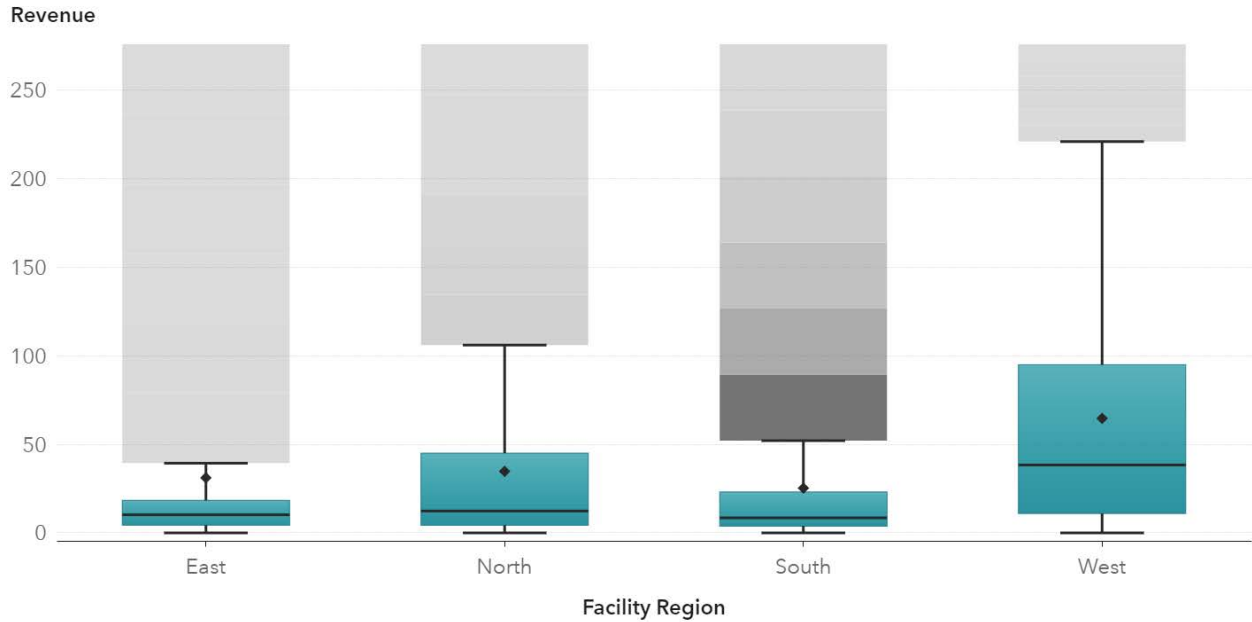With high cardinality data, box plots display outliers as a monochromatic heat map. See Figure 21.

Figure 21. Box Plot with Outlier Distribution

GEO MAPS

Marker type and color can now be driven by display rules. Figure 22 shows a display rule being used to denote airport locations with the airplane icon. Another rule defines a threshold for the number of flights and sets a color of the icon for airports exceeding it.
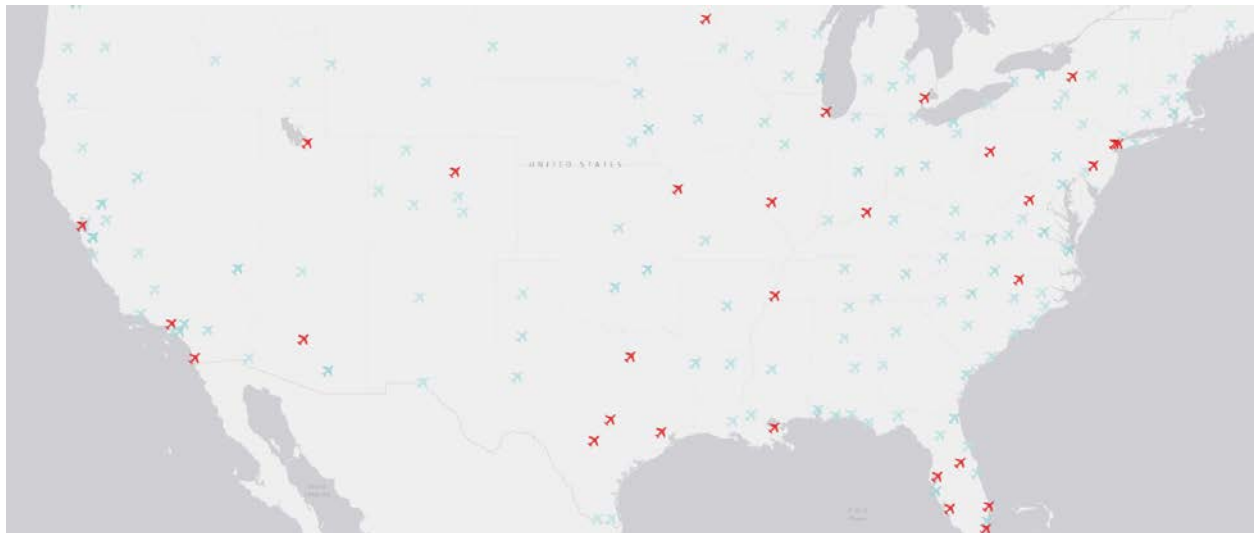

