



Getting to Know SAS[®] Viya

VA, VS, VDDML and VTA

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Agenda

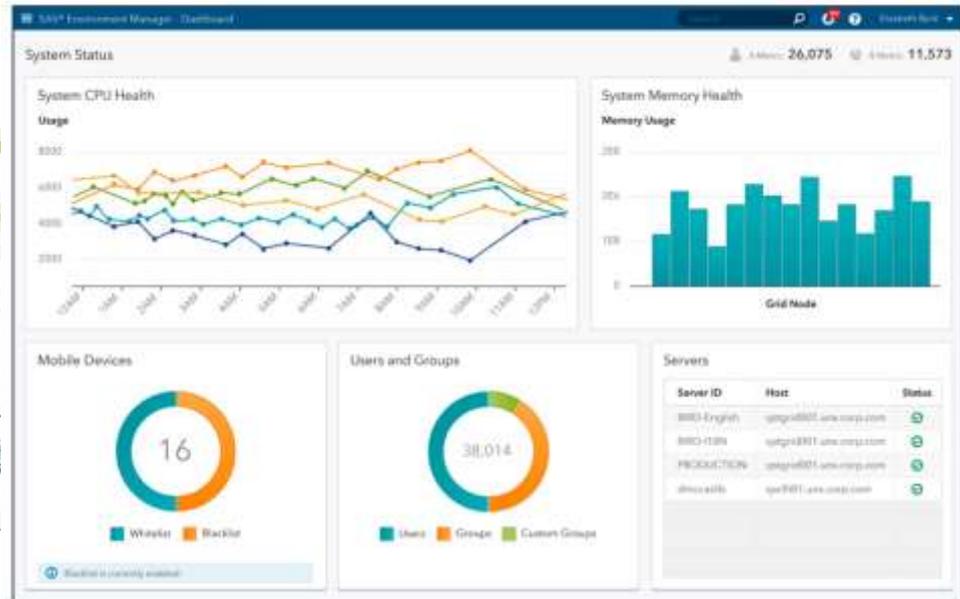
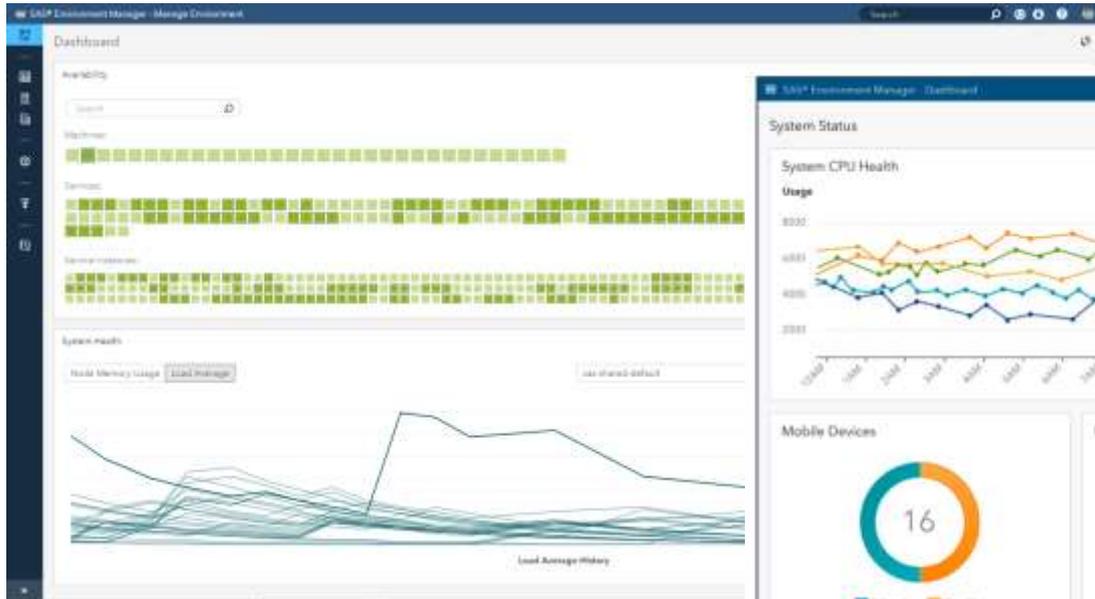
- Overview of Viya
- Introduction and Demo
 - SAS Visual Analytics
 - SAS Visual Statistics
 - SAS Visual Data Mining and Machine Learning
 - SAS Visual Text Analytics



Our digital transformation
to power the analytics economy

What is SAS Viya?

SAS Viya is a cloud-enabled, in-memory analytics engine that provides quick, accurate and reliable analytical insights.



SAS Viya Products

- SAS Viya is an underlying foundation for additional products that will take advantage of a cloud-enabled, open platform. Most offerings include both a coding interface as well a visual interface.
 - SAS Visual Analytics
 - SAS Visual Statistics
 - SAS Visual Data Mining and Machine Learning
 - SAS Visual Forecasting
 - SAS Visual Text Mining
 - SAS Optimization
 - SAS Econometrics
 - SAS Visual Investigator



How is SAS Viya Accessed?

MULTIPLE INTERFACES, SINGLE CODE BASE

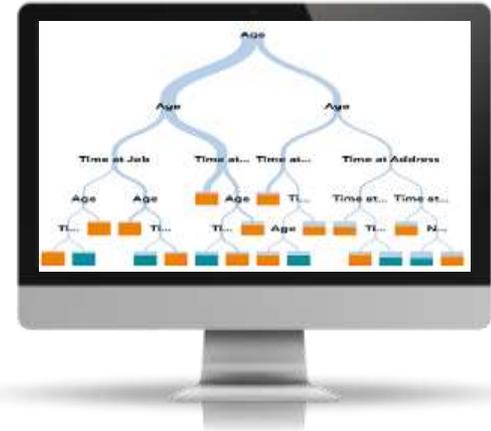
Visual Interfaces



Programming Interfaces



API Interfaces



Introduction: Software Overview

Multiple Interfaces Target Different Users

Domain Expert



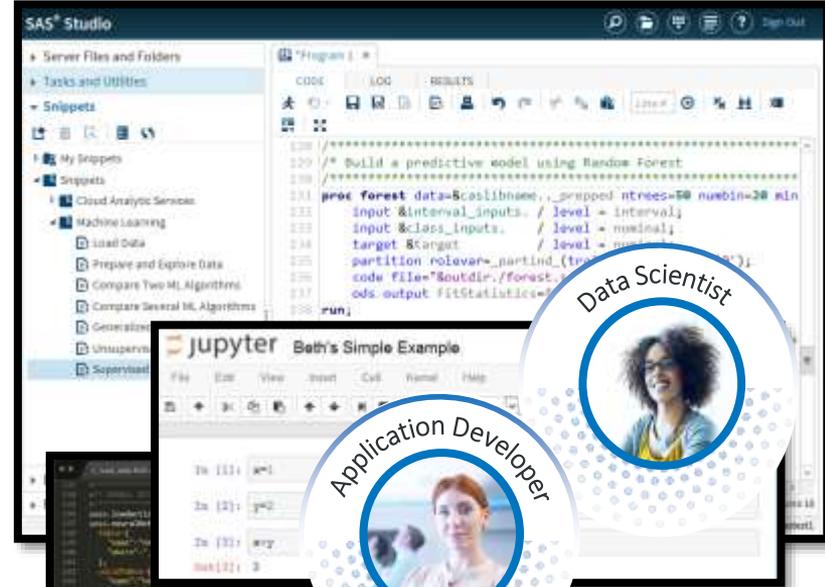
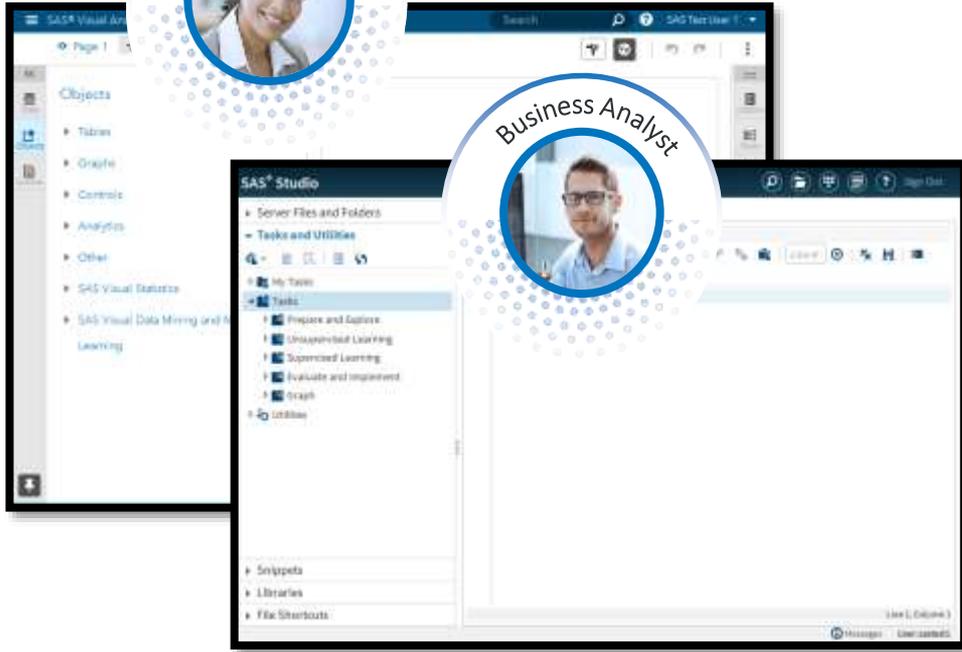
Business Analyst



Data Scientist



Application Developer





What is CAS?

Cloud Analytics Services

Cloud Analytic Services (CAS) In-Memory Engine



The CAS in-memory engine is a fast, scalable, and resilient run-time environment for data management and analytics for SAS® Viya™



Fast

- Multi-threaded
- Distributed In-Memory
- Efficient Inter-node Communication



Scalable

- Single Machine to Distributed MPP
- Memory-mapping to process data larger than physical memory * (No memory failures)



Resilient

- Fault-tolerant to Node and Network Failures
- Worker and Controller* Failover
- Session Independence

Multiple interfaces, single code base

Clients ask CAS to run “actions” on data

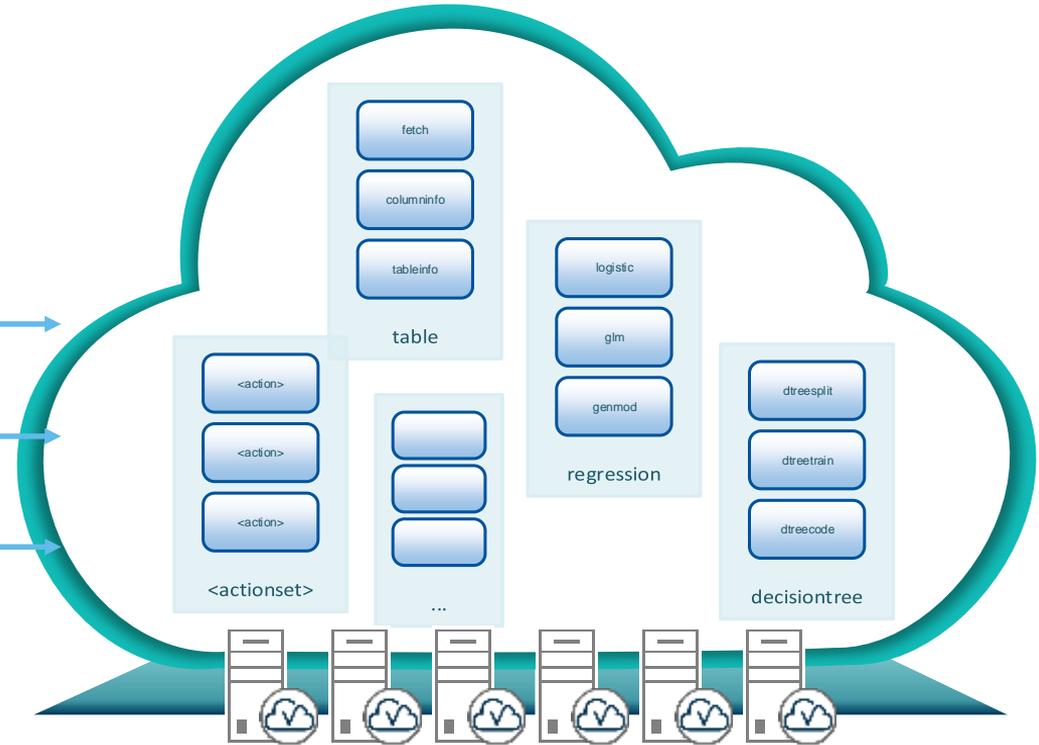
Visual Interfaces



Programming Interfaces



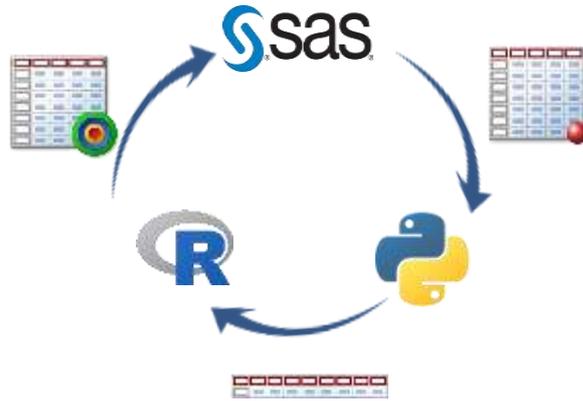
API Interfaces



CAS Server

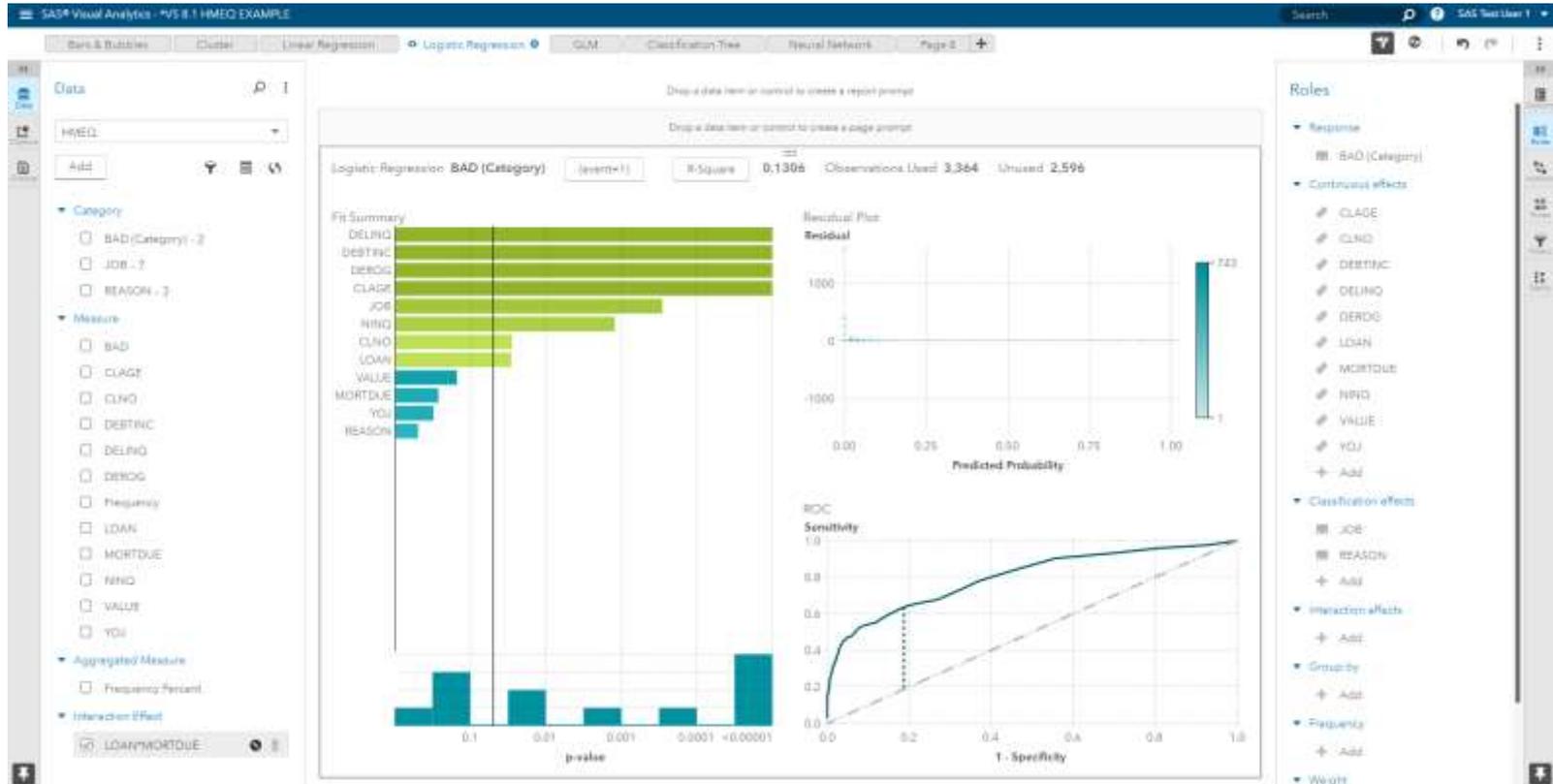
Open Architecture Advantage

- Same CAS action regardless of the interface and API.
- Results will be equivalent (given that all random elements are seeded).
- Information can be passed between different languages.
- Promote tables to persist on the server and apply CAS actions from different APIs.



