

What's new in SAS 9.4 M6

Poll Question

- What is your primary usage of the SAS Grid?
- A – ETL
- B – Data Preparation (SQL & SAS)
- C – Analysis (including Modeling)
- D – Reporting
- E – Enhance/Combine with Open-Source
- F – Other

Highlights

- What's new in 9.4M6? Security
 - Programming
 - Enhancements
 - Grid
- Integrating R Models into SAS Enterprise Miner
- SAS Viya – Extending SAS 9.4M6 Capabilities

What's New in SAS 9.4M6

- **Security** updates
 - Upgrade to Java 8 runtime
- **Programming** and **data access** enhancements
- New **SAS Grid Manager** options
- On-going **integration** between SAS 9.4M6 and SAS Viya Cloud Analytic Services (CAS) engines
- Administration updates
- Accessibility enhancements
- *Related*
 - Key updates in **Analytics**
 - Updates in **Data Management**

Simple. Powerful. Automated.

SAS 9.4M6 – Across the Products

Platform

- Security
- Integration between SAS 9 and SAS Viya
- Java 8 runtime
- Baseline for pending updates planned for SAS 9.4M6

Advanced Analytics 15.1*

- New procedures
- Increase integration with CAS
- Not everything updates!

Others

- Enterprise Guide 7.13 (HF 5)
- SAS Studio 3.8
- ESP 5.2
- Add-in for Microsoft Office 7.15 (HF4)
- SPDS 5.4
- Enterprise Miner 15.1
- Business Rules Manager 3.21

Data Management*

- Advance convergence of SAS 9 and SAS Viya
 - DI Studio
 - Data Quality

^ See separate roadmaps for details



9.4M6 Release Highlights



9.4 M6

RELEASE HIGHLIGHTS

- ***Security***
- ***Integration with SAS Viya***
- ***Programming***
- ***Grid***
- ***Accessibility***
- ***Administration***
- ***Infrastructure and Requirements***
- ***Related Products, including***
 - *Data Management*
 - *Analytics*



Security

9.4 M6

RELEASE HIGHLIGHTS

Security

Security is part of all SAS products.

*We invest in security to earn and keep your trust,
and to protect the information you analyze in SAS.*



9.4 M6

RELEASE
Details
Security

SAS Private JRE is based on Java 8 starting with SAS 9.4M6

- Delivered by SAS
- Quarterly updates will be delivered by SAS
- Changes the JVM options and defaults
 - Removes PermSize (not in Java 8)
 - Uses newer gc algorithms
 - Vendor-specific Java for HP/UX and AIX
- Changes the profiles and defaults
- Previous setenv content is saved in a backup file

9.4 M6

RELEASE HIGHLIGHTS

Security
“Due Diligence”

Update of 3rd party components

- Java 8–based SAS Private JRE, updated parameters & tuning options
- Updated Web Server, Web App Server, activemq
- Updated Spring components
- Updated OpenSSL libraries
- Updated Postgres (9.5)
- Incorporates Security Update 9-2018

GDPR focus

- Privacy by design



Security enhancements



9.4 M6

RELEASE HIGHLIGHTS

Security
“Due Diligence”

Deployment / Configuration / Security enhancements

- AMO and EG support encrypting local passwords
- TLS “hardening” -- TLSv1.2 is the default
- Web Server “hardening” – Directives, Header, available Ciphers
- Encryption and Encoding enhancements (SAS005, AES2)
- Postgres version upgrades
- FIPS 140 support

Highlights of other security enhancements

- Token-based CSRF filtering
- Database credentials specified in the PROC METALIB DBAUTH statement override any other predefined authentication types.
- New doc chapter: Security Considerations for SAS Studio on SAS 9

9.4 M6

RELEASE HIGHLIGHTS

Security
“Due Diligence”

Single Sign On between SAS 9.4 and SAS Viya 3.4

- Be careful with usernames!
- Configure using
 - Sas.logon.sas9 for SAS 9
 - sas.logon.jasig.cas on SAS Viya
- [Documentation](#)
- [Internal blog](#)

9.4 M6

RELEASE HIGHLIGHTS

Security *“Due Diligence”*

Regular Security Update releases

- Available for the M6 release only; includes updates for CVE's reported against 3rd party components.
- Product security fixes continue to be available via hot fixes

Enhancements to support constrained delegation (H1'2019)

- Kerberos-based connections
- Supports new Windows Defender Credential Guard option (Windows 10, Windows 2016, and higher)

Solution releases/updates on SAS 9.4M6

- Updated releases planned in 2019

9.4 M6

RELEASE Highlights *Security*

Privacy, General Data Protection Regulation

- Security & Privacy are strong and global business imperatives
- EU GDPR has been enforced on May 25th, 2018 and is changing the way organizations are processing personal data.
- Many countries have similar privacy regulations
 - HPA, PDP (Singapore, Argentina ...),
 - KVKK (Turkey),
 - PIPEDA (Canada).
 - California Consumer Privacy Act (CCPA).
- SAS capabilities* include
 - Personal Data Discovery and Analysis
 - Personal Data Mapping
 - Data Lineage
 - Data Masking (Anonymization, Encryption, Pseudonymization)
- Compliance to GDPR is “owned” by the customer
 - SAS engineers software that can be managed in compliance with GDPR

*details about data protection and privacy are included in Data Management materials

9.4 M6

RELEASE HIGHLIGHTS

Security
“Due Diligence”

... a sampling of documentation updates ...

Security Considerations for SAS Studio

- Focuses on SAS Studio; provides good “general” advice

Tuning Guide

- Updated for Java 8

Security Administration Guide

- Updated for SAS 9.4M6

Updates to SAS Software Security Framework whitepaper

- Published on the [“Security Assurance” page](#). (under About SAS)



General Enhancements

9.4 M6

RELEASE HIGHLIGHTS *General Enhancements*

Enhancements are delivered for foundation capabilities.

Examples include:

- ***Accessibility***
- ***Global Support (internationalization)***
- ***Metadata***

GRID

Programming tools

9.4 M6

RELEASE HIGHLIGHTS

General Enhancements

*SAS enables people of all abilities to
access the power of analytics.*

Accessibility

- Enable accessibility features at a site level using system options
 - ACCESSIBLECHECK - Check for common accessibility problems in SAS code
 - ACCESSIBLEPDF - Create Accessible PDF by default
 - ACCESSIBLEGRAPH - Create Accessible graphs by default
 - ACCESSIBLETABLE - Format data tables to be accessible by default
- Create accessible output using ODS HTML5 and PDF destinations
 - Options to support WCAG and PDF/UA standards
- Create accessible graphs using ODS Graphics
- Create, explore and share data visualizations using SAS Graphics Accelerator
 - Requires Chrome
 - Available as a free Chrome extension

For more information:

See www.sas.com/accessibility for more information about accessibility at SAS.