Figure 22. Markers Driven by Display Rule

Automatic clustering is available for geo maps that are based on custom coordinates. Adjacent markers are grouped into a cluster. The clusters are recalculated as the zoom level changes in the geo map. The maximum number of clusters and spacing between them can be set in the **Options** pane.

Figure 23 shows three zoom levels of one geo map. The geo map shows frequency of airline flights from airports in the US. The frequency of flights from airports are clustered differently for the different zoom levels of the geo map.

Figure 23. Automatic Clustering

ESRI supported radius-based selections (travel distance and travel time) is enhanced. For these selections, an item is provided in the pop-up menu to access and display demographic data from ESRI (ESRI Enrichment). Figure 24 shows demographic data from ESRI displayed for a selection defined by travel-distance. Note that these features require credentials to an ESRI Premium License that must be specified in the Settings window.
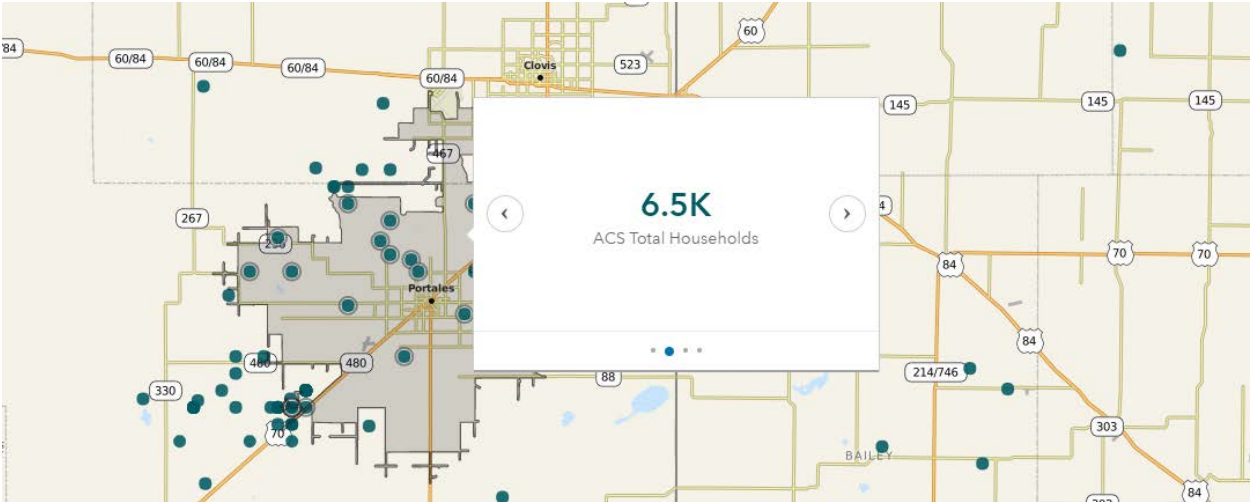
Figure 24. Demographic Data from ESRI

Geo maps support custom shapes. Custom shapes are nonstandard shapes, such as counties and school districts, and sometimes specific to a business, such as sales regions. Documentation is available on how to load the custom shape data, convert the data to a SAS data set, and use the data in the product. Figure 25 shows custom shapes for counties of US states imported into the geo map and a measure displayed as a color gradient applied to the shape.