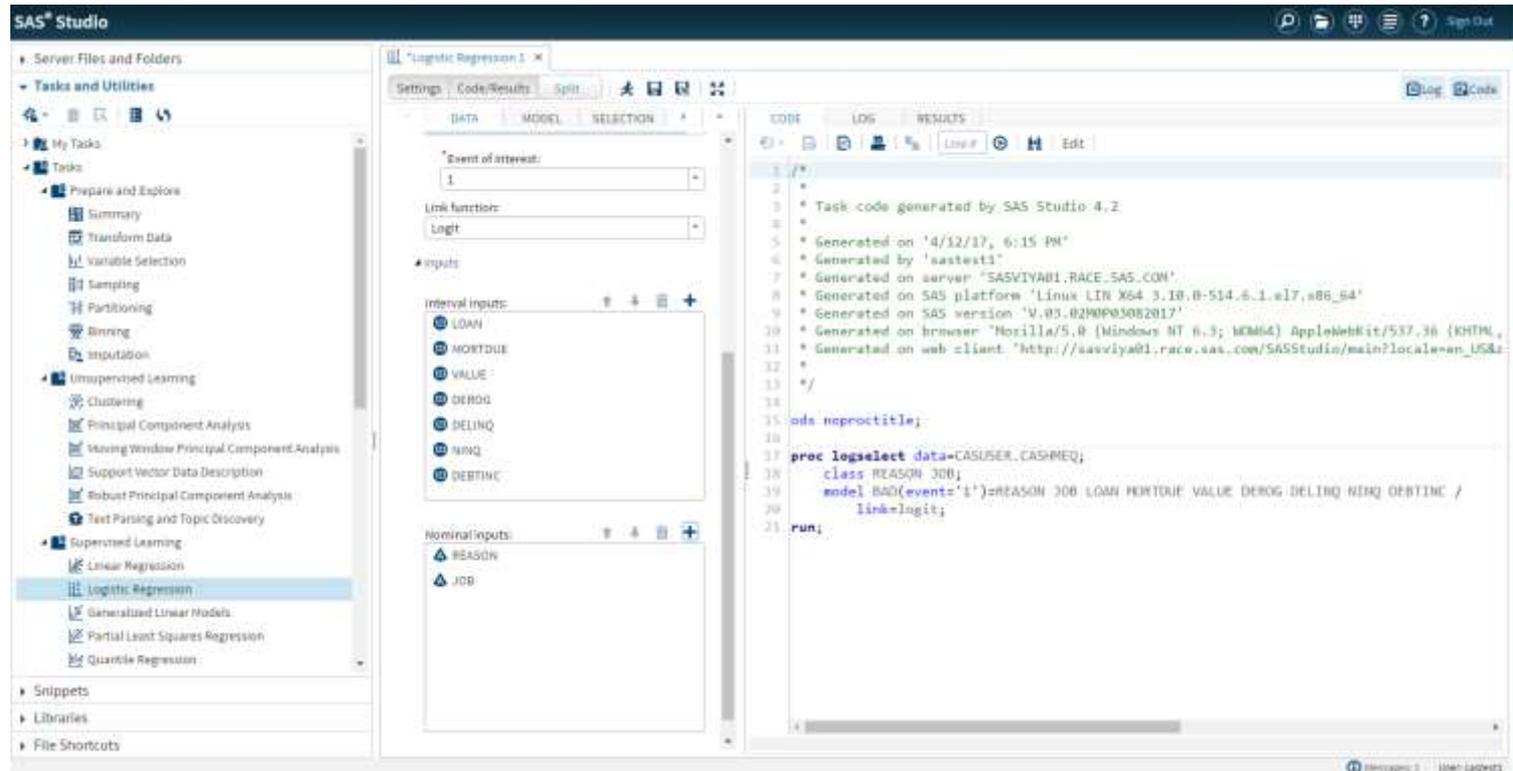
Interfaces

Building a Model from Scratch in the Visual Reporting Interface



Interfaces

Building a Model Using SAS Studio Tasks



The screenshot displays the SAS Studio interface for building a Logistic Regression model. The left sidebar shows the 'Tasks and Utilities' menu, with 'Logistic Regression' selected under 'Supervised Learning'. The main workspace is divided into three panes:

- Settings:** Shows the 'Event of interest' set to '1' and the 'Link function' set to 'Logit'. Under 'Interval inputs', variables LOAN, NORTDUE, VALUE, DEROG, DELINQ, NINQ, and DEBTINC are selected. Under 'Nominal inputs', variables REASON and JOB are selected.
- Code:** Displays the SAS code generated by the task:

```
1 /*
2
3 * Task code generated by SAS Studio 4.2
4
5 * Generated on '4/12/17, 6:15 PM'
6 * Generated by 'saastest1'
7 * Generated on server 'SASVIYAB1.RACE.SAS.COM'
8 * Generated on SAS platform 'Linux X64 3.10.0-514.0-1.el7.x86_64'
9 * Generated on SAS version 'V.03.02W0P03082017'
10 * Generated on browser 'Mozilla/5.0 (Windows NT 6.3; WOW64) AppleWebKit/537.36 (KHTML,
11 * Generated on web-client 'http://sasviya01.race.sas.com/SASStudio/main?locale=en_US&
12 *
13 */
14
15 ods noproctitle;
16
17 proc logselect data=CASUSER.CASHREQ;
18 class REASON JOB;
19 model BAO(event='1')=REASON JOB LOAN NORTDUE VALUE DEROG DELINQ NINQ DEBTINC /
20 link=logit;
21 run;
```
- LOG:** This pane is currently empty.

Interfaces

Building a Model Using SAS Studio Snippets

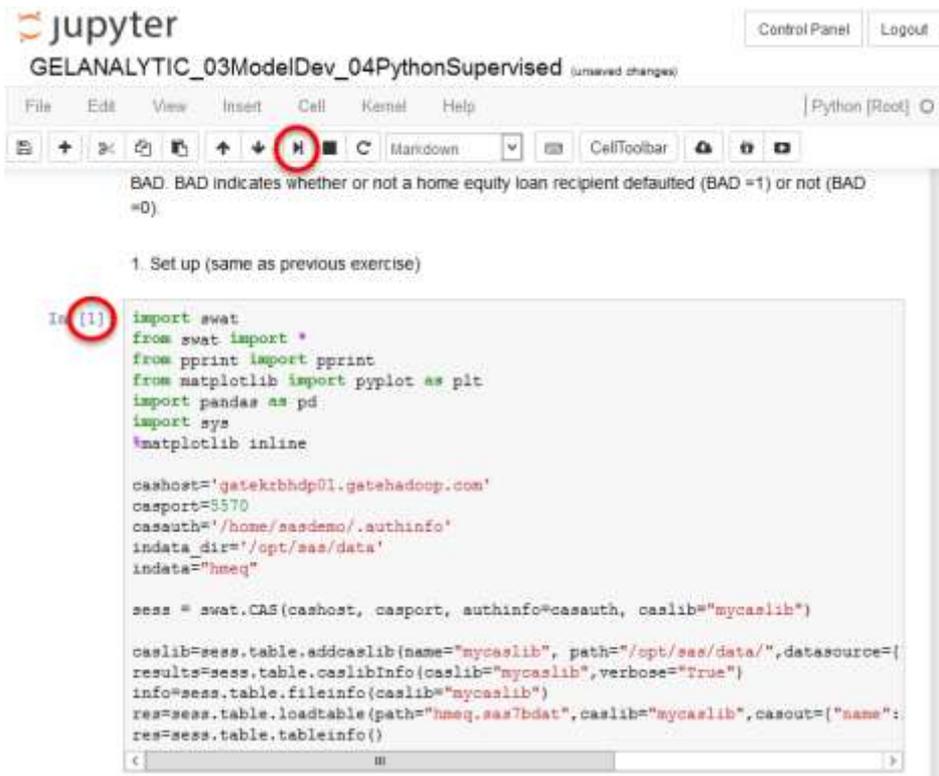
The screenshot displays the SAS Studio interface. On the left is a navigation pane with sections for Server Files and Folders, Tasks and Utilities, Snippets, Libraries, and File Shortcuts. The Snippets section is expanded to show 'Machine Learning' and 'Supervised Learning' sub-sections. The main area is a code editor titled 'Supervised Learning 1' with tabs for CODE, LOG, and RESULTS. The code editor contains the following SAS code:

```
118     by _NAME_;
119 run;
120
121 /* Variance explained by Iteration plot */
122 proc sgplot data=out_iter_trans;
123     title "Variance Explained by Iteration";
124     yaxis label="Variance Explained";
125     vbar Iteration / response=COL1 group=_NAME_;
126 run;
127
128 /*****
129 /* Build a predictive model using Random Forest */
130 *****/
131 proc forest data=&caslibname.._prepped ntrees=50 numbin=20 minleafsize=5;
132     input &interval_inputs. / level = interval;
133     input &class_inputs. / level = nominal;
134     target &target / level = nominal;
135     partition rolevar=_partind_(train='1' validate='0');
136     code file="&outdir./forest.sas";
137     ods output FitStatistics=fitstats;
138
```

At the bottom right of the interface, it shows 'Messages: 1' and 'User: sastest1'.

Interfaces

Building a Model Using Open Source



The screenshot shows a Jupyter Notebook interface. At the top, there is a "jupyter" logo and a "Control Panel" button. The notebook title is "GELANALYTIC_03ModelDev_04PythonSupervised" with a "(unsaved changes)" indicator. Below the title is a menu bar with "File", "Edit", "View", "Insert", "Cell", "Kernel", and "Help". A toolbar contains various icons, including a red circle around the "Run" button. The main content area displays the following text:

BAD. BAD indicates whether or not a home equity loan recipient defaulted (BAD =1) or not (BAD =0).

1. Set up (same as previous exercise)

```
In [1]: import swat
from swat import *
from pprint import pprint
from matplotlib import pyplot as plt
import pandas as pd
import sys
%matplotlib inline

casHost='gatekrbhd01.gatehadoug.com'
casport=5570
casauth='/home/sasdemo/.authinfo'
indata_dir='/opt/sas/data'
indata="hmeq"

sess = swat.CAS(casHost, casport, authinfo=casauth, caslib="mycaslib")

caslib=sess.table.addcaslib(name="mycaslib", path="/opt/sas/data/",datasource={
results=sess.table.caslibInfo(caslib="mycaslib", verbose="True")
info=sess.table.fileinfo(caslib="mycaslib")
res=sess.table.loadtable(path="hmeq.sas7bdat", caslib="mycaslib", casout={"name":
res=sess.table.tableinfo()
```



Programming Interfaces

SAS Studio

Open Access



SAS language



APIs



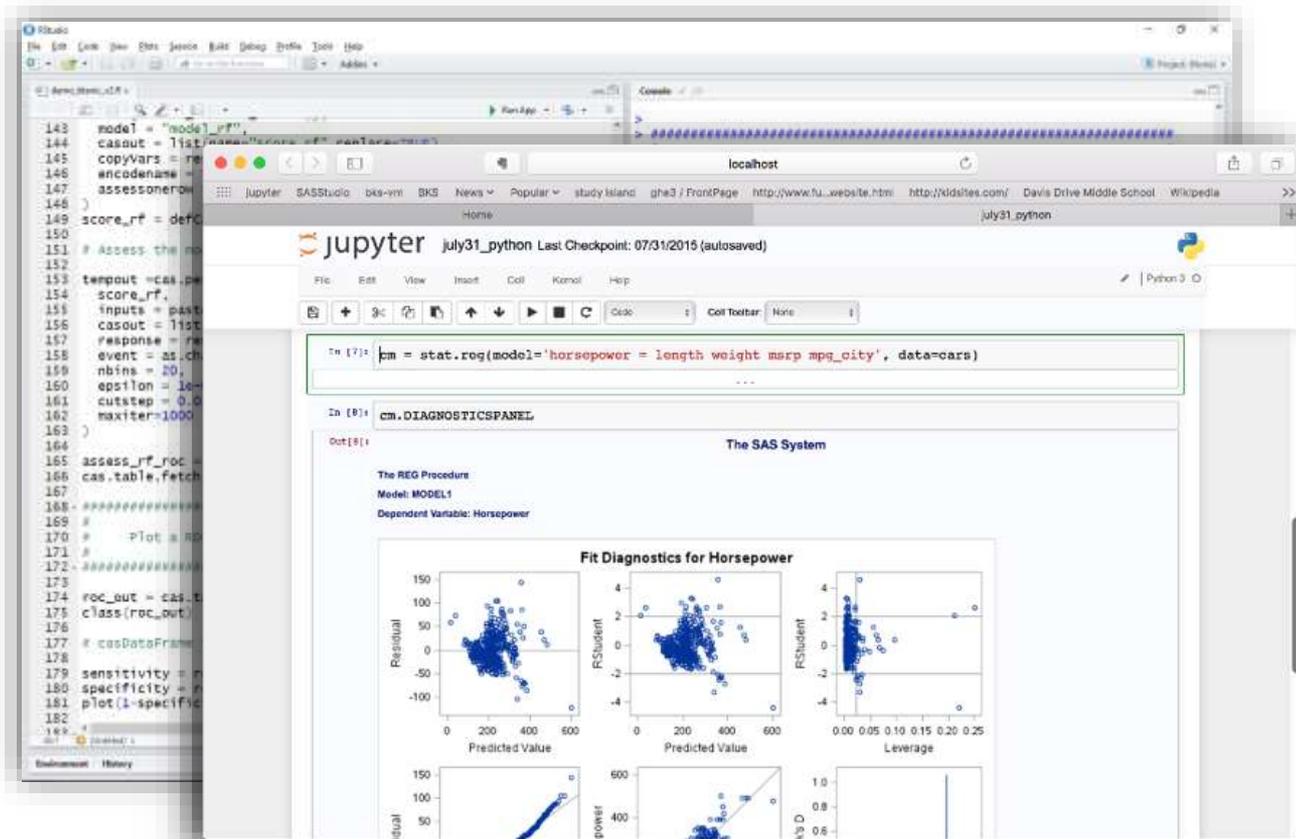
Other programming languages – R, Lua Python and Java



[Developer & user communities](#)

Ask the Expert

[The New Languages of SAS 9.4 and SAS Viya: A SAS Programmer's Primer](#)



SAS® Studio

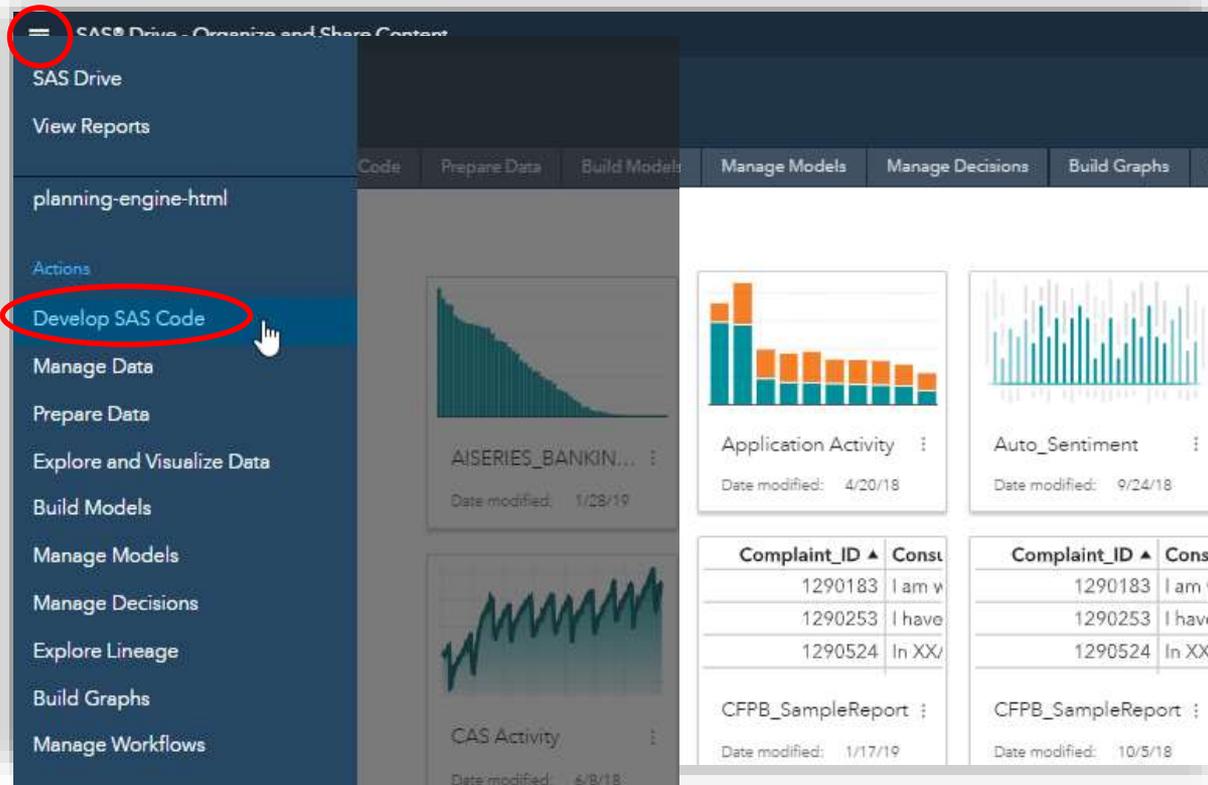
The screenshot displays the SAS Studio web interface. On the left is a navigation pane with sections for Search, Folders, Tasks, Snippets, Libraries, and File Shortcuts. The 'Tasks' section is expanded to show 'Statistics' > 'Distribution Analysis'. The main workspace is titled 'Program 1 x Distribution Analysis 1 x' and contains a 'Settings' panel on the left and a 'RESULTS' panel on the right. The 'Settings' panel has tabs for 'DATA', 'OPTIONS', and 'INFORMATION'. Under 'DATA', there are sections for 'EXPLORING DATA' (with options for Histogram, Add normal curve, Add kernel density estimate, Add inset statistics, and Inset Statistics), 'CHECKING FOR NORMALITY' (with options for Goodness-of-fit tests, Histogram with normal curve, Add inset statistics, Normal probability plot, Add inset statistics, and Normal quantile-quantile plot), and 'FITTING DISTRIBUTIONS'. The 'RESULTS' panel shows a histogram titled 'Distribution of Height' with a normal curve overlaid. Below the histogram is a table of parameters for the fitted normal distribution.

Parameters for Normal Distribution		
Parameter	Symbol	Estimate
Mean	Mu	62.33884
Std Dev	Sigma	6.88888

SAS Studio is a browser-based programming and code-generation interface. It's available via a browser on any device that connects to your SAS environment.

