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 enhance reporting and visualization of STDM and ADAM data

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.

sas

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

Open Files

Save all 1 unsaved

Start Page

* Regression.sas

Start Page × * Regression.sas +

GET STARTED

Program in SAS

Build a flow

Import data

Query data

NEW Explore new features in SAS Studio

LEARN

Learn SAS Studio - videos, tutorials, and training

Learn SAS programming

STAY CONNECTED

Join the community

Request a feature

Welcome to

SAS STUDIO

A rich environment to develop code and design flows.

Flows

Simplify and model repeatable steps.

Tasks

Analyze data and create reports via point-and-click wizards.

Data Access

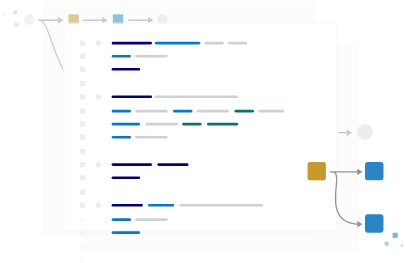
Import and access data seamlessly.

Data Preparation

Join, filter, sort, and transform data via a robust query.

Collaboration

Organize and share work.



SAS® Studio - Develop SAS Code

New Options View Open Save All

Open Files

Explore

Snippets

Tasks

Libraries

GIT

Programs

Run Cancel Copy to My Snippets Debug

Sep 3, 2020, 11:31:04 AM

Code

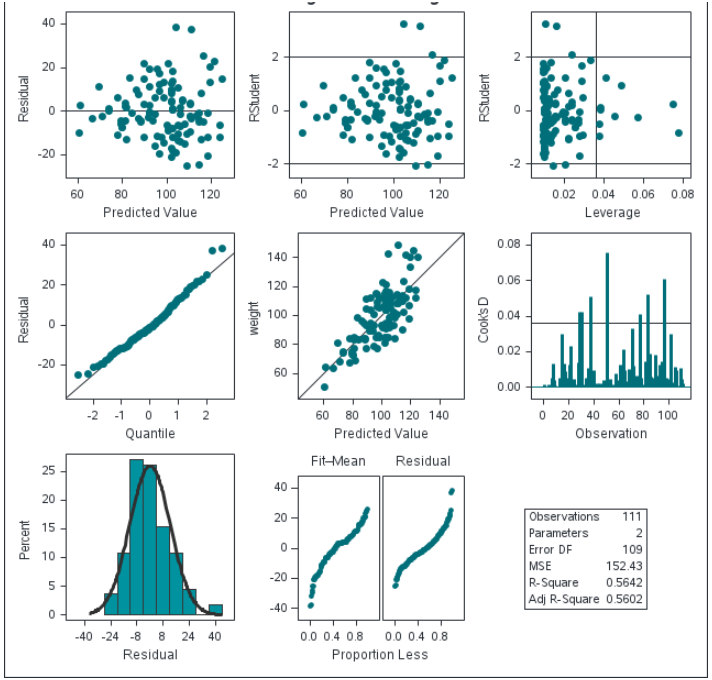
Log / Results / Output

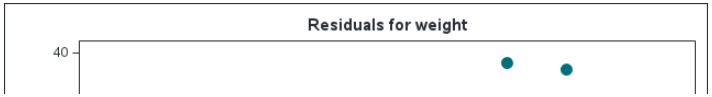
Log Results Output Data

```
2                 S A S   S A M P L E   L I B R A R Y
4                 PROC REG
5                 Age, Weight, and Height of Children
7                 PRODUCT: STAT
8                 SYSTEM: ALL
9                 Output data sets, BY processing
10                PROCS: REG
11
12 ----------------------------------------------------------------*/
13
14 proc reg data=htwt outest=est1 outsscp=sscp1 rsquare;
15     by sex;
16     eq1: model weight=height;
17     eq2: model weight=height age;
18     run;
19
20 proc print data=sscp1;
21     title2 'SSCP type data set';
22 run;
23
24 proc print data=est1;
25     title2 'EST type data set';
26 run;
```

Interactive Code Editor

- 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





File: /Users/sukaba/My Folder/Regression.sas Line 1 Column 1 UTF-8

Recover (2) Submission (0)

SAS® Studio - Develop SAS Code

New Options View Open Save All

Start Page | * Regression.sas

Run Cancel Recall

```
      TITLE: PROC REG
             Age, Weight, and Height of Children
       DATA: htwt
    PRODUCT: STAT
     SYSTEM: ALL
       KEYS: Output data sets, BY processing
      PROCS: REG

-----------------------------------------------------------------*/
proc reg outest=est1 outsscp=sscp1 rsquare;
    by sex;
    eq1: model weight=height;
    eq2: model weight=height age;
    run;

proc print data=sscp1;
    title2 'SSCP type data set';
run;

proc print data=est1;
    title2 'EST type data set';
run;
```

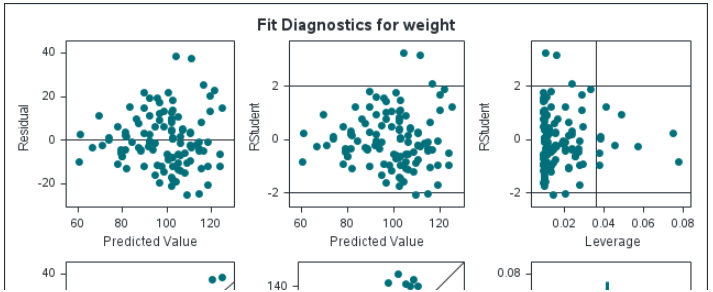
Log | Results

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



File: /Users/sukaba/My Folder/Regression.sas Line 13 Column 1 UTF-8

Recover (2) Submission (0)

SAS® Studio - Develop SAS Code

New Options View Open Save All

Start Page | * Regression.sas

Run Cancel Copy to My Snippets Debug

Sep 3, 2020, 11:31:04 AM

Code

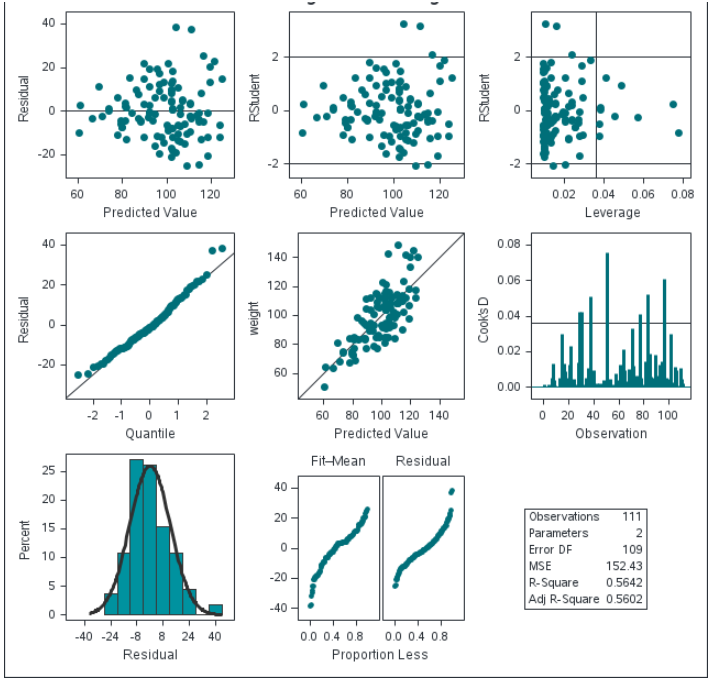
```
/*-----------------------------------------------------------------
            S A S   S A M P L E   L I B R A R Y

      TITLE: PROC REG
             Age, Weight, and Height of Children
       DATA: htwt
    PRODUCT: STAT
     SYSTEM: ALL
       KEYS: Output data sets, BY processing
      PROCS: REG

-----------------------------------------------------------------*/

proc reg data=htwt outest=est1 outsscp=sscp1 rsquare;
    b
    e
    e
    r

proc
    t
run;

proc
    t
run;
```