Figure 25. Custom Shapes of US Counties
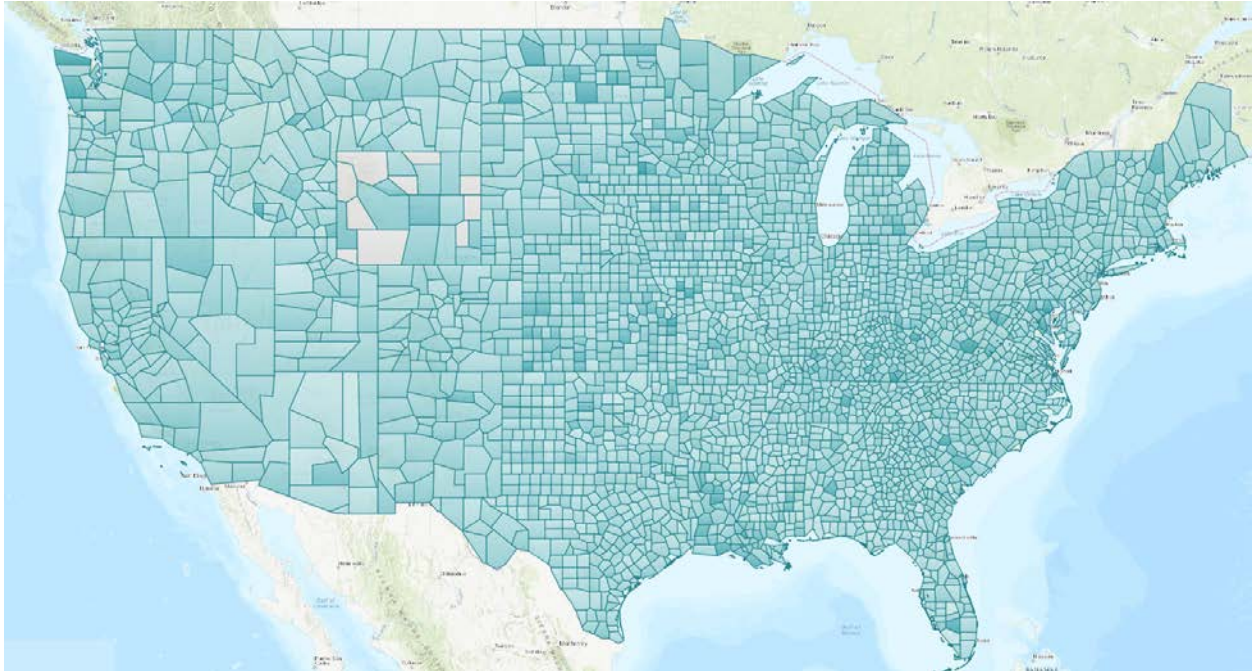
APPROACHABLE ANALYTICS

Addressing the goal of bringing analytics into the hands of more decision makers, improvements have been made to the visual output of the analytics and modeling objects supported within SAS Visual Analytics. The inclusion of auto-tuning for Decision Tree also marks the beginning of an effort to include more automation to help both novices and experts get to interpretable results faster.

NEW OBJECTS

Three new objects are added: Key Value, Parallel Coordinates Plot, and Data Driven Content This release also adds objects such as Path Analysis (previously Sankey Diagram), Vector Plot, Needle Plot, Schedule Chart, and Step Plot to bring parity with previous releases. These new objects follow all the rules of data assignment, layout, and interactivity that apply to other objects in the product.