SAS® Studio

How to open



- Click on the Top Left action menu. 
- Choose the first action, Develop SAS Code

▶ Server Files and Folders

▼ Tasks and Utilities



▶ My Tasks

▶ Tasks

▶ Data

▶ Graph

▶ Combinatorics and Probability

▶ Statistics

▶ SAS Viya Prepare and Explore

▶ SAS Viya Unsupervised Learning

▶ SAS Viya Supervised Learning

▶ SAS Viya Evaluate and Implement

▶ SAS Viya Text Analytics

▶ SAS Viya Network Analysis and Optimization

▶ SAS Viya Econometrics

▶ SAS Viya Forecasting

SAS® Studio

Tips

- Tasks will generate any code necessary to complete the desired task.
- You can even write your own custom tasks.
- Learn and “borrow” from the generated code if you wish to expand your programming knowledge.
- (Folders for tasks will vary depending on what products are licensed)



Programming Interfaces

CAS

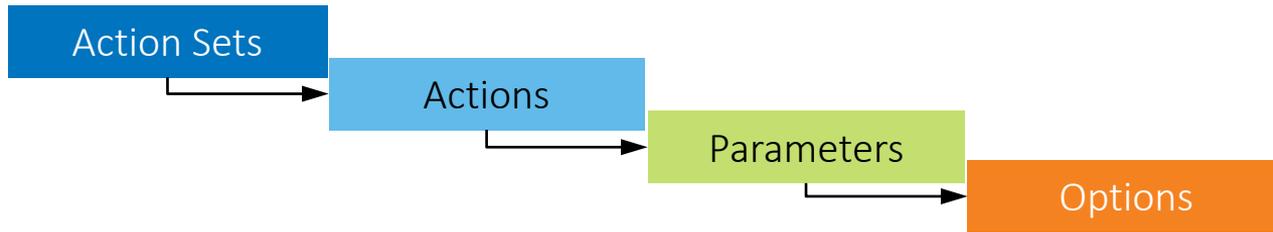
CAS Actions

- CAS actions are the tools used to interact with data on the CAS server.
- CAS actions are wrappers for parallel processing algorithms.
- CAS actions can load data, transform data, compute statistics, perform analytics, and create output.

Python Functions \equiv SAS 9.4 Procedures \equiv CAS Actions

The Python SWAT Package

- Gives unique Python functions to perform licensed CAS actions. The functionality mimics the look and feel of Python syntax, making it easy for Python users to take advantage of CAS.



```
sess.decisionTree.forestTrain(  
    table = dict(),  
    target = string,  
    inputs = value_list,  
    nominals = value_list,  
    ntree = int32,  
    casOut = dict()  
)
```

Simple CAS Actions Example

```
loadtable/path="datasources/cars.csv"  
  importOptions={fileType="csv"},  
  caslib="CASTestTmp";  
run;  
  
histogram result=hist_result/nBins=1  
  table={name="datasources.CARS"  
  caslib="CASTestTmp"  
  varList={{name="sales"}}};  
run;
```

PROC versus CAS Action

```
proc factmac data=mycas.movlens nfactors=10 learnstep=0.15
            maxiter=20 outmodel=mycas.factors;
  input userid itemid /level=nominal;
  target rating /level=interval;
  output out=mycas.out1 copyvars=(userid itemid rating);
run;
```

```
proc cas;
  action factmac result=R / table={name="movlens"},
  outModel={name="factors_out", replace=true},
  inputs={"userid", "itemid"},
  nominals={"userid", "itemid"},
  target="rating",
  maxIter=20, nFactors=10, learnStep=0.15,
  output={casout={name="score_out", replace="TRUE"},
  copyvars={"userid","itemid","rating"}};
run;
```

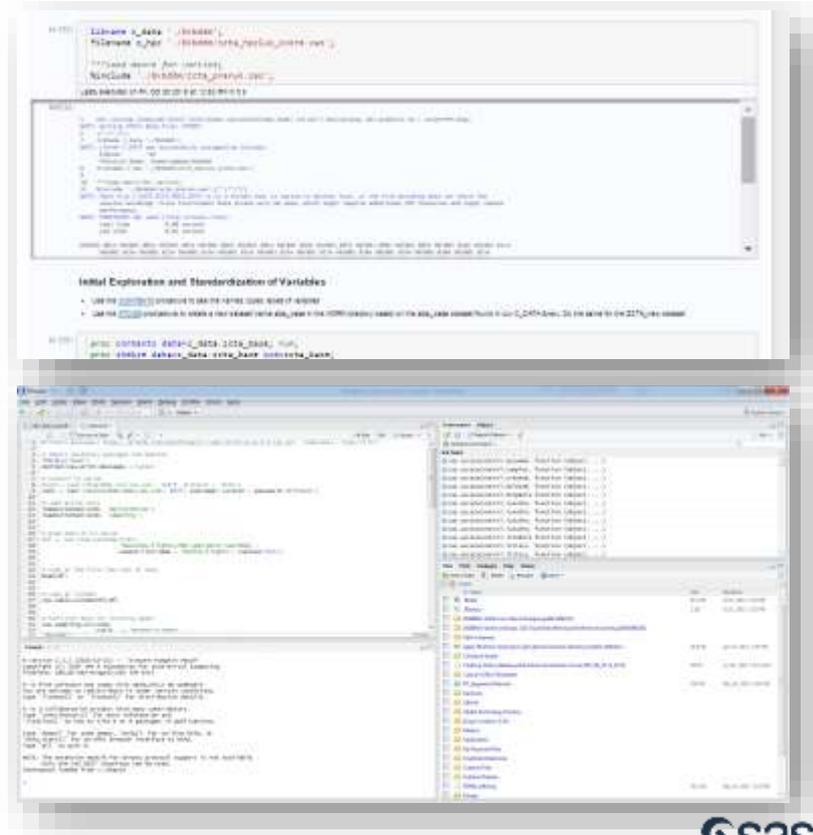


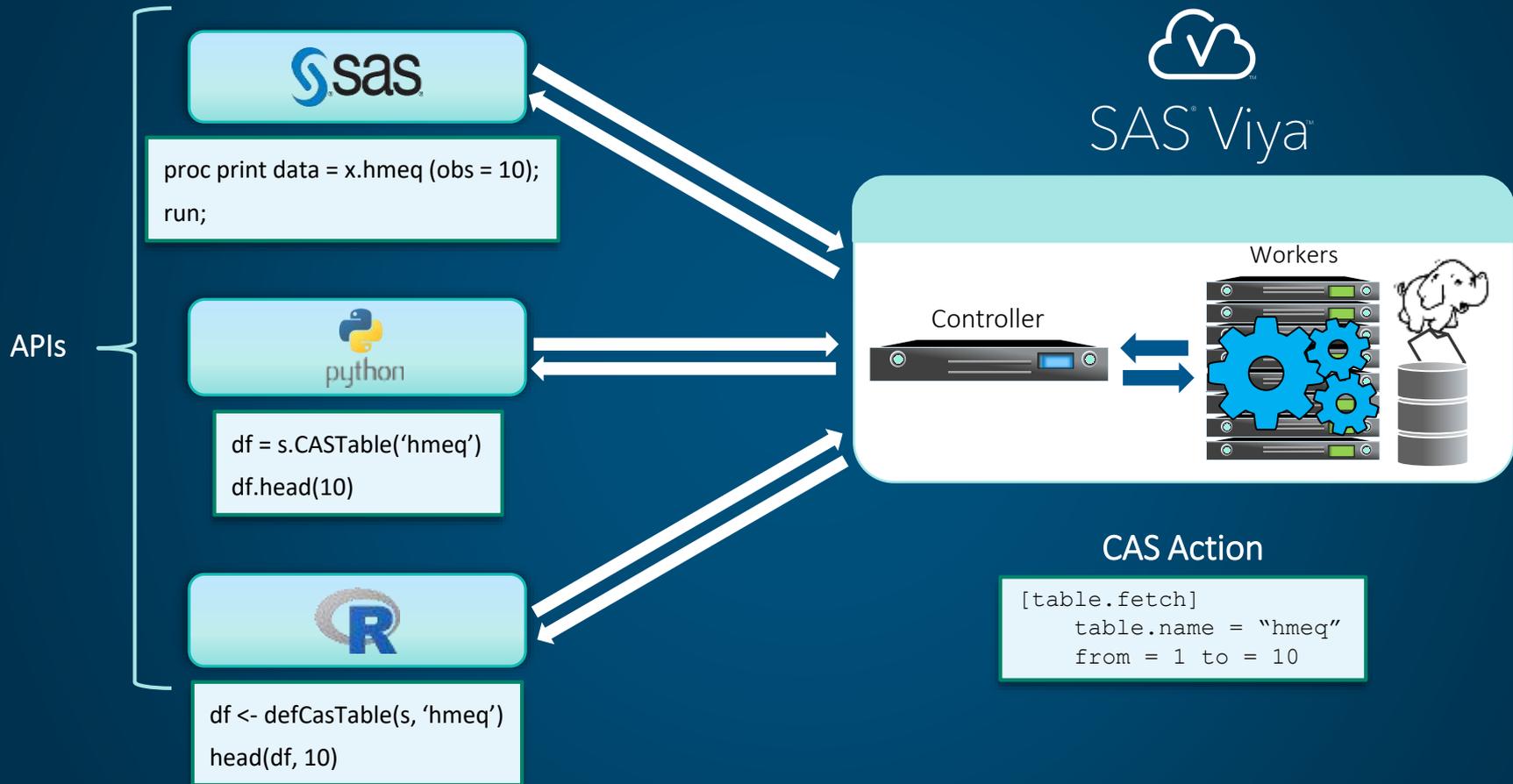
Open Source Interface

Jupyter Notebooks

SAS[®] Scripting Wrapper for Analytics Transfer (SWAT)

- Access to SAS[®] Viya™ from Python and R
- Integration of SAS[®] Analytics in Python and R code
- R Studio and Jupyter Notebook support
- Issue tracking and collaboration in development through GitHub project





Classification

Our example today

- The dataset is from a financial institution with customer demographics and loan/credit behavior.
- The goal of this modeling exercise is to **predict which people are likely to default on a home equity loan.**
- The data are at the customer-level (subject-level).
- n=5960
- columns = 13

Alphabetic List of Variables and Attributes			
#	Variable	Type	Label
1	BAD	Num	8 Default or seriously delinquent
10	CLAGE	Num	8 Age of oldest credit line in months
12	CLNO	Num	8 No. of trade credit lines
13	DEBTINC	Num	8 Debt to income ratio
9	DELINQ	Num	8 No. of delinquent credit lines
8	DEROG	Num	8 No. of major derogatory reports
6	JOB	Char	7 Prof/Exec/Office/Self/Other
2	LOAN	Num	8 Amount of current loan request
3	MORTDUE	Num	8 Amount due on existing mortgage
11	NINQ	Num	8 No. of recent credit inquiries
5	REASON	Char	7 Home improvement or Debt Consolidation
4	VALUE	Num	8 Value of current property
7	YOJ	Num	8 Years on current job

Home Equity Details

The screenshot shows the SAS HMEQ dataset details. The interface includes a top navigation bar with 'HMEQ', an 'Actions' dropdown, and icons for refresh, refresh, and help. Below this are three tabs: 'Details' (selected), 'Sample Data', and 'Profile'. The 'Details' tab displays a list of variables with their data types and icons. The 'Profile' tab shows summary statistics for the dataset.

Variable	Data Type
BAD	double
LOAN	double
MORTDUE	double
VALUE	double
REASON	char
JOB	char
YOJ	double
DEROG	double
DELINQ	double
AGE	double

Summary statistics from the Profile tab:

- Last profiled: Never
- Columns: 13
- Rows: 6 K
- Size: 698.4 KB
- Label: Home Equity Loan
- Location: cas-shared-default/Public
- Date created: Feb 15, 2018 10:56 AM
- Date modified: Feb 15, 2018 10:56 AM
- Encoding: utf-8

Home Equity Sample Data

HMEQ

Actions

Details Sample Data Profile

Sample rows: 100

BAD	LOAN	MORTDUE	VALUE	REASON	JOB	YOJ	DEROG	DELINQ	CLAGE	NINQ
1	1100	25860	39025	HomImp	Other	10.5	0	0	94.3666...	1
1	1300	70053	68400	HomImp	Other	7	0	2	121.833...	0
1	1500	13500	16700	HomImp	Other	4	0	0	149.466...	1
1	1500	.	.			.	.	.	.	.
0	1700	97800	112...	HomImp	Office	3	0	0	93.3333...	0
1	1700	30548	40320	HomImp	Other	9	0	0	101.466...	1
1	1800	48649	57037	HomImp	Other	5	3	2	77.1	1
1	1800	28502	43034	HomImp	Other	11	0	0	88.7660...	0
1	2000	32700	46740	HomImp	Other	3	0	2	216.933...	1
1	2000	.	62250	HomImp	Sales	16	0	0	115.8	0
1	2000	22608	.			18	.	.	.	.
1	2000	20627	29800	HomImp	Office	11	0	1	122.533...	1

Home Equity Profile

HMEQ Actions ▾ ⚡

Details Sample Data Profile

Report 02/15/18 11:29 AM Report is current Run Profile

Column	Unique	Null	Blank	Pattern Count	Mean	Median	Mode	Standa...	!
⊕ <u>BAD</u>	0% (2)	0			0.20	0.00	0.00	0.40	
⊕ <u>CLAGE</u>	94% (5314)	5% (308)			179.77	173.47		85.81	
⊕ <u>CLNO</u>	1% (62)	3% (222)			21.30	20.00	16.00	10.14	
⊕ <u>DEBTINC</u>	100% (4693)	21% (1267)			33.78	34.82		8.60	
⊕ <u>DELINQ</u>	0% (14)	9% (580)			0.45	0.00	0.00	1.13	
⊕ <u>DEROG</u>	0% (11)	11% (708)			0.25	0.00	0.00	0.85	
⚠ <u>JOB</u>	0% (6)	4% (279)	0	5			Other		
⊕ <u>LOAN</u>	9% (540)	0			18,60...	16,30...	15,00...	11,20...	
⊕ <u>MORTDUE</u>	92% (5053)	8% (518)			73,76...	65,01...	42,00...	44,45...	
⊕ <u>NINQ</u>	0% (16)	8% (510)			1.19	1.00	0.00	1.73	
⚠ <u>REASON</u>	0% (2)	4% (252)	0	1			DebtC...		
⊕ <u>VALUE</u>	92% (5381)	1% (112)			101,7...	89,23...	60,00...	57,38...	
⊕ <u>YOJ</u>	1% (99)	8% (515)			8.92	7.00	0.00	7.57	



SAS Viya Introduction

Demo



SAS Visual Analytics

Introduction

SAS® Visual Analytics

Data
Preparation



Data
Exploration &
Analytics



Interactive
Reporting



Governance



Collaboration
& Info Sharing



Location
Analytics





Data Preparation

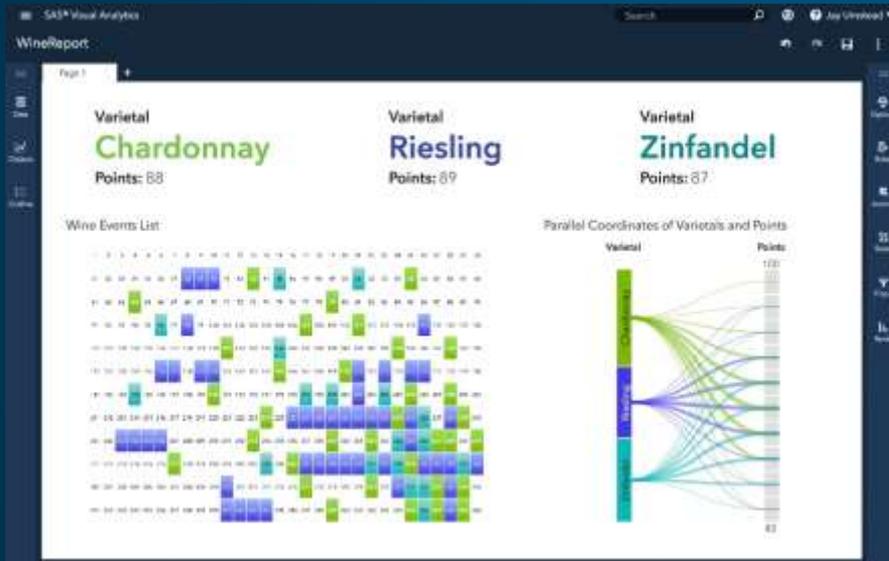
The screenshot displays the SAS Data Preparation interface. The main window shows a data table with the following columns: ID, Name, Age, Gender, and several numerical columns. The table contains data for various individuals, including 'John', 'Jane', and 'Bob'. The interface includes a sidebar with navigation options like 'Data', 'Columns', and 'Rows', and a top navigation bar with 'Data' and 'Rows' tabs.

ID	Name	Age	Gender	...
00001	John	35	Male	...
00002	Jane	28	Female	...
00003	Bob	42	Male	...

