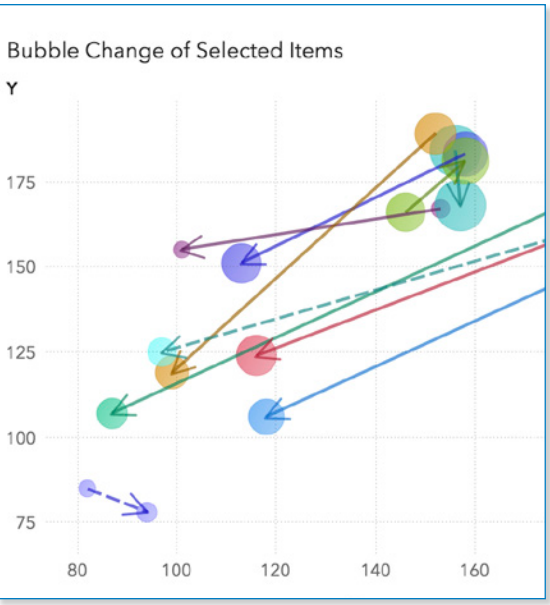
SAS® Visual Analytics on SAS® Viya®

Get self-service reports, visual discovery and approachable analytics all from a single, powerful in-memory solution



What does SAS® Visual Analytics on SAS® Viya® do?

SAS Visual Analytics provides a modern, integrated environment for governed discovery and exploration. Users, including those without advanced analytical skills, can examine and understand patterns, trends and relationships in data. It's easy to create and share reports and dashboards that monitor business performance. Easy-to-use analytics and visualizations help everyone get insights from data to better solve complex business problems.

Why is SAS® Visual Analytics on SAS® Viya® important?

Users of all skill levels can visually explore data, use automated analysis and create visualizations while tapping into powerful in-memory technologies for faster computations and discoveries. This self-service solution scales to an enterprisewide level, putting data and analytics in the hands of more people. At the same time, governance capabilities help IT promote consistency and reuse.

For whom is SAS® Visual Analytics on SAS® Viya® designed?

It's designed for anyone in an organization who wants to create, share and collaborate on insights from data. That includes decision makers, business analysts, report creators and citizen data scientists. It also provides IT with an easy way to govern and manage data integrity and security.

More people than ever want to explore data and use analytics, even if they don't possess deep analytical skills. At the same time, IT staffs find it harder to meet the constant demands for data access and preparation, while also handling daily requests for ad hoc analyses and updated dashboards. As a result, decision makers are frustrated because it takes too long to get insights.

To help everyone get the answers they need when they need them, SAS Visual Analytics provides an intuitive interface that combines self-service reporting, data visualization and easy-to-use analytics. It takes advantage of the SAS Viya engine for even faster insights.

SAS Viya modernizes the SAS Platform with features like high availability for always-on answers, faster in-memory processing and native cloud support. Resilient and scalable, SAS Visual Analytics can handle more users, more data and a wide range of BI and analytical workloads in a consistent and governed manner.

Benefits

- **Understand and share what's happening with dynamic visuals.** Create interactive reports and dashboards by querying data from multiple sources in a self-service manner. Then summarize and share key performance metrics via the web or mobile devices. Recipients can dynamically slice and dice to find answers or ask more questions as needed.
- **See the big picture and underlying connections**. Visually explore all relevant data – smartly, quickly and easily. Interactive discovery lets you examine opportunities hiding in your data, while automated analysis highlights important relationships in data with easy-to-understand explanations. Business users can find out why something happened and identify critical drivers to make better decisions. The software discovers key relationships, outliers, clusters, trends and more, revealing insights that inspire action.
- **Drive business results with data-backed insights**. With easy-to-use predictive analytics, business users and analysts can assess possible outcomes and make better, data-driven decisions – without programming. Visualizations, smart algorithms and automated analysis reduce the need for experimentation, and you avoid the risk of missing key insights. Collaborate with experts to focus on what's most relevant.
- **Add geographical context to your analyses and visualizations**. Combine traditional business data with location data to understand the full picture. Location analytics adds the "where" dimension so you can analyze data in new ways, understand location factors and identify location-specific opportunities.
- **Share and interact with insights when and where you want**. Executives and frontline staff can quickly interact and collaborate with reports, charts and dashboards to better understand business performance, jointly interpret results and decide on the best actions. Content can be shared with others via the web, Microsoft Office applications and mobile devices.

