

PHUSE: Software Demo

How I changed the Habits of a Lifetime with SAS Studio and SAS Viya

This session will provide overview of the latest version of SAS Studio and the new features available to make life as a SAS Programmer in Life Sciences easier and more efficient. It will also show how the new release of SAS Viya can be used to enhance performance of code with almost zero changes to existing code and how the results produced can be easily visualized in SAS Viya with a few simple clicks to enhanced reporting and visualization of STDM and ADAM data

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SAS®STUDIO

WHAT IS SAS STUDIO?

SAS Studio is the web based interface for SAS Programmers.

With SAS Studio, you can access your data files, libraries, and existing programs and write new programs.

You can also use the predefined tasks in SAS Studio to generate SAS code..

Available with SAS 9.4 since May 2014

WHO IS IT FOR?



PROGRAMMERS



DATA ANALYST



CITIZEN ANALYTICS



DATA SCIENTIST



CODING

SAS Studio includes a color-coded, syntax-checking editor for editing new or existing SAS programs. It includes code snippets, commonly used code or text that you can save and reuse.

TASKS

Tasks provide a way for you to run some of the most commonly used analyses on your data without requiring you to write any SAS code yourself. Tasks generate SAS code and results based on the options that you select in the user interface.

QUERIES

You can build queries to join multiple datasets, create simple and complex expressions, filter and sort data. When you create a query, SAS Studio generates Structured Query Language (SQL) or FedSQL code, which you can view and edit.

GIT INTEGRATION

SAS Studio includes integration with Git, a system for tracking changes and managing version control among multiple users. Git can be used with many different repository hosting services such as GitHub and Bitbucket.

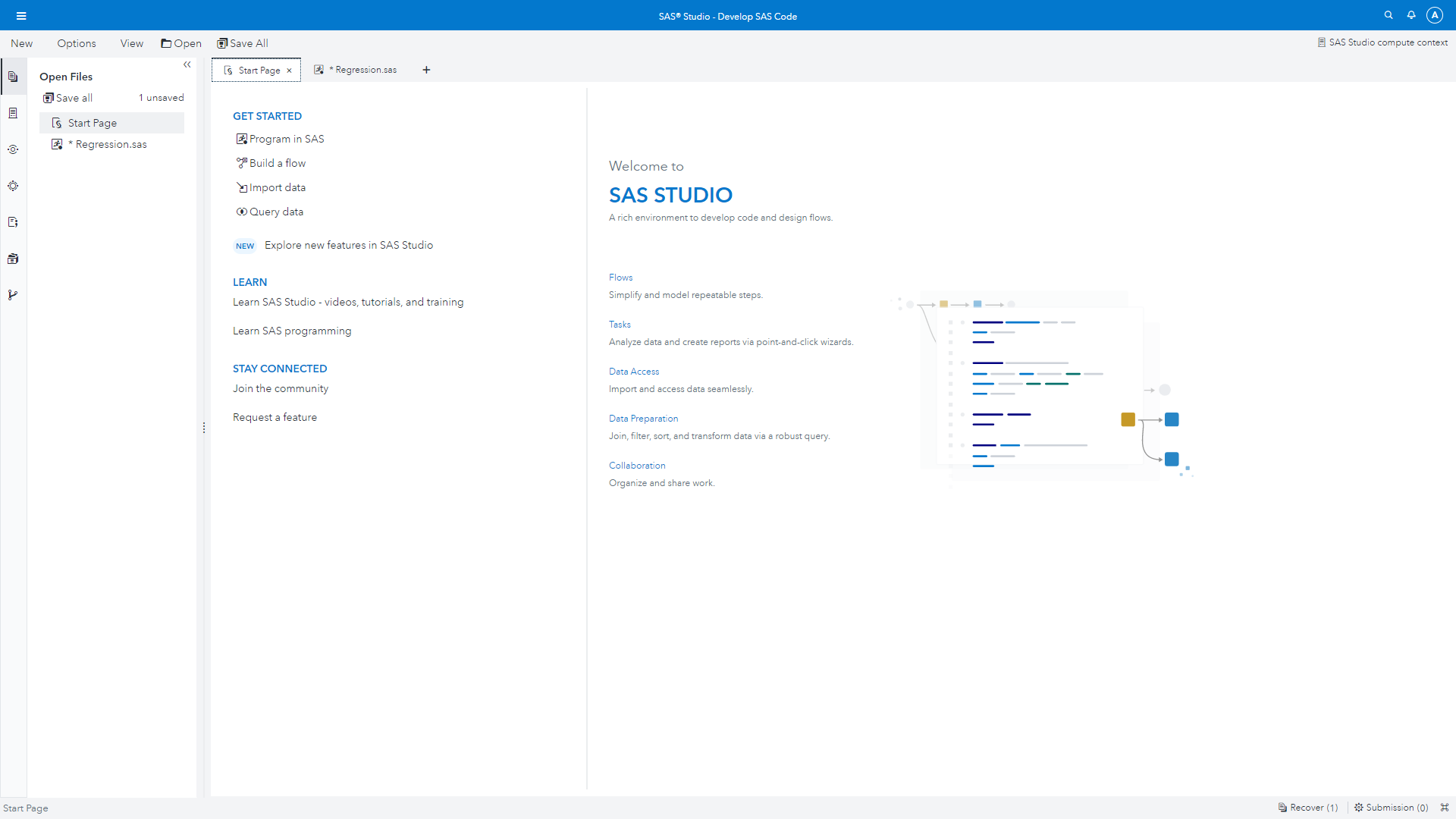
DATA ACCESS

With SAS Studio, you can access your data files, libraries, and existing programs. You can import a range of data sources including CSV and Excel.



Benefits of SAS Studio

- Accessed via a web browser via SAS drive
- Your SAS code will work in much the same way.
- Access to other tools
 - eg SAS Visual Analytics for adhoc data discovery and interactive analysis.
- Background / Scheduled Submit
- Code Snippet and Task
- Git integration



New Options View Open Save All

Open Files

Programs

Explore

Snippets

Tasks

Libraries

GIT

Interactive Code Editor

Log / Results / Output

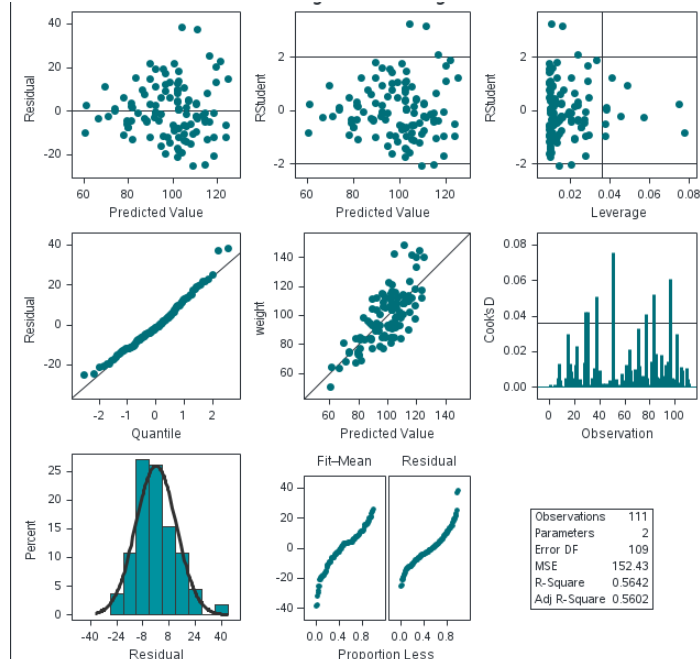
Sep 3, 2020, 11:31:04 AM

Log Results Output Data

```

The Reg Procedure
├─ sex=f
│   └─ eq1
│       └─ Fit
│           └─ weight
│               └─ Number of Observati...
│               └─ Analysis of Variance
│               └─ Fit Statistics
│               └─ Parameter Estimates
├─ Observation-wise Statistics
│   └─ weight
│       └─ Diagnostic Plots
│       └─ Residual Plots
│       └─ Fit Plot
├─ eq2
│   └─ Fit
│       └─ weight
│           └─ Number of Observati...
│           └─ Analysis of Variance
│           └─ Fit Statistics
│           └─ Parameter Estimates
├─ Observation-wise Statistics
│   └─ weight
│       └─ Diagnostic Plots
│       └─ Residual Plots
│       └─ Panel 1
└─ sex=m

```



Residuals for weight

New Options View Open Save All

Start Page *Regression.sas x +

Run Cancel

```
3  
4 TITLE: PROC REG  
5     Age, Weight, and Height of Children  
6 DATA: htw  
7 PRODUCT: STAT  
8 SYSTEM: ALL  
9 KEYS: Output data sets, BY processing  
10 PROCS: REG  
11  
12 -----*/  
13 proc reg outest=est1 outsscp=sscp1 rsquare;  
14     by sex;  
15     eq1: model weight=height;  
16     eq2: model weight=height age;  
17 run;  
18  
19 proc print data=sscp1;  
20     title2 'SSCP type data set';  
21 run;  
22  
23 proc print data=est1;  
24     title2 'EST type data set';  
25 run;
```