- Access to diverse data
- Data quality functions
- Table and column profiling
- Filter & transform (append, join, transpose, etc.)
- View lineage



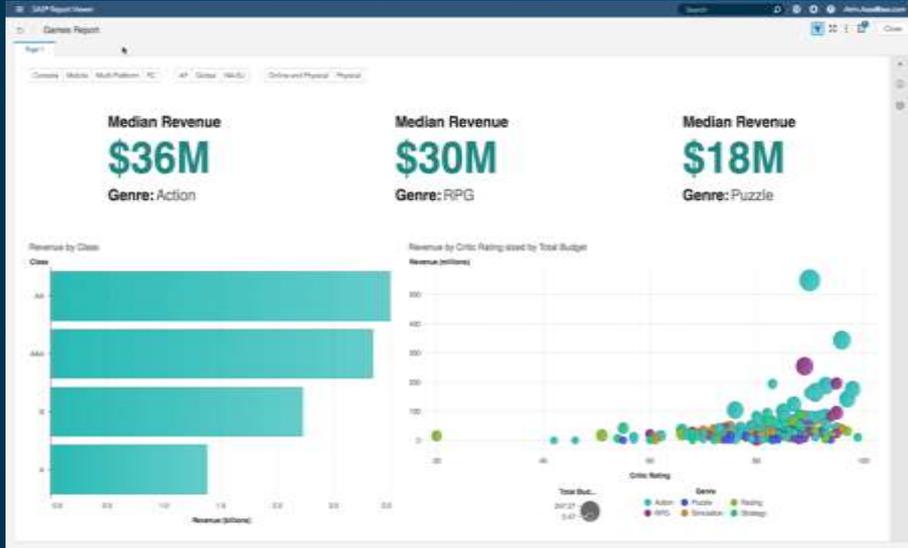
Visual Exploration



- Discover relationships, trends, outliers, clusters
- 3rd-party visualizations (e.g. D3, Google Chart)
- Forecasting and scenario analysis
- Decision trees
- Text analysis (e.g. word cloud)



Interactive Reporting



- Responsive and precise layouts
- Dashboard creation
- Report formatting for user interactivity; filters, prompts, linking, etc.
- Share, interact and collaborate



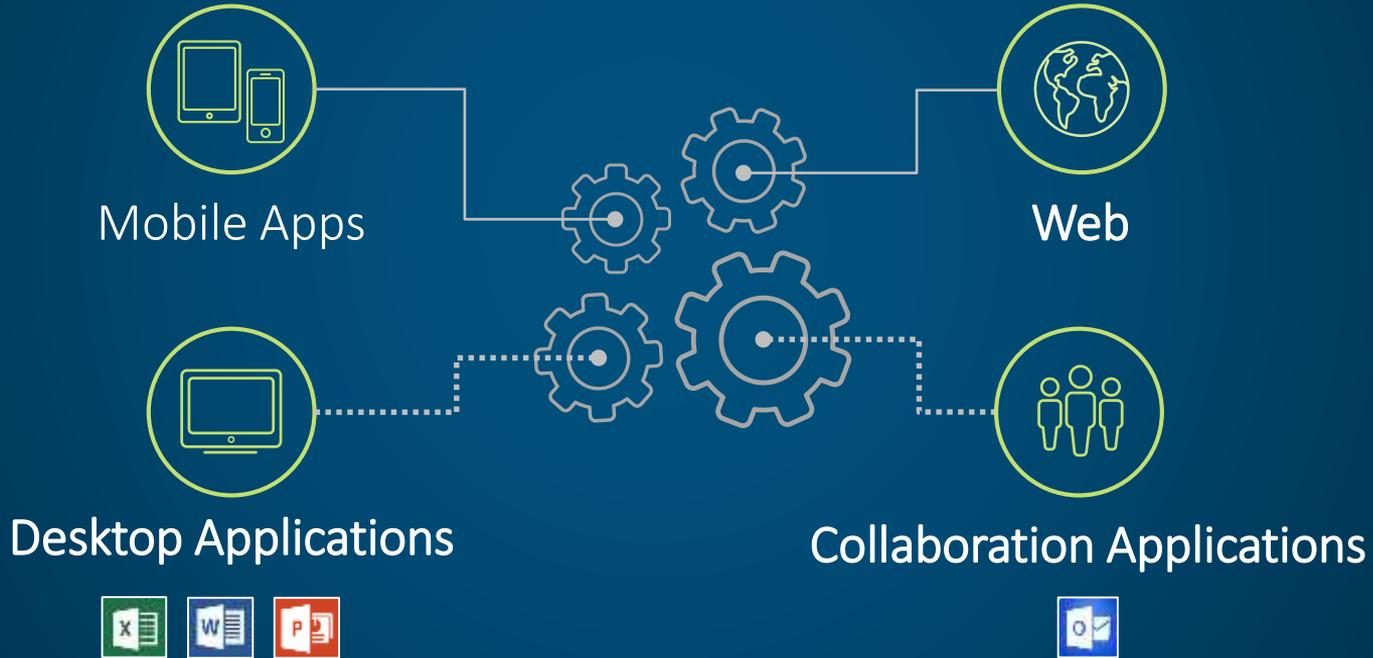
Location Analytics



- Travel-time analysis
- Travel-distance analysis
- Custom polygons or shapes
- Geographic enrichment
- Geographic clustering

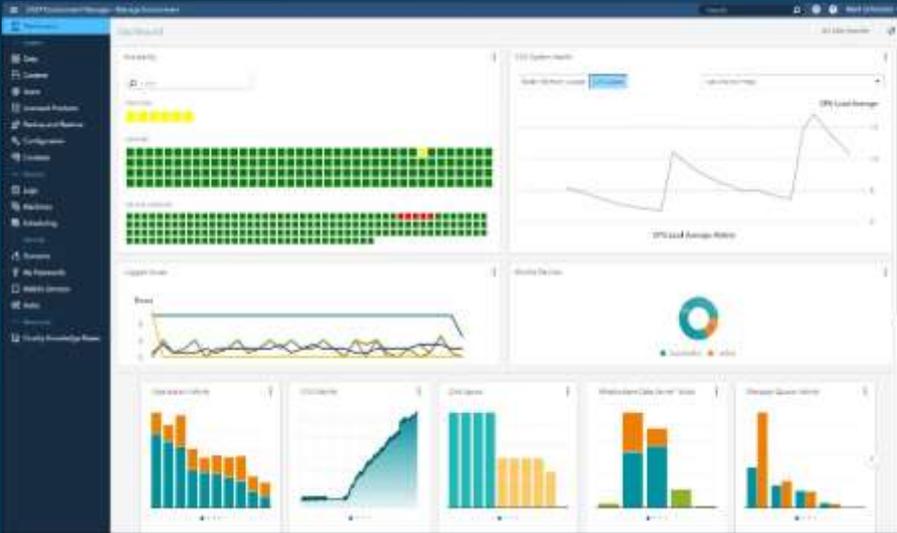


Collaboration and Information Sharing





Governance



- Identity Management (e.g. users, groups)
- Authorization (e.g. data, content, capabilities)
- Monitoring Performance
- Auditing

Baseline VA PROCs and Action Sets

Baseline VA	Action Set	Actions
Data Step	dataStep	runCode
TRANSPOSE	transpose	transpose
DS2	ds2	runDS2
FEDSQL	fedSql	execDirect
TREESPLIT	decisionTree optminer sampling table	dtreeCode; dtreeMerge; dtreePrune; dtreeScore; dtreeSplit; dtreeTrain; tuneDecisionTree Srsact
CAS		



SAS Visual Statistics

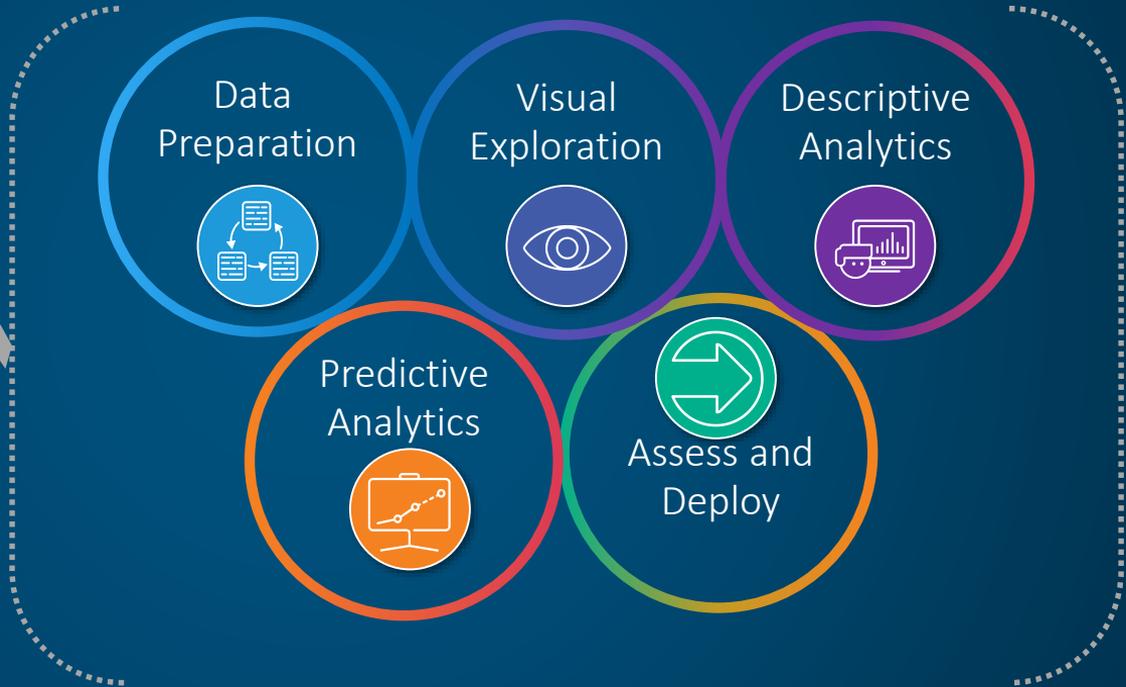
Introduction

SAS® Visual Statistics

Visual "drag & drop"
Interface



Programming
Interface





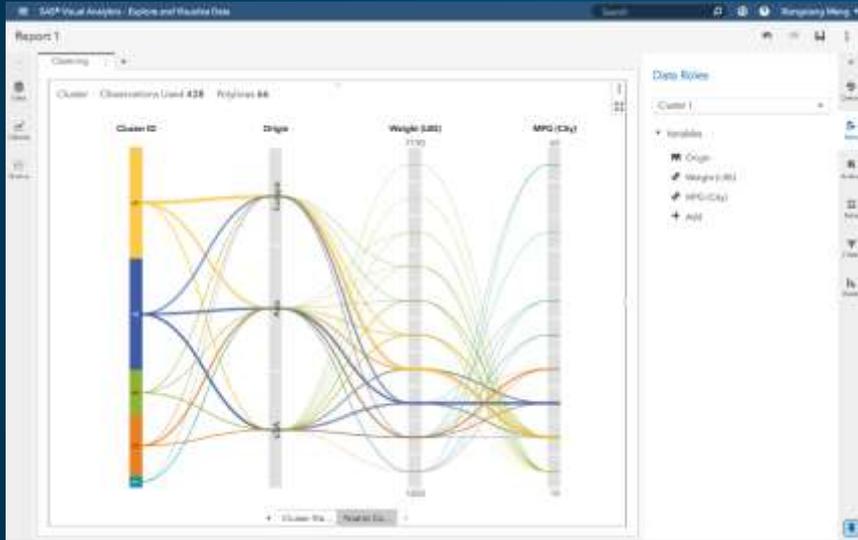
Visual Exploration



- Interactively discover relationships, trends, outliers
- Smart autocharting
- Analytics driven visualizations
- Explore predicted outputs



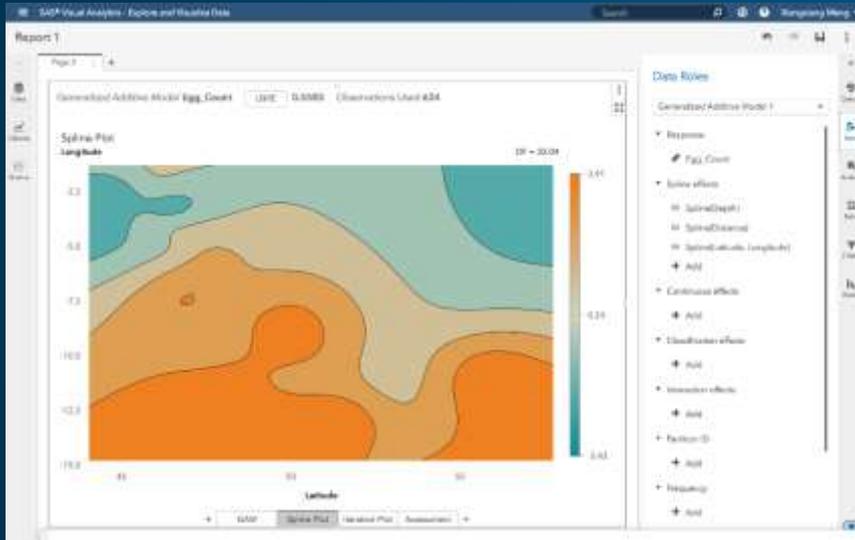
Descriptive Analytics



- Summary statistics
- K-means Clustering & Parallel Coordinate Plots
- Correlation matrices, scatter plots, box plots, etc. to visualize relationships & findings



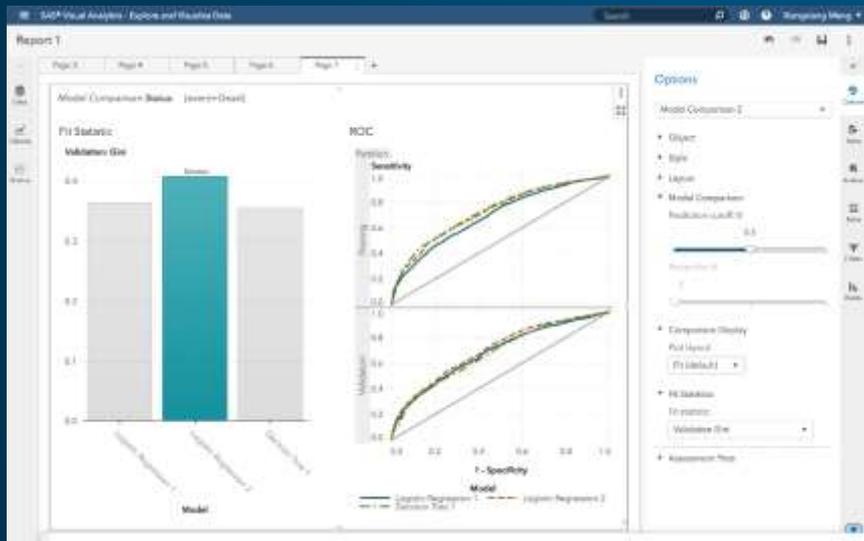
Predictive Analytics



- Linear Regression
- Logistic Regression & Non-parametric Logistic Regression
- GLM Regression
- Generalized Additive Model
- Decision Tree
- Group-By Processing



Access and Deploy

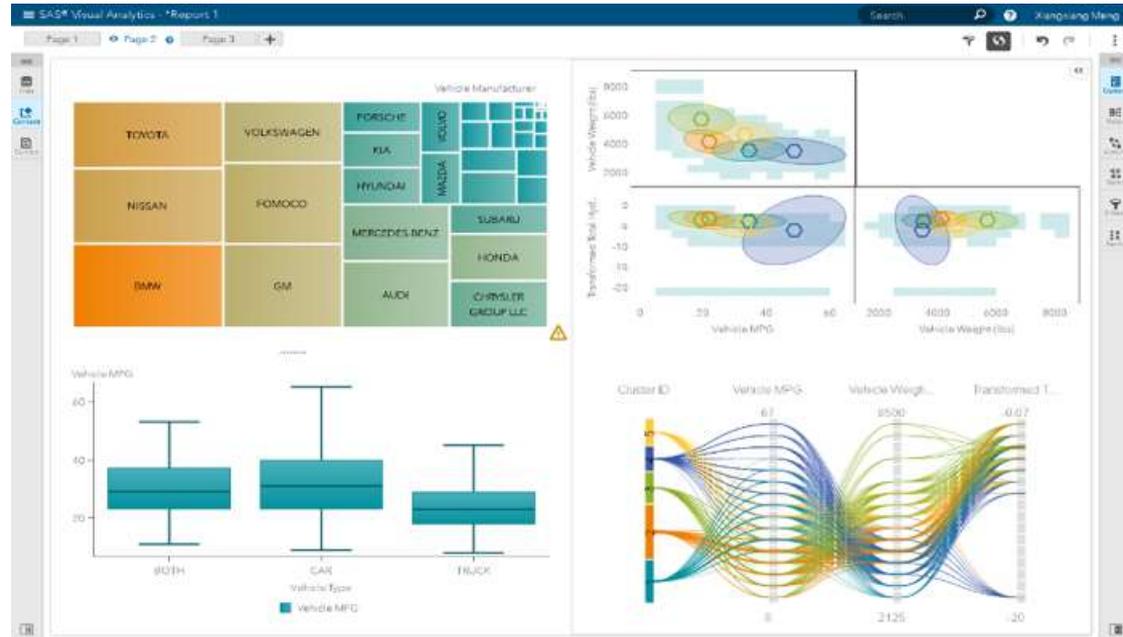


- Model comparison summaries
- Interactively assess models
- Assessment charts for partitioned data
- Model recipe to score new data

Introduction: Software Overview

Key Features of SAS® Visual Statistics 8.3

- Modeling Techniques
- (Visual Interface)
 - Clustering (k-means)
 - Linear Regression
 - Logistic Regression
 - GLM Regression
 - Decision Trees
- Common Features
 - Training-validation partitioning
 - Variable Importance / Profile
 - Model Assessment
 - Model comparison
 - Derivation of predictive outputs
 - Ability to export model statistics into Excel
 - Score Code



SAS® Visual Statistics

SAS Studio – Available Programming Tasks

◀ SAS Viya Prepare and Explore

- Summary
- Transform Data
- Variable Selection
- Sampling
- Partitioning
- Binning
- Imputation

◀ SAS Viya Unsupervised Learning

- Clustering
- Principal Component Analysis
- Moving Window Principal Component Analysis
- Support Vector Data Description
- Robust Principal Component Analysis

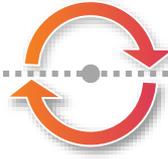
◀ SAS Viya Supervised Learning

- Linear Regression
- Logistic Regression
- Generalized Linear Models
- Partial Least Squares Regression
- Quantile Regression
- Decision Tree
- Neural Network
- Forest
- Gradient Boosting
- Factorization Machine
- Support Vector Machine
- Bayesian Network