Overview

Interactive data visualizations help everyone explore and better understand data. Adding analytics to visualizations uncovers insights buried in data, making it easy to spot patterns and trends that affect the bottom line.

You can quickly identify outliers that may influence product quality or customer churn, and recognize highly correlated parameters in data. Identifying these relationships helps determine if findings are relevant or significant, so you can focus on areas that matter most.

SAS Visual Analytics provides a scalable, in-memory engine along with an extremely easy-to-use interface. The combination of interactive data exploration, dashboards, reporting and analytics helps business users find valuable insights without coding or the need for advanced data scientist skills.

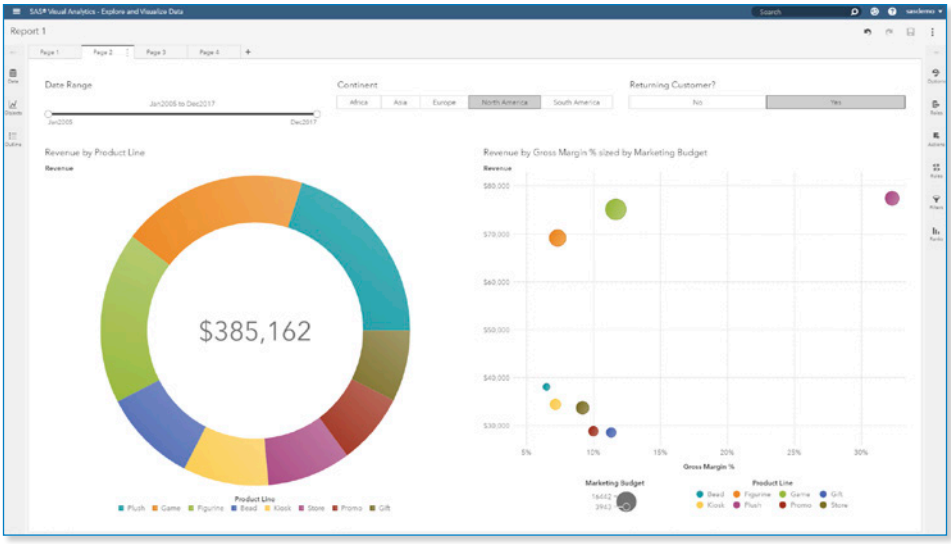


Figure 1: Design and distribute dynamic, interactive reports and dashboards using the SAS Visual Analytics drag-and-drop designer environment.

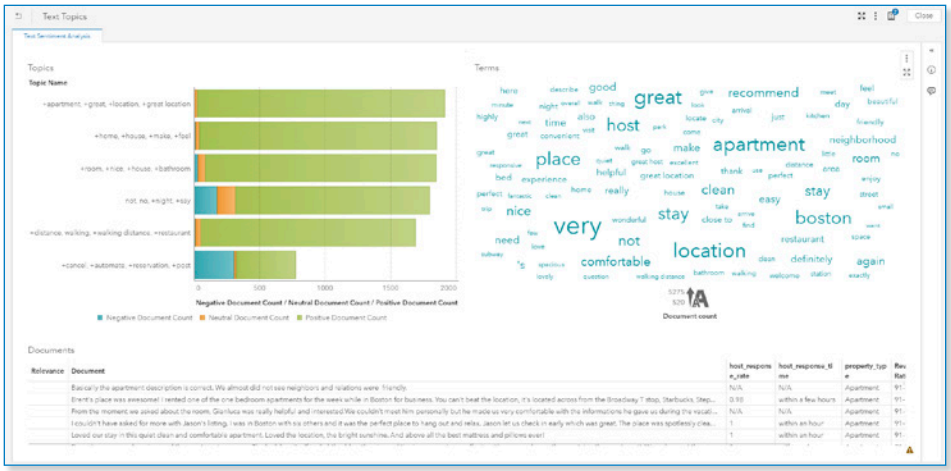


Figure 2: Text sentiment analysis shows you the most frequently used terms and phrases, as well as the sentiment of terms, phrases and documents, so you can quickly discern the good feedback from the bad.

Depending on different skill levels, roles and types of problems to solve, SAS Visual Analytics offers different visualization and exploration techniques. Everyone can quickly assess probable outcomes and make smarter, better data-driven decisions.

Report creators, business analysts and even traditional consumers can quickly create and share visualizations and reports to gain new insights from data. And IT staff is happy because it's easy to manage and administer the common SAS Viya environment. They can measure and monitor data, usage, scheduling and more to provide much needed governance.

