SAS Machine Learning and other Analytics: Trends and Roadmap

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Sberbank

8 Sep 2017

THE POWER TO KNOW.

How „Big“ Analytics will Change Organizations

Optimization and Innovation

Optimizing existing processes

Customer service

Pattern detection

Transformation and Disruption

Data Monetarization

Defintion of new business models

Collaboration with new industries

Both benefit from the same technology trends

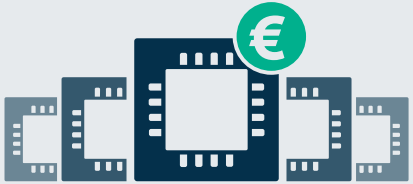
Machine Learning – Why is ML so HOT?

Abundance of Data

"There were 5 Exabytes of information created between the dawn of civilization through 2003, but that much information is now created every 2 days."

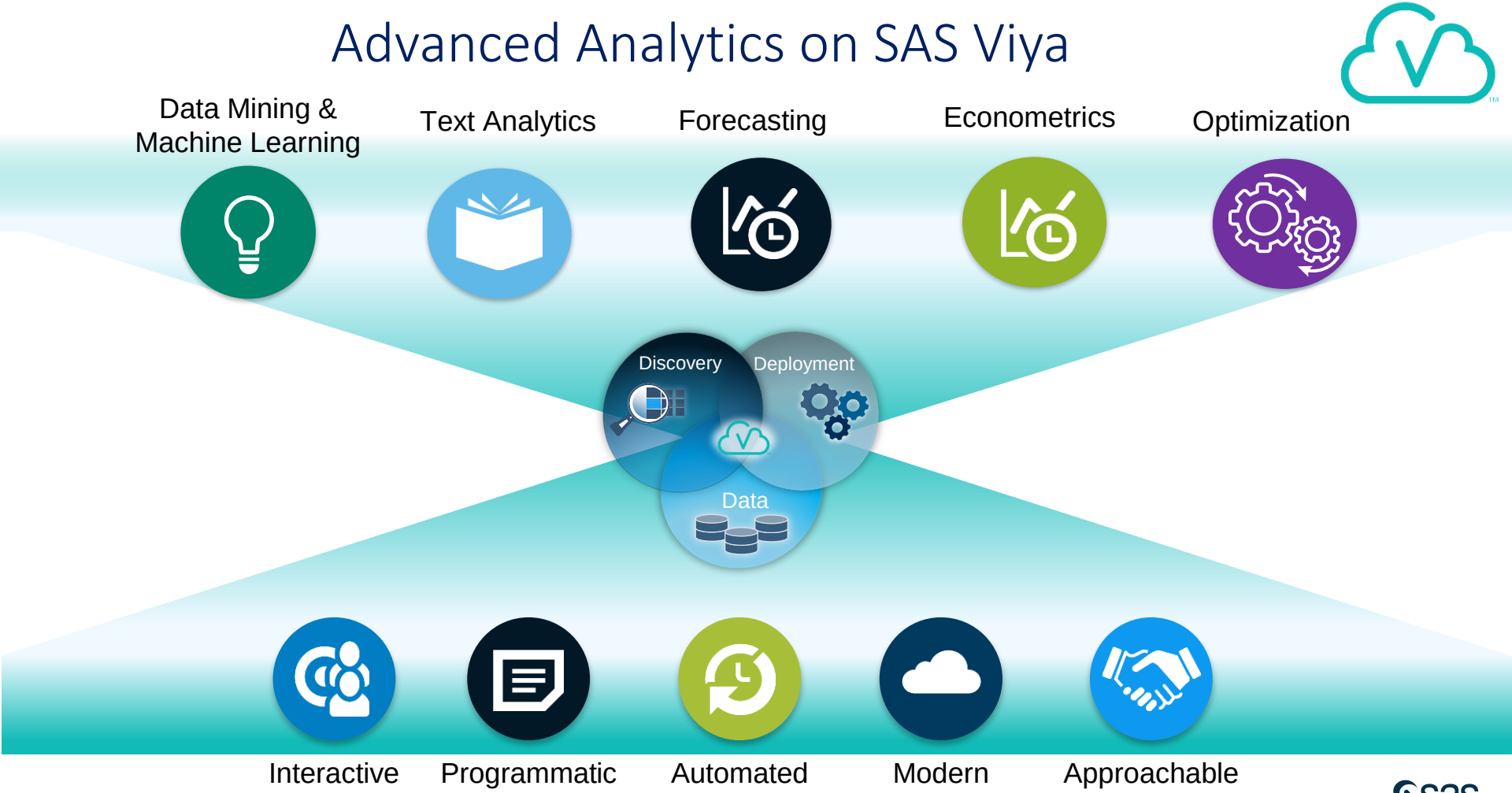
Eric Schmidt,
Google CEO 2010

Affordable Compute Power & Scalability



Development of Algorithms

Advanced Analytics on SAS Viya



SAS® Visual Data Mining and Machine Learning

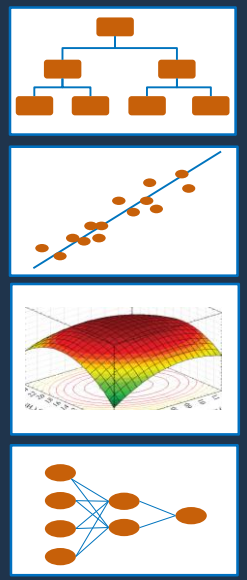
- K-means and K-modes Clustering
- Linear and Logistic Regression
- Generalized Linear Models
- Partial Least Squares Regression
- Nonlinear Regression
- Principal Component Analysis
- Robust PCA