SAS® Visual Statistics

Capabilities via Programming Interfaces

Common



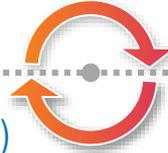
- ASSESS (Assess Supervised Models)
- BINNING (Variable Binning)
- CARDINALITY (Cardinality Analysis)
- PARTITION (Sampling and Partitioning)
- VARIMPUTE (Missing Value Imputation)
- VARREDUCE (Variable Reduction)
- FREQTAB (Frequency & Cross Tabulation)
- CORRELATION (Correlation)

SAS® Visual Statistics

Capabilities via Programming Interfaces

Analytical

GENSELECT (Generalized Linear Model)
KCLUS (Kmeans and Kmodes Clustering)
LOGSELECT (Logistic Regression)
NLMOD (Non-linear Regression)
PCA (Principle Component Analysis)
REGSELECT (Linear Regression)
PLSMOD (Partial Least Square)
GAMMOD (Generalized Additive



Analytical

- ICA (Independent Component Analysis)
- MBC (Multivariate Gaussian)
- MODELMATRIX (Design Matrix)
- LMIXED (Linear Mixed Models)
- TREESPLIT (Decision Trees)
- QTRSELECT (Quantile Regression)
- PHSELECT (Proportional Hazard Models)
- SPC (Statistical Process Control)

SAS® Visual Statistics

Action Sets

Cardinality Analysis	Partial Least Squares
Clustering	Principal Component Analysis
Dimension Reduction	Proportional Hazards Regression Modeling
Frequency and Cross Tabulation	Quantile Regression Modeling
Generalized Additive Models	Regression
Independent Component Analysis	Sampling and Partitioning
Mixed Modeling	Statistical Process Control
Model-Based Clustering	



SAS Visual Statistics

Demo



SAS Visual Data Mining and Machine Learning

Introduction

SAS® Visual Data Mining and Machine Learning

Visual "drag & drop"
Interface



Programming
Interface



Data
Preparation



Visual
Exploration



Model
Studio



Model
Deployment



Machine
Learning





Data Preparation

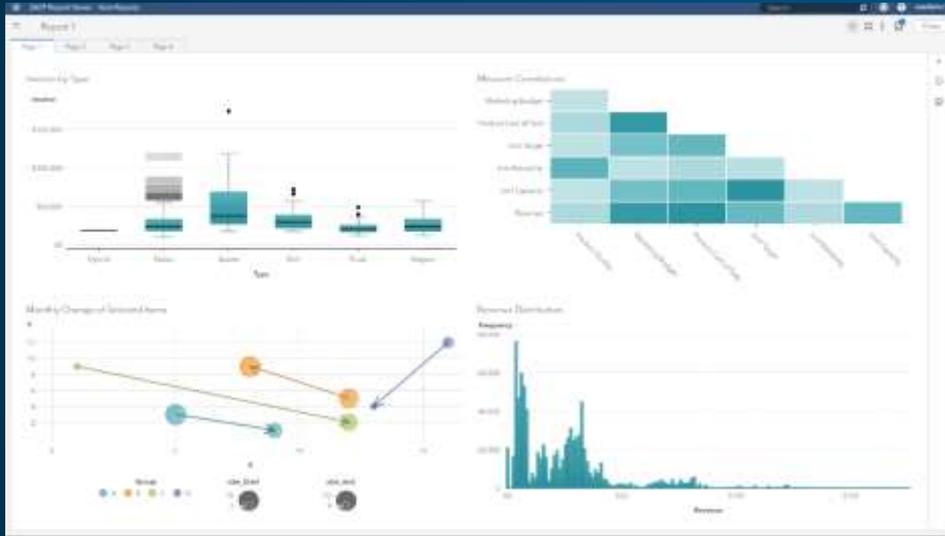
The screenshot shows the SAS Data Preparation interface. The main window displays a data table with the following columns: Row ID, Name, Age, Sex, Height, Weight, BMI, and a column for the variable type (e.g., Numeric, Character). The table contains several rows of data, including a row with a missing value in the 'Sex' column.

Row ID	Name	Age	Sex	Height	Weight	BMI	Variable Type
01000	John	34	M	175	70	22.6	Numeric
01001	Jane	28	F	160	55	21.1	Numeric
01002	Bob	45	M	180	90	27.8	Numeric
01003	Alice	32	F	170	65	22.0	Numeric
01004	Charlie	50	M	190	110	30.3	Numeric
01005	Diana	25	F	155	45	18.8	Numeric
01006	Frank	60	M	170	85	28.9	Numeric
01007	Grace	30	F	165	60	21.7	Numeric
01008	Henry	40	M	185	100	29.4	Numeric
01009	Ivy	22	F	150	40	17.8	Numeric
01010	Jack	55	M	175	95	30.9	Numeric
01011	Karen	35	F	160	50	19.6	Numeric
01012	Leo	48	M	180	105	32.3	Numeric
01013	Mia	27	F	165	55	20.3	Numeric
01014	Noah	52	M	185	115	33.8	Numeric
01015	Olivia	31	F	170	60	20.9	Numeric
01016	Peter	42	M	180	100	30.9	Numeric
01017	Quinn	29	F	160	50	19.6	Numeric
01018	Ryan	58	M	190	120	33.3	Numeric
01019	Sarah	33	F	165	55	20.3	Numeric
01020	Tim	47	M	180	105	32.3	Numeric
01021	Uma	24	F	155	40	16.5	Numeric
01022	Victor	51	M	185	110	31.8	Numeric
01023	Wendy	36	F	165	55	20.3	Numeric
01024	Xavier	44	M	180	100	30.9	Numeric
01025	Yara	26	F	160	50	19.6	Numeric
01026	Zoe	54	F	180	110	33.3	Numeric
01027	Adam	38	M	175	75	24.2	Numeric
01028	Eve	21	F	150	35	15.6	Numeric
01029	Frank	59	M	185	115	33.8	Numeric
01030	Grace	32	F	165	55	20.3	Numeric
01031	Henry	41	M	180	100	30.9	Numeric
01032	Ivy	28	F	160	50	19.6	Numeric
01033	Jack	53	M	185	110	31.8	Numeric
01034	Karen	34	F	165	55	20.3	Numeric
01035	Leo	46	M	180	100	30.9	Numeric
01036	Mia	25	F	155	40	16.5	Numeric
01037	Noah	56	M	190	120	33.3	Numeric
01038	Olivia	30	F	165	55	20.3	Numeric
01039	Peter	43	M	180	100	30.9	Numeric
01040	Quinn	27	F	160	50	19.6	Numeric
01041	Ryan	57	M	185	115	33.8	Numeric
01042	Sarah	31	F	165	55	20.3	Numeric
01043	Tim	45	M	180	100	30.9	Numeric
01044	Uma	23	F	155	35	14.9	Numeric
01045	Victor	50	M	185	110	31.8	Numeric
01046	Wendy	35	F	165	55	20.3	Numeric
01047	Xavier	44	M	180	100	30.9	Numeric
01048	Yara	26	F	160	50	19.6	Numeric
01049	Zoe	54	F	180	110	33.3	Numeric
01050	Adam	38	M	175	75	24.2	Numeric
01051	Eve	21	F	150	35	15.6	Numeric
01052	Frank	59	M	185	115	33.8	Numeric
01053	Grace	32	F	165	55	20.3	Numeric
01054	Henry	41	M	180	100	30.9	Numeric
01055	Ivy	28	F	160	50	19.6	Numeric
01056	Jack	53	M	185	110	31.8	Numeric
01057	Karen	34	F	165	55	20.3	Numeric
01058	Leo	46	M	180	100	30.9	Numeric
01059	Mia	25	F	155	40	16.5	Numeric
01060	Noah	56	M	190	120	33.3	Numeric
01061	Olivia	30	F	165	55	20.3	Numeric
01062	Peter	43	M	180	100	30.9	Numeric
01063	Quinn	27	F	160	50	19.6	Numeric
01064	Ryan	57	M	185	115	33.8	Numeric
01065	Sarah	31	F	165	55	20.3	Numeric
01066	Tim	45	M	180	100	30.9	Numeric
01067	Uma	23	F	155	35	14.9	Numeric
01068	Victor	50	M	185	110	31.8	Numeric
01069	Wendy	35	F	165	55	20.3	Numeric
01070	Xavier	44	M	180	100	30.9	Numeric
01071	Yara	26	F	160	50	19.6	Numeric
01072	Zoe	54	F	180	110	33.3	Numeric
01073	Adam	38	M	175	75	24.2	Numeric
01074	Eve	21	F	150	35	15.6	Numeric
01075	Frank	59	M	185	115	33.8	Numeric
01076	Grace	32	F	165	55	20.3	Numeric
01077	Henry	41	M	180	100	30.9	Numeric
01078	Ivy	28	F	160	50	19.6	Numeric
01079	Jack	53	M	185	110	31.8	Numeric
01080	Karen	34	F	165	55	20.3	Numeric
01081	Leo	46	M	180	100	30.9	Numeric
01082	Mia	25	F	155	40	16.5	Numeric
01083	Noah	56	M	190	120	33.3	Numeric
01084	Olivia	30	F	165	55	20.3	Numeric
01085	Peter	43	M	180	100	30.9	Numeric
01086	Quinn	27	F	160	50	19.6	Numeric
01087	Ryan	57	M	185	115	33.8	Numeric
01088	Sarah	31	F	165	55	20.3	Numeric
01089	Tim	45	M	180	100	30.9	Numeric
01090	Uma	23	F	155	35	14.9	Numeric
01091	Victor	50	M	185	110	31.8	Numeric
01092	Wendy	35	F	165	55	20.3	Numeric
01093	Xavier	44	M	180	100	30.9	Numeric
01094	Yara	26	F	160	50	19.6	Numeric
01095	Zoe	54	F	180	110	33.3	Numeric
01096	Adam	38	M	175	75	24.2	Numeric
01097	Eve	21	F	150	35	15.6	Numeric
01098	Frank	59	M	185	115	33.8	Numeric
01099	Grace	32	F	165	55	20.3	Numeric
01100	Henry	41	M	180	100	30.9	Numeric

- Access to different data sources
- Training-Validation Data Partitioning
- Feature Engineering (e.g. parameters, interactions)
- Variable selection and missing values



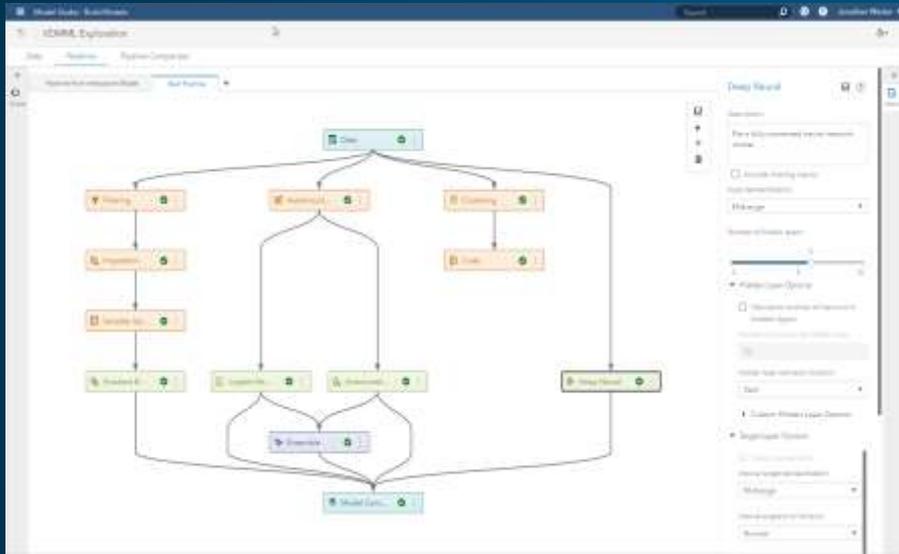
Visual Exploration



- Interactively discover relationships, trends, outliers
- Smart autocharting
- Analytics driven visualizations
- Explore predicted outputs
- Variable transformation



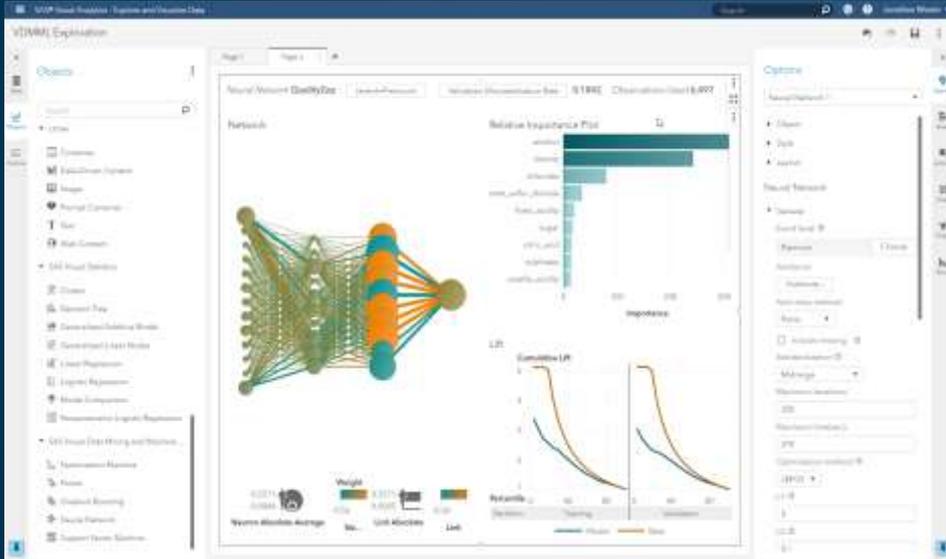
Model Studio



- Pipeline of activities
- Drag and drop and access to code
- Nodes are run asynchronously
- Reproducibility
- SAS best practice toolkit



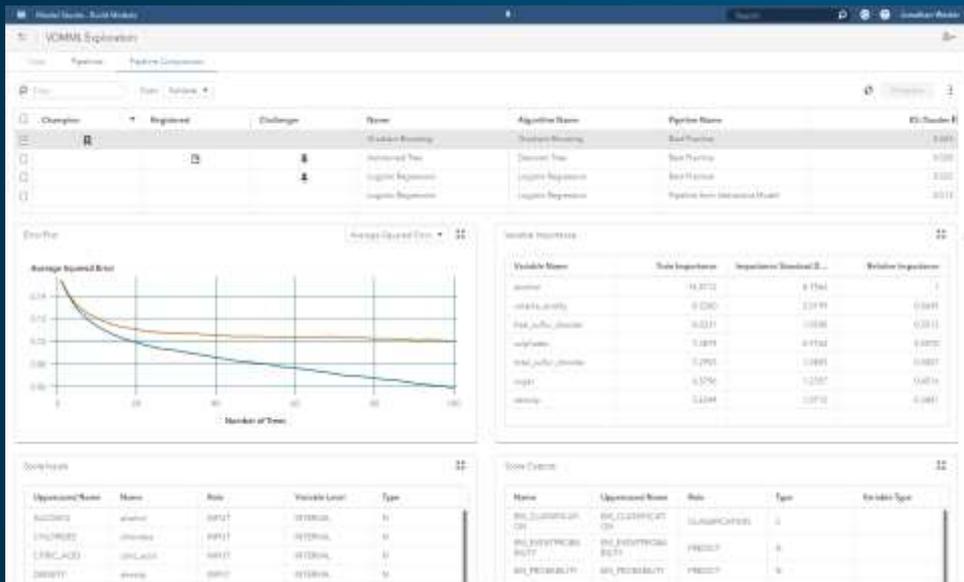
Modern Machine Learning



- Forest
- Neural Network (including Deep Learning)
- Gradient Boosting
- Support Vector Machines
- Factorization Machines
- Bayesian Networks
- Autotuning



Comparison and Deploy



- Model comparison summaries
- Interactively assess models
- Assessment charts for partitioned data
- Publish score code; batch, API call, in-database

SAS® Visual Data Mining and Machine Learning 8.3

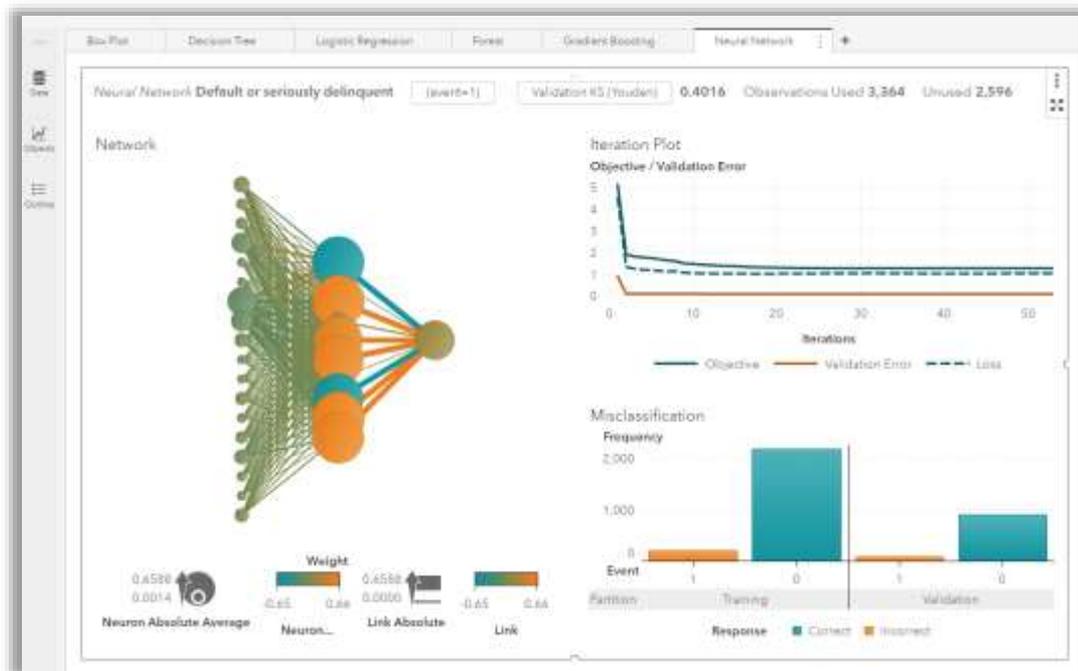
Visual Interface

Machine Learning Techniques

- Forest
- Factorization Machine
- Gradient Boosting
- Neural Network
- Support Vector Machine