Log

Results x

Log / Results / Output

The Reg Procedure

sex=f

eq1

Fit

weight

Number of Observations

Analysis of Variance

Fit Statistics

Parameter Estimates

Observation-wise Statistics

weight

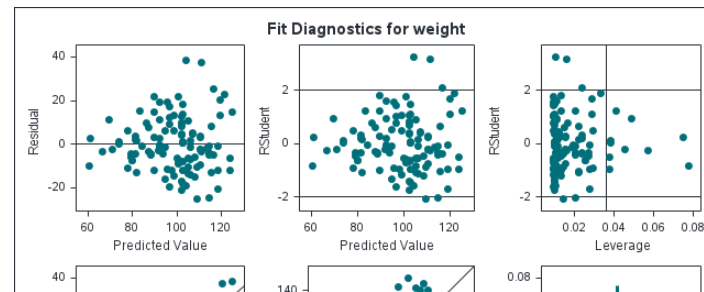
Diagnostic Plots

Fit Diagnostics

Residual Plots

Dependent Variable: weight

sex=f



```

1  /*-----
2      SAS SAMPLE LIBRARY
3  */
4  TITLE: PROC REG
5      Age, Weight, and Height of Children
6  DATA: htwt
7  PRODUCT: STAT
8  SYSTEM: ALL
9  KEYS: Output data sets, BY processing
10 PROC: REG
11
12
13
14 proc reg data=htwt outest=est1 outsscp=sscp1 rsquare;
15
16
17
18
19
20
21
22 run;
23
24
25
26

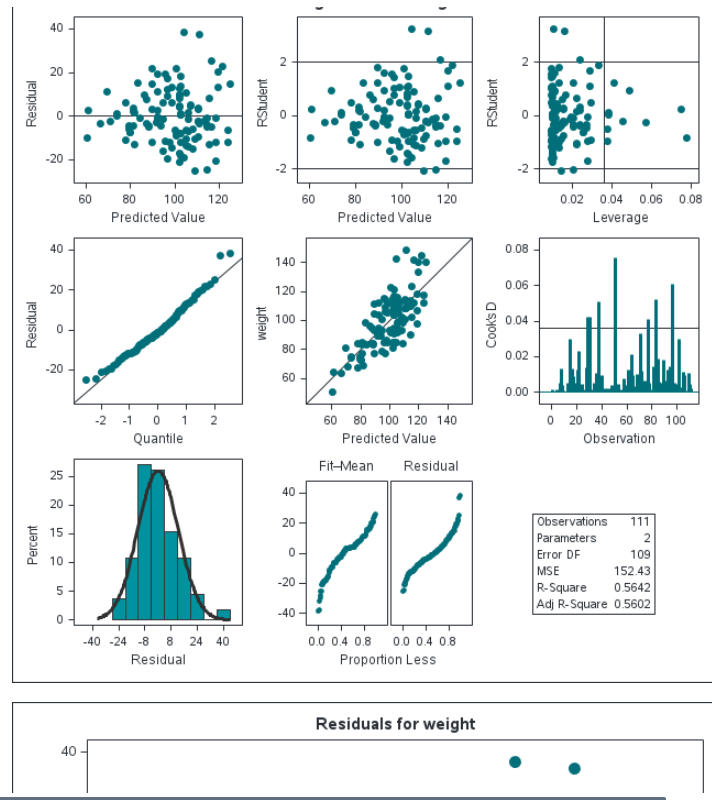
```

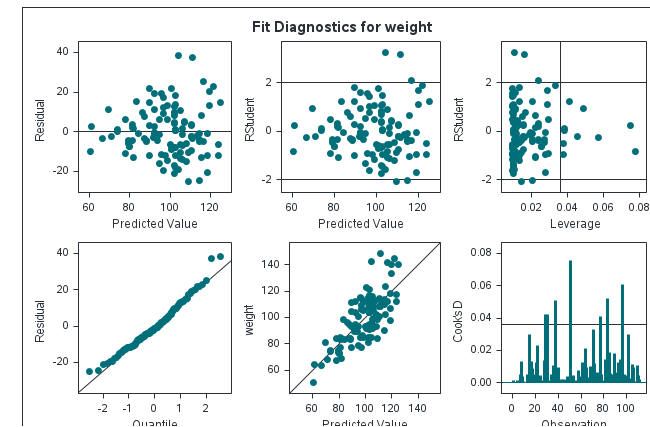
Keyword: REG
Context: [PROCEDURE DEFINITION] PROC REG

Syntax: PROC REG <options>;
<label>MODEL dependents=<regressors> </ options>;
BY variables;
FREQ variable;
ID variables;
VAR variables;
WEIGHT variable;
ADD variables;
DELETE variables;
<label>MTEST <equation, ..., equation> </ options>;
OUTPUT <OUT=SAS-data-set> < keyword=names> <... keyword=names>;
PAINT <condition | ALLOBS> </ options> | < STATUS | UNDO>;
RESTRICT equation, ..., equation;
REWEIGHT <condition | ALLOBS> </ options> | < STATUS | UNDO>;
PRINT <options> <ANOVA> <MODELDATA>;
REFIT;
RESTRICT equation, ..., equation;
REWEIGHT <condition | ALLOBS> </ options> | < STATUS | UNDO>;
<label>TEST equation <... equation> </ options>;

Log Results Output Data

- The Reg Procedure
 - sex=f
 - eq1
 - Fit
 - weight
 - Number of Observati...
 - Analysis of Variance
 - Fit Statistics
 - Parameter Estimates
- Observation-wise Statistics
 - weight
 - Diagnostic Plots
 - Fit Diagnostics
 - Residual Plots
 - height
 - Fit Plot

- eq2
- Fit
 - weight
 - Number of Observati...
 - Analysis of Variance
 - Fit Statistics
 - Parameter Estimates
- Observation-wise Statistics
- weight
 - Diagnostic Plots
 - Fit Diagnostics
 - Residual Plots
 - Panel 1
- sex=m




Code

```
proc reg data=htwt outest=est1 outsscp=sscp1 rsquare;  
  by sex;  
  eq1: model weight=height;  
  eq2: model weight=height age;  
run;
```

```
roc print data=sscp1;  
    title2 'SSCP type data set';  
un;
```

```
roc print data=est1;
      title2 'EST type data set';
un;
```

Submission Status x

Filter

▼ Status (no filter)

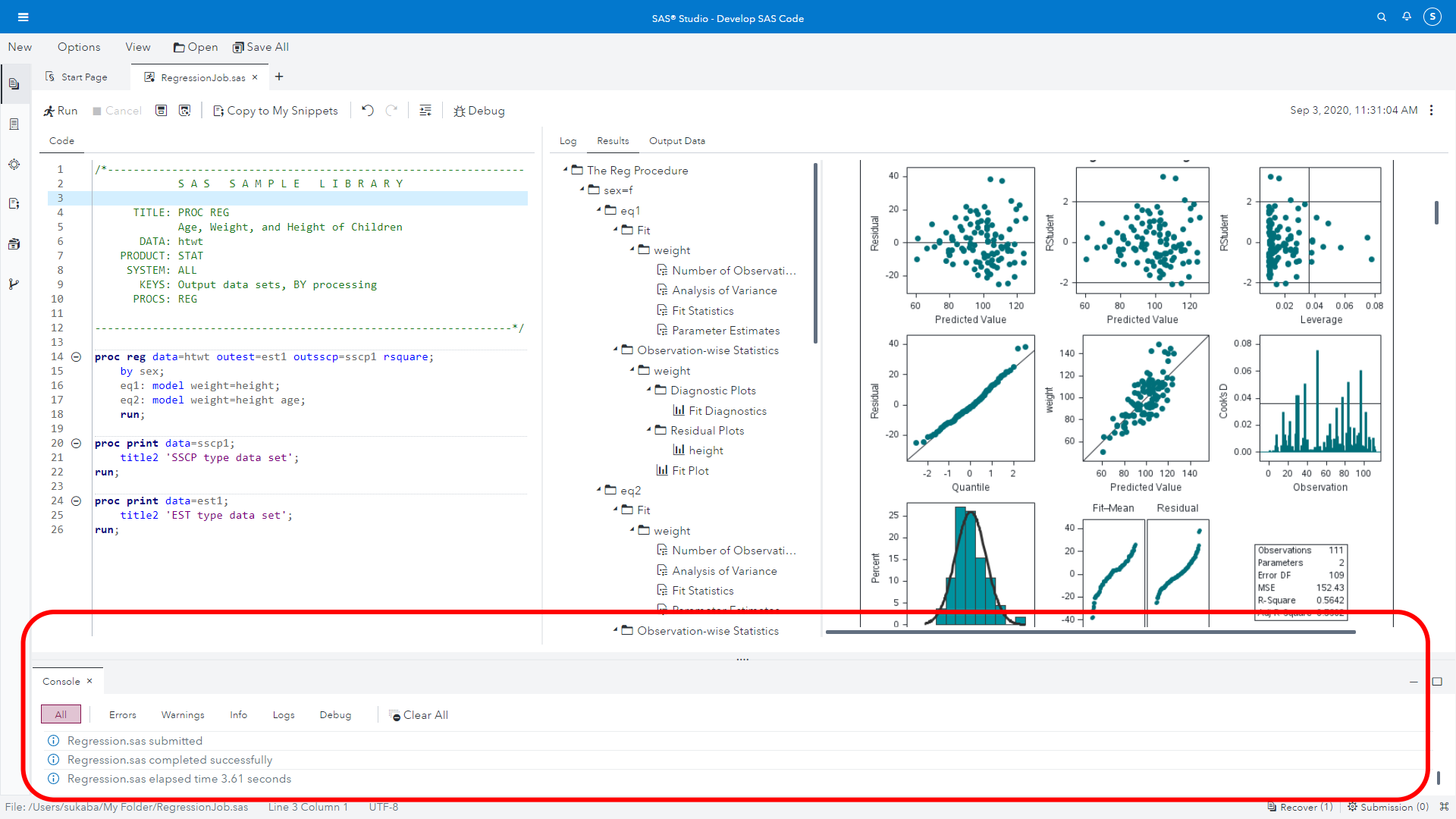
☐ Successful

 Filter submissions list

Cancel All

Clear All

[illegible]