A better way to tell your BI story

Diving into reports and dashboard data enables you to explore options and identify opportunities. Arriving at an aha moment brings the thrill of uncovering new relationships in your data. You can then easily share your journey so others can follow and find new opportunities.

By telling your story, sharing and collaborating, you enhance the value and credibility of your results. These are more than just static reports. SAS Visual Analytics allows you to build reports that enable collaborative, engaging discussions that can drive deeper insights – and better decisions.

Self-service discovery

With web-based exploratory analysis and other easy-to-use features, even users without analytical expertise can use SAS Visual Analytics to gain precise insights.

Nontechnical users can create and change queries simply by selecting items from a sidebar or dynamically filtering and grouping data. Automated analysis determines which variables contribute to an outcome and a simple natural language explanation highlights essential insights. Autocharting selects the visualization that best suits the type of data chosen.

Analytically savvy users can use visualization techniques to spot trends and derive deep insights faster. This eliminates many

of the everyday trial-and-error processes currently used to identify areas that need further analysis.

Self-service analytics for everyone

Analytical capabilities are tailored for ease of use so business analysts can generate and use analytical models on their own without learning new skills or engaging IT. Business users get the answers they need when they need them, and specialists are not burdened with constant requests for analyses.

SAS Visual Analytics enables business analysts to quickly assess possible outcomes or estimate unknown parameters to support better decisions. Powerful, yet easy-to-use capabilities include:

- **Automated forecasting.** The most appropriate forecasting method is chosen to suit the data. Even novice users can forecast reliably.
- **Scenario analysis.** Identify important variables and how changes to them influence forecasts.
- **Goal seeking.** Determine the values of underlying factors that would be required to achieve the target forecast.
- **Decision trees.** Create a hierarchical segmentation of the input data based on a series of rules applied to each observation.
- **Network diagrams.** See how complex data is interconnected.
- **Path analysis.** Visualize relationships between a distinct sequence of events. Path analysis displays the flow of data from one event to another as a series of paths.
- **Text analysis.** Applying sentiment analysis to YouTube videos, Twitter streams, Facebook posts, Google Analytics data or customer comments provides fast insight into what's being discussed in social media and beyond. SAS Visual Analytics provides more than simple word clouds that display how many times a word is used. Content categorization determines which topics are most important, and identifies sentiments of topics and documents to provide clear paths for further exploration.

Key Features

Self-service discovery

- Interactive discovery of relationships, trends, outliers, etc. for business users and analysts.
- Autocharting automatically chooses the graph best-suited to display selected data.
- Analytical visualizations include box plots, heat maps, animated bubble charts, network diagrams, correlation matrices, line charts with forecasting, parallel coordinates plots, donut charts, decision trees and more.
- Geographical map views provide a quick understanding of geospatial data.
- Network diagrams provide the ability to display networks across a map.
- Reuse and share modifications to your report, such as filters, calculations, hierarchies and report element formatting.
- Create calculated, aggregated or derived data items.
- A resizable overview bar lets you interactively subset a portion of visuals with many data points.
- Bring your own custom interactive visualizations (e.g., D3.js graphs, C3 visualizations or Google charts) into SAS Visual Analytics, so they're all driven by the same data.
- Key value visualization allows you to display important metrics (numeric or categorical value) in an infographic style for quick reference.
- Perform path analysis (Sankey diagrams) to visualize relationships between a distinct sequence of events.
- Drag an Excel file, CSV or SAS data set onto your workspace and quickly start building reports or dashboards.
- Automated analysis determines which variables contribute to an outcome and provides a simple natural language explanation that is easy to understand.

Self-service analytics

- Create drillable hierarchies in a self-service manner without the need to predefine user paths.
- Add cell visualizations, like bars and heat maps, to your tables to quickly identify problem points and see trends in your data.
- Forecasts can be generated on the fly with forecasting confidence intervals included.
- Measure details to help you quickly get a feel for your data.