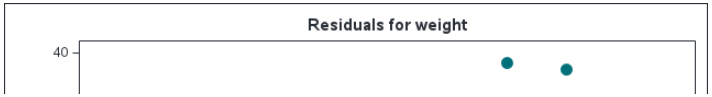
Keyword: REG
Context: [PROCEDURE DEFINITION] PROC REG

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> </ option> ;

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





File: /Users/sukaba/My Folder/Regression.sas Line 14 Column 7 UTF-8

Recover (2) Submission (0)

SAS® Studio - Develop SAS Code

New Options View Open Save All

SAS Studio compute context

Explorer

- My Favorites
- Folder Shortcuts
  - Shortcut to My Fol...
    - My Snippets
    - My Tasks
      - Regressi...
- sas-launcher-...
- SAS Content

Open
Insert
Insert as path
Schedule as a job
Background submit
Create job
Copy to My Snippets
Add to My Favorites
Add to flow
Create file reference
Delete
Move to
Copy to
Download file
Properties

Start Page | Regression.sas

Run Cancel Copy to My Snippets Code to Flow Debug

Aug 21, 2020, 3:49:48 PM

Code

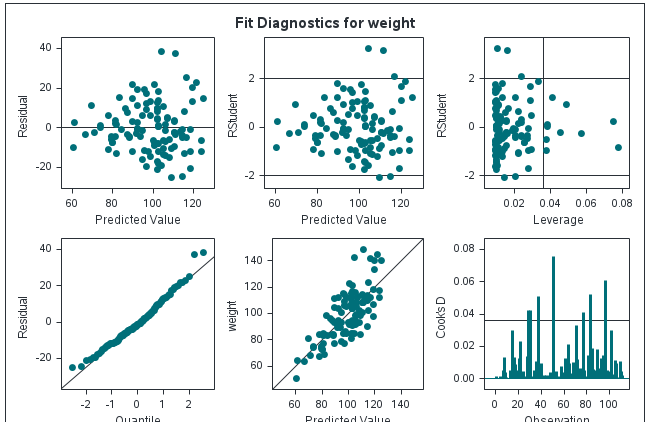
```
proc reg data=htwt outest=est1 outsscp=sscp1 rsquare;
   by sex;
   eq1: model  weight=height;
   eq2: model  weight=height age;
run;

proc print data=sscp1;
  title2 'SSCP type data set';
run;

proc print data=est1;
  title2 'EST type data set';
run;
```

Log | Results | Output Data

- The Reg Procedure
  - sex=f
    - eq1
      - Fit
        - weight
          - Number of Obser...
          - 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 Obser...
          - Analysis of Variance
          - Fit Statistics

The REG Procedure
Model: eq1
Dependent Variable: weight

sex=f



Submission Status

Filter

Status (no filter)

Successful (1)

Filter submissions list | Cancel All | Clear All

		Name	Type	Run Time	Submitted	Completed	Server
✓		Regression.sas	Program	14.693s	8/21/2020, 3:49:48 PM	8/21/2020, 3:50:03 PM	SAS Studio compute context

File: /Users/sukaba/My Folder/Regression.sas

Line 1 Column 1 UTF-8 Recover (1) Submission (0)

SAS® Studio - Develop SAS Code

New Options View Open Save All

Start Page | RegressionJob.sas ×

Run Cancel Copy to My Snippets Debug

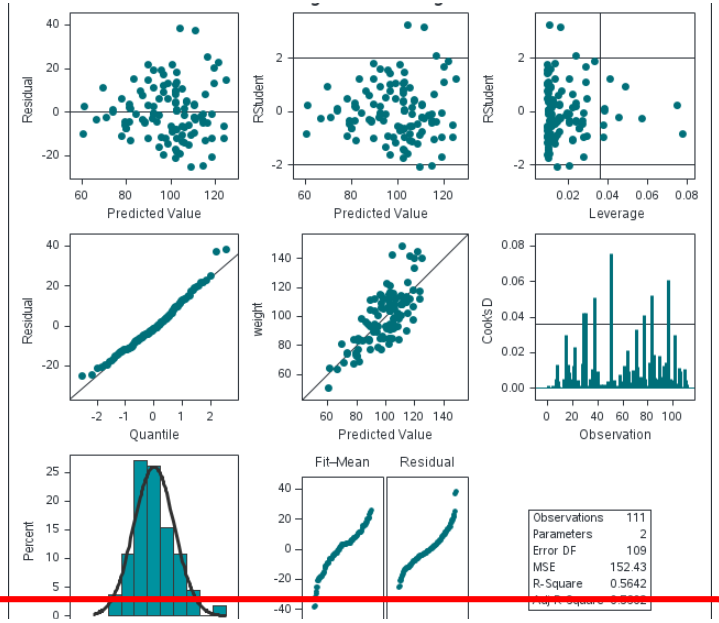
Sep 3, 2020, 11:31:04 AM

Code

```
/*-----------------------------------------------------------------
            S A S   S A M P L E   L I B R A R Y

      TITLE: PROC REG
             Age, Weight, and Height of Children
       DATA: htwt
    PRODUCT: STAT
     SYSTEM: ALL
       KEYS: Output data sets, BY processing
      PROCS: REG

-----------------------------------------------------------------*/

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

proc print data=sscp1;
    title2 'SSCP type data set';
run;

proc print data=est1;
    title2 'EST type data set';
run;
```

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
        - Observation-wise Statistics



Console ×

All Errors Warnings Info Logs Debug Clear All

- Regression.sas submitted
- Regression.sas completed successfully
- Regression.sas elapsed time 3.61 seconds

File: /Users/sukaba/My Folder/RegressionJob.sas Line 3 Column 1 UTF-8

Recover (1) Submission (0)

SAS® Studio - Develop SAS Code

New Options View Open Save All

SAS Studio compute context

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

Run Cancel Copy to My Snippets Code to Flow Debug

Code

```
/* Import a csv file from the location specified on the filename statement */
/* The SAS data set created is named by substituting a name for work.mycsv */

filename csv "<location on file system of the CSV file>";

/* Import the csv file */
proc import datafile=csv out=work.mycsv dbms=csv;
   getnames=yes;
   run;

/* Print the first 10 observations **/
proc print data=work.mycsv(obs=10);
   run;

filename csv;
```

Log

Import CSV File.sas [temp]

Line 1 Column 1 UTF-8 Submission (0)