Snippets



Filter snippets

SAS Snippets My Snippets

Data

- DS2 Code
- DS2 Package
- DS2 Thread
- Generate CSV File
- Generate PowerPoint Slide
- Generate XML File
- Import CSV File
- Import XLSX File
- Simulate Linear Regression Data
- Simulate One-Way ANOVA Data

Data Quality

Descriptive

Graph

IML

Macro

SAS Viya Cloud Analytic Services

SAS Viya Image Processing

SAS Viya Machine Learning

Start Page Import CSV File.sas x +

Run Cancel Copy to My Snippets + Code to Flow Debug

Code

```
1 /* Import a csv file from the location specified on the filename statement */
2 /* The SAS data set created is named by substituting a name for work.mycsv */
3
4 filename csv "<location on file system of the CSV file>";
5
6 /* Import the CSV file */
7 proc import datafile=csv out=work.mycsv dbms=csv;
8     getnames=yes;
9     run;
10
11 /* Print the first 10 observations */
12 proc print data=work.mycsv(obs=10);
13     run;
14
15 filename csv;
16
```

Log

Characterize Data.ctlk [temp]

New

Options

View

Open

Save All

Tasks

Filter tasks

SAS Tasks

My Tasks

Econometrics

Forecasting

Optimization and Network Analysis

Prepare Data

Examine Data

Describe Missing Data

List Data

List Table Attributes

Transform Data

SAS Viya Cloud Analytic Services

SAS Viya Econometrics

SAS Viya Evaluate and Implement M...

SAS Viya Forecasting

SAS Viya Machine Learning

SAS Viya Optimization and Network ...

SAS Viya Prepare and Explore Data

SAS Viya Statistics

SAS Viya Text Analytics

Statistical Process Control

Statistics

Visualize Data

Start Page

Import CSV File.sas

Characterize Data.ctlk

Run

Cancel

Copy to My Tasks

Code to Flow

Data

Options

Information

Categorical Variables

☒ Frequency table

☒ Frequency chart

☐ Treat missing values as valid level

☐ Limit categorical values

Numeric Variables

☒ Descriptive statistics

☒ Histogram

Date Variables

Task Console (0)

No items

Code

Log

1

2

3

4

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33

/*

*

* Task code generated by SAS® Studio 6.0

*

* Generated on '8/21/20, 3:02 PM'

* Generated on server 'sas-launcher-328af5fc-47b5-440f-bbda-968495fefda7-tvbw5'

* Generated on SAS platform 'Linux LIN X64 3.10.0-957.1.3.el7.x86_64'

* Generated on SAS version 'V.04.00M0P082020'

* Generated on browser 'Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko)

* Generated on web client 'http://d2mwf.ingress-nginx.d2mwf-m1.quest.sashq-d.openstack.sas.com/SASStudio.

*/

ods noproctitle;

/** Analyze categorical variables ***/

title "Frequencies for Categorical Variables";

proc freq data=SASHELP.HEART;

tables Sex / plots=(freqplot);

run;

/** Analyze numeric variables ***/

title "Descriptive Statistics for Numeric Variables";

proc means data=SASHELP.HEART n nmiss min mean median max std;

var AgeAtStart Height Weight;

run;

title;

proc univariate data=SASHELP.HEART noprint;

histogram AgeAtStart Height Weight;

run;

SAS Studio compute context

Edit Code

Characterize Data.ctlk [temp]

Line 1 Column 1 | Submission (0)

Tasks

Filter tasks

SAS Tasks : My Tasks

- Econometrics
- Forecasting
- Optimization and Network Analysis
- Prepare Data
 - Examine Data
 - Characterize Data
 - Describe Missing Data
 - List Data
 - List Table Attributes
 - Transform Data
- SAS Viya Cloud Analytic Services
- SAS Viya Econometrics
- SAS Viya Evaluate and Implement M...
- SAS Viya Forecasting
- SAS Viya Machine Learning
- SAS Viya Optimization and Network ...
- SAS Viya Prepare and Explore Data
- SAS Viya Statistics
- SAS Viya Text Analytics
- Statistical Process Control
- Statistics
- Visualize Data

Start Page Import CSV File.sas * Characterize Data.ctlk x +

Run Cancel Copy to My Tasks + Code to Flow

Code Log Results

- The Freq Procedure
 - Table Sex
 - One-Way Frequencies
 - Distribution Plots
 - Frequency Plot
- The Means Procedure
 - Summary statistics
- The Univariate Procedure
 - AgeAtStart
 - Histogram 1
 - Panel 1
 - Height
 - Histogram 1
 - Panel 1
 - Weight
 - Histogram 1
 - Panel 1





Git Repositories

Clone Add

Current Repository

Local
✓ master (1)

Start Page

Local x

Local
Current repositorymaster
Current branchPull master
Last pulled: Nov 13, 2019,...Push master
Last pushed: Nov 13, 201...

Commit History

Unstaged Changes (0)



No items

Staged Changes (0)



No items

Enter a commit comment

Commit



WORKING WITH GIT.

Edit

Edit files in your working directory. As you work, the files you change and save are added to the Unstaged Changes area of the Commit tab.

Stage

Move the changed files that you want to keep together to the Staged Changes area. It is good practice to group related changes together in the same commit.

Commit

Enter a short description of your changes and commit the files to your local repository. Each commit represents a snapshot of the changes since your last commit.

Push

Share your committed changes with others by pushing them to the remote repository.

Tasks



Filter tasks

SAS Tasks My Tasks

Flow Tasks

- File
- Import
- Query
- SAS Program
- Table
- Prepare Data
- SAS Viya Cloud Analytic S...
- SAS Viya Econometrics
- SAS Viya Evaluate and Im...
- SAS Viya Forecasting
- SAS Viya Machine Learning
- SAS Viya Optimization an...
- SAS Viya Prepare and Expl...
- SAS Viya Statistics
- SAS Viya Text Analytics
- Statistical Process Control
- Statistics
- Visualize Data

Start Page

* Flow.flw x



Run



Add



View

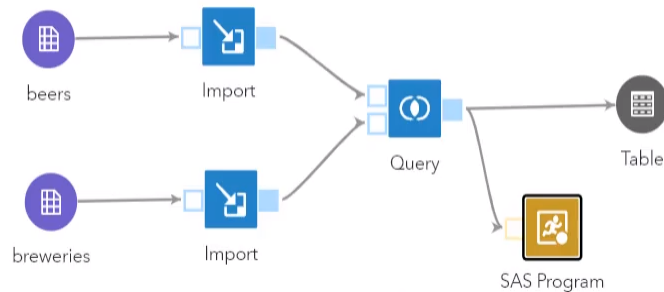


Apr 20, 2020 05:20 PM

Flow

Generated Code

Submission



SAS Program

Code Node

```
1 proc freq data=&input1;  
2 tables beer_name;  
3 where state = "ND";  
4 run;
```

SAS Viya

Latest Version of SAS Studio

Maintains existing SAS capability (Takes nothing away)

Unifies the SAS 9.4 and SAS In Memory Capabilities

Magnifies Scale.

With minimal or no modification to existing code

Broadens diversity of analytics.

Adding new deep learning capabilities.

Extends Openness.

Offer wider cloud data connectivity including native parallel access to data formats such as S3



SAS Viya

SAS 9



Benefits of SAS Viya

- You do not have to re-code your programs to run in Viya
 - Your current code will run as-is
 - Your current code will return the same results
- Optimizing your code for the new in memory capability will provide performance increases
 - Run DATA STEP; SAS PROCs and SQL in memory
 - Convert SAS9 PROCs to Enhanced In-Memory enabled PROCs
- SAS Viya provides a range of additional capability

SAS9 Code and SAS Viya

- You *do not* have to re-code your programs to run in Viya
 - Your current code *will* run as-is
 - Your current code *will* return the same results
- Optimizing your code for the new in memory capability will provide performance increases
 - Run DATA STEP; SAS PROCs and SQL in memory
 - Convert SAS9 PROCs to Enhanced In-Memory enabled PROCs

Same Code Same Results

SAS9

```
PROC LIFETEST DATA=data method=pl nelson  
  PLOTS(only)=hazard(kernel=bw bw=50);  
  TIME period*outcome(0) ;  
  STRATA age_c;  
RUN;
```

NOTE: The LOGLOG transform is used to compute the confidence limits for the quartiles of the survivor distribution. To suppress using this transform, specify CONFTYPE=LINEAR in the PROC LIFETEST statement.