See on-line [user documentation](#) for techniques to create accessible output.

Send questions about accessibility at SAS to accessibility@sas.com.

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RELEASE HIGHLIGHTS

General Enhancements

*SAS enables people of all abilities to
access the power of analytics.*

Accessibility Features in Visual Analytics and Mobile reports

- Create accessible (WCAG-compliant) reports
- Compatibility with SAS Graphics Accelerator
- Sonification
- Screen reader and keyboard-only support
- High contrast display on all viewers

Terminology note: “a11y” refers to “accessibility”

For more information:

See www.sas.com/accessibility for more information about accessibility at SAS.

See on-line [user documentation](#) for techniques to create accessible output.

Send questions about accessibility at SAS to accessibility@sas.com.

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RELEASE HIGHLIGHTS

General Enhancements

Language / encodings/ formats

- KCOMPRESS adds modifiers (similar to COMPRESS)
 - Benefits customers who move from single-byte environments to multi-byte environments
 - Documented in NLS references

ODS – Native Word destination (pre-production)

- [Documentation on native ODS WORD destination.](#)
- Includes examples, such as customizing a header using PROC TEMPLATE.



Grid Enhancements

9.4 M6

RELEASE HIGHLIGHTS *General Enhancements*

SAS GRID Manager enhancements

- New Grid software – targeted for new customers
 - The new offering using the SAS built provider will be called SAS Grid Manager (retaining the current name).
 - SAS will continue the support for the Platform Suite for SAS technology from IBM under an adjusted name of SAS Grid Manager for Platform.
- Dropping support for Grid Manager Plugin for SAS Management Console (GRIDSMC) starting at 9.4M6.
- Link to [What's New in SAS Grid Manager for SAS 9.4M6](#) (Internal)



Administrative Updates

9.4 M6

RELEASE HIGHLIGHTS

Administrative Updates

Administrative updates add robustness to the tools and environments used when deploying and managing SAS 9.4 M6.

Administrative tools are updated, additional High Availability options are available, and new supported OS and locales.

9.4 M6

RELEASE HIGHLIGHTS

Administrative Updates

BIG change is Java 8 runtime.

- NEW and updated JVM defaults and tuning recommendations.

Reorganized “getting started” information.

- [These Install Center links](#) are to collections of information (vs the “old” install documents of a similar name)
- NEW [SAS Starter Kit](#) site

High Availability options are expanded.

- Guidelines WIP Data Server availability
- Enhanced health checks in SAS Grid Manager
- Added SAS Web Application Server assignments

General

- Updates to “performance and tuning papers” indexed in the (external) [SAS Note 42197](#). These notes contain valuable information when planning a deployment and infrastructure.
- Web-based documentation is primary delivery format.

9.4 M6

RELEASE HIGHLIGHTS

Administrative Updates

- Added “smart agent” in SAS Environment Manager
 - Supports Grid environment
- Added resource templates in SAS Environment Manager
 - Enables synchronization between SAS Management Console and SAS Environment Manager
 - Displays options and connection options
- Security enhancements
 - Updated middle tier infrastructure components

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RELEASE HIGHLIGHTS

Administrative Updates

SAS 9.4M6 is a maintenance update.

- Some manual steps required for “upgrade in place”
- SAS Migration Utility is available
- New defaults will be configured
 - SAS Private JRE – based on Java 8
 - TLSv1.2 is default protocol
 - Upgrade to Postgres 9.5



Infrastructure Requirements

9.4 M6

RELEASE HIGHLIGHTS

Infrastructure Updates

- Requirements are on the support site, including
 - [Supported OS lists](#)
 - [Third party software notes](#)
 - ...plus product-specific requirements
- Supported OS and browsers
 - Most user interfaces: Firefox 31 and higher; Chrome 42 and higher. 32-bit and 64-bit versions
 - General: : Microsoft Internet Explorer 11, Microsoft Edge (limited)
 - Note: Chrome browsers require registration of SSL certificates
 - See [SAS 9.4 Support for Web Browsers](#) for details
 - Products may add specific requirements or limitations.
 - AIX TL3+ (update required to support Java 8)
- Infrastructure and Tuning Guidelines: [SAS Note 42197](#)
Includes:
 - General notes
 - Filesystem guidelines
 - And a lot more!

Third party notes

9.4 M6

RELEASE HIGHLIGHTS

Infrastructure Updates

- SAS Private JRE is updated to Java 8 baseline
 - * Version 1.8.0_181 initially ships with SAS 9.4M6
 - * Quarterly security updates will be available from SAS for Java 8
- SAS Web Server
 - * Changes to an Apache-based product
- Postgres 9.5
 - By default OOTB
 - Manual update for UIP
- Regular Security Updates planned in 2019+
 - * Updates embedded products such as Spring, Struts



Analytics Updates

9.4 M6

RELEASE HIGHLIGHTS

Analytics Updates

SAS continues to power the Analytics Lifecycle with enhancements in key analytic products.

New capabilities from observational data analysis to survival data analysis increase your effectiveness and your versatility.

9.4 M6

RELEASE HIGHLIGHTS

Analytics Updates

Updates include:

- SAS® Contextual Analysis
- SAS/ETS®
- SAS/IML®
- SAS/QC®
- SAS/OR®
- SAS® Simulation Studio
- SAS/STAT®
- SAS/Forecast Server®
- SAS/Enterprise Miner®
- SAS/Factory Miner®
- SAS/Text Miner®



Programming Tools

Integrating R Models into SAS Enterprise Miner

9.4 M6

RELEASE HIGHLIGHTS *Programming tools*

Enhancements are delivered across foundation and client offerings.

Examples include:

- ***SAS Studio***
- ***Enterprise Guide***
- ***SAS language support (DS2, FEDSQL)***
- ***PROC***s
- ***ODS***

- ***Toolkit***

9.4 M6

RELEASE

HIGHLIGHTS

Programming Updates

Customer-written code continues to run

- Some special handling for customers using SPDS (from M5)
- Programming documentation has a new format
- TOOLKIT caution
- PROC SQL view with USING clause caution

You can manage a GIT repository using a set of new GIT functions.

CAS enablement not supported on some platforms

- Not on Windows 32 or Mainframes

Expect compatibility with previous releases!