KEY VALUE

The Key Value object addresses the need to insert a single aggregated value of a data item into a report. The value is dynamic, so it updates when the data is updated. This usage is seen in dashboards that display one or more key metrics that communicate an overview of the state of a system. This new object can be modified in multiple ways, such as changing how the value is displayed, style options, and properties. Figure 26 shows the Key Value object showing the aggregate value of a measure, Product Sale.

Product Sale

77M

Figure 26. Key Value

In addition to a single aggregated value of a measure, the key value can display a value of a category determined by a rank (highest or lowest) of the aggregated measure. The display can also include the measure label, category label (for categories), and aggregation type.

By default, the measure value uses the shortened form, for example, the letters K, M, and B to indicate thousands, millions, and billions respectively. Either the measure or the category value can be highlighted for emphasis. The **Highlight** text value is shown in a different color and in a larger size.

Two presentation styles are available for the key value. **Text** is the default style and uses all the space to lay out the various text elements. **Infographic** style presents the content inside a circle. The border of the circle and the highlighted text element are the same color property and can be edited by the report author or controlled by a display rule.

Figure 27 shows the Text and Infographic styles. On the left, the key value with the Text style also displays the aggregate type "sum". In the key value on the right, the circle of the Infographic style is shown with color edited.

Figure 27. Text and Infographic Style

If a category data item is assigned to the key value, then the category label and the category value with the highest (or lowest) corresponding measure value is displayed.

Figure 28 shows two key values. The measure Product Sale and the category value, Manchester, which is the highest aggregated Product Sale of all values in the category Facility City. The key value on the left shows the measure value highlighted, while the key value on the right shows the category value highlighted and the aggregate type "sum" suppressed.

Figure 28. Highlighting Measure and Category in Key Value

PARALLEL COORDINATES PLOT

The Parallel Coordinates Plot visualizes data across an ordered set of variables plotted as axes placed parallel to each other. The variables can be measures or categories. Measure values can be displayed as bins (10 by default), and category values are shown as sections of the axis sized by relative frequency. Polylines are drawn connecting an observation across its position on each axis. The resultant patterns formed by the polylines in the Parallel Coordinates Plot facilitates exploring of the various patterns within the data. Figure 29 is a Parallel Coordinates Plot that shows patterns across several health-related variables, colored by the selected category variable.
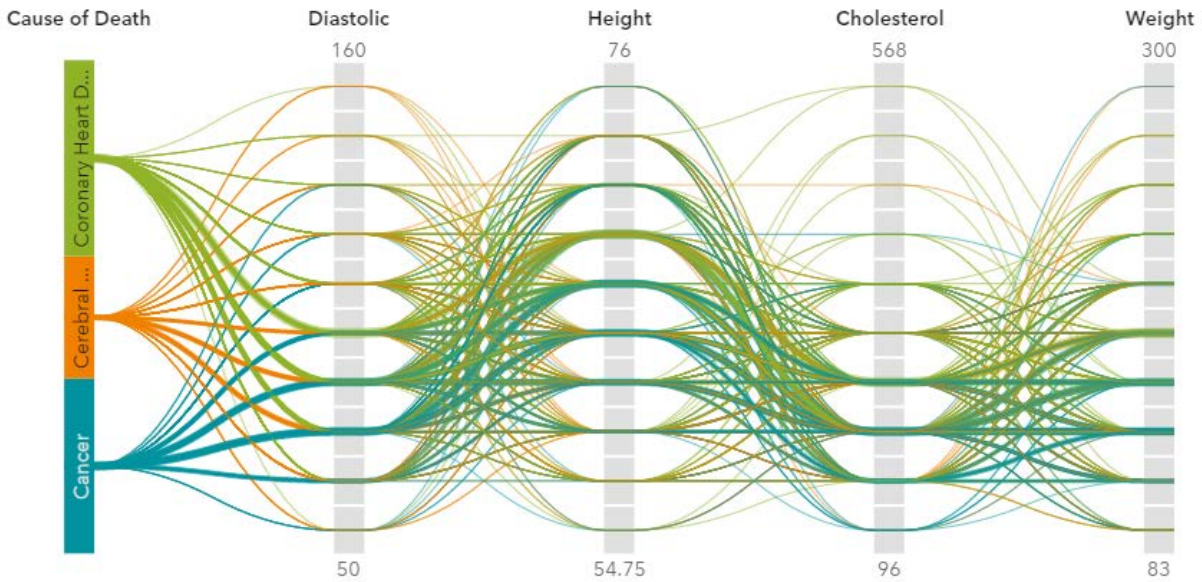