SAS® Studio - Develop SAS Code

New Options View Open Save All

SAS Studio compute context

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.ctk

Run Cancel Copy to My Tasks Code to Flow (0)

Data Options Information

Data

SASHELP.HEART

Filter: (none)

Automatic Characterization

Variables:

- AgeAtStart
- Height
- Weight

Custom Characterization

Categorical variables:

- Sex

Date variables:

Add numeric variables

Task Console (0)

No items

Code Log Edit Code

```
/*
 *
 * 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-tvbws'
 * 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;
```

Characterize Data.ctk [temp]

Line 1 Column 1 | Submission (0)

SAS® Studio - Develop SAS Code

New Options View Open Save All

SAS Studio compute context

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.ctk

Run Cancel Copy to My Tasks Code to Flow (0)

Data Options Information

Categorical Variables

- [x] Frequency table
- [x] Frequency chart
- [ ] Treat missing values as valid level
- [ ] Limit categorical values

Numeric Variables

- [x] Descriptive statistics
- [x] Histogram

Date Variables

Task Console (0)

No items

Code Log Edit Code

```
/*
 *
 * 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-tvbws'
 * 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;
```

Characterize Data.ctk [temp]

Line 1 Column 1 | Submission (0)

SAS® Studio - Develop SAS Code

New Options View Open Save All

SAS Studio compute context

Tasks

Filter tasks

SAS Tasks My Tasks

- Econometrics
- Forecasting
- Optimization and Network Analysis
- Prepare Data
  - Examine Data
    - Characterize Data
    - Describe Missing Data
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    - List Table Attributes
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- 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.ctk

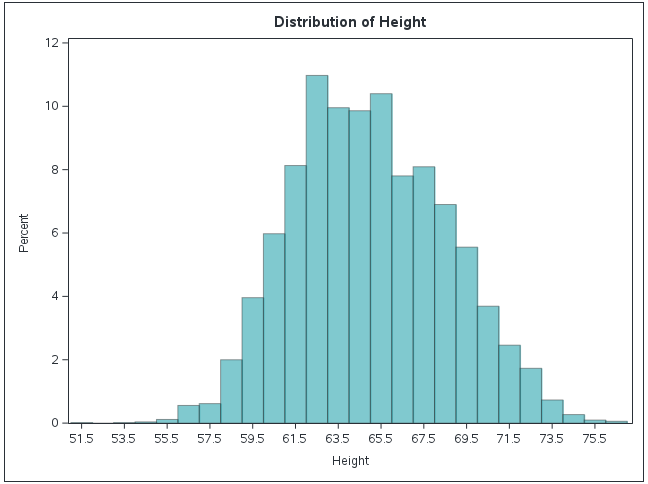
Run Cancel Copy to My Tasks Code to Flow

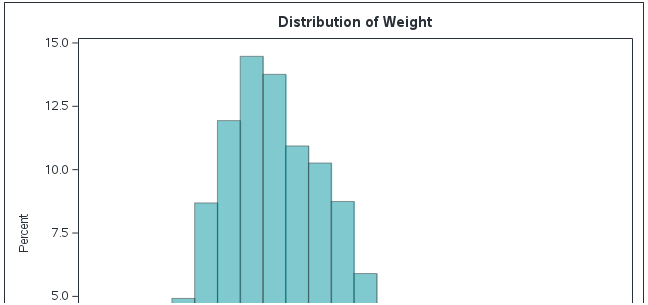
Aug 21, 2020, 3:03:22 PM (0)

Code Log Results

Edit Code

- 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





Characterize Data.ctk [temp]

Line 1 Column 1 Submission (0)

SAS® Studio - Develop SAS Code

New Options View Open Save All

Start Page | Local ×

Git Repositories

Clone Add

Current Repository

Local

✓ master (1)

Local Current repository | **master** Current branch | **Pull master** Last pulled: Nov 13, 2019,... | **Push master** Last pushed: Nov 13, 201... 1

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.

Local (1) (0) Submission (0)