9.4 M6

RELEASE HIGHLIGHTS

Programming tools

SAS Studio 3.8 enhancements include

- new Base SAS *functions* for integrating with Git for source management
 - SAS Studio has an experimental Git UI for using these functions
- ability to append and clear the log
- new tasks including
 - new map tasks
 - a combine data task
 - econometric tasks
 - multiple new Viya tasks
- new preferences to control the number of rows and columns in the table viewer
- tree location persistence after a refresh
- VALIDMEMNAME support and additional options for VALIDVARNAME

- SAS Studio Help Center – [comparison with Enterprise Guide](#)
- [Security Considerations](#) chapter added to SAS Studio documentation

9.4 M6

RELEASE HIGHLIGHTS *Programming Tools*

SAS language updates / DS2

- PROC DS2 supports **JDBC-compliant databases** as data sources.
- The SAS In-Database Code Accelerator can be executed on MapReduce or Spark.
- Character data can be written in a universally unique identifier (**UUID**) format.
- Inline declarations can be specified for DO loop counters.
- A **RETAIN** option has been added to the MERGE statement that produces a many-to-many match-merge that is similar to a DATA step merge.
- **New functions** are available: CMISS, LOGISTIC, SAVING, SHA256, and SYSGET.
- **New methods** for the DS2 HTTP package enhance security and a default character set.

SAS Language updates / Fed SQL

- PROC FEDSQL support for **JDBC-compliant databases** as data sources.
- The FedSQL language creates VARCHAR columns containing greater than 65,535 characters as type STRING in Hive.

9.4 M6

RELEASE HIGHLIGHTS *Programming Tools*

SAS PROC updates

- If you use the V9 engine to create a PROC SQL view that contains a USING clause, the view is not accessible in SAS 9.4M5 or prior releases.
- PROC HDMD supports managed, external, and transactional tables for Hive 3.0.
- When invoking a web service using PROC HTTP, you can set SSL options using the new SSLPARMS statement.
- When you use PROC PROTO LINK statement to load modules that are written in C or C++, you can specify only load modules whose paths are registered by the administrator.

SAS FROM R



Discovery

```
1 library("Rcurl")
2 tempDir <- tempfile()
3 dir.create(tempDir)
4
5 myhtml <- getURL(url="http://joeloonix-sasbiws2.na.sas.com:7980/SASBIWS/rest/storedProcesses/CABdemo/RandomForest/d:
6             httpheader=c(Accept="application/xml,text/html",
7                 "content-type" = "application/xml", Authorization="basic c2FzZG9tbzpwYXNkd29yZA=="),
8             postfields="RandomForest<parameters><dataset>shoptrain</dataset><numtrees>100</numtrees><varstot
9                 verbose = TRUE)
10
11 write(myhtml, file.path(tempDir, "sasout.html"))
12 rstudio::viewer(file.path(tempDir, "sasout.html"))
13
14
15
```

Console

```
< Content-Length: 131
* upload completely sent off: 131 out of 131 bytes
< HTTP/1.1 200 OK
< Date: Tue, 26 May 2015 13:05:29 GMT
< Server: Apache-Coyote/1.1
< Content-Type: text/html;charset=utf-8
< Transfer-Encoding: chunked
* connection #0 to host joeloonix-sasbiws2.na.sas.com left intact
> source("~/active-rstudio-document")
* Hostname was NOT found in DNS cache
* Trying 10.12.38.157...
* Connected to joeloonix-sasbiws2.na.sas.com (10.12.38.157) port 7980 (#0)
> POST /SASBIWS/rest/storedProcesses/CABdemo/RandomForest/dataTargets/_WEBOUT HTTP/1.1
Host: joeloonix-sasbiws2.na.sas.com:7980
Accept: application/xml,text/html
Content-Type: application/xml
Authorization: Basic c2FzZG9tbzpwYXNkd29yZA==
Content-Length: 131
* upload completely sent off: 131 out of 131 bytes
< HTTP/1.1 200 OK
< Date: Tue, 26 May 2015 14:29:25 GMT
< Server: Apache-Coyote/1.1
< Content-Type: text/html;charset=utf-8
< Transfer-Encoding: chunked
* connection #0 to host joeloonix-sasbiws2.na.sas.com left intact
>
```

USER_FACTOR	1271	0.000548	-0.00056	0.001096	-0.00001
USER_FACTOR2	1426	0.000653	-0.00056	0.001305	0.00008
USER_FACTOR16	1398	0.000584	-0.00057	0.001168	0.00003
USER_FACTOR10	1482	0.000644	-0.00057	0.001288	0.00007
USER_FACTOR20	1547	0.000594	-0.00057	0.001187	0.00002
USER_FACTOR11	1447	0.000623	-0.00058	0.001246	0.00005
USER_FACTOR9	1412	0.000615	-0.00059	0.001230	0.00006
USER_FACTOR17	1557	0.000604	-0.00060	0.001208	0.00001
USER_FACTOR19	1610	0.000658	-0.00062	0.001318	0.00005
USER_FACTOR18	1793	0.000763	-0.00068	0.001527	0.00011

Task	Seconds	Percent
Reading Data	2.18	22.14%
Training Forest	7.04	77.79%
Saving Model	0.01	0.07%