Figure 29. Parallel Coordinates Plot

The Parallel Coordinates Plot is primarily meant for exploring data as opposed to presentation and story-telling. The order of the variables determines the order of the axes and is important as adjacent variables show their correlations most clearly. Figure 30 shows the Parallel Coordinate Plot with more bins for the measures and a category value selected.
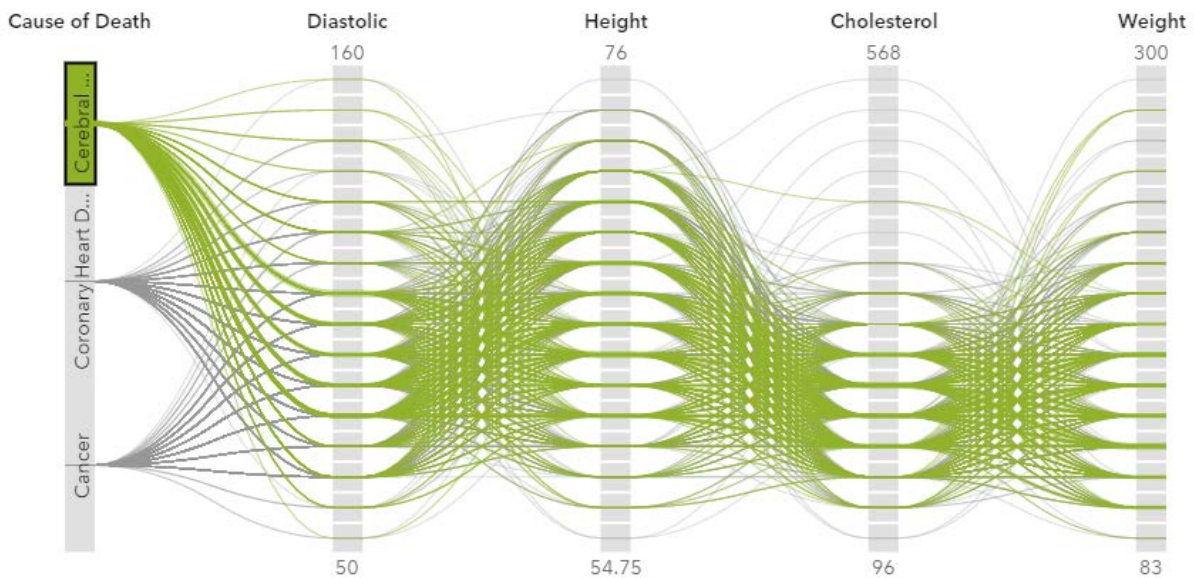