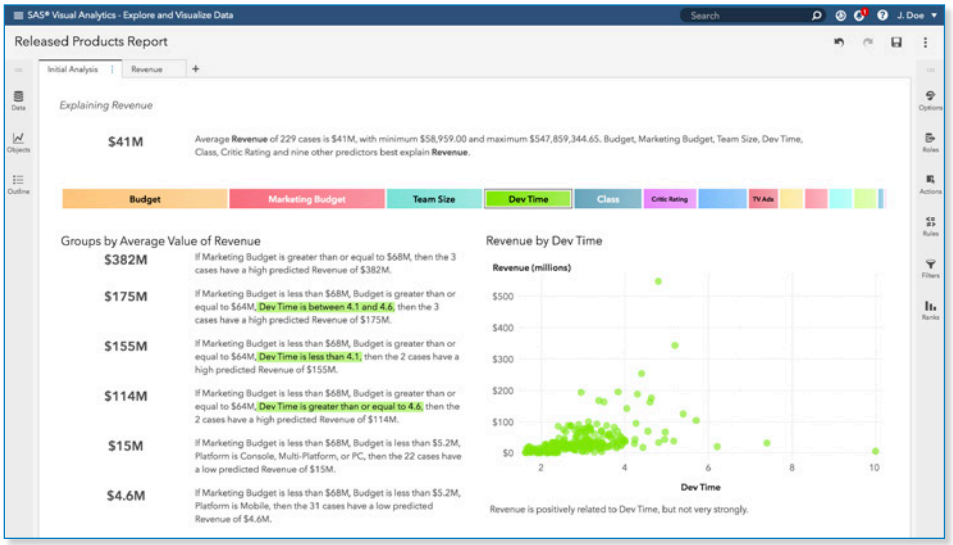


Figure 3: Automated analysis determines which significant variables affect key business measures, reducing time spent on data discovery and improving response time.

Interactive dashboards, reports, BI and analytics – all from a single interface

Go beyond the scope of typical business intelligence solutions. With SAS Visual Analytics, you can move directly from reporting and exploration to analysis and sharing information through different channels – all from the same user interface.

As more people have access to data and to analytics applied to the data, it's increasingly important for people to have conversations about their BI dashboards and reports. These conversations are critical for understanding and interpretation, for alignment and decision making. One way to facilitate conversations around the data is to put information where people can easily get to it, including the web, Microsoft Office applications and mobile devices.

SAS Visual Analytics reduces the number of tools your teams use – and the number of systems IT must maintain.

Collaboration and storytelling through Microsoft Office integration

Microsoft Office integration encourages collaboration and sharing through live, dynamic visualizations delivered through familiar Microsoft applications. Combine exploring, reporting and presenting with Excel and PowerPoint to tell your story. Collaborate using dynamic reports shared with others through their Outlook email inbox. And document your discovery in Microsoft Word using the same dynamically updated reports.

SAS® Visual Analytics app for mobile devices

Sharing and collaboration relies on reaching decision makers no matter where they are. With SAS Visual Analytics, they can use native apps for Windows 10, iOS and Android to quickly view dynamic reports and dashboards on tablets and smartphones. Users can annotate, add comments and email reports to others. Email alerts can

Key Features (continued)

- The most appropriate forecasting model is automatically selected after running multiple models against data.
- Scenario analysis lets you see how changes in different variables would affect forecasts.
- Goal seeking lets you to specify a target value for your forecast, and then determines the values of underlying factors that would be required to achieve the target value.
- Decision trees graphically depict likely outcomes. An expert level allows you to modify certain influencing parameters for the tree generation.
- Custom binning for moving continuous data into a small number of groups for better interpretation and presentation of results.
- Text analysis capabilities enable you to automatically find topics and understand sentiment from text sources, including Facebook, Twitter, Google Analytics, YouTube comments and more.

Interactive reporting and dashboards

- Precision and responsive layout capabilities provide flexibility in report layout and design. Stack or group items and more.
- A variety of graph objects or charts are included: bar with multiple lines, pie, donut, line, scatter, heat map, bubble, animated bubble, treemap, dot, needle, numeric series, schedule chart, vector, etc.
- Add content from the web (e.g., YouTube videos, web apps) and images (e.g., logos) to your report.
- A variety of prompt controls help you interact with reports.
- Custom sort allows you to rank order category data items in a table or graph by characteristics (e.g., products, customers). The characteristics that are most important to your organization will be displayed first.
- One-click filtering (e.g., one way, bidirectional) and linked selections will allow you to spend less time manually linking content (e.g., visualizations, reports).
- Text objects can include date-driven or system-generated text for relevant context.
- Collaborate across mobile devices and the web by adding comments to a report.
- Synchronize selection and filters across visualizations in a report or dashboard.