SAS® Studio - Develop SAS Code

New Options View Open Save All

SAS Studio compute context

Tasks

Filter tasks

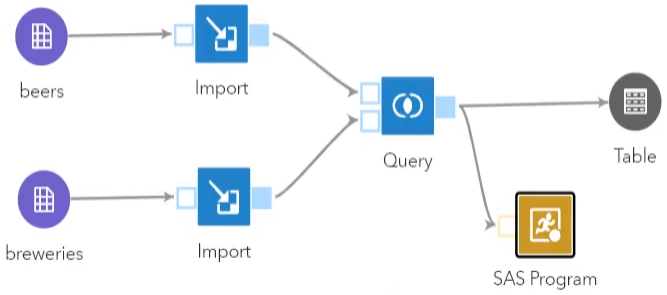
SAS Tasks My Tasks

- 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

Run Add View Apr 20, 2020 05:20 PM

Flow Generated Code Submission



SAS Program

Code Node

```
proc freq data=&input1;
tables beer_name;
where state = "ND";
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

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 diuerent 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 yourdata.

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

STUDY1 STUDY2

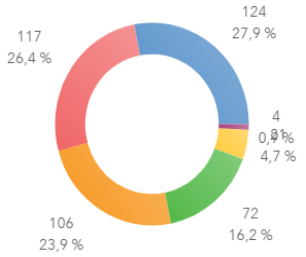
Summary of Demogrpahic Characteristics | Adverse Event Body System | Adverse Event Analysis on Preferred Term | Concomitant Medication

Study Site Identifier | Subject Death Flag

Subjects in the study

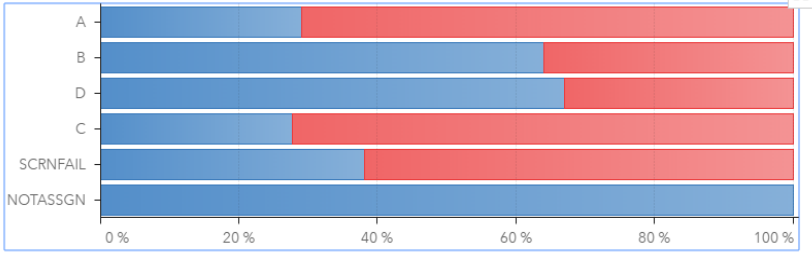
444

Count of Planned arm



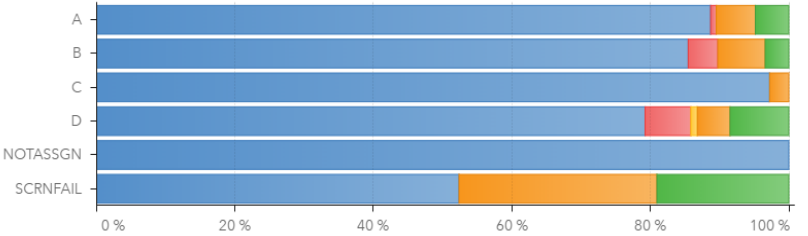
Count of Actual Arm

Gender Distribution



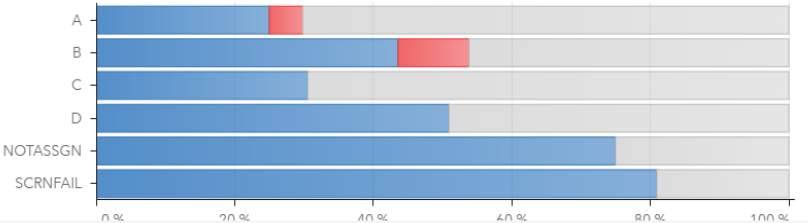
Description of Planned Arm	Age	Unique Subject Identifier (Distinct Co...	Frequency Percent
Placebo/ProductX 600U	43,9	26	16,22 %
ProductX 600U	46,4	41	27,93 %
Not Assigned	47,5	4	0,90 %
Screen Failure	48,1	13	4,73 %
ProductX 800U	49,1	41	26,35 %
Placebo/ProductX 800U	49,3	29	23,87 %

Race Distribution



Study Site Identifier	Subject Identifier for the Study	Unique Subject Identifier	Description of Actual Arm	Subject Reference Start Date/Time	Subject Reference End Date/Time	Date/Time of Informed Consent	Da of
642001	64200100016	STUDY1-6420010...		2018-09-26T...	2018-09-26	2018-09-03	20
616007	61600700001	STUDY1-6160070...		2018-08-07T...	2018-08-07	2018-07-06	20
792006	79200600018	STUDY1-7920060...		2018-03-27T...	2018-03-27	2018-03-06	20
840009	84000900002	STUDY1-8400090...		2018-07-17T...	2018-07-17	2018-05-24	20
792006	79200600015	STUDY1-7920060...		2018-03-02T...	2018-07-03	2018-02-21	20
792006	79200600021	STUDY1-7920060...		2018-04-26T...	2018-08-02	2018-04-12	20
840011	84001100008	STUDY1-8400110...		2018-08-06T...	2018-08-06	2018-07-16	20