OOB vs Training

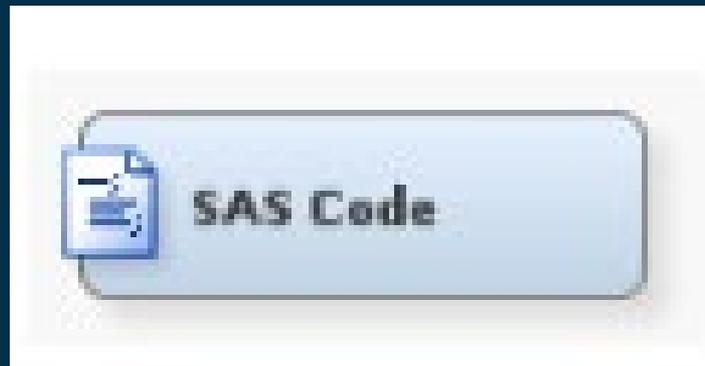




SAS Enterprise Miner

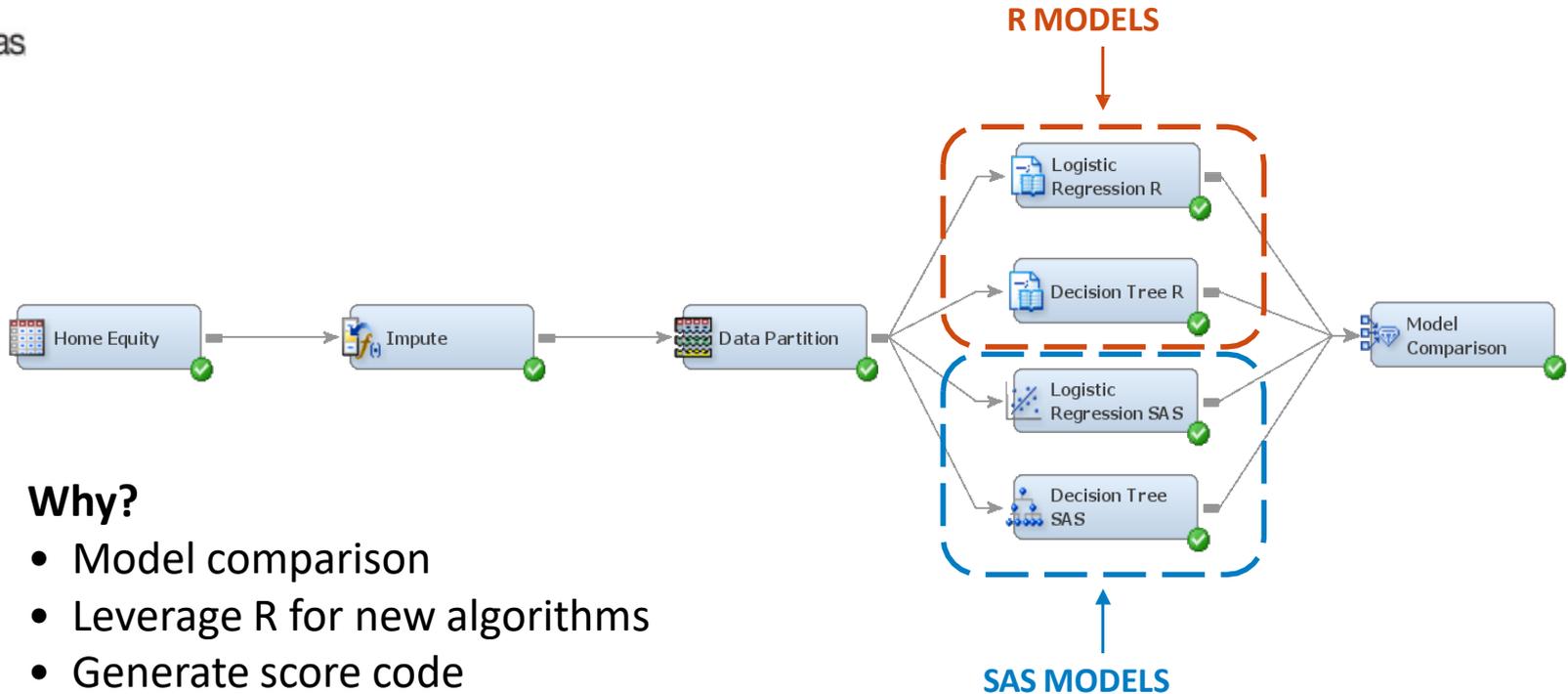


SAS
Enterprise
Miner



[More information on SAS Enterprise Miner](#)

USE SAS TO INTEGRATE R



Why?

- Model comparison
- Leverage R for new algorithms
- Generate score code
- Deploy R models

Discovery



SAS Enterprise Miner & R

- Open Source Integration node enables the execution of R code within Enterprise Miner.

```
library(randomForest)

eMR_MODEL <- randomForest(eMR_CLASS_TARGET ~ eMR_CLASS_INPUT + eMR_NUM_INPUT, ntree= 500, mtry= 5, data= eMR_IMPORT_DATA, importance= TRUE)

eMR_EXPORT_TRAIN <- predict(eMR_MODEL, eMR_IMPORT_DATA, type="prob")

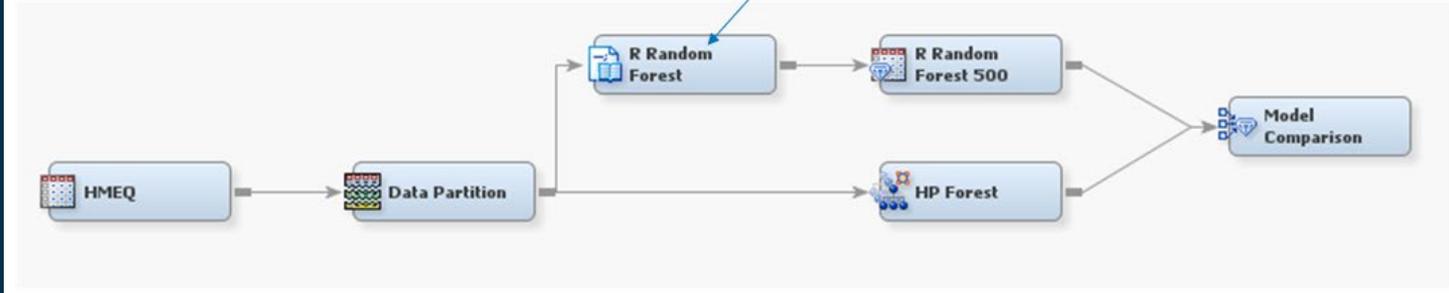
eMR_EXPORT_VALIDATE <- predict(eMR_MODEL, eMR_IMPORT_VALIDATE, type="prob")
eMR_EXPORT_TEST <- predict(eMR_MODEL, eMR_IMPORT_TEST, type="prob")

eMR_EXPORT_TRAIN[1:10,]

png("EMR_forestMSEPlot.png")
plot(eMR_MODEL, main= 'randomForest MSE Plot')
dev.off()

write.table(round(importance(eMR_MODEL),2), file= "EMR_forestImportance.csv", sep= ",", row.names= TRUE, col.names= TRUE)

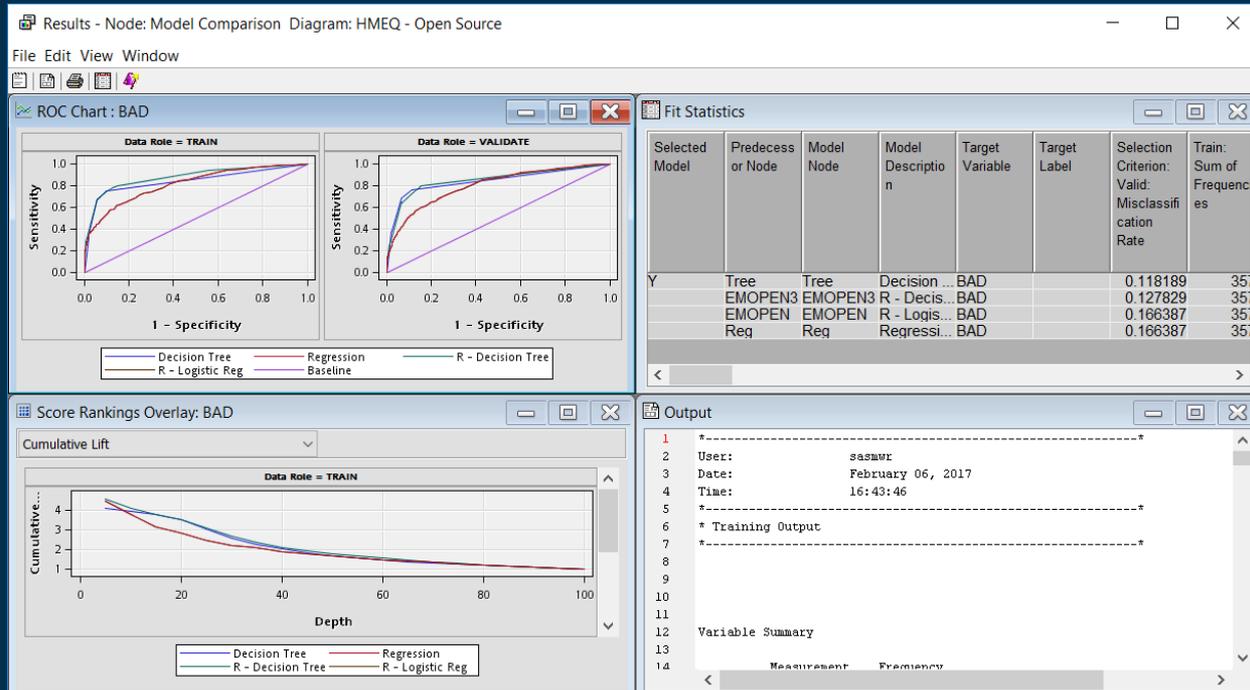
print(eMR_MODEL)
round(importance(eMR_MODEL),2)
```