- Moving Window PCA
- Quantile Regression
- Decision Trees*
- Factorization Machines*
- Gradient Boosting*
- Neural Networks*
- Random Forest*
- Support Vector Machines*
- Boolean Rules
- Text Mining
- Network Analytics/Community Detection
- Autotuning

- Assess Supervised Models
- Creates score code

- Multi Threaded Data Step
- DS2
- SQL
- Variable Binning
- Variable Cardinality Analysis
- Sampling and Partitioning
- Missing Value Imputation
- Variable Selection
- Transpose
- Image processing

* Supports Autotuning

AUTOTUNING HYPERPARAMETERS

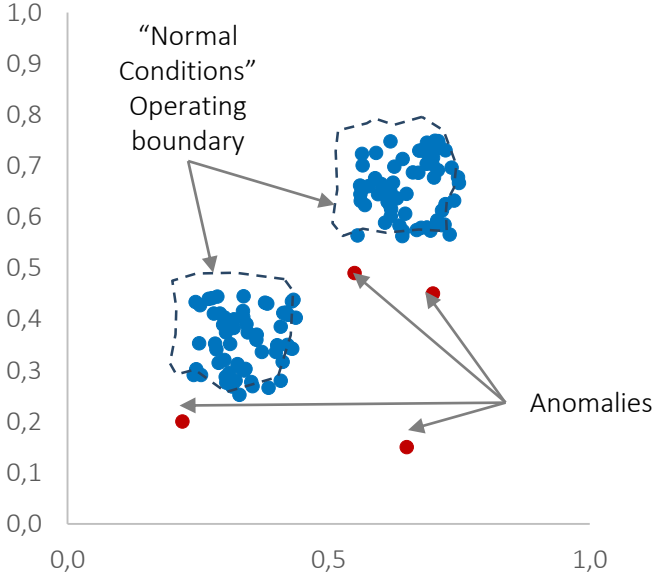


- Highly data dependent
- Related to model complexity

- Auto Tuning:
  - Automate hyperparameters search and find the optimal set
  - Maximize predictability on independent data set
  - Aims to avoid over-fitting by controlling model complexity
  - Creates more accurate models faster vs hand tuning
  - SAS auto tuning leverages world class SAS optimization engines

High Frequency Analytics Applications

- Many use cases are focused on anomaly detection
  - Fraud detection
  - Cyber-security intrusion detection
  - Process degradation (capitally intensive assets)