Common Features

- Training-Validation
- Model Assessment
- Model Comparison
- Score Code or Astore Table
- Ability to export model statistics into Excel



SAS® Visual Data Mining and Machine Learning

SAS Studio – Available Programming Tasks

◀ SAS Viya Prepare and Explore

- Summary
- Transform Data
- Variable Selection
- Sampling
- Partitioning
- Binning
- Imputation

◀ SAS Viya Unsupervised Learning

- Clustering
- Principal Component Analysis
- Moving Window Principal Component Analysis
- Support Vector Data Description
- Robust Principal Component Analysis

◀ SAS Viya Supervised Learning

- Linear Regression
- Logistic Regression
- Generalized Linear Models
- Partial Least Squares Regression
- Quantile Regression
- Decision Tree
- Neural Network
- Forest
- Gradient Boosting
- Factorization Machine
- Support Vector Machine
- Bayesian Network

SAS® Visual Data Mining and Machine Learning

Capabilities via Programming Interfaces

Analytical

- FOREST (Random Forest Model)
- GRADBOOST (Gradient Boosting)
- NNET (Neural Network)
- SVMACHINE (Support Vector Machine)
- FACTMAC (Factorization Machine)
- NETWORK (Network analytics and community detection)
- TEXTMINE (NLP and statistical analysis of text)
- TMSCORE (Scores textual data)
- BOOLRULE (Boolean rules extraction)
- MTLEARN (Multi Learning task for least squares loss)
- SEMISUPLEARN (graph-based semisupervised learning algorithm)



Analytical

- SVDD (Support Vector Data Description)
- MWPCA (Moving Window Principal Component Analysis)
- RPCA (Robust Principal Component Analysis)
- TSNE (*t*-distributed stochastic neighbor embedding)
- ASTORE (Analytic Store for Models)
- FISM (Frequent Item Set)
- MBANALYSIS (Market Basket Analysis)
- GVARCLUS (Graphical Variable Clustering)
- FASTKNN (K- Nearest Neighbor)
- BNET (Bayesian Network)
- Deep Learning (no procedures, through CAS actions)

SAS Visual Data Mining and Machine Learning

Action Sets

Analytic Store Scoring	Image
Association Rule Mining	Language Model
Audio Action	MLTools
Autotune	Network
Bayesian Net Classifier	Neural Network
BioMedImage	Nonparametric Bayes
Boolean Rule	Robust PCA
Factorization Machine	Support Vector Data Description
Fast k-Nearest Neighbors Algorithm	Support Vector Machine
Generalized Linear Multitask Learning	Text Mining
Graph-Based Semisupervised Learning	TSNE
Graphical Variable Clustering	



SAS Visual Data Mining and Machine Learning

Visual Interface Demo



SAS Visual Text Analytics

Unearthing the full potential within complex data sources can be tricky

Language is messy!



- Large data volumes and inconsistent formats
- Multiple sources and languages
- Misspellings, slang, and abbreviations
- Highly subjective to interpretation and context

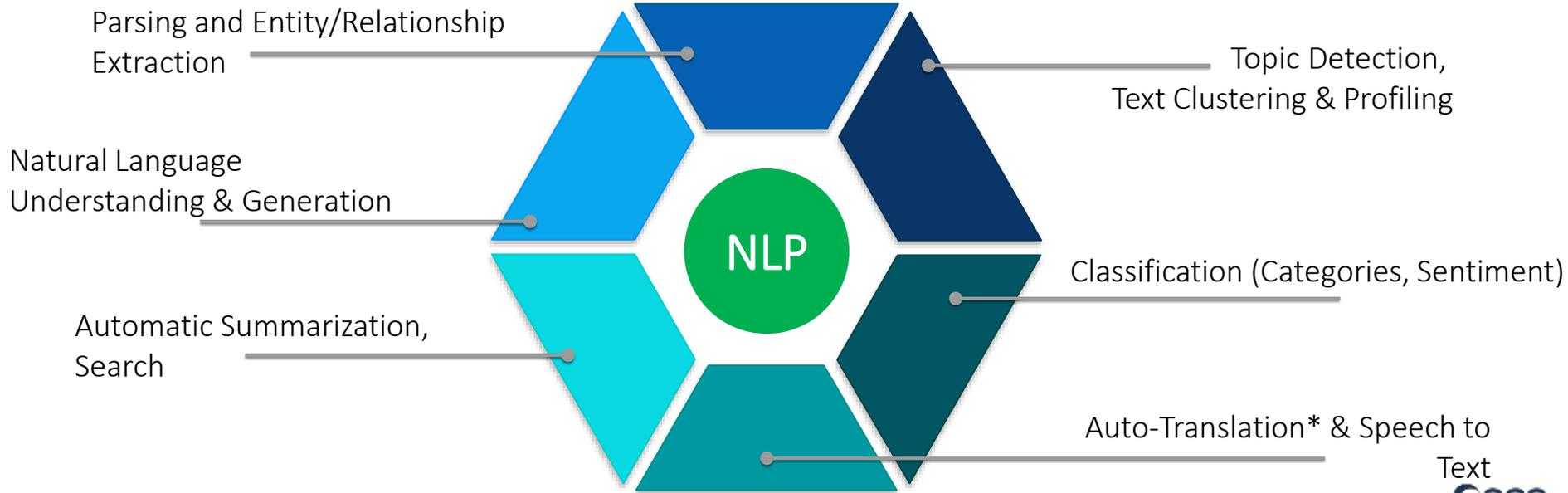
Manual review is both inconsistent and time consuming, and a sampling approach can mean missing out on valuable information and the big picture

SAS is continually extending its Natural Language Processing capabilities

Natural Language Processing (NLP)



A branch of artificial intelligence that helps computers understand, interpret and manipulate human language.



SAS Natural language processing at a glance

SAS Text Analytics solutions perform **document conversion***, **tokenization**, **lemmatization (~stemming)**, **part-of-speech detection**, and **apply lexicons** for misspellings*, synonyms, multi-word terms, and start/stop words

Import Data

I disputed a creditor for the incorrect amt they reported to Trans Union credit bureau.

Parse and Detect Entities

I disputed a creditor for the incorrect amt they reported to Trans Union credit bureau.

Filter, Tag, and Resolve Terms

I disputed a creditor for the incorrect amt they reported to Trans Union credit bureau.

Automatically detect term variants, misspellings and parts-of-speech

Resolve shorthand, slang, and abbreviations with synonym lists

Global Language Support



Arabic

Chinese

Croatian

Czech

Danish

Dutch

English

Farsi

Finnish

French

German

Greek

Hebrew

Hungarian

Hindi

Indonesian

Italian

Japanese

Korean

Norwegian

Polish

Portuguese

Romanian

Russian

Slovak

Slovene

Spanish

Swedish

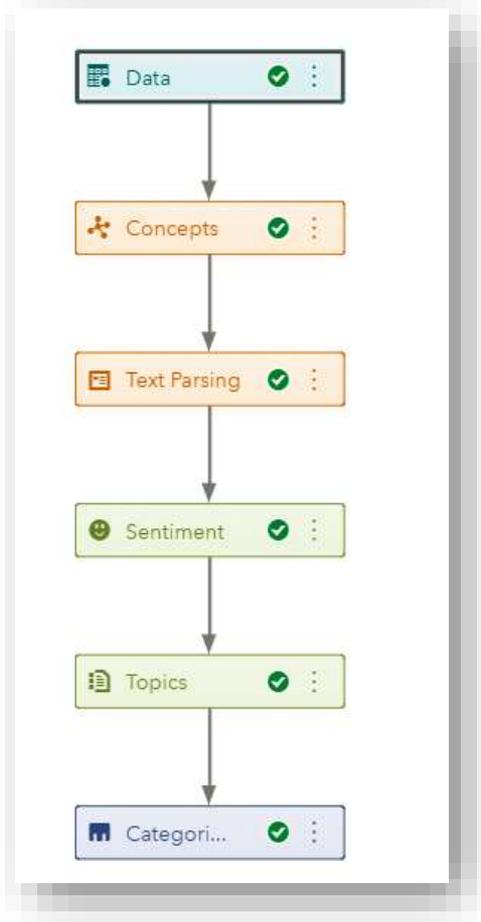
Tagalog

Thai

Turkish

Vietnamese

Visual Pipeline



- Customizable and portable nodes and pipelines
- Quick save of output data from Topics and Categories
- Easy access to automatically-generated score code
- Native integration and common interface with data preparation, visualization, model management, data lineage, and other analytics solutions

Explore and Manage Discovered Topics

- Text Topics are discovered automatically, without requiring explicit input from the user
- View the terms and document comprising a topic and how pervasive each topic is in the collection
- Merge or split topics, create custom topics from selected terms, or promote topics to become rule-based categories

The screenshot displays the SAS Text Analytics interface. The top section, titled 'Topics (11)', shows a list of discovered topics with columns for 'Topic', 'Created by', and 'Documents'. The selected topic is 'rule, +short, +short sale, +modification, +mortgage'. Below this, the 'Terms' table lists terms and their associated rules, documents, and frequencies. The bottom section, 'Documents', shows a list of documents with columns for 'Document', 'Score', 'Relev...', and 'Issue'. The selected document is 'Consensus_report_narrative'.

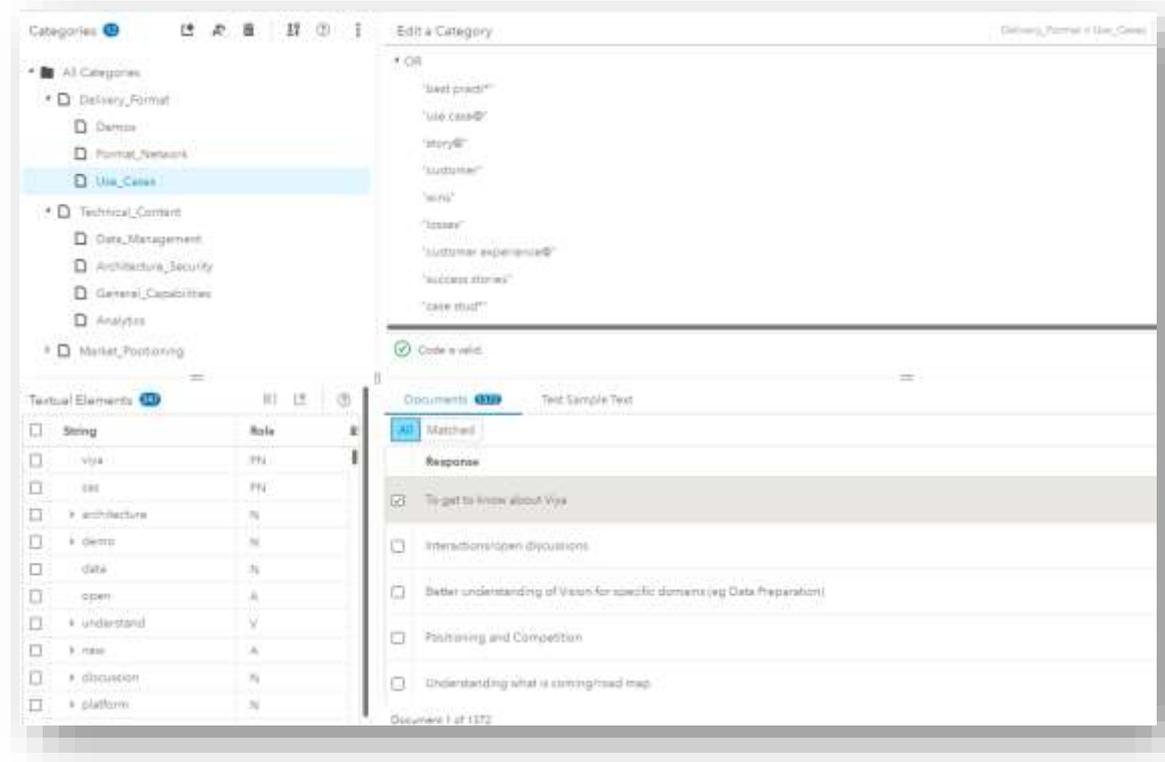
Topic	Created by	Documents
logo, web, fargo, wells, +well, +well	System	345
+state, +street, +loan, +modification, +mortgage	System	216
+check, +account, +close, +close +check	System	542
+water, +debit, +debit, +information, +document	System	239
+report, +credit, +credit report, +report, +phase	System	327
+file, +payment, +so, +file, +file, +statement	System	203
rule, +short, +short sale, +modification, +mortgage	System	275
+file, +event, +change, +oversight, fee, 335.00	System	210

Term	Rule	Documents	Frequency
not	ADV	1788	5219
+ amount	fi	1101	3536
+ payment	fi	886	2821
+ bank	fi	1096	2397
+ credit	fi	949	2261
+ loan	fi	743	2157
+ tell	fi	960	1997
+ city	fi	942	1932

Document	Score	Relev...	Issue
Consensus_report_narrative	0.845	0.845	Loan modification
...	0.839	0.839	Loan modification

Content Categorization

- Build, test, and assess category definitions and manage your taxonomy structure
- Leverage machine-built rules, or author your own definitions using keywords and a broad range of Boolean and linguistic operators & qualifiers
- Use Textual Elements and the rule-builder to help write rules from scratch
- Produce report-ready or modeling-ready categorized output



Contextual Extraction

- Leverage pre-defined entities for standard concepts such as dates, locations, and measures
- Create custom entities using a broad range of rule types, operators, regular expressions, and linguistic qualifiers
- Extract custom facts (relationships between entities)

The screenshot displays the SAS interface for defining and using concepts. On the left, a list of predefined concepts is shown, including nlpDate, nlpMeasure, nlpMoney, nlpNounGroup, nlpOrganization, nlpPercent, nlpPerson, nlpPlace, and nlpTime. An 'Edit a Concept' dialog box is open, showing a rule definition for nlpPercent: `CONCEPT_RULE: (SENT, (DIST_6, "_c(nlpPercent)", (OR, "rate", "apr", "interest", "introductory")))`. Below this, a table of extracted facts is shown, with a 'Matched' button. The table has a header 'Consumer_complaint_narrative' and contains three rows of text with checkboxes, each containing a percentage value extracted from the text.

Matched	Consumer_complaint_narrative
<input type="checkbox"/>	... Repriced APR of 29.99 % . On XXXX called Cit, escalated call to management explained that within 4 days of being past due XXX due to PAYING the wrong account in ERROR, Cit took adverse action and decreased my credit limit by ~ (\$1200.00) and increased APR on to 29.99 % . Reducing Mastercard credit line by [\$700.00] when MC has perfect credit performance for life of account. Age
<input type="checkbox"/>	... I had a 0 % introductory APR on purchases made prior to XXXX XXXX. All purchases made after XXXX XXXX would be subject to standard APR. I searched the remainder of the T & C 's document to be certain the balances remaining would not be subject to the increased APR, and nothing on the terms and conditions indicated that purchases made during the introductory period needed to
<input type="checkbox"/>	... interest rates of 10.74 % , 6.991 % , 6.490 %, and even 4.490 %. The banks are making way too much money on these student loans. I make no attempt to lower these interest rates. I understand banks having to make money, but really??? 10.74 % interest rate!! That

Sentiment Analysis

Available languages for domain-independent sentiment model

- Create custom entities using a broad range of rule types, operators, regular expressions, and linguistic qualifiers
- Extract custom facts (relationships between entities)

- Arabic
- Chinese (Simplified)
- Chinese (Traditional)
- Dutch
- English
- Farsi
- French
- German
- Italian
- Japanese
- Korean
- Portuguese
- Spanish
- Turkish

Consumer_complaint_narrative	Relevancy	Sentiment
... late last month, and charged a [\$35.00] because the payment arrived after the closing date. The payment was for (\$750.00), payment was credited to my next statement along with a pand to my surprise a late fee for [\$35.00]!!!	0.982	

SAS Studio

VTA Pre-built tasks

- Wizard-driven tasks
- Options to use algorithms not presented in Model Studio GUI
- Easily access intermediate and output tables
- Auto-generate SAS code for further development

The screenshot displays the SAS Studio interface. On the left, the 'Tasks' pane is visible, with a blue gear icon circled in orange. Below it, the 'SAS Viya Text Analytics' category is expanded, and 'Text Parsing and Topic Discovery' is highlighted with an orange box. On the right, the configuration window for this task is shown, with the 'METHODS' section expanded to 'Parse Text'. The 'Include parts of speech' checkbox is checked, and the 'Extract noun groups' checkbox is also checked. The 'Minimum number of occurrences to keep a term' is set to 4. The 'Weight terms by' dropdown is set to 'Entropy'. The 'Specify a start or stop list' checkbox is checked. An orange arrow points from the 'Text Parsing and Topic Discovery' task in the Tasks pane to the configuration window. Below the configuration window, a button labeled 'Text Parsing and Topic...' is circled in orange, with an 'Open' button below it. The status bar at the bottom shows 'Ready', 'Document Recovery', and 'Submit'.