[More information on the Open Source Code Node](#)

SAS Enterprise Miner & R

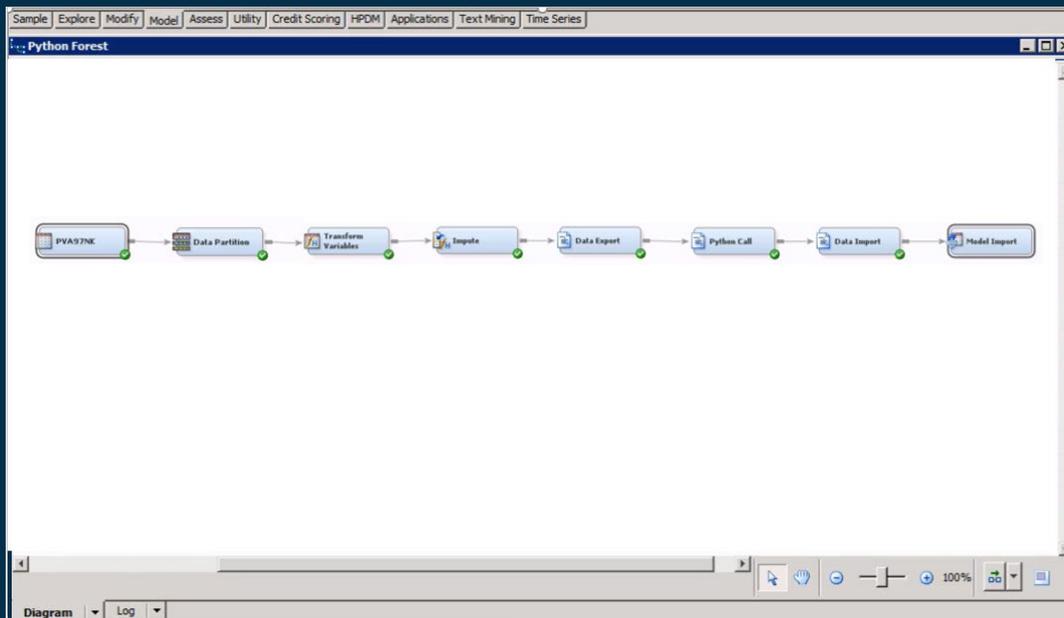
- Open Source Integration node enables the execution of R code within Enterprise Miner.



[More information on the Open Source Code Node](#)

SAS Enterprise Miner & Python

- The SAS Code node allows you to incorporate SAS code into a process flow.
- Using a SAS data step, you can call a Python program.
- Using PROC FCMP with a SAS data step, you can write a Python program inline or call a Python program.





Integration with SAS Viya

9.4 M6

RELEASE HIGHLIGHTS

Integration with SAS Viya

SAS 9 and SAS Viya work together → SAS Platform

***Programmers can work in a familiar environment,
and directly access the scalability of SAS Viya.***

Integration with SAS Viya is optional.

9.4 M6

RELEASE HIGHLIGHTS

Integration with SAS Viya

Also see enhancements for
Data Management, Analytics

Advance convergence with SAS Viya

- PROCs for accessing Viya/CAS
- Encodings/formats compatible with SAS Viya

Product and Solution impacts (examples)

- Direct interoperability with CAS added to products. Examples: Enterprise Guide, SAS Studio, SAS Enterprise Miner, DI Studio, ODS

Administration

- SAS 9.4M6 and SAS Viya 3.4 are designed to integrate, but are managed separately.
- Administering SAS – Comparing SAS 9.4 to SAS Viya
 - [Webinar & slides](#) on the Administration & Deployment User Community

Limitation

- PROCs for accessing Viya/CAS are not available on Windows 32 or Mainframe environments

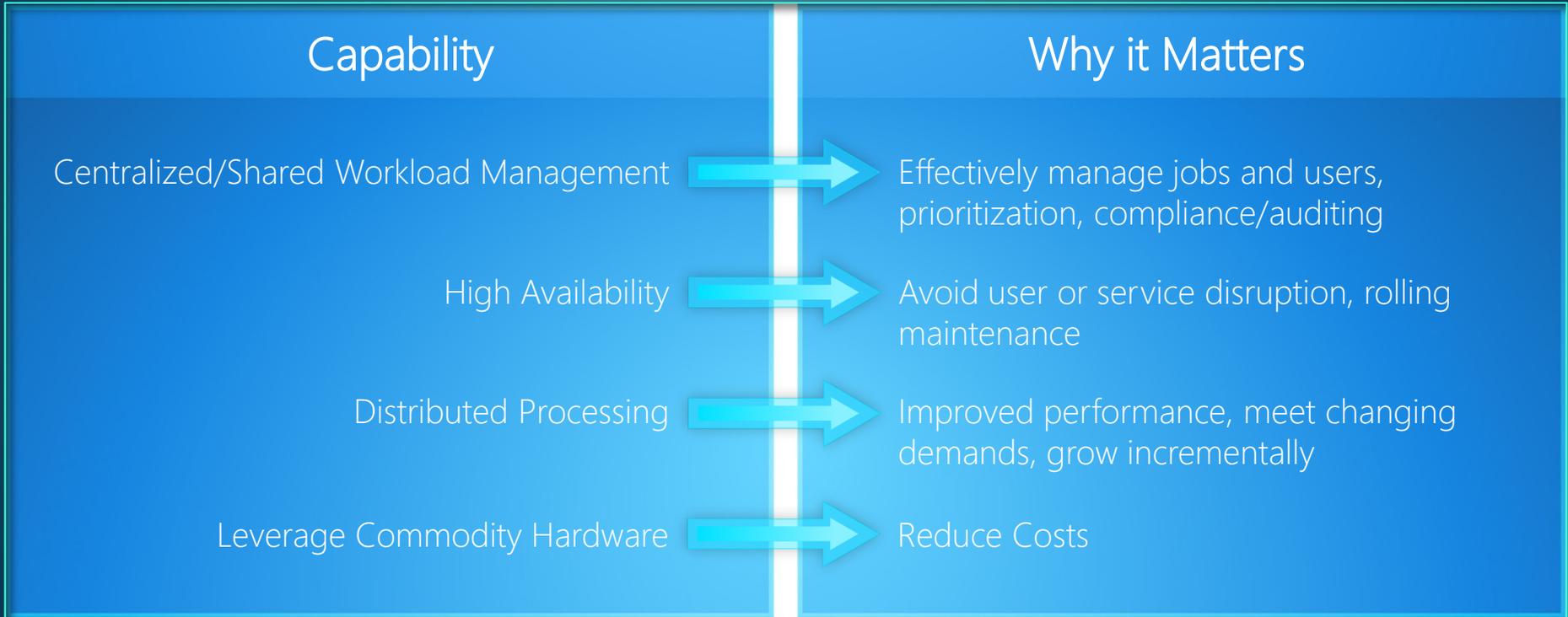
SAS 9.4 and SAS Viya Functional Comparison