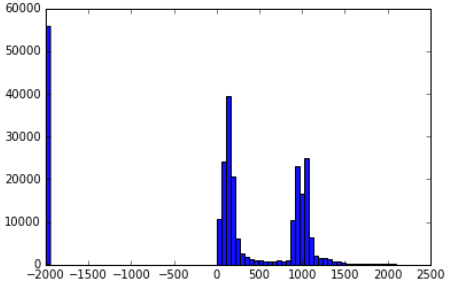
From Images to Data

Image

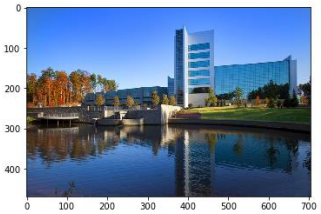
Preprocess and transform into table

c1	c2	c3	c4	c5	c6	c7	c8	C9
208.0	220.0	225.0	232.0	237.0	244.0	250.0	254.0	255.0

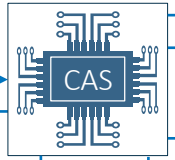
Analyze



SAS Viya Image Processing Toolkit



loadImages



flattenImageTable

c1	c2	c3	c4	c5	c6	c7	c8	C9
208.0	220.0	225.0	232.0	237.0	244.0	250.0	254.0	255.0

compareImages

channel1	_channel2_	_channel3_	_channel4_	_source_id_	_reference_id_
0.00245	0.00481	0.00147	1.0	sor.jpg	ref.jpg

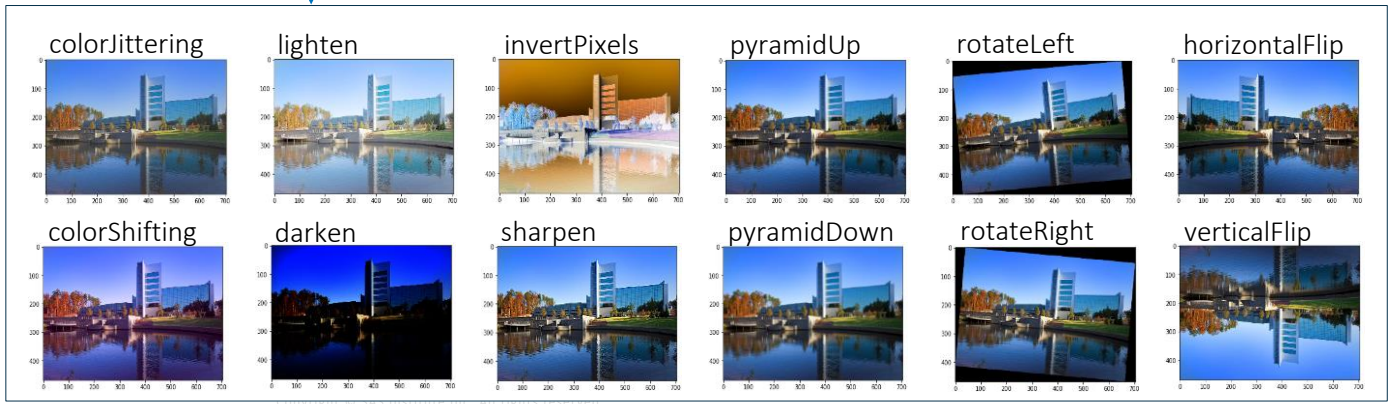
summarizeImages

	Column	jpg	minWidth	maxWidth	...	max3rdChannel
0	_image_	1.0	704.0	704.0	...	255.0