NOTE: The data set DM.PLE SAS has 3859 observations and 11 variables.

NOTE: The PROCEDURE LIFETEST printed pages 379-467.

NOTE: PROCEDURE LIFETEST used (Total process time):

real time 12.99 seconds

cpu time 6.64 seconds

SAS Viya

```
PROC LIFETEST DATA=data method=pl nelson  
  PLOTS(only)=hazard(kernel=bw bw=50);  
  TIME period*outcome(0) ;  
  STRATA age_c;  
RUN;
```

NOTE: The LOGLOG transform is used to compute the confidence limits for the quartiles of the survivor distribution. To suppress using this transform, specify CONFTYPE=LINEAR in the PROC LIFETEST statement.

NOTE: The data set DM.PLE SAS has 3859 observations and 11 variables.

NOTE: The PROCEDURE LIFETEST printed pages 379-467.

NOTE: PROCEDURE LIFETEST used (Total process time):

real time 7.69 seconds

cpu time 4.62 seconds

Performance Improvements

PROC FREQ => PROC FREQTAB

SAS9

```
PROC FREQ DATA=public.actdata;
```

```
TABLES age;
```

```
QUIT;
```

NOTE: There were 204163217 observations read from the data set DM.ACTDATA.

NOTE: The PROCEDURE FREQ printed pages 3-4.

NOTE: PROCEDURE FREQ used (Total process time):

real time	12:19.57
-----------	----------

cpu time	44.37 seconds
----------	---------------

SAS Viya

```
PROC FREQTAB DATA=public.actdata;
```

```
TABLES age;
```

```
QUIT;
```

NOTE: The Cloud Analytic Services server processed the request in 15.052263 seconds.

NOTE: The PROCEDURE FREQTAB printed pages 3-4.

NOTE: PROCEDURE FREQTAB used (Total process time):

real time	15.16 seconds
-----------	---------------

cpu time	0.11 seconds
----------	--------------

Performance Improvements

PROC SQL => PROC FEDSQL

SAS9

```
PROC SQL;
```

```
create table publicdrug as
select patientid,
       min(datamonth),
       max(dap)
  from work.actdata
 where dap=1
 group by patientid;
```

NOTE: Table DM.DRUG_DAP created, with 4727 rows and 3 columns.

```
QUIT;
```

NOTE: PROCEDURE SQL used (Total process time):

real time 2:59.71

cpu time 8.77 seconds

SAS Viya

```
PROC FEDSQL sessref=casauto;
```

```
create table public.drug as
select patientid,
       min(datamonth),
       max(datamonth)
  from public.actdata
 where dap=1
 group by patientid;
```

NOTE: Table DRUG_DAP was created in caslib Public with 4727 rows returned.

```
QUIT;
```

NOTE: PROCEDURE FEDSQL used (Total process time):

real time 16.42 seconds

cpu time 0.03 seconds

Performance Improvements

PROC LOGISTIC => PROC LOGSELECT

SAS9

PROC LOGISTIC

150 lines of code;

7 hour runtime

SAS Viya

PROC LOGSELECT

2 lines of code changed;

3 added;

10 minutes runtime

SAS Delivering Actionable Insights from Analytics

SAS® STUDIO

If you are a SAS Enterprise Guide or Base SAS user, this is the new interface for you. Like all the other tools, it is accessed via the homepage, SAS Drive. This is the tool for you to access data, perform data manipulation and analysis. SAS Studio is where you would go to write SAS code. It also has the point and click task and query you are familiar with in SAS Enterprise Guide. There are additional capabilities such as code snippets which contains pre-written code and the ability to background submit.

For more information:
support.sas.com/en/software/studio-support.html

2 SAS® VISUAL ANALYTICS

SAS Visual Analytics is the point-and-click, user-friendly visualization tool. Here, you can build reports or dashboards using different graphs available to you. SAS Visual Analytics can also be leveraged as a starting place for analytics. It lets you explore your data sets and find patterns you didn't know were there.

For more information:
support.sas.com/en/software/visual-analytics-support.html



SAS® DRIVE

SAS Drive is a hub for the SAS Viya applications, and enables you to easily view, organize, and share your content from one place. You can think of SAS Drive as your homepage. The availability of the features in SAS Drive depends on the applications that have been installed, and the features and permissions that have been specified by your administrator.

For more information: support.sas.com/en/software/sas-viya.html

3 SAS® VISUAL STATISTICS

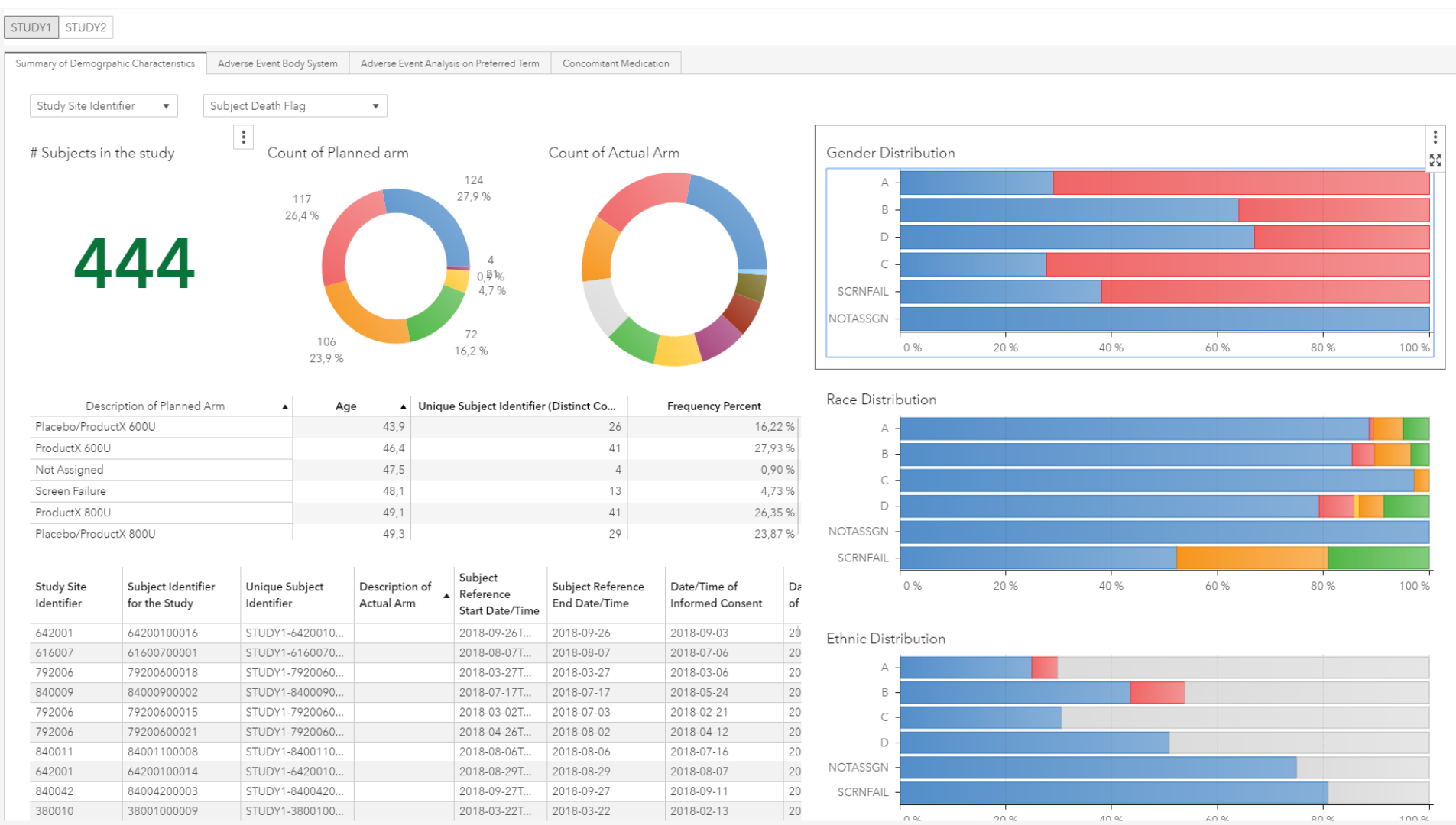
SAS Visual Statistics enables you to use powerful statistical modelling techniques like clustering or regression within SAS Viya. Data scientists, statisticians and analysts can collaborate and iteratively refine models for each segment or group to make decisions based on accurate insights. SAS Visual Statistics also provides summary statistics so that you can compare models and see which one best suits your data.

For more information:
support.sas.com/en/software/visual-statistics-support.html

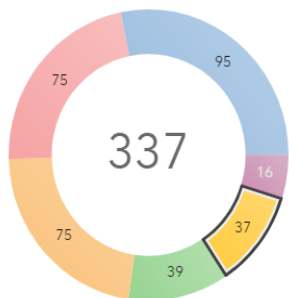
4 SAS® VISUAL DATA MINING & MACHINE LEARNING

SAS Visual Data Mining and Machine Learning (also referred to as SAS VDMML) gives you the ability to solve complex analytical problems with a comprehensive visual interface. It encompasses all the tasks in the analytics life cycle from data wrangling, exploration, feature engineering, and modern statistical, data mining, and machine learning techniques. You can compare multiple models to see the best performing model on your data.