9.4 M6

**RELEASE
HIGHLIGHTS**

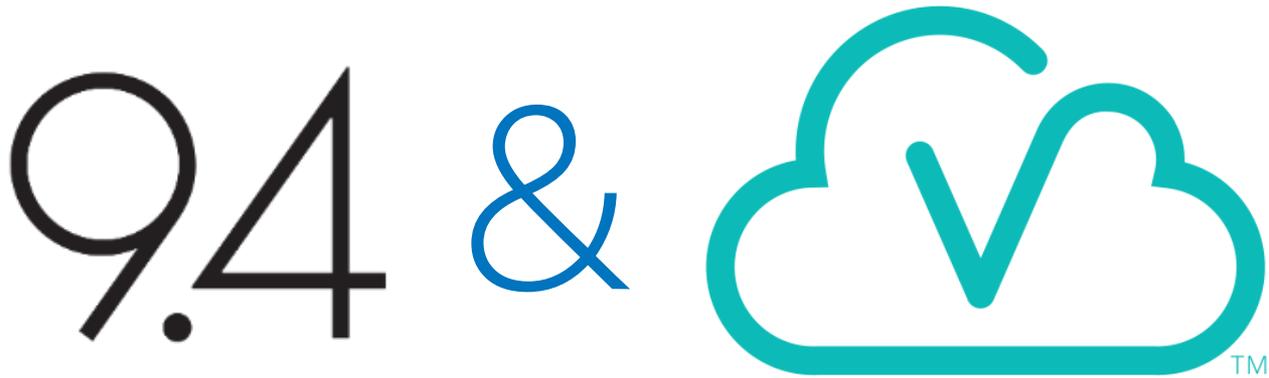
Integration with SAS Viya

Current State – SAS Grid



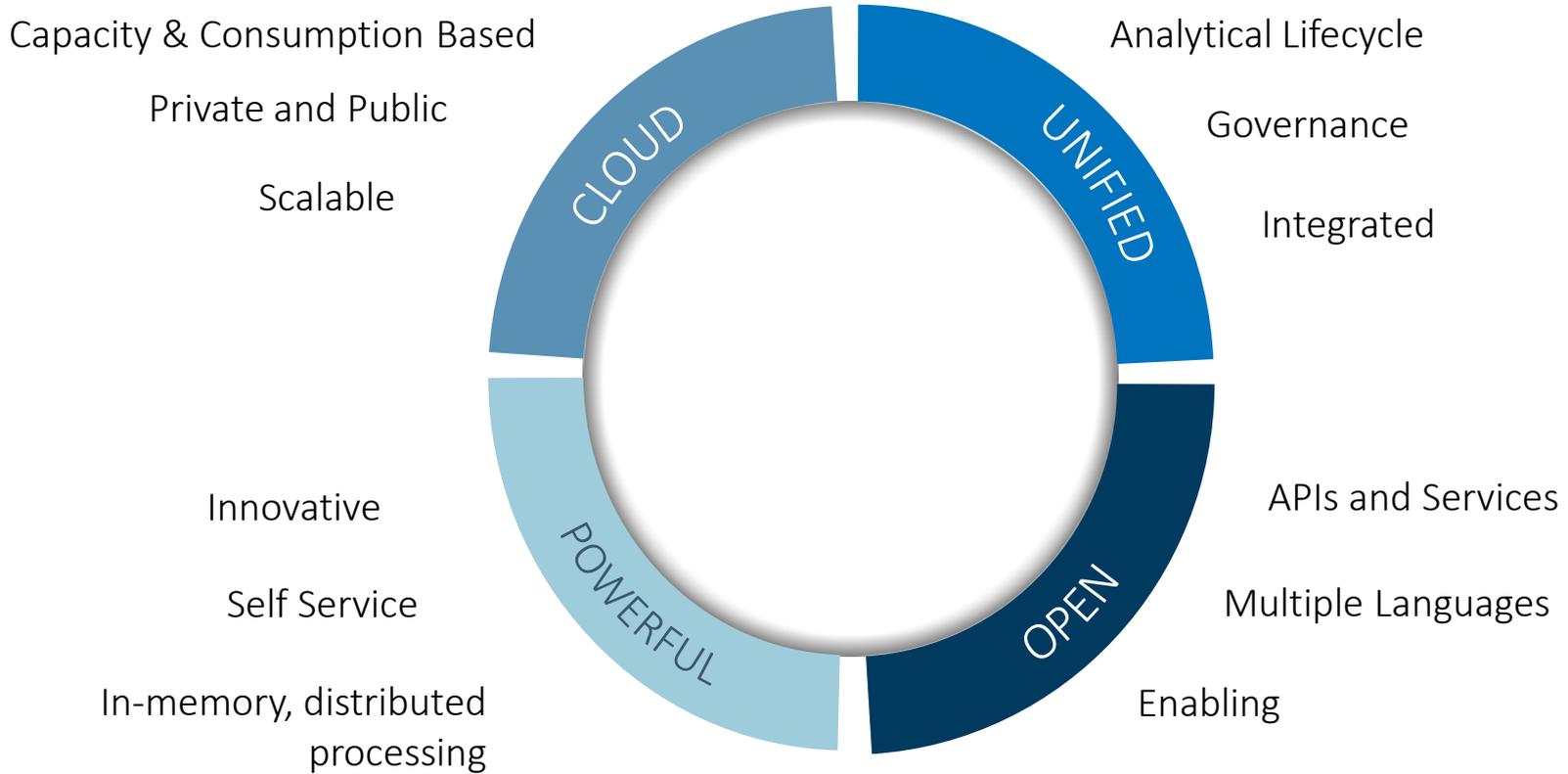


- Architecture that is enabled by wide range of capabilities
 - End-to-end data cleansing/data mining and machine-learning process with a comprehensive, visual (and programming) interface
- Extension of the success of SAS GRID @ VINCI
 - Today the VINCI Grid utilizes SAS via user interfaces such as Base SAS, SAS Enterprise Guide, and batch submit