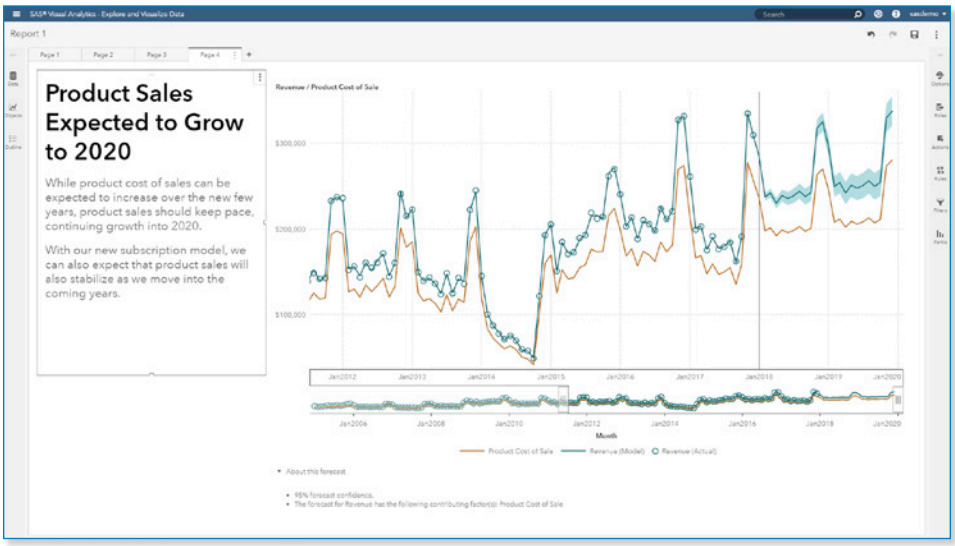


Figure 4: Use goal seeking to see how changes to a forecast affect underlying factors, and use scenario analysis to see how a forecast is influenced by changes to underlying factors.

be sent to notify users when reports are updated or data is changed. The SAS Visual Analytics app is available for free from the Microsoft Store, Apple App Store® and Google Play. In addition, create your own custom mobile apps using the SAS SDK for iOS and SAS SDK for Android.

Location analytics

Location data has long been collected and used for GIS and mapping purposes. Urban planners, law enforcement and real estate companies have been using geographical data for years. But with more and more location data being collected from smartphones, smart watches, iBeacons and sensors, interest in location analytics is growing in almost every industry.

Location analytics is more than just putting points on a map. It's about augmenting location information with other data and analytics to produce deeper insights. With SAS Visual Analytics, you can combine traditional data sources, such as transactional, customer and operational, with location and demographic data for analysis in a geographical context. You can analyze data in new ways, understand opportunities and risks, and visually engage with the information for more informed decision making.

Now you can add map pins to mark points of interest and insights on a map. For instance, a pin can be based on the result of a geosearch or you can simply select a location on a map to add a pin. From a pin, you can create a direct-line route to or from another pin and make a geographic selection with the pin at the center.

Data loading and self-service data preparation

Fast, parallel data loading into the in-memory environment is provided for many relational and Hadoop data sources. Data set compression is available so you can load data that is larger than the available memory.

Key Features (continued)

- Link different reports (e.g., link a sales report to an inventory report).
- Report consumers can change calculation parameters and display rules using controls, filters, etc. to see information that is most relevant to them.
- Create alerts for a report object so that subscribers are notified via email or a text message when the threshold condition is met.
- Set refresh rates for individual objects, pages or your entire report.
- Distribute reports as PDFs or email in a secure manner. Distribute reports once or at recurring intervals, such as daily, weekly or monthly.
- Recover reports you are editing when your session ends unexpectedly. Reports are automatically saved every five seconds after an edit is made.
- Pick up where you left off from a prior session on all your devices.
- Playable dashboards let you put your report in slideshow mode.
- Administrators can configure support for guest access to view report or visualization. Guest users can view the insights that are available to the public.

SAS® Visual Analytics mobile app

- Install the free SAS Visual Analytics app (formerly SAS Mobile BI) from the App Store for iOS iPhone and iPad, Google Play for Android phones and tablets, and Microsoft Store for Windows 10 devices.
- The app lets you connect and interact with your SAS Visual Analytics reports and dashboards using gestures native to your devices.
- Interact with your SAS Visual Analytics app for iOS using voice commands.
- Reports created once in SAS Visual Analytics can be viewed anywhere.
- Secure access to content on mobile devices, both online and offline.
- Annotate, comment, share and email reports to others for increased collaboration.
- Screenshots can be captured and comments shared with others.
- Notifications alert business users when a report is updated, data is changed or the application is updated.
- Create your own mobile apps using the SAS SDK for iOS and SAS SDK for Android to create embedded insights:
  - Personalize your mobile app with embedded SAS Visual Analytics content, your corporate logo and name of your choosing.
  - Preconfigure your mobile app to connect to SAS servers and subscribe to specified reports.
  - Develop completely customized mobile apps that embed SAS Visual Analytics content (e.g., GatherIQ).
  - Manage and secure your mobile app and data by integrating with mobile device management (MDM) service (via new APIs).