642001	64200100014	STUDY1-6420010...		2018-08-29T...	2018-08-29	2018-08-07	20
840042	84004200003	STUDY1-8400420...		2018-09-27T...	2018-09-27	2018-09-11	20
380010	38001000009	STUDY1-3800100...		2018-03-22T...	2018-03-22	2018-02-13	20

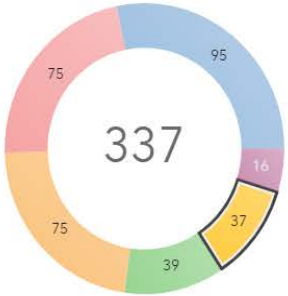
Ethnic Distribution



STUDY1 STUDY2

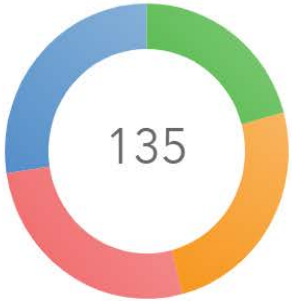
Summary of Demogrpahic Characteristics | Adverse Event Body System | Adverse Event Analysis on Preferred Term | Concomitant Medication

Pt receiving at least one Concomitant meds

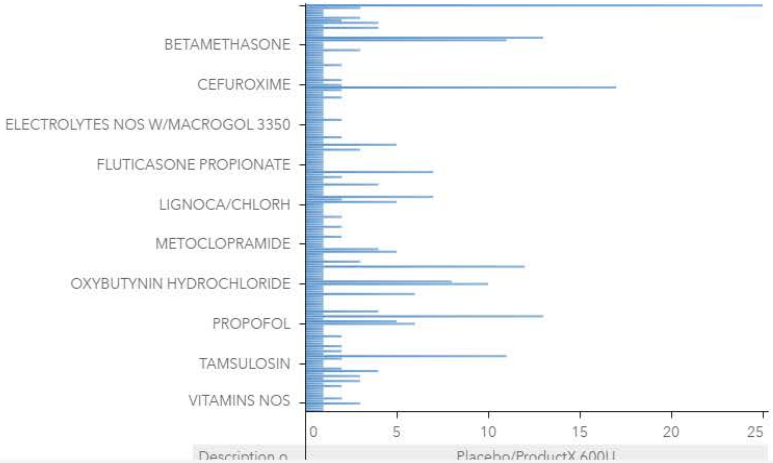


Category for Medication

Subcategory of Medication



Number of Subjects

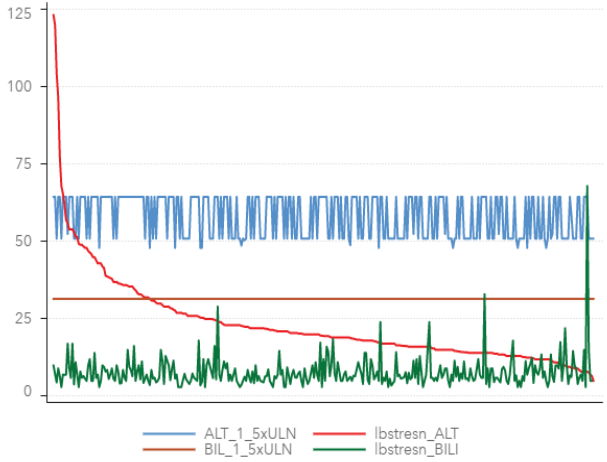


Medication Name Listing

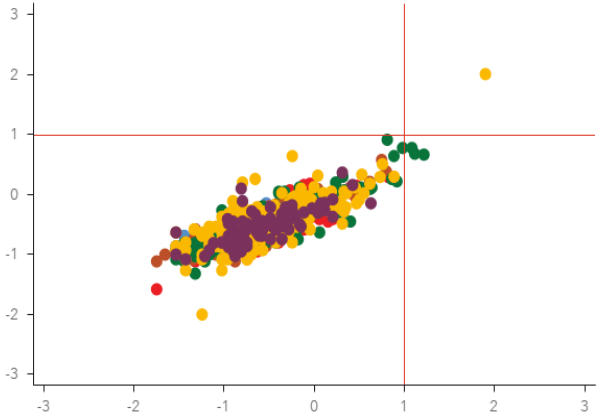
Unique Subject Identifier	Age	Sex	Race	Route of Administration	Dose Units	Dosing Frequency per Interval	Dose per Administration
STUDY1-840039000...	72	F	WHITE	ORAL	mg	BID	100
STUDY1-840039000...	72	F	WHITE	ORAL	mg	QD	139,28571429
STUDY1-840039000...	72	F	WHITE	INTRAMUSCULAR	U	ONCE	200
STUDY1-380004000...	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

Lab Analysis | Lab Shift Analysis | Hy's Law DILI Analysis | VS Analysis | Medical History Analysis

Filtres : Aucune sélection



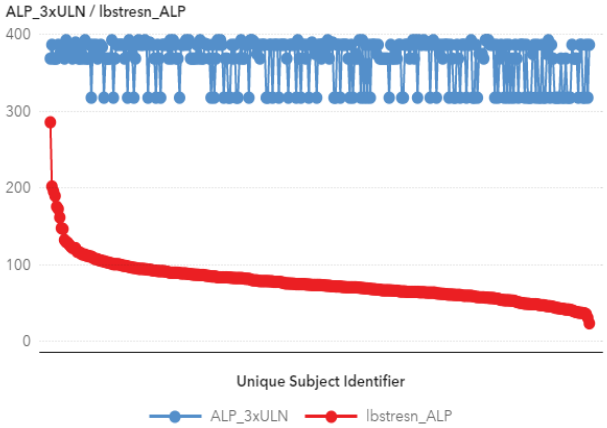
ALT vs AST



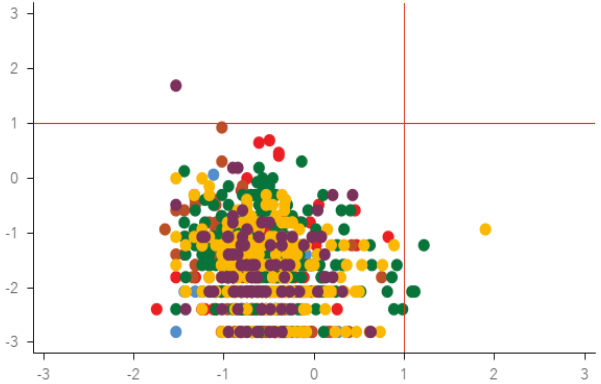
Hy's Law Criteria

☐ 0,00 100,00 %

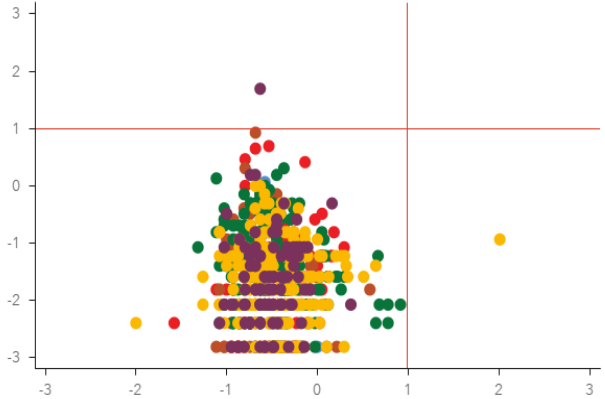
Unique Subject Identifier	Description of Planned Arm	Study Sit...	Age	Sex	rfstdt	rfe
STUDY1-12400100001	Screen Fai...	12...	88	F	.	.
STUDY1-12400100002	ProductX...	12...	605	M	22 nov...	23
STUDY1-12400100003	Placebo/P...	12...	450	M	31 janv...	30
STUDY1-12400100004	Screen Fai...	12...	65	F	.	.
STUDY1-12400100005	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	.	.



ALT vs BILI



AST vs BILI



SAS® Data Studio - Prepare Data

Search

Untitled | 2 DataPrep

Run | Save

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

1 Join — 2 Split — 3 Standardize — 4 Calculated Column

Source column:	Name of new column:	Locale:	Definition:	Character length:
Location_Co...	Location_Country_STN	English (United Kingd...	Country	60

Options for new columns

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)

AZ_DEVIATIONS (session)

Date profiled: 15 Jan 2019 16:21:54

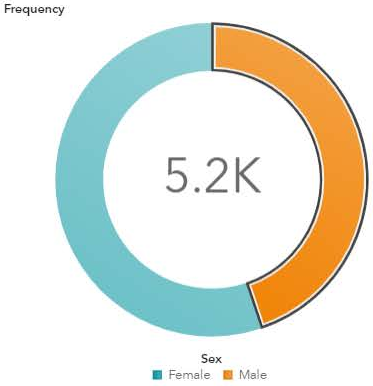
Input table (AZ_DEVIA... | Run Profile

Column	Unique	Null	Blank	Patte	Mode	Standa...	Standa...	Minimum	Maximum	Data Ty
Area_redacted	5.97% (580)				Area 3...			Area 1	Area 99	char
Date_Closed	96.40% (8866)	5.34% (519)			21,42...	197.82	2.06	20,739.61	21,466.60	double
Date_Created	99.25% (9643)					206.09	2.09	20,737.43	21,466.62	double
Date_Due	6.91% (669)	0.32% (31)			21,40...	206.00	2.09	20,779.00	21,508.00	double
Date_of_Incident	7.93% (770)					221.50	2.25	16,071.00	21,466.00	double
Department_reda	1.63% (158)				Dept 65			Dept 1	N/A	char
Deviation_Level	0.03% (3)	3.02% (293)			Minor			Critical	Minor	char
Event_Category_1	0.06% (6)	3.09% (300)			Produ...			Facility and...	Quality Sys...	char
Event_Category_2	0.30% (28)	3.09% (300)			Produ...			Change C...	Utilities	char
Event_Category_3	2.21% (208)	3.10% (301)			Other			APR/PQR ...	Yield Discr...	char
Item_ID	100.00% (9716)					10,38...	105.34	68,994.00	105,365.00	double
Item_State	0.08% (8)				Close...			Awaiting A...	Minor Devi...	char
Location	0.09% (9)				Argen...			Argentina ...	Global Qu...	char
RCC1_1	0.06% (5)	9.52% (925)			People			Environment	People	char

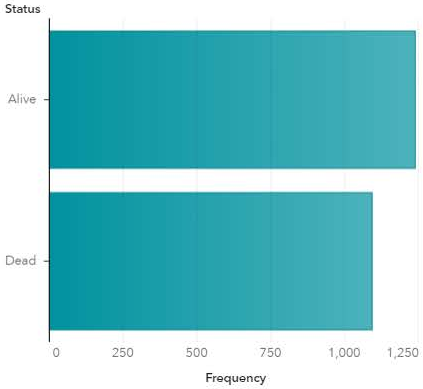
Heart Analysis

Filters: Male

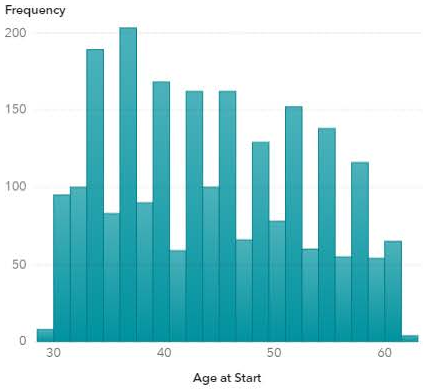
Frequency of Sex



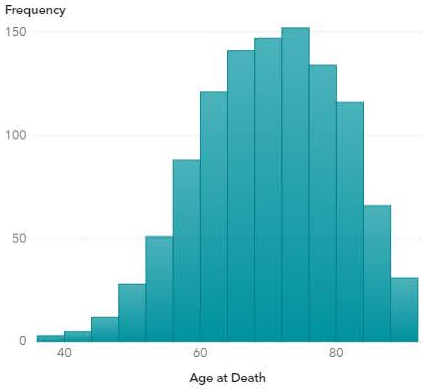
Frequency of Status



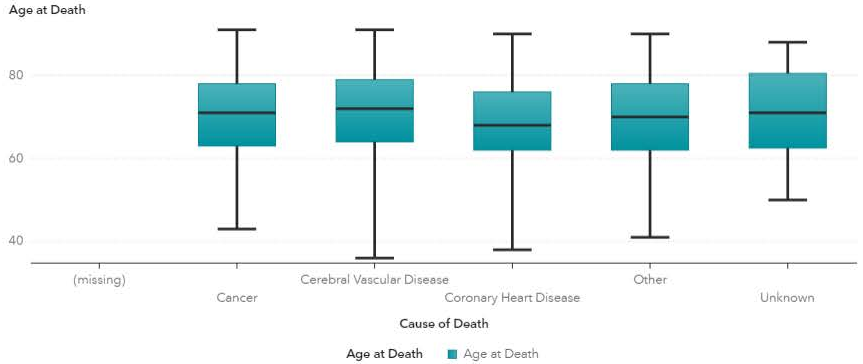
Frequency of Age at Start



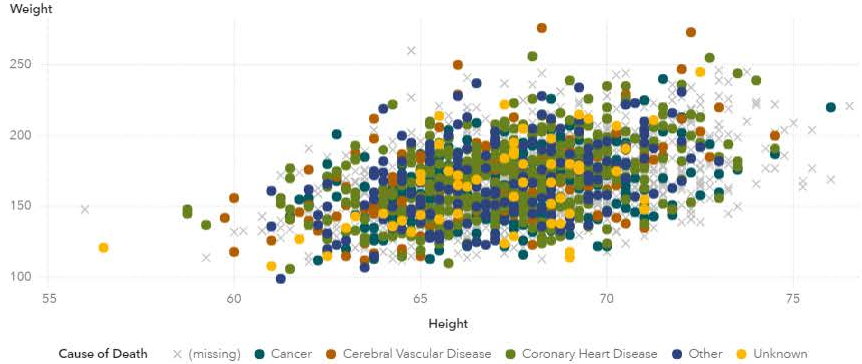
Frequency of Age at Death



Age at Death by Cause of Death



Scatter Plot of Selected Measures



Explaining Status

Alive

61.78% 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**.

Groups by Chance of Status

80.84% If Age at Start is less than 47, Systolic is less than 140, then Status has a 80.84% chance (2.1K out of 2.6K cases) of being Alive.

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.