Figure 30. Parallel Coordinate Plot with Category Value Selected

DATA-DRIVEN CONTENT

Data-Driven Content enables inserting a custom visualization (created outside SAS Visual Analytics) that is fed live data and responds to filters, ranks, and actions just like the built-in objects. The custom visualization can be created using any JavaScript charting framework such as C3, D3, Google Charts, or CanvasJS. This custom visualization needs to be hosted somewhere. Programming knowledge is needed to create an HTML page that can receive data, perform selection handling, and display any messages. For more information, see Programming Considerations for Data-Driven Visualizations and check out the samples and utilities in the SAS Software GitHub repository. Figure 31 shows a bar chart next to data-driven content, a timeline chart from Google.
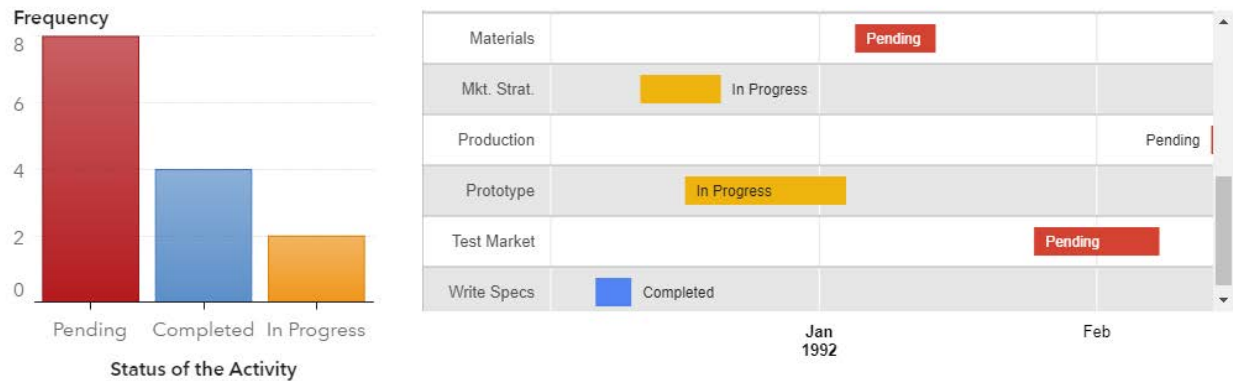

Figure 31. Bar Chart with Google Timelines

Figure 32 shows a grouped line chart interacting with data-driven content to provide a custom SVG based map created with the help of NetworkX, a Python package for working with network data. The results were integrated using the SAS Python Scripting Wrapper for Analytics Transfer (SWAT) interface to the SAS Cloud Analytic Services (CAS). For more information see the open GitHub repository for SAS SWAT.

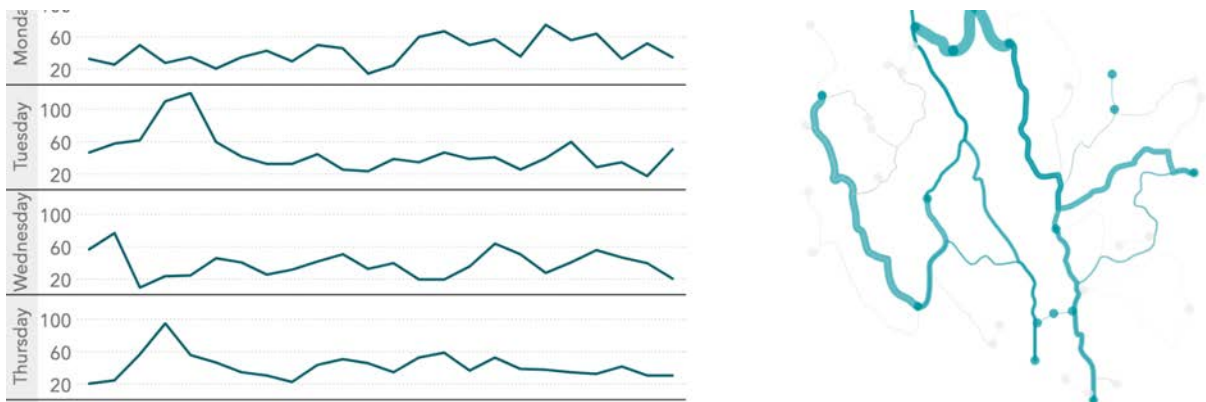**Figure 32. Line Chart and Custom Map**

THE VIYA PLATFORM

The open APIs of the new VIYA platform will continue to enable more opportunities for more flexible and integrated reports. To help with the transition to the new platform many of the existing report and exploration features are preserved through a promotion process when opened in SAS Visual Analytics 8.2.

CONCLUSION

SAS® Visual Analytics 8.2 provides an enhanced interface for authoring and consuming business reports and introduces powerful new objects for visualizations. The new features advance the user experience for exploration and reporting toward increased interactivity of report content, a build once and consume anywhere layout design, more flexible objects, increased distribution and sharing, and integration with external content. Overall, the structure of the application is organized into clear and distinct functional areas, which makes SAS Visual Analytics 8.2 scalable and a robust base for future releases.

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