Location analytics

- Geographical maps are enabled through Esri ArcGIS Online or OpenStreetMap.
- You can lasso data points on geographical maps to select specific data for further analysis.
- Geographical maps make it easy to visualize measurement variances over a geographical area.
- Access to all Esri basemaps and geosearch is available through Esri ArcGIS Online at no additional charge.
- Custom polygons (e.g., sales territories, voting districts, floor plans, seating charts) will let you see the world just as your business demands for it. These polygons can be animated to show how key metrics change over time.

Business users can take advantage of drag-and-drop capabilities to import their own data, join tables, apply data quality functions, create calculated columns and more.

The demand for self-service data preparation needs will increase as more users create interactive content, whether it's reports, dashboards or explorations. SAS Visual Analytics gives them the power to do so.

Administration and management

The SAS Viya administration environment includes out-of-the-box audit and usage reports so administrators have direct access to monitoring and management capabilities. Data is automatically collected for all SAS Visual Analytics components, and administrative reports are created based on this data.

Highly scalable and distributed processing

SAS Visual Analytics takes advantage of SAS Viya to handle ever-growing numbers of users, data types, data volumes, and the evolving range of BI and analytical workloads. It's designed for scalable, distributed processing so it's super responsive to changing needs.

The SAS Viya server called CAS (SAS Cloud Analytic Services) performs processing in memory and distributes processing across nodes in a cluster. Data and intermediate results are held in memory as long as required, across jobs and user boundaries, reducing latency. Fault tolerance ensures requests continue to process, even if the server loses connectivity to some nodes, guaranteeing that submitted jobs always finish.

Key Features (continued)

- Geographic point clustering makes it easier to visualize high-volume location data and identify areas of interest. Get more or less details at different zoom levels.
- Add map pins to mark points of interest and insights on a map.
- With an Esri ArcGIS Online license, you can enrich your data with Esri demographics data:
  - Starting from a pin, select the area that can be traveled based on travel distance or provided travel time.
  - Create travel routes between points.
  - Add latitude and longitude columns to your data based on location information in your data (country, state, ZIP code, city and street).

Self-service data preparation

- Import data from a variety of sources: databases, Hadoop, Excel spreadsheets, clipboard, social media, etc.
- View lineage with network diagrams.
- Use basic data quality functions like change case; convert, rename, remove and split columns; and create calculated columns and transformations using custom code.
- New table and column profiling to understand data immediately.
- Prep data using append, join, filter and transpose functions.
- Reuse, schedule and monitor jobs.

Administration and management

- See, organize and collaborate on your work using SAS Drive.
- Users can favorite, share, preview and tag their content from one place.
- Create projects that share data, content and other resources with project members.
- SAS Environment Manager provides easy-to-use, web-based centralized administration and monitoring of your BI and analytics environment, including users, data, content, servers, services and security.