SAS® Visual Text Analytics

Capabilities via Programming Interfaces

Analytical



- TEXTMINE (NLP and statistical analysis of text)
- TMScore (Scores textural data)
- BOOLRULE (Boolean rules extraction)

SAS Visual Text Analytics

Action Sets

Boolean Rule	Text Mining
Deep RNN	Text Parse
LDA Topic Modeling	Text Rule Development
Search	Text Rule Discovery
Search Analytics	Text Rule Score
Sentiment Analysis	Text Summarization
Smart Data Set Analysis	Text Topics
TA Conditional Random Fields	Text Utilities

SAS Visual Text Analytics

Open Source

The screenshot shows a Jupyter Notebook titled "VTA_ScoreTextCategories" with a last checkpoint 4 hours ago. The interface includes a menu bar (File, Edit, View, Insert, Cell, Kernel, Widgets, Help) and a toolbar with icons for file operations, running, and markdown. The notebook content is as follows:

Score Categories

```
In [14]: s.textRuleScore.applyCategory(  
    model={'caslib': mco_binary_caslib, 'name': mco_binary_table_name},  
    table={'caslib': inputTableLib, 'name': inputTableName},  
    docId=keyColumn,  
    text=docColumn,  
    casOut={'caslib': clName, 'name': outCategories, 'replace': True},  
    matchOut={'caslib': clName, 'name': outMatches, 'replace': True}  
)
```

Out[14]: § OutputCasTablesFull

	casLib	Name	Label	Rows	Columns	casTable
0	CASUSER(chhsia)	Out_Categories		65664	4	CASTable('Out_Categories', caslib=CASUSER(ch...
1	CASUSER(chhsia)	Out_TermMatches		109834	5	CASTable('Out_TermMatches', caslib=CASUSER(ch...

elapsed 2.92s · user 9.88s · sys 2.99s · mem 274MB

Review Outputs

```
In [16]: s.CASTable(outCategories).head(10)
```

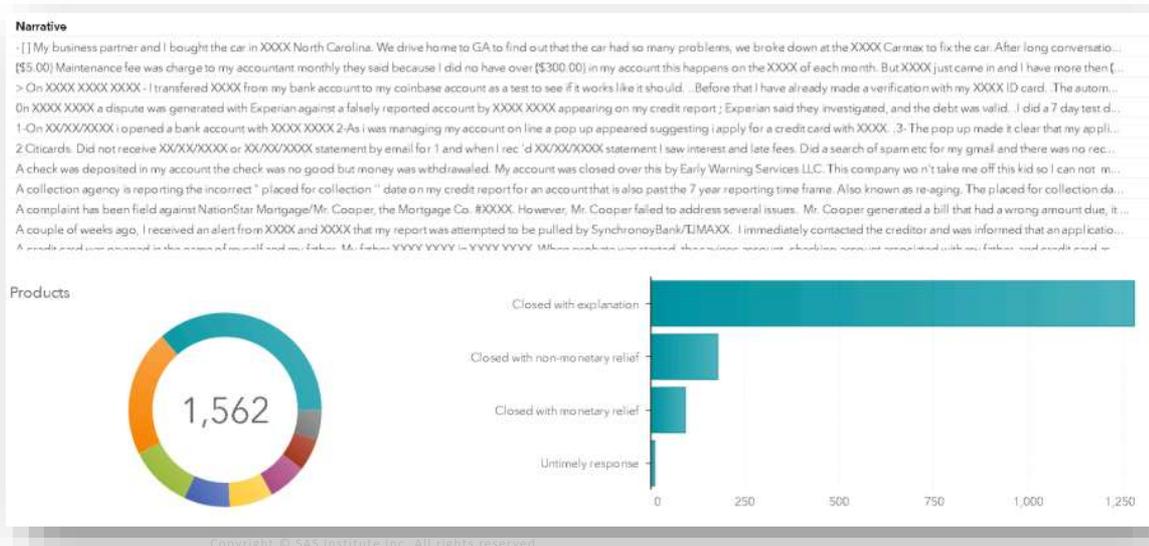
Out[16]: Selected Rows from Table OUT_CATEGORIES

	Unique_ID	_result_id_	_category_	_score_
0	157.0	1	HELPERS/Costmember	1.0
1	357.0	1	HELPERS/PosKeywordsPPL	1.0
2	457.0	1	HELPERS/PosKeywordsPPL	1.0
3	557.0	1	Atmosphere/Appearance/Clean_Attractive	1.0

Consumer Complaints

Our example today

- The dataset is from the Consumer Financial Protection Bureau (CFPB) and contains complaints submitted by customers
- The goal of this exercise is to **analyze the text data from their complaints**
- The data are at the customer-level (subject-level)
- n=2.4K
- columns = 18



Consumer Complaints

Details

The screenshot displays the SAS Data Studio interface for a dataset named 'bigbanks_cfpb.sas7bdat'. The interface is divided into two main sections: a table of columns on the left and a metadata panel on the right.

Table of Columns:

#	Name	Length
1	Date_received	
2	Product	
3	Sub_product	
4	Issue	
5	Sub_issue	
6	Consumer_complaint_narrative	
7	Company_public_response	
8	Company	
9	State	
10	Submitted_via	
11	Date_sent_to_company	
12	Company_response_to_consum	
13	Timely_response	

Metadata Panel:

- Date profiled:** 02/13/19 10:44 AM
- Columns:** 17
- Rows:** 2.4 K
- Size:** 10.3 MB
- Label:** (not available)
- Location:** cas-shared-default/Public
- Date created:** Nov 21, 2018 10:23 AM
- Date modified:** Nov 21, 2018 10:23 AM
- Encoding:** (not available)
- Tags (0):** No items have been added.

Consumer Complaints

Sample Data

bigbanks_cfpb.sas7bdat

Actions

Details Sample Data Profile

Sample rows: 100

ate_received	Product	Sub_prod	Issue	Sub_issue	Consumer_complaint_narrative	Cr
06/19/2...	Bank ac...	Checkin...	Deposit...		I live paycheck to paycheck. I check my bank account balance daily if not XXXX a ...	Compl
06/19/2...	Bank ac...	Checkin...	Deposit...		I have been a customer with Wells Fargo for nearly 20 years – we have our checkin...	Compl
06/17/2...	Bank ac...	Other b...	Making/...		To Whom It May Concern : Dear Sir/MadamI needed to pay XXXX AED to a lawyer...	Compl
06/17/2...	Credit c...		Other		Without my permission, Wells Fargo took money from my bank account to pay for ...	Compl
06/16/2...	Credit c...		Other		I opened a secured credit card through Wells Fargo in XXXX of 2013 in the amoun...	Compl
06/16/2...	Mortgage	FHA mo...	Loan m...		I purchased a Condo in XXXX in XXXX the mortgage was for (\$1400.00) monthly ...	Compl
06/15/2...	Bank ac...	Checkin...	Making/...		On XXXX/XXXX/2015 my account was negative [\$170.00] and some change. I de...	Compl
06/14/2...	Debt co...	Non-fed...	Cont'd ...	Debt w...	I paid of my JP Morgan Chase student loan more than XXXX years ago and even r...	
06/13/2...	Bank ac...	Other b...	Making/...		1. I authorize withdrawals from my checking account for my payment and they do ...	
06/13/2...	Credit c...		Late fee		My credit card company charged me [\$26.00] for late fee on a [\$20.00] interest at ...	
06/13/2...	Debt co...	Credit c...	Commu...	Freque...	Citi Bank has called me a minimum of 3 times (sometimes up to XXXX) every day ...	
06/12/2...	Credit c...		Credit d...		I applied online for a credit card with Chase Bank USA , N.A . XXXX XXXX XXXX X...	
06/12/2...	Mortgage	Conven...	Loan m...		We have had an extremely difficult time with our mortgage company, CitiMortgag...	
06/12/2...	Mortgage	Conven...	Loan se...		I started a loan modification with Citi mortgage in 2011 which was supposed to co...	
06/11/2...	Bank ac...	Checkin...	Deposit...		our sons and daughter send us money XXXX XXXX (Thursday) and XXXX XXXX (...	Compl
06/11/2...	Bank ac...	Checkin...	Accoun...		I feel that my bank chase is withdrawing money or fees for insuffent funds.	
06/11/2...	Money t...	Domest	Winnin...		Wells Fargo on direct deposit advances they stopped such transactions and can c...	Compl

Consumer Complaints Profile

bigbanks_cfpb.sas7bdat

Report: '02/13/19 10:44 AM'

Report is current Run Profile

Column	Unique	Null	Blank	Pattern Count	Mean	Median	Mode	Standa...	Star
Company	0.17% (4)			4			Bank ...		
Company_public	0.11% (1)	63.74%		1			Comp...		
Company_respons	0.21% (5)			5			Close...		
Company_respons	0.17% (4)			4			Close...		
Complaint_ID	100.00% (2413)				1,355,...	1,355,...		36,80...	7
Consumer_compl	99.83% (2409)			2,409					
Consumer_dispute	0.10% (2)	12.97% (313)		2			No		
Date_received	3.85% (93)				20,20...	20,20...		24.70	
Date_sent_to_com	3.77% (91)				20,21...	20,20...	-20,18...	24.66	
Issue	2.69% (65)			63			Loan ...		
Product	0.44% (11)			9			Mortg...		
State	2.34% (56)	0.75% (18)		1			CA		
Sub_issue	16.08% (24)	93.41% (2254)		24			Debt i...		
Sub_product	1.82% (30)	27.35% (...)		29			Check...		

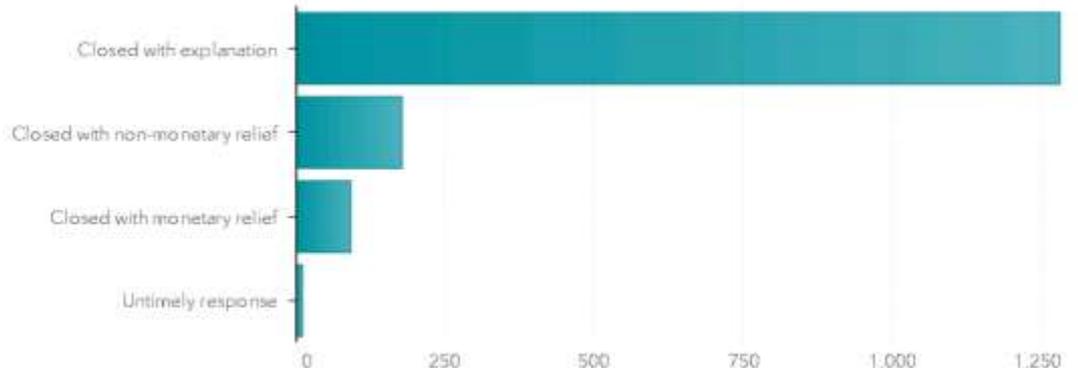
Narratives

Consumer Complaints Submitted to CFPB

Narrative

[] My business partner and I bought the car in XXXX North Carolina. We drive home to GA to find out that the car had so many problems, we broke down at the XXXX Carmax to fix the car. After long conversatio...
[\$5.00] Maintenance fee was charge to my accountant monthly they said because I did no have over (\$300.00) in my account this happens on the XXXX of each month. But XXXX just came in and I have more then (...
> On XXXX XXXX XXXX - I transfered XXXX from my bank account to my coinbase account as a test to see if it works like it should. .Before that I have already made a verification with my XXXX ID card. The autom...
On XXXX XXXX a dispute was generated with Experian against a falsely reported account by XXXX XXXX appearing on my credit report ; Experian said they investigated, and the debt was valid. I did a 7 day test d...
1-On XX/XX/XXXX i opened a bank account with XXXX XXXX 2-As i was managing my account on line a pop up appeared suggesting i apply for a credit card with XXXX. :3- The pop up made it clear that my appli...
2-Citicards. Did not receive XX/XX/XXXX or XX/XX/XXXX statement by email for 1 and when i rec 'd XX/XX/XXXX statement i saw interest and late fees. Did a search of spam etc for my gmail and there was no rec...
A check was deposited in my account the check was no good but money was withdraveled. My account was closed over this by Early Warning Services LLC. This company wo n't take me off this kid so I can not m...
A collection agency is reporting the incorrect " placed for collection " date on my credit report for an account that is also past the 7 year reporting time frame. Also known as re-aging. The placed for collection da...
A complaint has been field against NationStar Mortgage/Mr. Cooper, the Mortgage Co. #XXXX. However, Mr. Cooper failed to address several issues. Mr. Cooper generated a bill that had a wrong amount due, it ...
A couple of weeks ago, I received an alert from XXXX and XXXX that my report was attempted to be pulled by SynchronyBank/TIMAXX. I immediately contacted the creditor and was informed that an applicatio...
A credit card was opened in the name of myself and my father. Mr. father XXXX YYYY is YYYY YYYY. When credits was stated, the creditor report, checking account associated with my father and credit card...

Products

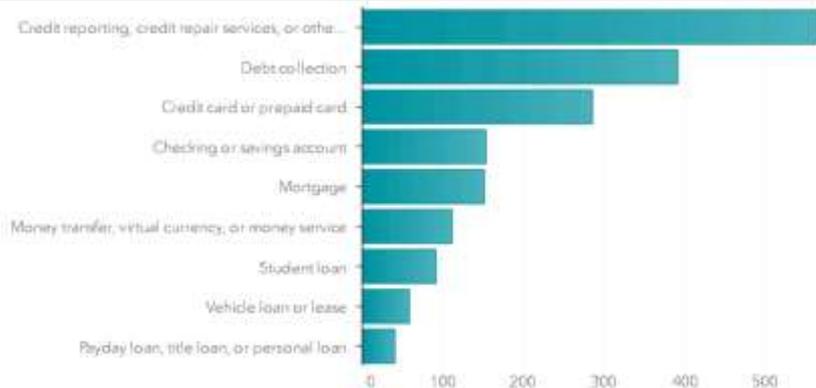


Categorization

Documents are categorized as related to Products, Overdrafts, Legal Issues or Digital Currency.



Categories
 ■ Digital Currency ■ Legal ■ Overdraft



Keywords

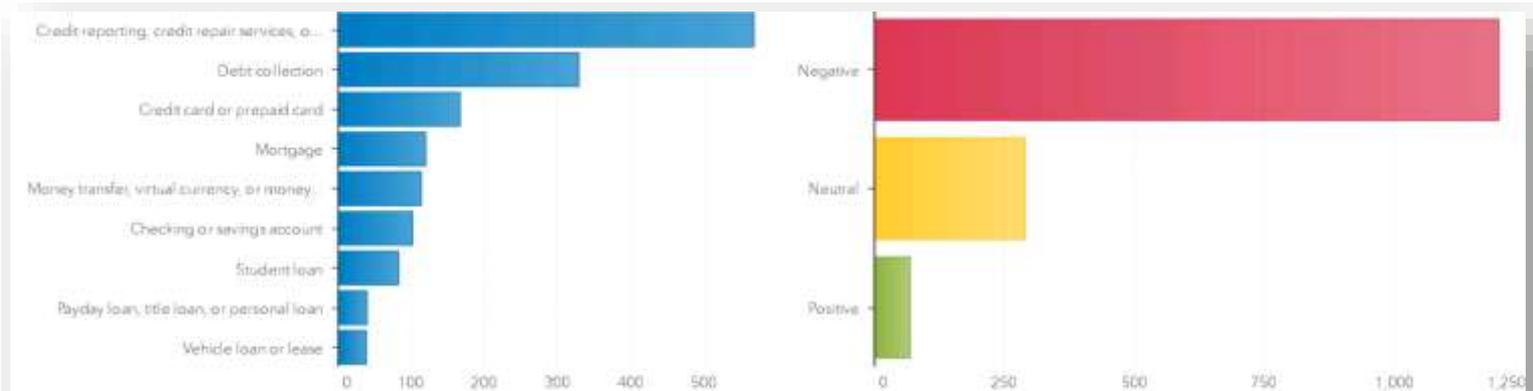
additional charge
 additional charges
 additional charges
 additional charges
 additional charges | additional charges
 adequately
 adequately
 adequately
 already | already | laws
 already | law
 already | law
 already | Law
 American Express
 American Express

Narrative

XX/XX/XXXX. I originally got a XXXX XXXX XXXX van from XXXX XXXX with [\$2000.00] down payment, total sale price is [\$10000.00]. Amount financed is [\$6...
 On XX/XX/XXXX I received a copy of my credit report. On that report was a collections from XXXX XXXX XXXX XXXX XXXX. I notified XXXX I was never given...
 Letter dated XX/XX/XXXX, from the Barclayscard Office of the President / a XXXX XXXX XXXX, outlined credits that were in process of paying to my account (...
 I called XXXX XXXX XXXX on XX/XX/XXXX. I was informed that I still owe XXXX after my payment of XXXX on XX/XX/XXXX. During XXXX I experienced som...
 Name : XXXX XXXX Acct # : XXXX Debt Amount : XXXX Best method of contact : Email - XXXXXXXXXXXXX I received a letter on XX/XX/XXXX informing me t...
 XXXX XXXX XXXX XXXX (CFPB Case XXXX)(Acct ending in XXXX) I nor XXXX XXXX was ever under any circumstances properly told about the interest rat...
 XXXX XXXX XXXX (CFPB Case XXXX)(Acct ending in XXXX) I nor XXXX XXXX was ever under any circumstances properly told about the interest rate that th...
 XXXX XXXX XXXX XXXX (CFPB Case XXXX)(Acct ending in XXXX) I nor XXXX XXXX was ever under any circumstances properly told about the interest rat...
 I received a loan in the amount of [\$1000.00] and have already repaid [\$1000.00] to date and the amount to pay the loan in full is currently over [\$1100.00]. I a...
 I was approved a loan in the amount of [\$600.00]. I chose the 1 yr option. I was led to believe the outrageous interest rate was on the annual interest rate. Howe...
 I am facing a foreclosure sale date by my mortgage servicer Owen on XX/XX/XXXX. I have been battling them for several years as I try to resolve issues relat...
 A lawsuit was filed against me by Pressler & Pressler Law office. I was never notified stating that a lawsuit would be taken if debt isn't settled. I found out via an al...
 American Express reduced our credit limit lowering it to just over the purchase thus causing our credit rating to be affected even though we never missed a pay...
 I recently submitted a complaint (complaint XXXX) and received a response that the issue was resolved. It seems that the issue has not been resolved. ... I am u...

Sentiment

Do people feel positive, negative or neutral toward something?