For more information:
support.sas.com/en/software/visual-data-mining-and-machine-learning-support.html

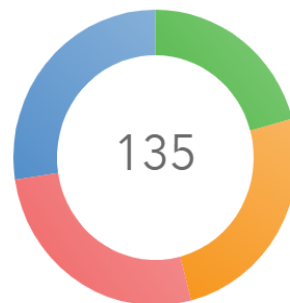


Pt receiving at least one
Concomitant meds

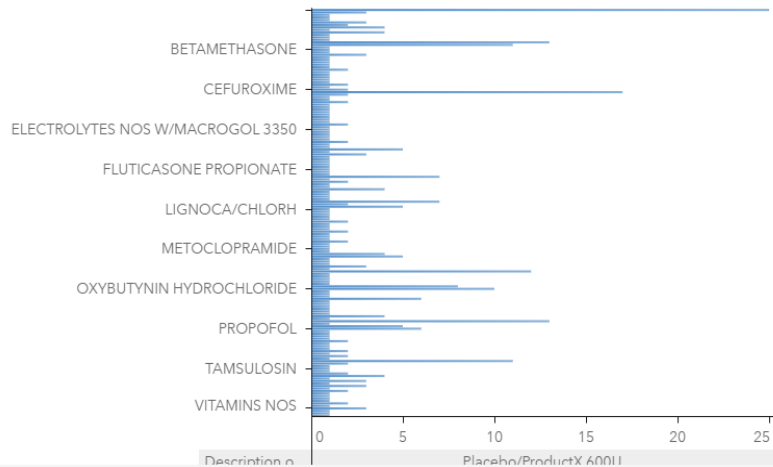


Category for Medication

Subcategory of Medication



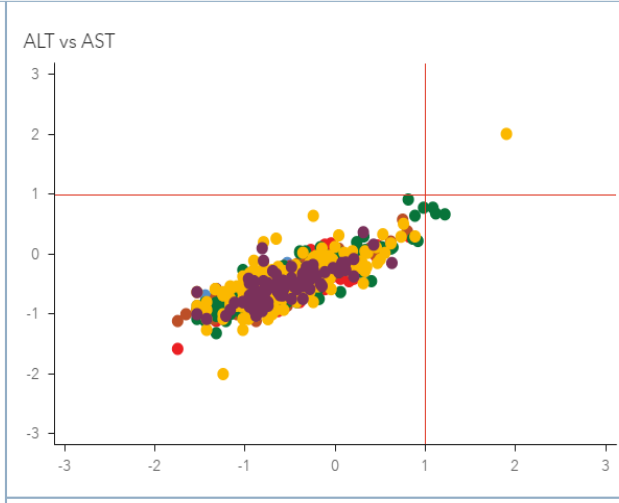
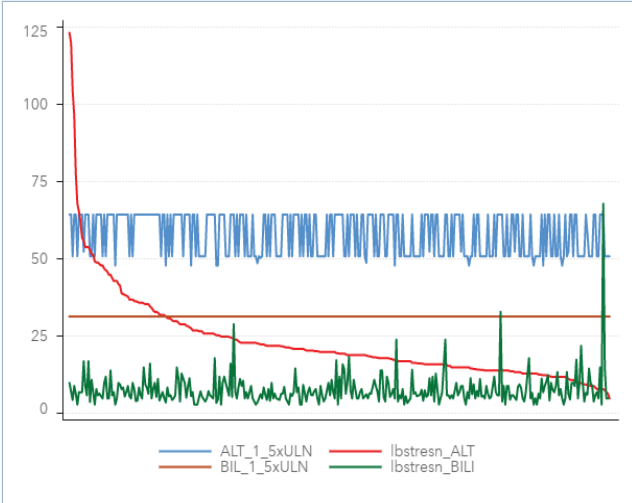
Number of Subjects



Medication Name Listing

Unique Subject Identifier	Age	Sex	Race	Route of Administration	Dose Units	Dosing Frequency per Interval	Dose per Administration
STUDY1-840039000...	72	F	WHITE	ORAL	mg	BID	100
STUDY1-840039000...	72	F	WHITE	ORAL	mg	QD	139,28571429
STUDY1-840039000...	72	F	WHITE	INTRAMUSCULAR	U	ONCE	200
STUDY1-380004000...	68	M	WHITE	INTRAVENOUS	g	BID	1
STUDY1-380004000...	68	M	WHITE	TRANSDERMAL	ug	ONCE	50
STUDY1-840001000...	68	F	WHITE	ORAL	mg	PRN	825
STUDY1-380004000...	68	M	WHITE	INTRAVENOUS DRIP	IU	QD	60000
STUDY1-380004000...	68	M	WHITE	INTRAMUSCULAR	g	BID	1
STUDY1-380004000...	68	M	WHITE	ORAL	mg	TID	149,375
STUDY1-840001000...	68	F	WHITE	ORAL	IU	QD	1000
STUDY1-840001000...	68	F	WHITE	ORAL	mg	BID	343
STUDY1-840001000...	68	F	WHITE	ORAL	mg	QD	346,5
STUDY1-380004000...	68	M	WHITE	INTRAVENOUS	g	TID	2
STUDY1-840001000...	68	F	WHITE	ORAL	TABLET	QD	1
STUDY1-380004000...	68	M	WHITE	ORAL	mg	UNKNOWN	0,4
STUDY1-840001000...	68	F	WHITE	SUBLINGUAL	mg	QD	2000

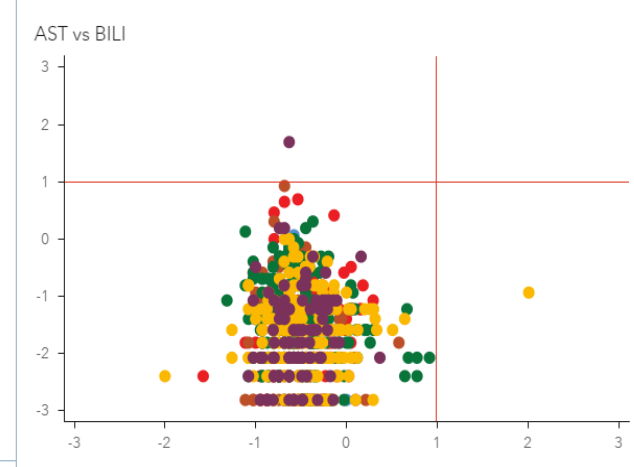
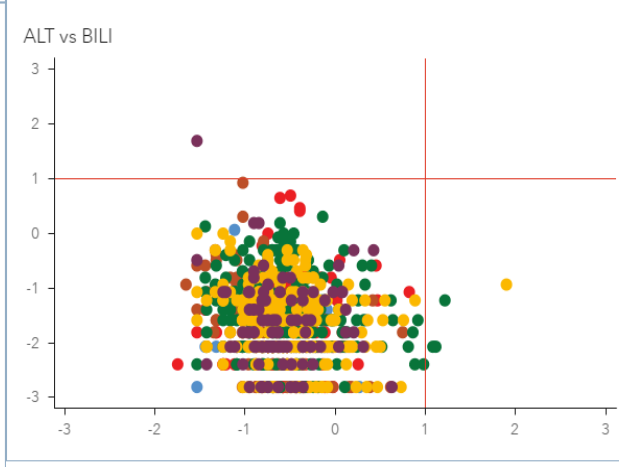
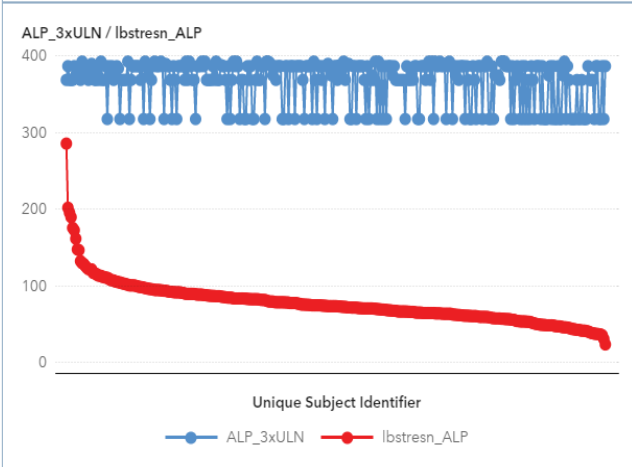
Filtres : Aucune sélection



Hy's Law Criteria

☐ 0,00 100,00 %

Unique Subject Identifier	Description of Planned Arm	Study Site	Age	Sex	rfstdt	rfe
STUDY1-12400100001	Screen Fai...	12...	88	F	.	.
STUDY1-12400100002	ProductX...	12...	605	M	22 nov...	23
STUDY1-12400100003	Placebo/P...	12...	450	M	31 janv...	30
STUDY1-12400100004	Screen Fai...	12...	65	F	.	.
STUDY1-12400100005	Screen Fai...	12...	53	M	.	.
STUDY1-12400100006	ProductX...	12...	216	M	13 juin...	13
STUDY1-12400100007	Placebo/P...	12...	252	M	22 août...	11
STUDY1-12400100008	ProductX...	12...	216	M	24 avril...	9
STUDY1-12400100009	Screen Fai...	12...	27	M	.	.