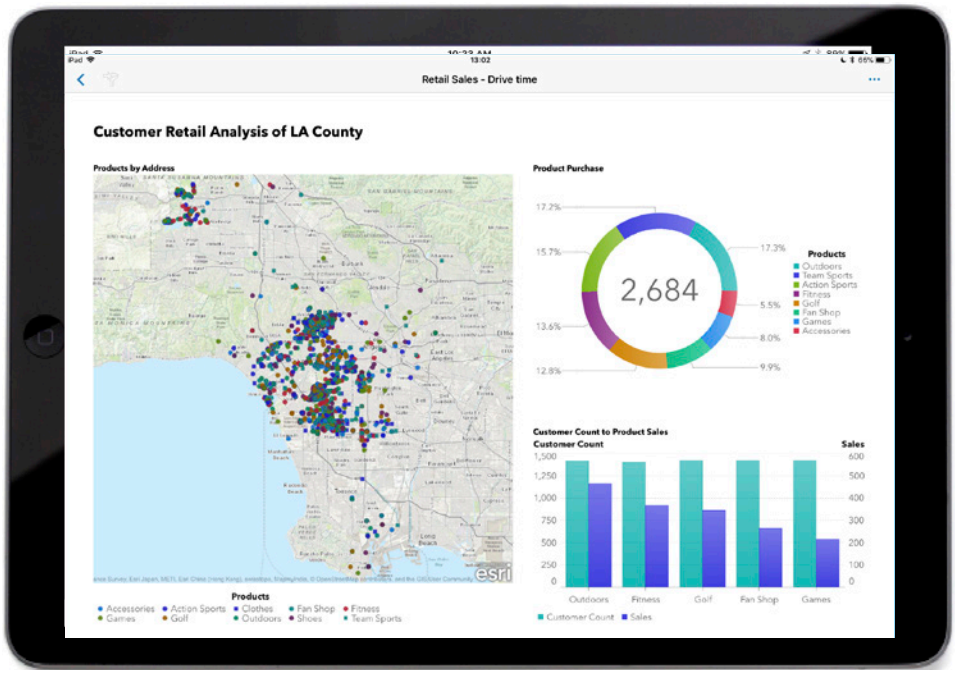


Figure 5: Interact with dynamic reports through the SAS Visual Analytics app, available for Windows 10, iPad®, iPhone®, Android tablets and smartphones.

Support for multitenancy allows multiple tenants to share resources, even though each tenant is logically isolated. The communication layer also enables the removal or addition of nodes from a server while it is running, ensuring elasticity and scalability.

Open to other programming languages

While SAS Visual Analytics is designed primarily for business users who prefer a visual interface, it does include a programming interface for those who want to write their own SAS code.

And if your programmers prefer to work in other languages, like Python, R, Lua or Java, that's OK too. They can call SAS Visual Analytics capabilities from their preferred programming environment. In addition, public REST APIs enable developers to easily add content created with SAS Visual Analytics to other applications.

Deployment flexibility

SAS Visual Analytics on SAS Viya is engineered to run either on a single server or in a distributed mode using a massive compute cluster. When SAS Visual Analytics executes in distributed mode, all nodes in the distributed computing environment are used for calculations. Data is distributed across the nodes in the cluster, and the massive computing power of the cluster is used to solve analytical tasks.

You can deploy SAS Visual Analytics wherever makes the most sense for your organization: on-site, in a private cloud via technologies such as Cloud Foundry or in public clouds, including Amazon Web Services and Microsoft Azure. You can also access this software via the predeployed and preconfigured managed software-as-a-service offerings provided by SAS.

Key Features (continued)

- User authentication and content authorization support governance.
- Object-level security (folders, reports, etc.) and data security (table and row level) support governance.
- Seamless integration with corporate identity directories such as LDAP.
- Rules-mapping application capabilities for users and groups support governance.
- Whitelist or blacklist mobile devices to determine authorization for SAS Visual Analytics apps.
- Near-real-time dashboard for monitoring system health and key activities.
- Distributed processing node addition and deletion.
- Scriptable APIs perform administrative tasks in batch, including management of security, libraries, users groups and configurations.
- Customizable monitoring and performance reports.
- Environmentwide log exploration, job scheduling and monitoring.

SAS® Viya® in-memory engine

- CAS (SAS Cloud Analytic Services) performs processing in memory and distributes processing across nodes in a cluster.
- User requests (expressed in a procedural language) are translated into actions with the parameters needed to process in a distributed environment. The result set and messages are passed back to the procedure for further action by the user.
- Data is managed in blocks and can be loaded in memory and on demand.
- If tables exceed memory capacity, the server caches the blocks on disk. Data and intermediate results are held in memory as long as required, across jobs and users.
- Includes highly efficient node-to-node communication. An algorithm determines the optimal number of nodes for a given job.
- Communication layer supports fault tolerance and lets you remove or add nodes from a server while it is running. All components can be replicated for high availability.
- Support for legacy SAS code and direct interoperability with SAS 9.4M5 clients.
- Supports multitenancy deployment, allowing for a shared software stack to support isolated tenants in a secure manner.