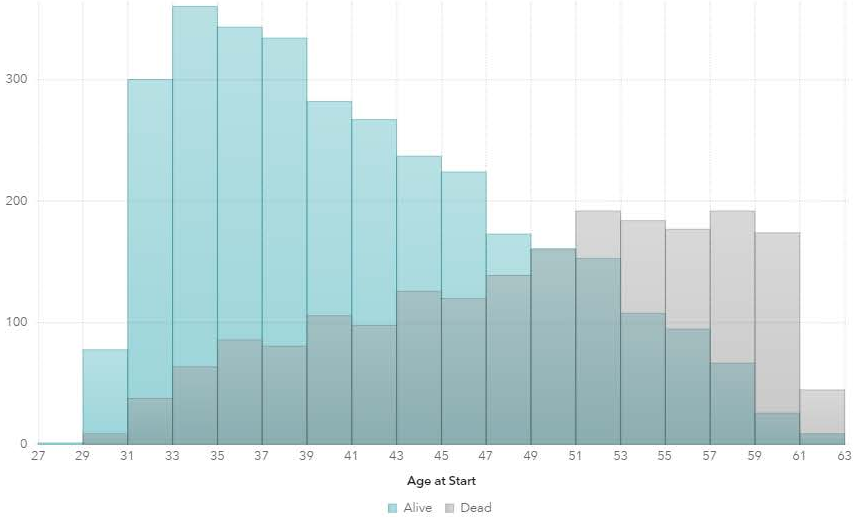
72.37% If Systolic is greater than or equal to 140, Age at Start is less than 39, Smoking is 15 or 20, then Status has a 72.37% chance (55 out of 76 cases) of being Alive.

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.

Status by Age at Start



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.

SAS® Visual Analytics - Explore and Visualize Data

Search

Heart Analysis

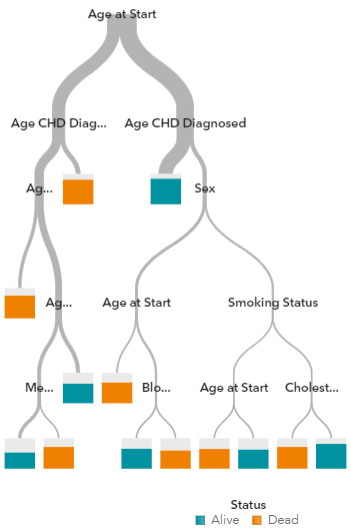
Data Exploration | Automated Analysis | Decision Tree | Gradient Boosting | Neural Network

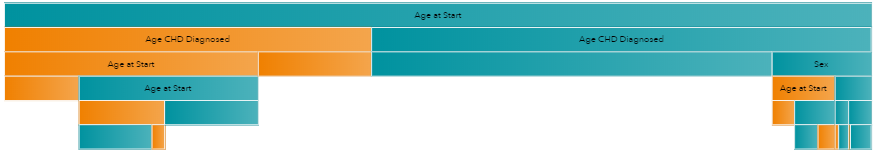
Data | Objects | Outline

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

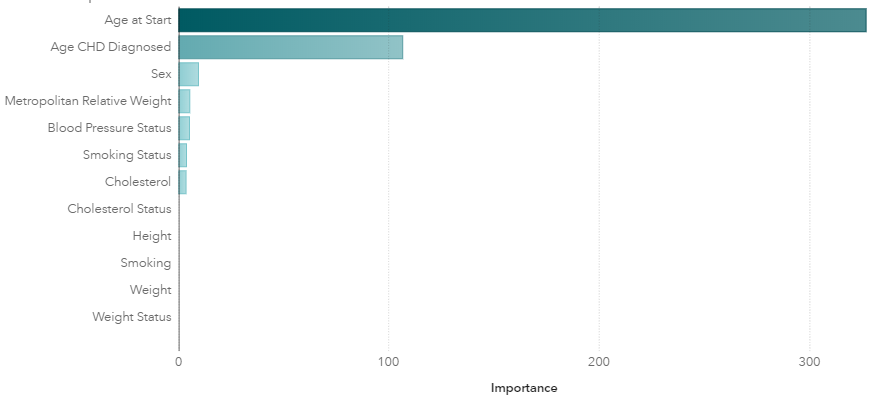
Options | Roles | Actions | Rules | Filters | Ranks

Tree

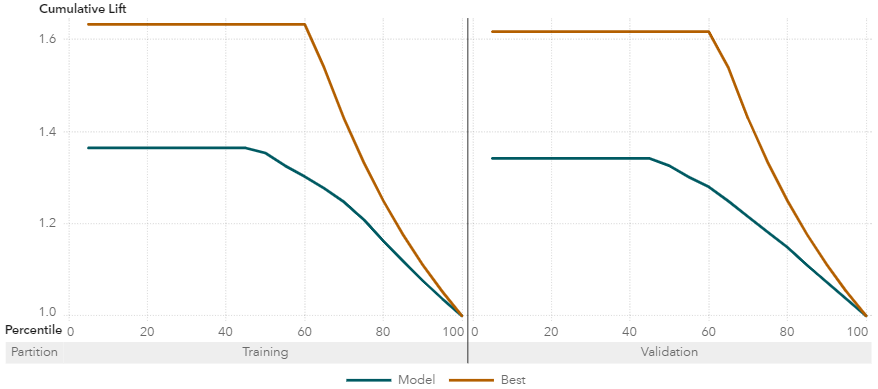




Variable Importance



Lift



SAS® Visual Analytics - Explore and Visualize Data

Search

Heart Analysis

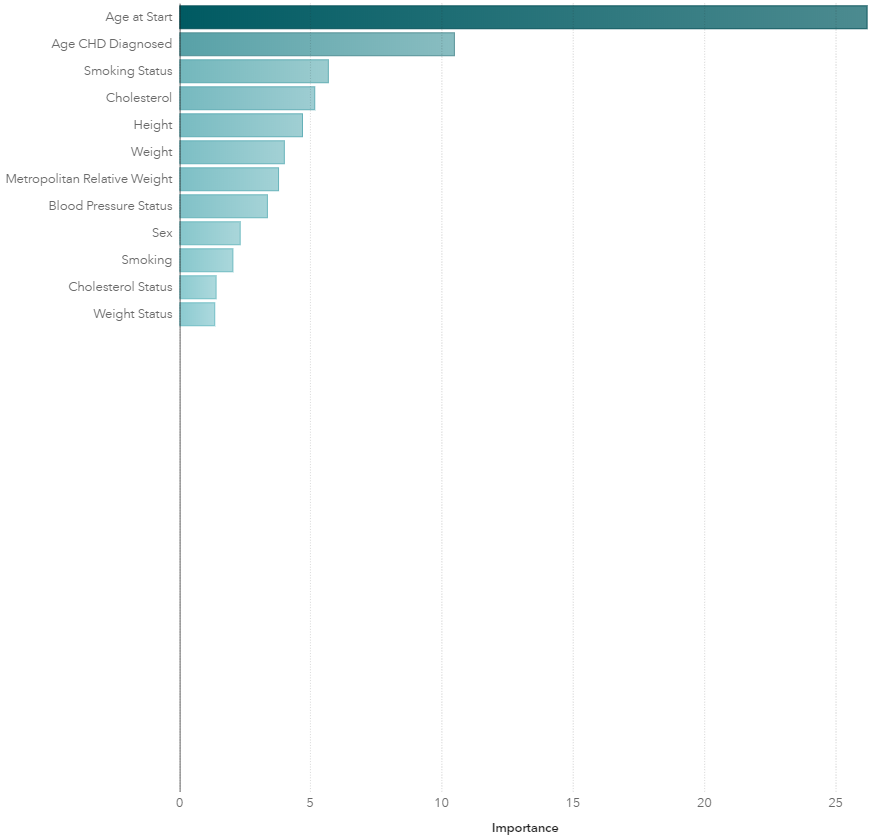
Data Exploration | Automated Analysis | Decision Tree | Gradient Boosting | Neural Network

Data | Objects | Outline

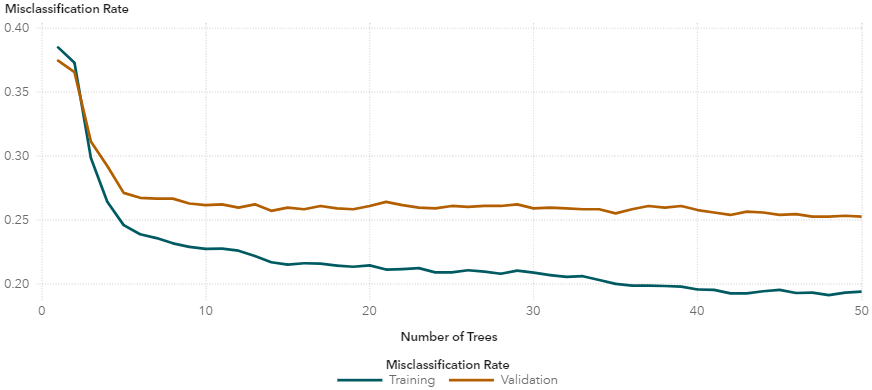
Options | Roles | Actions | Rules | Filters | Ranks

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

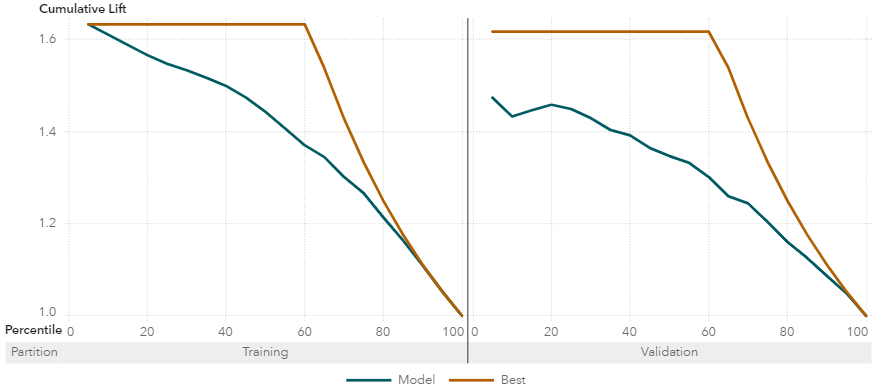
Variable Importance



Iteration Plot



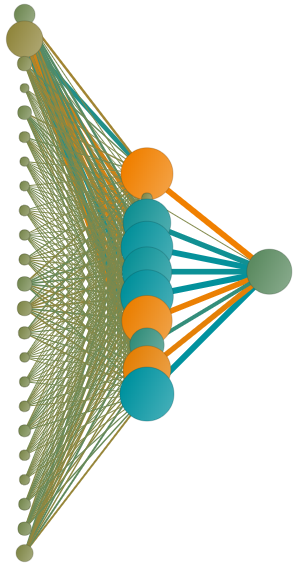
Lift

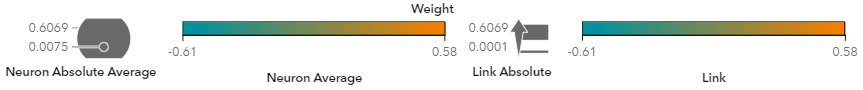


Heart Analysis

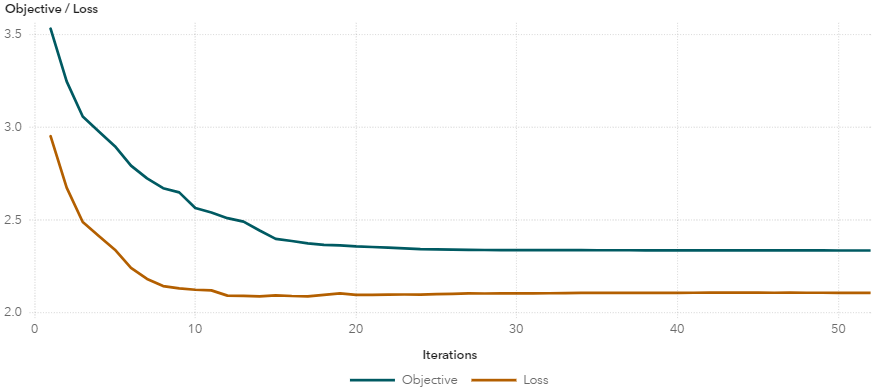
Neural Network **Status** (event=Alive) Misclassification Rate **0.2768** Observations Used **1,404** Unused **3,805** Create pipeline

Network

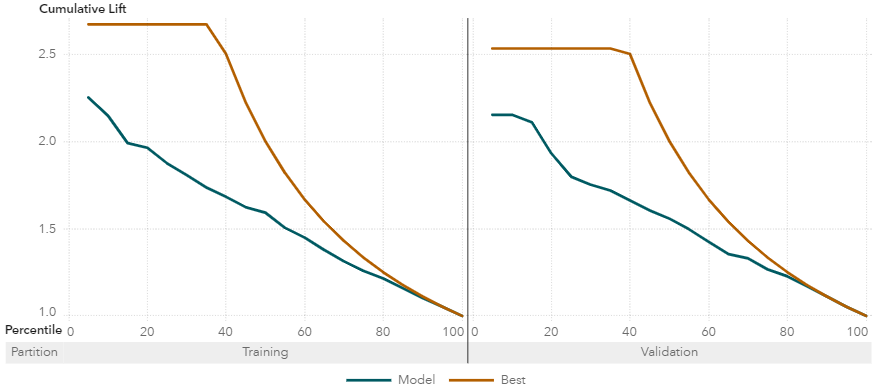




Iteration Plot



Lift



Model Studio - Build Models

My Model Pipeline

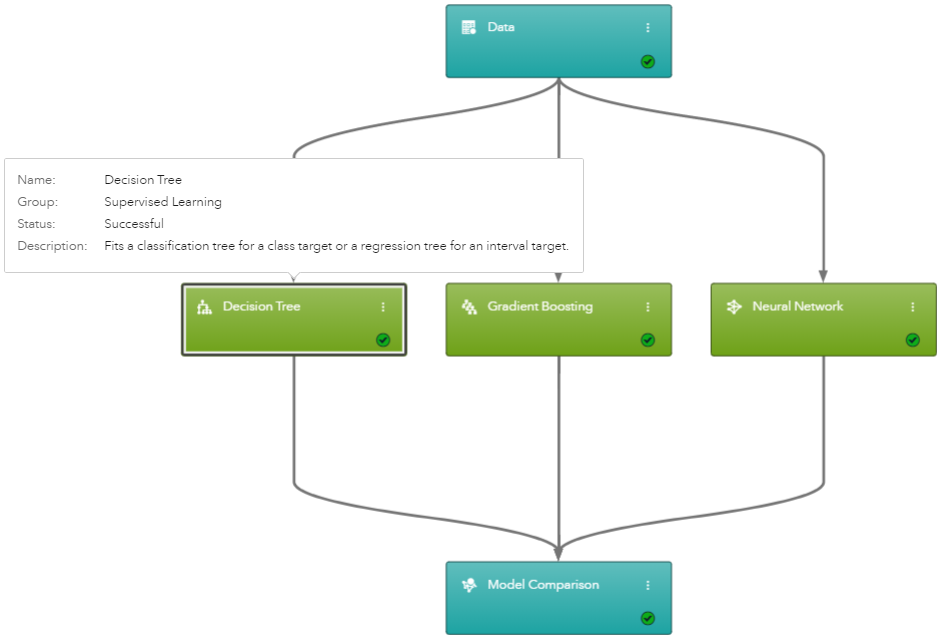
Data | Pipelines | Pipeline Comparison

Nodes

Filter

- Data Mining Preprocessing
- Supervised Learning
- Postprocessing
- Miscellaneous

Pipeline 1



Decision Tree