Sentiment	Sentiment Score	Narrative
Negative	0.23	I don't believe this is my loan and I told them that. I asked for a copy of the paperwork they say I signed and they would not mail me a copy. I told them I was g...
Negative	0.23	2 Citicards. Did not receive XX/XX/XXXX or XX/XX/XXXX statement by email for 1 and when I rec'd XX/XX/XXXX statement I saw interest and late fees. Did ...
Negative	0.23	I have 2 credit cards with Capital one. They reported me late in XXXX of XXXX for both cards. I had a payment due on XX/XX/XXXX on one card and XX/XX/X...
Negative	0.31	I will provide two incorrect/fraud information that was use without my permission that was reported in my credit. First one was XXXX XXXX in XX/XX/XXXX t...
Negative	0.16	A collection agency is reporting the incorrect "placed for collection" date on my credit report for an account that is also past the 7 year reporting time frame...
Negative	0.00	A complaint has been filed against NationStar Mortgage/Mr. Cooper, the Mortgage Co. #XXXX. However, Mr. Cooper failed to address several issues. Mr. Co...
Negative	0.40	A couple of weeks ago, I received an alert from XXXX and XXXX that my report was attempted to be pulled by SynchronyBank/TJMAXX. I immediately cont...
Negative	0.16	My XXXX XXXX XXXX XXXX credit card : XXXX was lost/stolen on XXXX XXXX, 2018, someone made over \$20000.00 in fraudulent charges/transactions. Th...
Negative	0.31	I filed a complaint against this company in XXXX XXXX. The company agreed to cancel the referenced account and remove it from my credit. It has been rea...
Negative	0.04	I experienced several problems while doing business with Commerce Bank over the past few months. I) I was not able to access my full account number onli...
Negative	0.31	A flight was purchased on XXXX/XXXX/XXXX for a trip to XXXX XXXX, XXXX for XXXX XXXX, XXXX flying on XXXX XXXX purchased through JP Morgan Cha...
Negative	0.31	A lawsuit was filed against me by Pressler & Pressler Law office. I was never notified stating that a lawsuit would be taken if debt isn't settled. I found out via an al...
Negative	0.16	A plumber did repair work to a leaking pipe. The plumber damaged other pipes during the repair, but did not pay for the damages. I disputed the charge with ...
Negative	0.40	A series of parking tickets were accumulated by my wife through XXXX XXXX University in the fall of XXXX. These tickets were eventually brought to collectio...

Concept Extraction

Extract specifics, like interest rate, from the text.

Select a Concept	Concept	Matched Text	Narrative
<input checked="" type="checkbox"/> Interest_Rate	Interest_Rate	-4.25%	On XXXX XXXX I was contacted by Royal United Mortgage via a Request I submitted via XXXX XXXX. At the time XXXX X...
<input type="checkbox"/> nlpDate	Interest_Rate	7 %	We are filing a complaint regarding a situation that resulted in our paying an additional [\$2,100.00] in exchange fees. We...
<input type="checkbox"/> nlpMeasure	Interest_Rate	0 %	I signed up for an american express everyday credit card under the pretense that my balance transfer would be 0% interes...
<input type="checkbox"/> nlpMoney	Interest_Rate	0 %	On XX/XX/XXXX I received an incentive email from Bank of America regarding opening up a credit card. Upon receiving th...
<input type="checkbox"/> nlpOrganization	Interest_Rate	0 %	On XX/XX/XXXX I went in to a Best Buy store to purchase a new laptop. During purchase the supervisor encouraged us t...
<input type="checkbox"/> nlpPercent	Interest_Rate	0 %	On XX/XX/XXXX, I applied a credit card with XXXX XXXX XXXX online with the offer a balance transfer with 0% introduct...
<input type="checkbox"/> nlpPerson	Interest_Rate	0%	I responded to an offer from Bank of America for its "Travel Rewards" card. The offer included 0% interest for 12 months...
<input type="checkbox"/> nlpPlace	Interest_Rate	0%	In XXXX 2017 I applied online for the XXXX XXXX XXXX XXXX and was approved along with a 7 month 0%APR. I was cor...
<input type="checkbox"/> nlpTime	Interest_Rate	0%	We have been reviewing our Bank of America convenience check we used. We have attached at a copy of the offer we receo...
	Interest_Rate	1 %	In 2017, Best buy charged me the full interest for 2 item amounts that were interest deferred. Total ; XXXX \$ All interest ra...
	Interest_Rate	1.5 %	On XX/XX/XXXX, I attempted to re-finance my XXXX XXXX XXXX at XXXX XXXX XXXX in XXXX, CA. I was doing this so ...
	Interest_Rate	1.5 %	On XXXX XXXX, XXXX, I attempted to re-finance my XXXX XXXX XXXX at XXXX XXXX XXXX in XXXX, CA. I was doing th...
	Interest_Rate	1.5 %	On XXXX XXXX, XXXX, I attempted to re-finance my XXXX XXXX XXXX at XXXX XXXX XXXX in XXXX, CA. I was doing th...
	Interest_Rate	10 %	I assumed the mortgage from XXXX XXXX XXXX. I have made the payments of [\$570.00] there after the assumption of mo...
	Interest_Rate	13.99 %	On XX/XX/XXXX, I applied a credit card with XXXX XXXX XXXX online with the offer a balance transfer with 0% introduct...
	Interest_Rate	17 %	As many filed complaints against XXXX XXXX XXXX, why this vehicle lender does n't want to reduce my interest of 17 % o...
	Interest_Rate	19.99 %	I obtained a line of credit from Paypal in the beginning of XXXX to make a singular, particular purchase. Paypal offers a pr...
	Interest_Rate	2 %	I have made several requests to get this Home Equity Line of Credit Refinanced. In XX/XX/XXXX I filed a complaint with th...
	Interest_Rate	2.8 %	I had a private loan through XXXX XXXX XXXX in which averaged a 2.8 % interest rate. A few months ago I was notified th...
	Interest_Rate	24 %	Santander USA, was hidden that this was a simple interest loan. I pay early and every week and only XXXX has been taken...
	Interest_Rate	25.9 %	I took out a credit card from Capital One several years ago after experiencing a XXXX illness which left me XXXX XXXX. M...
	Interest_Rate	25.90 %	I took out a credit card from Capital One several years ago after experiencing a XXXX illness which left me XXXX XXXX. M...
	Interest_Rate	26.99 %	Attr : GE/CareCredits/Synchrony Bank/Consumer Financial Protection Bureau To Whom it May Concern : In regards to the l...
	Interest_Rate	26.99 %	XXXX XXXX XXXX [CFPB Case XXXX] [Acct ending in XXXX] I nor XXXX XXXX was ever under any circumstances propo...
	Interest_Rate	26.99 %	XXXX XXXX XXXX XXXX [CFPB Case XXXX] [Acct ending in XXXX] I nor XXXX XXXX was ever under any circumstance...
	Interest_Rate	279%	I went into XXXX XXXX XXXX in XX/XX/XXXX or XX/XX/XXXX to get a personal loan, and was approved. Over the rema...
	Interest_Rate	29.9 %	I am writing to report unexplainable fees charged on my XXXX XXXX XXXX XXXX credit card. It is my financial habit to ps...
	Interest_Rate	29.9 %	In XX/XX/XXXX, I was in the midst of a financial crisis, losing my job and having to relocate and downsize. At that time I h...
	Interest_Rate	3.5 %	Contacted Miland Inc. in XXXX, GA back in XXXX of 2017 of securing a mortgage through them. Spoke with a young girl n...
	Interest_Rate	3.5 %	I had a private loan through XXXX XXXX XXXX in which averaged a 2.8 % interest rate. A few months ago I was notified th...

Topic Discovery

Which topics appear in my document collection?

+loan, +mortgage, +modification, +payment, +home	_1_0_+loan, +mortgage, +modification, +pay...	Narrative
0.940625	1	Caliber home loans - I was misled by the amount I would receive out of the refinance even though I questioned on several different occasions. XX/XX/XXXX.
0.931230	1	After graduating I looked for options on how to consolidate my Student loans. I was able to do this with all outstanding loans except Navient. I was told it cou...
0.926342	1	I can pay these loans either with my income.
0.924023	1	XX/XX/XXXX-XX/XX/XXXX (XXXX university) & XX/XX/XXXX-XX/XX/XXXX (XXXX University) Loans have been transferred several times to different servic...
0.920298	1	Navient has my loans. My loan payment amount continue to go up by hundreds of dollars and this is really affecting my credit. Can you please help me. I tried...
0.917604	1	XX/XX/XXXXXXXXXXXX XXXX XXXX XXXX XXXXXXXXXXX XXXX XXXX, FL XXXX) would like to start this letter by stating that I am XXXX years old and what h...
0.909699	1	Starting in the summer of 2015 I had wanted to consolidate all my student loans so I could have one single manageable payment. When I found a consolidate...
0.909690	1	My concern is that I was recently informed by Nelnet that I do not qualify for the Public Service Student Loan Forgiveness Program. I have been a XXXX XXXX f...
0.908207	1	Hi, One more than one occasion, Navient has offered to lower my interest rate (my rates for my private loans are : 5.9 %, 6.1 %, 9.8 %) They do this over the p...
0.907686	1	In 2005, I was forced into taking a private, co-signed loan for around [\$8000.00] with XXXX XXXX (now navient). I was told to defer my loan or use forbearanc...
0.905149	1	NAVIENT This loan was paid off. Reinvestigate and erase please.
0.896977	1	I have been in contact with Navient to attempt to get on IBR to repay my student loans, but I've been given the run-around. I was on a \$ XXXX/month paymen...
0.896696	1	My house was sold in a foreclosure sale, while I was trying to work out a Workable Solution with CitMortgage. I contacted with the foreclosure team a CitMor...
0.896678	1	I've submitted financials and request for mortgage modification to Owen Servicing several time. Owen is in willing to work with me to keep the my home tha...
0.893058	1	I have had my loan go into default a few years back and I have corrected it, but I am getting harassing never ending calls and emails about my loan will be goin...
0.890163	1	We have a problem with Fay Servicing who recently took over our family's mortgage loan. As soon as they got this loan they set an auction date before informi...
0.889492	1	my student loans have increased from XXXX, to XXXX, XXXX XXXX dollars and the school I attend was no where near this cost and I was in the military but so...
0.889389	1	I had a private loan through XXXX XXXX XXXX in which averaged a 2.8 % interest rate. A few months ago I was notified that Navient will be taking over the loa...
0.888939	1	After speaking with Navient on XX/XX/XXXX after several times, I am disappointed in their lack of helpfulness in allowing me to make student loan payments, ...
0.887907	1	For years I have reaching out about how to make payments to my Navient loan (s). I learned that payments were only made to select loans and I found myself ...
0.887077	1	This is the second complaint I am filling for this company. The original complaint number is XXXX. Originally I was working with Option Funding on refinancing...
0.886041	1	XXXX XXXX : Back in XXXX+XXXX of XXXX, I was in the middle of an ugly divorce. My Ex Wife was responsible for all the monthly bills but she never paid a XX...
0.884603	1	I RECEIVED A PACKAGE FROM CAPITAL ONE ON XXXX XXXX XXXX FOR BORROWER ASSISTANCE LOAN. I HAVE A HELOC LOAN THAT WOULD MATUR...
0.883815	1	I moved in to my rental due to flinical problem found out later it was identify theft. I started a home modification in XXXX. it took 5 months for the go-ahead. T...
0.881225	1	I have a student loan with Navient. Been paying them for a little over a year and they keep increasing my loan. That is affecting my credit score as well.
0.879201	1	PURCHASE VEHICLE CAR SALE MAN DIDNT TELL ME HE WAS RUNNING CREDIT TO DIFFERENT AUTO LOAN FINANCE COMPANY
0.878441	1	To Whom It May Concern : I am writing this letter to inform you of the deplorable customer service and the unfair and deceptive acts and/or practices of XXXX...
0.878396	1	On several occasions I contacted Navient regarding my payment being too high. I am a XXXX XXXX XXXX, and they told me I do not qualify for loan forgiven...



SAS Visual Text Analytics

Demo

End-to-End Analytical Capabilities

Data Manipulation

In-Memory Data Step
Frequency / Crosstab
Data Transpose
Variable Binning
Variable Cardinality Analysis
Variable Summary
Sampling and Partitioning
Missing Value Imputation
Variable Selection
Model Assessment
DS2
FedSQL
S3 Data Connector

Text Analytics

Word Cloud
Topics
Text Parsing
Content Categorization
Sentiment Analysis
Contextual Extraction

Statistics

Cox Proportional Hazards
Decision Trees
Design Matrix
General Additive Models
Generalized Linear Models
Independent Component Analysis
K-means and K-modes Clustering
Linear Regression
Linear Mixed Models
Logistic Regression
Model-Based Clustering
Nonlinear Regression
Ordinary Least Squares Regression
Partial Least Squares Regression
Pearson Correlation
Principal Component Analysis
Quantile Regression
Shewhart Control Chart Analysis

- *For documentation please click [here](#)*
- *[Optimization](#) and [Forecasting](#) are also supported*

Machine Learning

Bayesian Networks
Boolean Rules
Factorization Machines
Frequent Item Set Mining
Gaussian Mixture Model
Gradient Boosting
K Nearest Neighbor
Image Processing (including Biomedical)
Market Basket Analysis
Moving Windows PCA
Multitask Learning
Network Analytics / Community Detection
Neural Networks / Deep Learning
Random Forest
Robust PCA
Semi-supervised Learning
Support Vector Data Description
Support Vector Machines
t-distributed Stochastic Neighbor Embedding
Text Mining
Variable Clustering



Resources

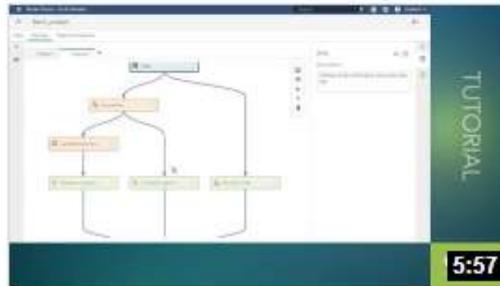
SAS® Viya Resources

Videos

- 6 minutes getting started [video](#)
- 5 minutes getting started [video](#)
- 8 minute demo [video](#)
- Feature Engineering [video](#)



Using the Automated Analysis Feature in SAS® Visual Analytics in SAS® Viya®



Getting Started with Data Mining and Machine Learning Pipelines on SAS® Viya®



Building and Using Pipelines in SAS® Visual Forecasting

SAS[®] Viya Resources

SAS Visual Statistics User's Guide

<http://support.sas.com/software/products/visual-statistics/index.html#s1=2>

SAS Visual Data Mining and Machine Learning User's Guide

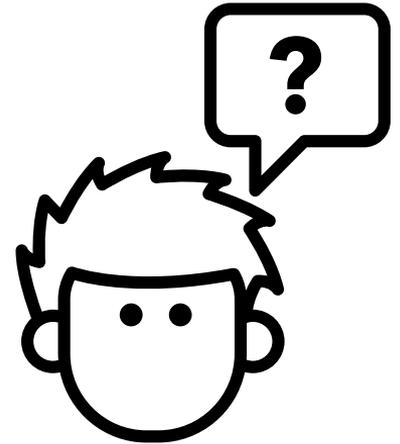
<http://support.sas.com/software/products/visual-data-mining-machine-learning/index.html#s1=1>

SAS Visual Text Analytics User's Guide

<http://support.sas.com/software/products/visual-text-analytics/index.html>

Overview, Training, Samples and Tips

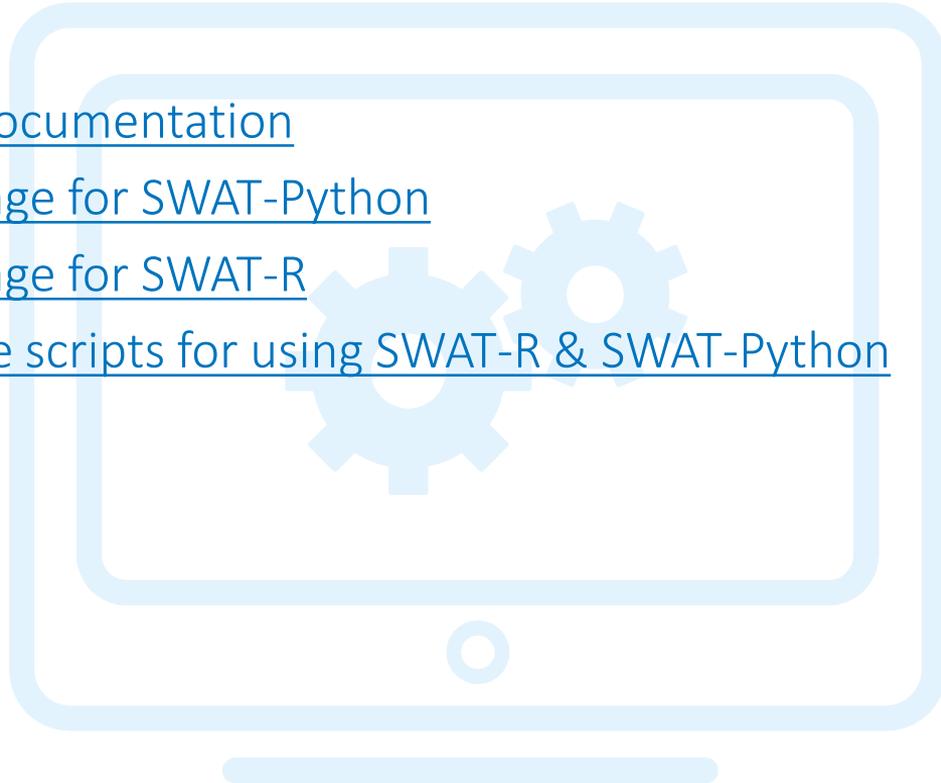
- [SAS Viya Overview](#)
- [SAS Viya Training](#)
- [A Beginner's Guide to Programming in the SAS[®] Cloud Analytics Services Environment](#)



Resources

Programming

- [SAS Studio](#)
- [CAS actions documentation](#)
- [SAS Github page for SWAT-Python](#)
- [SAS Github page for SWAT-R](#)
- [More example scripts for using SWAT-R & SWAT-Python](#)



Useful Websites

Developer.sas.com, Communities.sas.com



SAS for Developers [Get us your feedback](#)

Use the power of SAS Viya[™] in your applications.

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One underlying...

sas
SAS Viya uses PROC CAS to run CAS actions in SAS Cloud Analytic Services.

java
Java APIs for using SAS Viya CAS actions.

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While you're here, get a SAS tip and share what you know. This community of SAS experts is here to help you to succeed!

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115,540 **1,534** **201,428**

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Questions?

Thank you for your time and attention!

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Twitter: @Melodie_Rush

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