Transforms

Add Transform

Column Transforms

Change case

Convert column

Remove

Rename

Split

Trim whitespace

Custom Transforms

Calculated column

Code

Data Quality Transforms

Casing

Field extraction

Gender analysis

Identification analysis

Match and cluster

Matchcodes

Parsing

Standardize

Multi-input Transforms

Append

Join

Row Transforms

Analytic partitioning

Filter

Transpose

Unique identifier

Untitled2 DataPrep

1 Join2 Split3 Standardize4 Calculated Column

Source column:Location_Co...

Name of new column:Location_Country_STM

Locale:English (United Kingd...

Definition:Country

Character length:60

Options for new columns

AZ_DEVIATIONS (session)

Date profiled: 15 Jan 2019 16:21:54

Column	Unique	Null	Blank	Pattern
Area_redacted	5.97% (580)			
Date_Closed	96.40% (886)	5.34% (519)		
Date_Created	99.25% (9643)			
Date_Due	6.91% (669)	0.32% (31)		
Date_of_Incident	7.93% (770)			
Department_redacted	1.63% (158)			
Deviation_Level	0.03% (3)	3.02% (293)		
Event_Category_1	0.06% (6)	3.09% (300)		
Event_Category_2	0.30% (28)	3.09% (300)		
Event_Category_3	2.21% (208)	3.10% (301)		
Item_ID	100.00% (9716)			
Item_State	0.08% (8)			
Location	0.09% (9)			
RCC1_1	0.06% (5)	9.52% (925)		

Country

Select an item

Address

ASCII Non-Printable Character Removal

Business Title

Business Title (No Parse)

City

City - State/Province - Postal Code

Country

Country (FIPS)

Country (Internet)

Country (ISO 2 Char)

Country (ISO 3 Char)

Country (ISO Number)

Country (Region)

Country (Sub-Region)

Date (DMY)

Date (MDY)

Date (YMD)

Date/Time (DMY) Basic

Date/Time (DMY) Extended

Date/Time (MDY) Basic

Date/Time (MDY) Extended

Date/Time (YMD) Basic

Date/Time (YMD) Extended

E-mail

Hyphen/Dash Removal

Hyphen/Dash Space Replacement

IBAN (Electronic)

IBAN (Printed)

Run

Save

Input table (AZ_DEVIA...

Run Profile

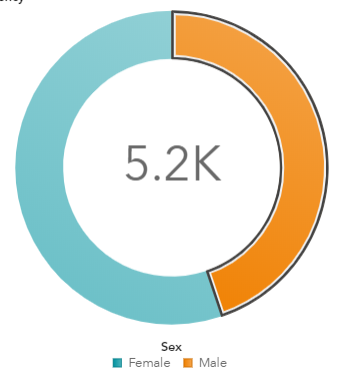
Mode	Standa...	Standa...	Minimum	Maximum	Data Ty
Area 3...			Area 1	Area 99	char
21,42...	197.82	2.06	20,739.61	21,466.60	double
	206.09	2.09	20,737.43	21,466.62	double
21,40...	206.00	2.09	20,779.00	21,508.00	double
	221.50	2.25	16,071.00	21,466.00	double
Dept 65			Dept 1	N/A	char
Minor			Critical	Minor	char
Produ...			Facility and...	Quality Sys...	char
Produ...			Change C...	Utilities	char
Other			APR/PQR ...	Yield Discr...	char
	10,38...	105.34	68,994.00	105,365.00	double
Close...			Awaiting A...	Minor Devi...	char
Argen...			Argentina ...	Global Qu...	char
People			Environment	People	char

Heart Analysis

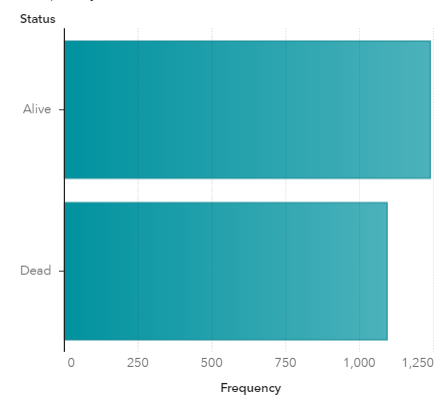
« Data Exploration Automated Analysis Decision Tree Gradient Boosting Neural Network +

Filters: Male 

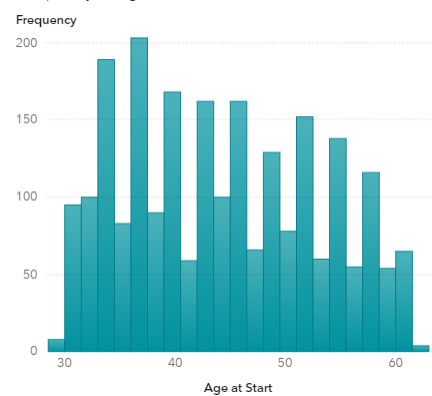
Frequency of Sex
Frequency



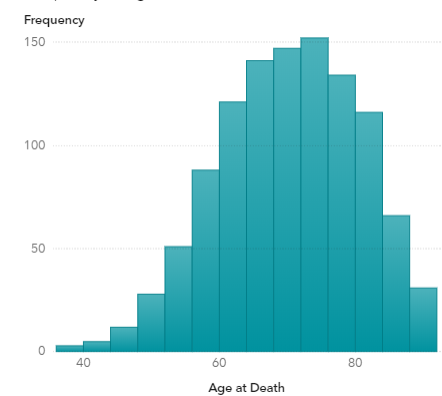
Frequency of Status



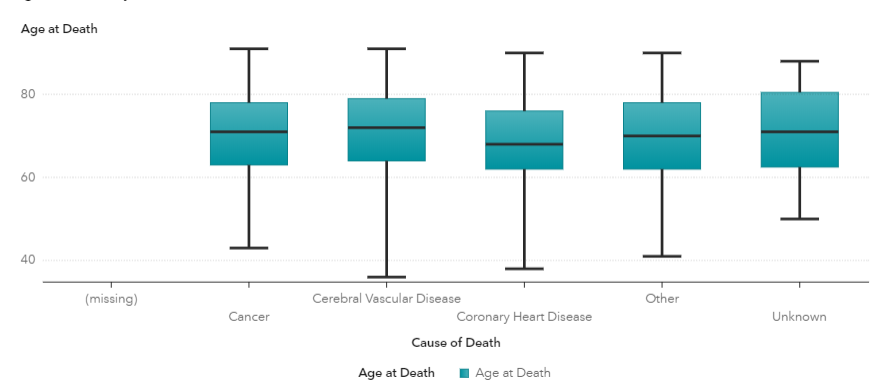
Frequency of Age at Start



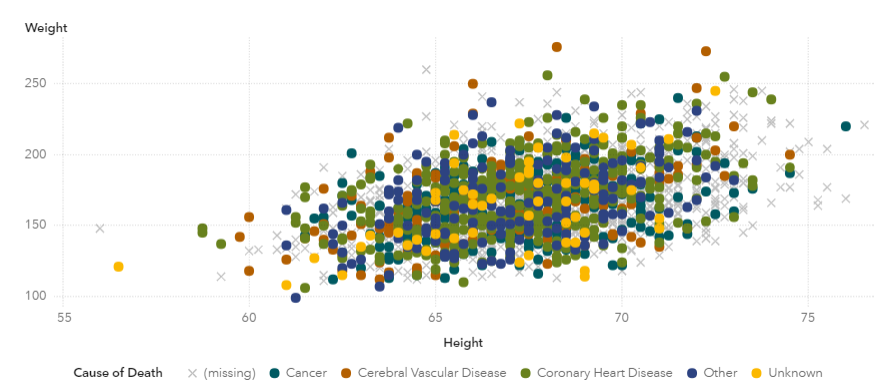
Frequency of Age at Death



Age at Death by Cause of Death

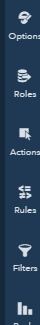


Scatter Plot of Selected Measures



Alive

Overall, **Status** has a 61.78% chance (3.2K out of 5.2K cases) of being **Alive**. Age at Start, Systolic, Diastolic, Blood Pressure Status, Cholesterol, Sex and eight other predictors best explain **Status**.



80.84%

76.70%

If **Age at Start** is less than 47, Smoking is 0, 1, 5, 10, or 35, Systolic is between 140 and 160, then Status has a 76.70% chance (237 out of 309 cases) of being Alive.

72.37%

If Systolic is greater than or equal to 140, Age at Start is less than 39, Smoking is 15 or 20, then Status has a 72.37% chance (55 out of 76 cases) of being Alive.

69.01%

If **Age at Start** is less than 47, Smoking is 0, 1, 5, 10, or 35, Systolic is greater than or equal to 160, Cholesterol is less than 221, then Status has a 69.01% chance (49 out of 71 cases) of being Alive.

18.75%

If Age at Start is greater than or equal to 55, Sex is Female, Systolic is greater than or equal to 154, then Status has a 18.75% chance (30 out of 160 cases) of being Alive.

11.22%

If Age at Start is greater than or equal to 55, Sex is Male, then Status has a 11.22% chance (33 out of 294 cases) of being Alive.