The Decision Tree node is a Supervised Learning node that creates a predictive model called a decision tree. There are two types of decision trees: classification trees that model a class target and regression trees that model an interval target. In a decision tree, the input variable and its split value that minimize the variability in the target are used to create a rule to split the data into two or more subsets. The process is then repeated in each subset, and then again in each new subset, and so on until some constraint is met. In the terminology of the tree metaphor, the subsets are nodes, the original data table is the root node, and the final unpartitioned subsets are leaves or terminal nodes. A node is an internal node if it is not a leaf. The data in a leaf determine the estimates of the value of the target variable. These estimates are subsequently applied to predict the target of a new observation that is assigned to the leaf. The process of building a decision tree begins with growing a large, full tree. The full tree can overfit the training data, resulting in a model that does not adequately generalize to new data. To prevent overfitting, the full tree is often pruned back to a smaller subtree using the validation partition. If your data is not partitioned, you can use cost-complexity pruning with k-fold cross-validation to prune either type of decision tree or C4.5 pruning to prune a classification tree.

You can view two visual representations of your decision tree in the node results. The first is the Tree Diagram that shows the nodes and branches of the tree. The width of each branch is proportional to the number of observations in that branch. Each node can contain an embedded bar chart representing

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

THE POWER TO KNOW.

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=p0puc7muifjjycn1uemlm9lj1jkt.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/?cdcId=pgmsascdc&cdcVersion=9.4_3.5&docsetId=viyaov&docsetTarget=titlepage.htm&locale=en

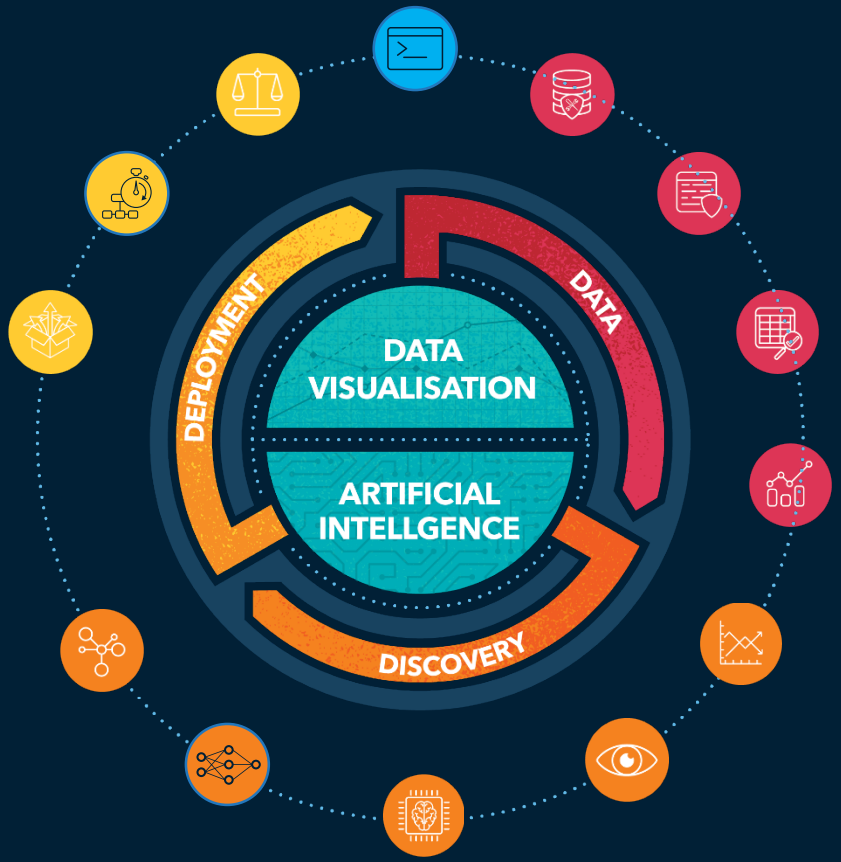
SAS Viya

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 driver read-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 steam 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