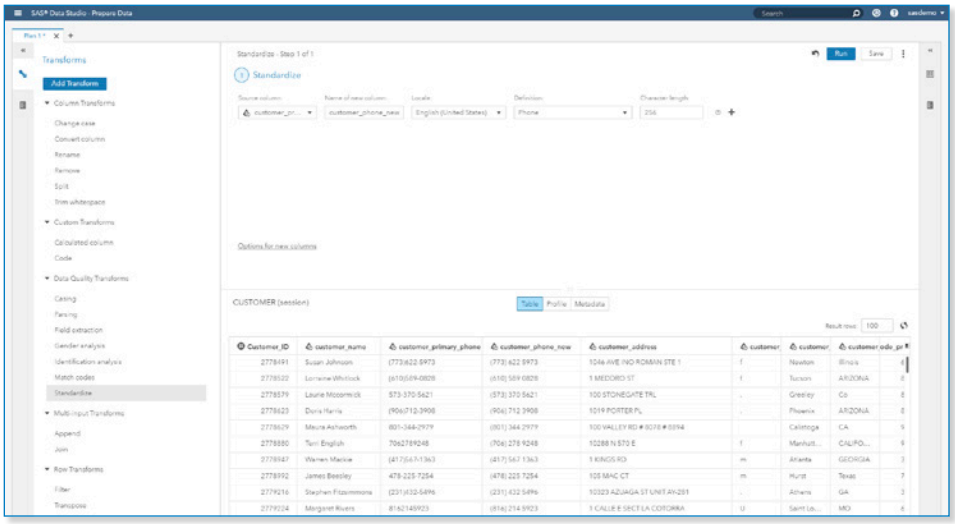


Figure 6: Prepare and load your data through a drag-and-drop interface where you can join tables, create calculated columns and more.

TO LEARN MORE »

To learn more about SAS Visual Analytics, download white papers, view screenshots and see other related material, please visit sas.com/va.

Key Features (continued)

SAS® procedures (PROCs) and CAS actions

- A programming interface (SAS Studio) allows IT or developers to access a CAS server, load and save data directly from a CAS server, support local and remote processing on a CAS server, write queries, perform basic data manipulation, etc.
- Python, Java, R or Lua programmers or IT staff can also access data and perform basic data manipulation against a CAS server or execute CAS actions using PROC CAS.
- With REST APIs, you can integrate and add the power of SAS to other applications.

Deployment options

- On-site deployments:
  - Single-machine server to support the needs of small to midsize organizations.
  - Distributed server to meet growing data, increasing workloads and scalability requirements.
- Cloud deployments:
  - Enterprise hosting; private or public cloud (e.g., BYOL in Amazon) infrastructure; SAS managed software as a service (SaaS); and Cloud Foundry platform as a service (PaaS) to support multiple cloud providers.

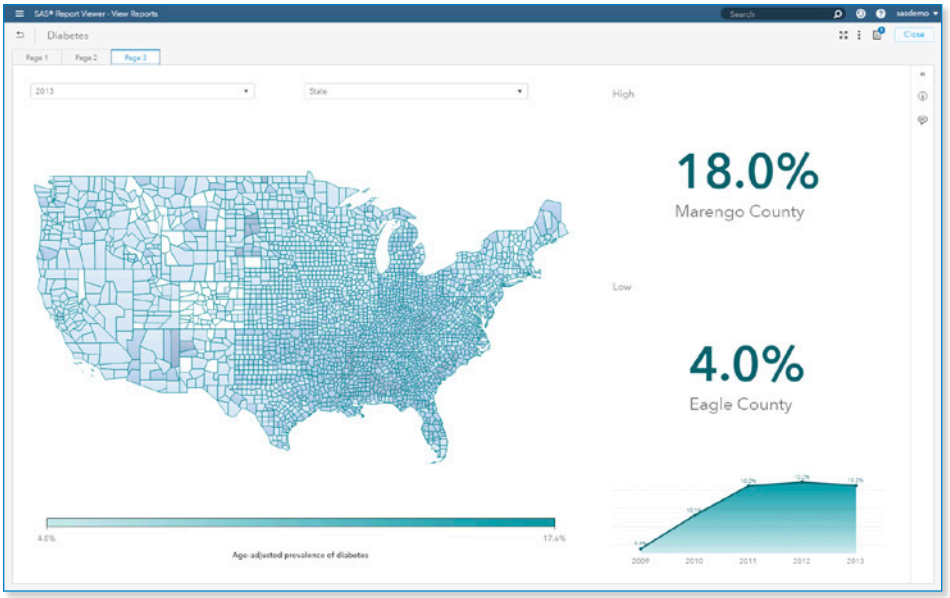


Figure 7: Easily augment geographical maps with location analytics for deeper, yet easy to understand, insights.

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