Stacked bar chart showing the distribution of age at start for 'Alive' and 'Dead' groups. The x-axis represents 'Age at Start' (ranging from 27 to 63) and the y-axis represents frequency (ranging from 0 to 300). The bars are stacked, with 'Alive' (teal) at the bottom and 'Dead' (grey) on top.

Age at Start	Alive	Dead
27	0	0
29	0	0
31	75	10
33	240	60
35	340	85
37	320	80
39	270	105
41	265	95
43	210	125
45	190	115
47	135	140
49	0	160
51	0	190
53	0	185
55	0	175
57	0	190
59	0	170
61	0	40
63	0	10

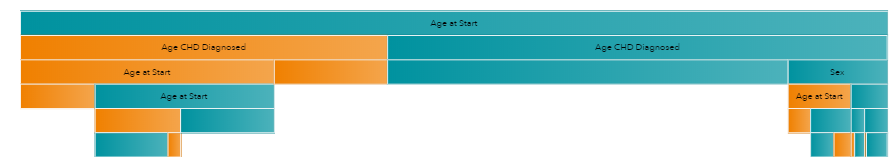
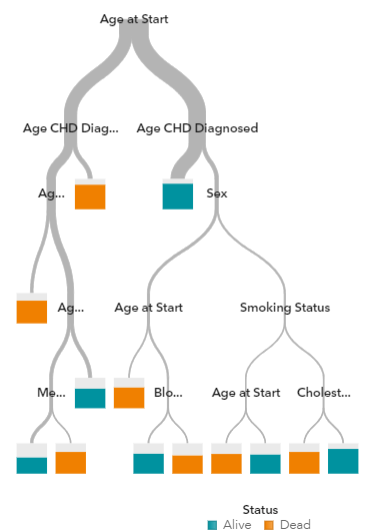
The average Age at Start when Status is Alive is 41, with a minimum of 28 and a maximum of 62. The average Age at Start when Status is Dead is 47, with a minimum of 29 and a maximum of 62.

Heart Analysis

« Data Exploration Automated Analysis **Decision Tree** Gradient Boosting Neural Network +

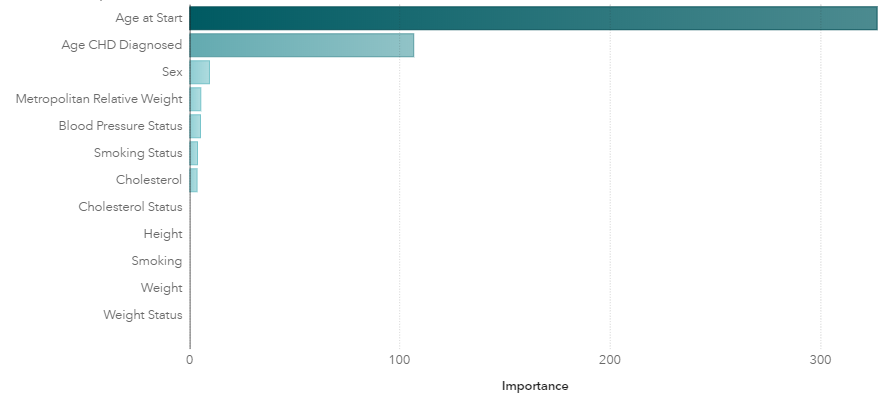
Decision Tree Status (event=Alive) Misclassification Rate 0.2430 Observations Used 5,209 [Create pipeline](#)

Tree

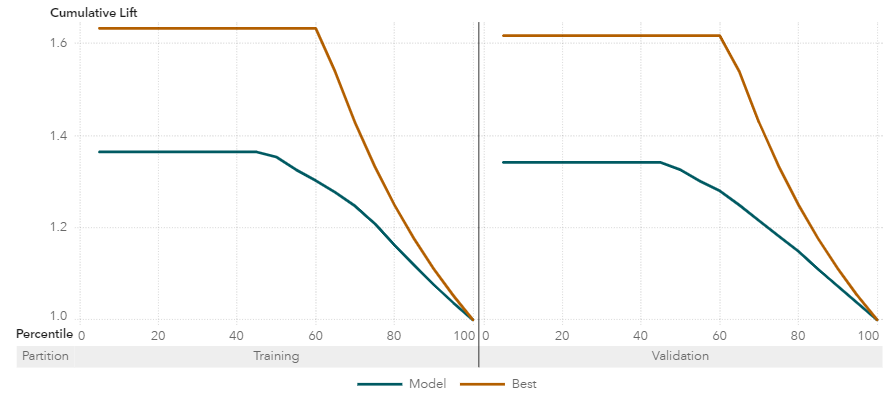


⋮


Variable Importance



Lift



Gradient Boosting Status	(event=Alive)	Misclassification Rate	0.1939	Observations Used 5,209	Create pipeline
--------------------------	---------------	------------------------	--------	-------------------------	-----------------

Variable	Count (Approximate)
Age at Start	100
Age CHD Diagnosed	95
Smoking Status	85
Cholesterol	80
Height	75
Weight	70
Metropolitan Relative Weight	65
Blood Pressure Status	60
Sex	45
Smoking	40
Cholesterol Status	35
Weight Status	10

The graph illustrates the relationship between the number of trees in a random forest and the misclassification rate for both training and validation data. The x-axis represents the 'Number of Trees' from 0 to 50, and the y-axis represents the 'Misclassification Rate' from 0.20 to 0.40. The training misclassification rate (dark teal line) starts at approximately 0.38 and decreases steadily to about 0.19. The validation misclassification rate (orange line) starts at approximately 0.37, drops sharply to about 0.27 by 5 trees, and then fluctuates slightly around 0.25 for the remaining trees.

Number of Trees	Training Misclassification Rate	Validation Misclassification Rate
1	0.38	0.37
2	0.37	0.36
3	0.30	0.31
4	0.26	0.28
5	0.24	0.27
10	0.23	0.26
15	0.22	0.26
20	0.21	0.26
25	0.21	0.26
30	0.21	0.26
35	0.20	0.26
40	0.20	0.26
45	0.19	0.25
50	0.19	0.25

Cumulative Lift

Y-axis: Lift (1.0 to 1.6)

X-axis: Percentile (0 to 100)

Legend: Model (Teal line), Best (Orange line)

Sections: Training (Percentile 0-100), Validation (Percentile 0-100)

Section	Percentile	Model Lift	Best Lift
Training	0	1.65	1.65
	10	1.65	1.65
	20	1.58	1.65
	30	1.55	1.65
	40	1.50	1.65
	50	1.45	1.65
	60	1.38	1.65
	70	1.30	1.45
	80	1.20	1.25
	90	1.10	1.10
Validation	0	1.48	1.62
	10	1.43	1.62
	20	1.46	1.62
	30	1.45	1.62
	40	1.40	1.62
	50	1.35	1.62
	60	1.30	1.62
	70	1.25	1.45
	80	1.15	1.25
	90	1.05	1.10

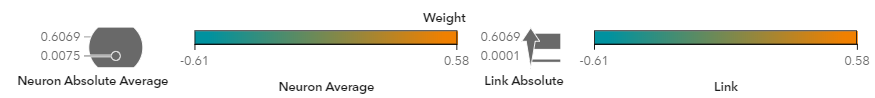
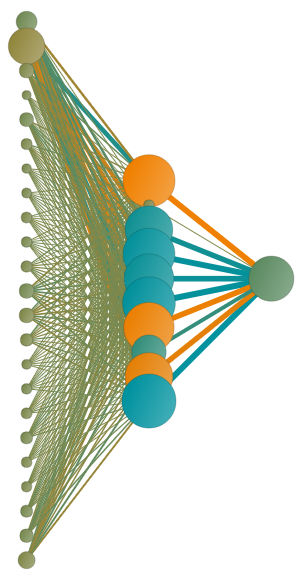
Heart Analysis

- Data
- Objects
- Outline

Data Exploration
Automated Analysis
Decision Tree
Gradient Boosting
Neural Network
+

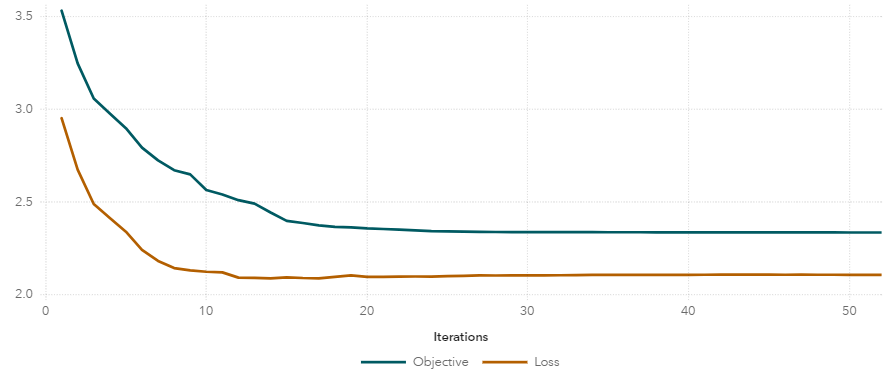
Neural Network Status
(event=Alive)
Misclassification Rate 0.2768
Observations Used 1,404
Unused 3,805
Create pipeline