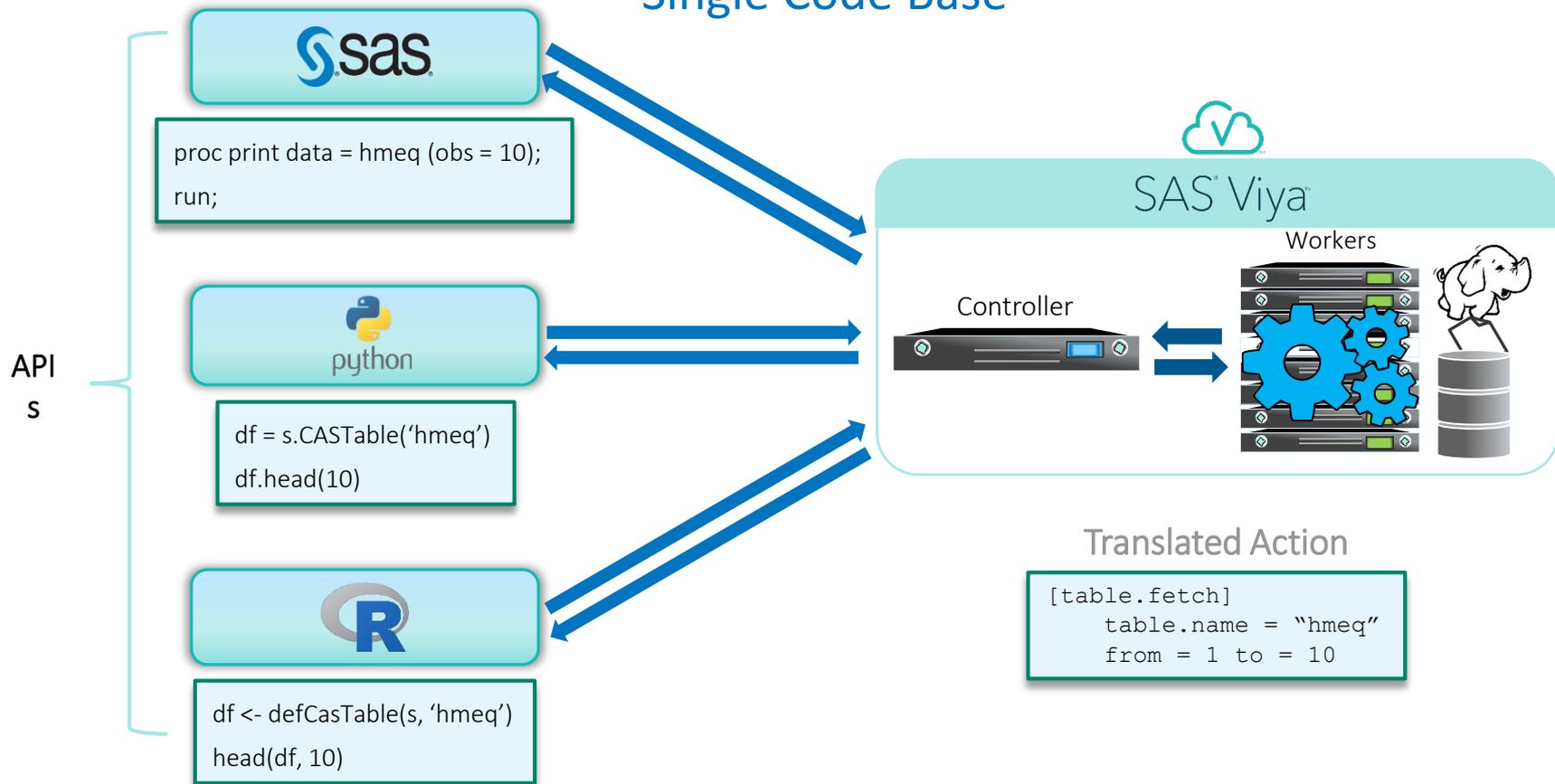
- It's an enhances current strategy (Viya extends 9.4)
- Each is designed to solve different use cases
- Can co-exist
- Data, models and code can be accessed directly
- In 9.4M5, it's just another library engine

SAS[®] Viya[™] The Platform



VIYA Open Platform

Single Code Base





Open: Multiple Interfaces, Single Code Base



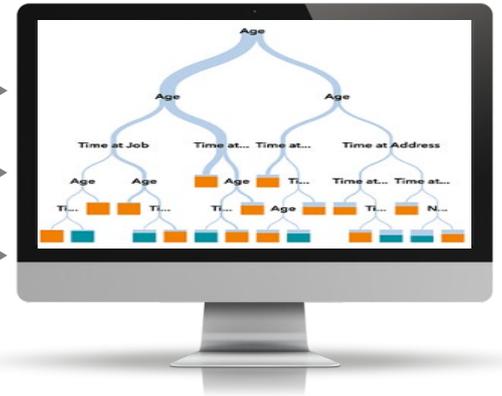
Visual Interfaces



Programming Interfaces



API Interfaces



SAS AS AN ENHANCEMENT



AND



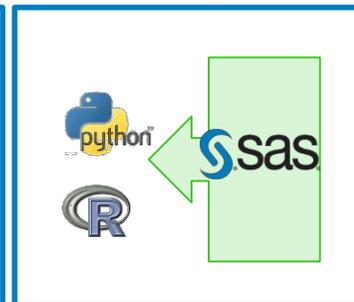
SAS can augment open source

- Increase productivity
- Leverage your assets, people and platforms
- Bring the power of SAS to open source
- Create deployable analytics
- Goal is to 'embrace' and 'extend'