Network



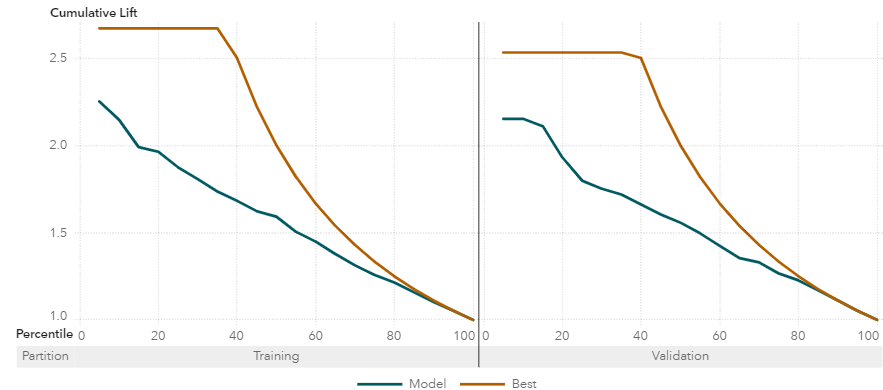
Iteration Plot

Objective / Loss



Lift

Cumulative Lift



PHUSE: Software Demo

How I changed the Habits of a Lifetime with SAS Studio and SAS Viya

SAS Studio and SAS Viya have allows me to move beyond being just a **SAS Programmer** to become a true **Data Scientist**

- Building on my coding skills
- Data visualisation
- Artificial Intelligence and Machine Learning
- Delivering true insight into the data I use everyday





Additional Slides

SAS Studio – Additional Material

Main references



SAS Studio website

<https://support.sas.com/en/software/studio-support.html>



Tutorial Video: Getting Started with SAS Studio

<https://video.sas.com/detail/video/4573016757001/getting-started-with-sas-studio?autoStart=true&q=getting%20started%20with%20sas%20studio>



SAS Studio Fact Sheet

https://www.sas.com/content/dam/SAS/en_us/doc/factsheet/sas-studio-107188.pdf



SAS Studio FAQ

<https://support.sas.com/software/products/sas-studio/faq/index.html>



SAS Studio Community

https://communities.sas.com/t5/SAS-Studio/bd-p/sas_studio



SAS Studio – Additional Material

Main references



SAS Studio documentation

<https://go.documentation.sas.com/?docsetId=webeditorug&docsetTarget=n1lynjknlzrukln1cxencems3iec.htm&docsetVersion=5.2&locale=en>



SAS Studio Programming Guide

<https://go.documentation.sas.com/?docsetId=webeditorug&docsetTarget=n0tyf6c7kxkp54n1wqfsd0ava758.htm&docsetVersion=5.2&locale=en>



SAS Studio Vs SAS Enterprise Guide

https://support.sas.com/software/products/sas-studio/faq/SASStudio_vsEG.htm



SAS Studio Tasks

<https://go.documentation.sas.com/?docsetId=webeditorug&docsetTarget=n1omecs2luwpb0n1x8btX0ya00uv.htm&docsetVersion=5.2&locale=en>



SAS Studio Integration with Git

<https://go.documentation.sas.com/?docsetId=webeditorug&docsetTarget=p0puc7muifjiycn1uemlm9lj1jkt.htm&docsetVersion=5.2&locale=en>

SAS Viya

Useful Links



SAS Viya website

https://www.sas.com/en_us/software/viya.html



SAS Viya Enablement - Free E-Learning

<https://support.sas.com/edu/schedules.html?crs=EVIYAEN&source=aem&ctry=US>



Tutorial Video: SAS® Viya™: The Big Picture

<https://video.sas.com/detail/videos/introducing-sas-viya/video/4911667600001/sas%C2%AE-viya%E2%84%A2:-the-big-picture?autoStart=true>



Documentation: SAS Viya Overview

https://go.documentation.sas.com/?cdId=pgmsascdc&cdcVersion=9.4_3.5&docsetId=viyaov&docsetTarget=titlepage.htm&locale=en

SAS Viya

Model

Governance

Monitor model performance

Decision Support

Use insight to drive
Control how and where
models are deployed

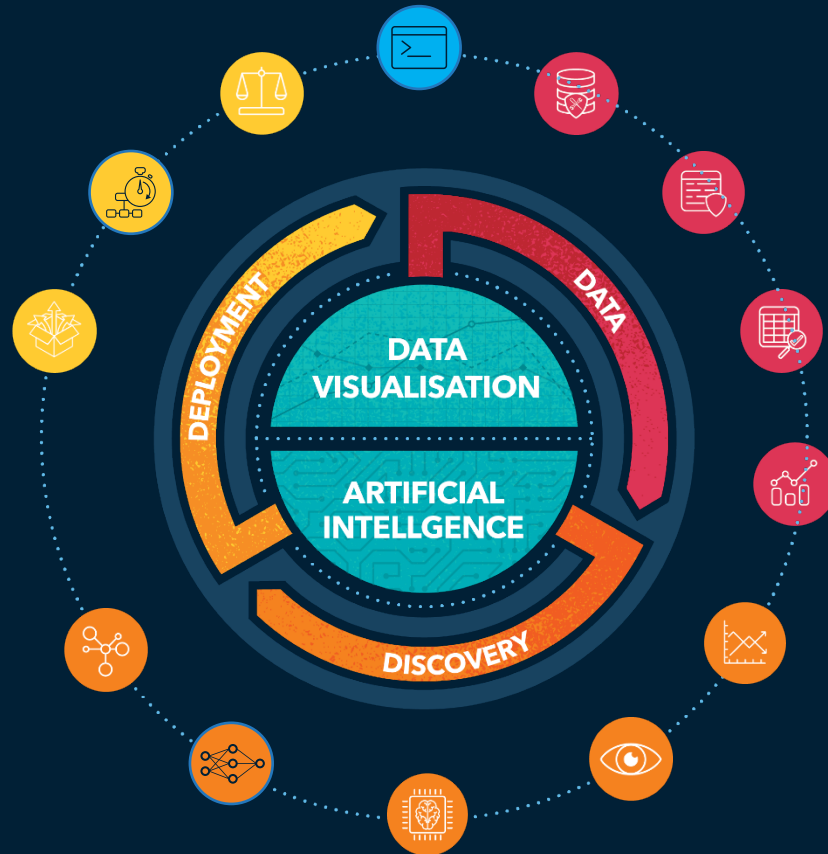
Model

Deployment

Control how and where
models are deployed

Advanced Analytics and Data Modelling

Artificial Intelligence,
Machine Learning,
Natural Language
Processing, Forecasting,
Optimisation
Image Analysis



Data Preparation

Access and convert raw
data for visualisation
and analytics

Data Profile

Analysis data by type to
identify uniqueness, key
patterns and data
issues

Data Cleansing

Sophisticated AI driven
data cleansing using
code, knowledge bases
and dictionaries

Data Visualisation

Create interactive
dashboard and reports
which can be viewed
via the web or mobile
device

SAS Viya Capabilities

Component	Overview	Link to Webpage
SAS Studio	Interactive programming development environment	https://www.sas.com/en_us/software/studio.html
SAS Visual Analytics	Visually explore all data, discover new patterns create interactive reports and dashboards which can be published to the web and mobile devices	https://www.sas.com/en_us/software/visual-analytics.html
SAS Visual Statistics	Create and modify predictive models faster than ever using a visual interface and in-memory processing	https://www.sas.com/en_us/software/visual-statistics.html
SAS Visual Data Mining and Machine Learning	Solve your most complex problems faster with a single integrated in-memory environment	https://www.sas.com/en_us/software/visual-data-mining-machine-learning.html
SAS Data Preparation	Quickly prepare data for analytics in a self-service, point and click environment with data preparation from SAS	https://www.sas.com/en_us/software/data-preparation.html
SAS Data Quality	Data profiling and cleansing using a wide range of techniques with support for over 40 languages	https://www.sas.com/en_gb/software/data-quality.html
SAS Add-In for Microsoft Office	Integration of SAS with Microsoft Office product suite	https://www.sas.com/en_gb/software/office-analytics.html

SAS Viya Capabilities

Component	Overview	Link to Webpage
SAS Visual Forecasting	Generate large numbers of reliable forecasts – quickly and automatically – in an open environment	https://www.sas.com/en_us/software/visual-forecasting.html
SAS Visual Text Analytics	Uncover insight hidden in text data with the combined power of natural language processing, machine learning and linguistic rules	https://www.sas.com/en_us/software/visual-text-analytics.html
SAS Model Manager	Register, modify, track, score, publish and report on analytics models through a web interface that is integrated with the model building process	https://www.sas.com/en_us/software/model-manager.html
SAS Optimization	Find optimal solutions to complex business and planning problems faster than ever	https://www.sas.com/en_us/software/model-manager.html
SAS Econometrics	Analyse complex business and economic scenarios, providing a scientific basis for better decision making	https://www.sas.com/en_us/software/econometrics.html
SAS Intelligent Decisioning	Enable analytically driven real-time customer interactions and automate operational business decisions at scale	https://www.sas.com/en_us/software/intelligent-decisioning.html
SAS Event Stream Processing	SAS Event stream processing capability – deployment of data processing, data cleansing, advanced analytics and AI and ML against streaming data	https://www.sas.com/en_us/software/event-stream-processing.html