Open to SAS



SAS to Open





Open: Consistent Results Across Different Interfaces

Python in Jupyter Notebook

Fit Statistics			
RowId	Description	Training	Validation
M2LL	-2 Log Likelihood	26293.763289	11351.559792
AIC	AIC (smaller is better)	26397.763289	11455.559792
AICC	AICC (smaller is better)	26397.880956	11455.83476
SBC	SBC (smaller is better)	26853.060156	11866.79791
ASE	Average Square Error	0.082181822	0.0829827159
M2LLNULL	-2 Log L (Intercept-only)	36367.490885	15585.606217
RSQUARE	R-Square	0.1933015701	0.1899502038
ADJRSQ	Max-rescaled R-Square	0.3582874055	0.3520858071
MCFADDEN	McFadden's R-Square	0.2769981473	0.2716638908
MISCLASS	Misclassification Rate	0.1050600252	0.1086123688
DIFFMEAN	Difference of Means	0.277629269	0.2702324535

SAS Studio

Fit Statistics		
Description	Training	Validation
-2 Log Likelihood	26294	11352
AIC (smaller is better)	26398	11456
AICC (smaller is better)	26398	11456
SBC (smaller is better)	26853	11867
Average Square Error	0.08218	0.08298
-2 Log L (Intercept-only)	36367	15586
R-Square	0.19330	0.18995
Max-rescaled R-Square	0.35829	0.35209
McFadden's R-Square	0.27700	0.27166
Misclassification Rate	0.10506	0.10861
Difference of Means	0.27763	0.27023

Fit Statistics

Model Studio

Data Role ▲	Sum of Frequencies	Average Squared Error	Divisor for ASE	Root Average Squared Error	Misclassification Rate	Multi-Class Log Loss	KS (Youden)
TRAIN	46,897	0.0822	46,897	0.2867	0.1051	0.2803	0.5150
VALIDATE	20,099	0.0830	20,099	0.2881	0.1086	0.2824	0.5081

FOR MORE INFORMATION

Empowering the SAS/IML user with the functionality of R

Documentation: *IML User's Guide - Calling Functions in the R Language*

http://support.sas.com/documentation/cdl/en/imlug/66845/HTML/default/viewer.htm#imlug_r_toc.htm

Video: *Calling R Procedures from SAS/IML® Software*

<https://www.youtube.com/watch?v=rUaTTre24kl>

Video: *SAS/IML and R: Using Them Together*

<https://www.youtube.com/watch?v=nmRQ3MtkG6A>

Blogs: *The DO Loop – R tags*

<http://blogs.sas.com/content/iml/tag/r/>

Paper (p 14-17): *Rediscovering SAS/IML® Software: Modern Data Analysis for the Practicing Statistician*

<http://support.sas.com/resources/papers/proceedings10/329-2010.pdf>

Article: *Versions of R that are supported by SAS/IML*

<http://blogs.sas.com/content/iml/2013/09/16/what-versions-of-r-are-supported-by-sas.html>

FOR MORE INFORMATION - EXTENDING R

Video: *Using R in SAS Enterprise Miner*

<https://www.youtube.com/watch?v=TbXo0xQCqDw>

Blogs: *Spectral Clustering in SAS® Enterprise Miner™ Using Open Source Integration Node*

<https://communities.sas.com/docs/DOC-8011>

Blogs: *How to execute a Python script in SAS® Enterprise Miner™*

<https://communities.sas.com/docs/DOC-10832>

Blogs: *Open Source Integration Using the Base SAS Java Object*

<https://communities.sas.com/docs/DOC-10746>

Article: *The Open Source Integration node installation cheat sheet*

<https://communities.sas.com/docs/DOC-9988>

Usage Notes:

<http://support.sas.com/dsearch?Find=Search&ct=&qt=open+source&col=suppprd&nh=25&qp=&qc=suppsas&ws=1&qm=1&st=1&lk=1&rf=0&oq=&rq=0>

FOR MORE INFORMATION MATERIALS ON GITHUB

Sas integration and sample code Integration with R, Python

<https://github.com/sassoftware/enlighten-integration>

Integration with Jupyter Notebook and Python

https://github.com/sassoftware/sas_kernel

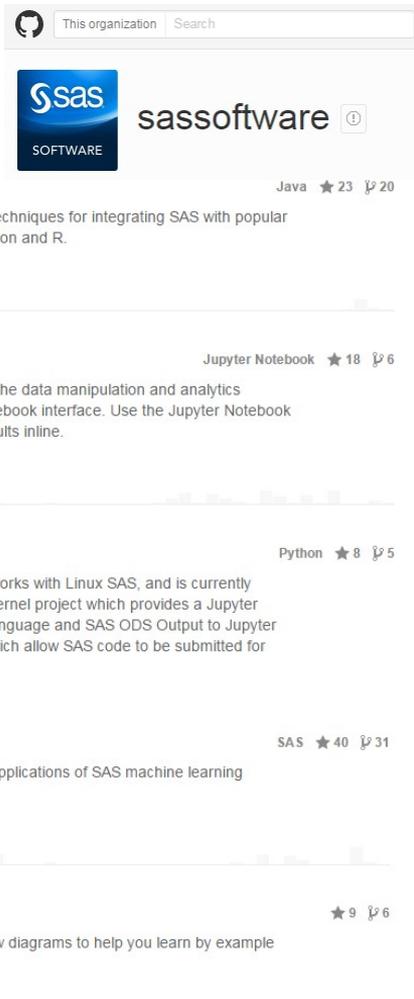
<https://github.com/sassoftware/saspy>

Sample codes of SAS Machine Learning methods

<https://github.com/sassoftware/enlighten-apply>

SAS Enterprise Miner process flow diagrams

<https://github.com/sassoftware/dm-flow>



This screenshot shows the GitHub organization page for 'sassoftware'. At the top, there is a search bar and the organization's logo. Below the header, several repositories are listed, each with its name, a brief description, and statistics like stars and forks. The repositories shown are:

- enlighten-integration**: Java, 23 stars, 20 forks. Description: Example code and materials that illustrate techniques for integrating SAS with popular open source analytics technologies like Python and R. Updated a day ago.
- sas_kernel**: Jupyter Notebook, 18 stars, 6 forks. Description: A Jupyter kernel for SAS. This opens up all the data manipulation and analytics capabilities of your SAS system within a notebook interface. Use the Jupyter Notebook interface to execute SAS code and view results inline. Updated 2 days ago.
- saspy**: Python, 8 stars, 5 forks. Description: An interface module to the SAS System. It works with Linux SAS, and is currently intended as a support module for the sas_kernel project which provides a Jupyter Notebook kernel which surfaces the SAS Language and SAS ODS Output to Jupyter Notebooks. Additionally, provides magics which allow SAS code to be submitted for notebooks with other kern... Updated 4 days ago.
- enlighten-apply**: SAS, 40 stars, 31 forks. Description: Example code and materials that illustrate applications of SAS machine learning techniques. Updated 8 days ago.
- dm-flow**: 9 stars, 6 forks. Description: Library of SAS Enterprise Miner process flow diagrams to help you learn by example about specific data mining topics. Updated 21 days ago.



Appendix