saveImages

augmentImages

matchImages



SAS® Viya™: New Open Architecture

Different Interfaces for Different User Personas

Interactive GUI

Programming

sas python Scala

Java Lua R

API Interfaces

REST API

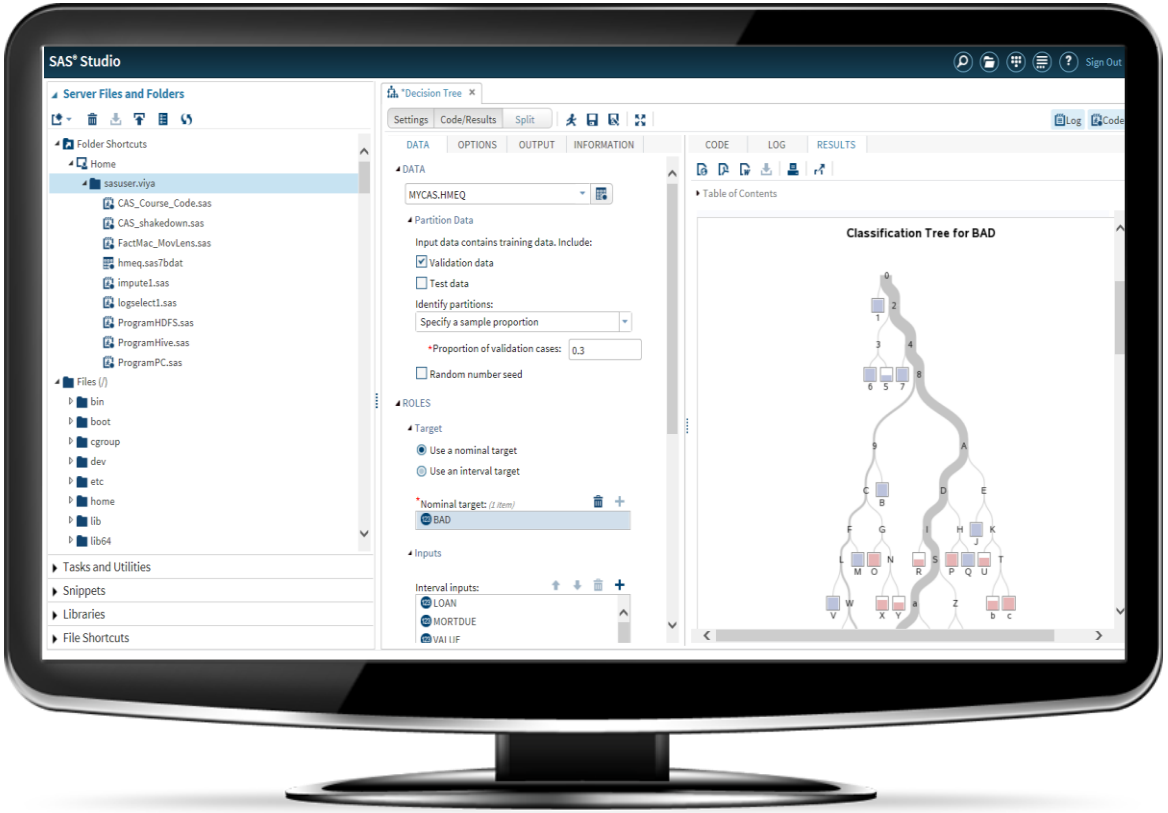
SAS® Visual Data Mining and Machine Learning

GUI Interface – SAS Visual Analytics

- Machine Learning
  - Forest
  - Gradient Boosting
  - Neural Networks
  - Support Vector Machines
  - Factorization Machines
- Statistics
  - Linear Regression
  - Logistic Regression
  - GLM Regression
  - Clustering (k-means)
  - Decision Tree

SAS® Visual Data Mining and Machine Learning

Programmatic Interface - SAS Studio



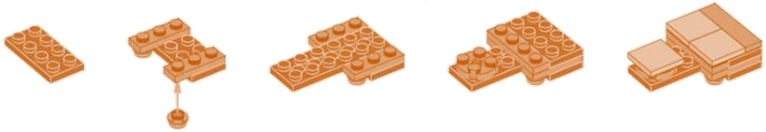
- Web Interface
- Interactive Program Editor
- Snippets
- Tasks
- Program Generator

SAS Viya Programming

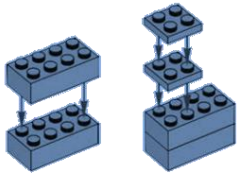
As viewed through Legos…

SAS Studio can include one or more procedures to create a task.

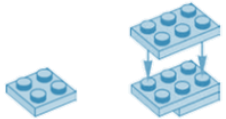
Stack one or more action sets to create procedures

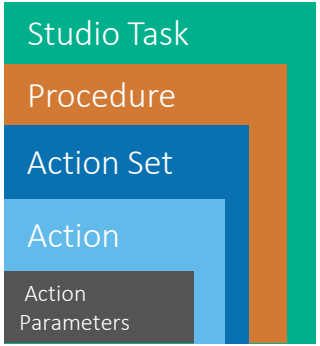


Stack one or more actions to create action sets



Each action has one or more parameter settings.

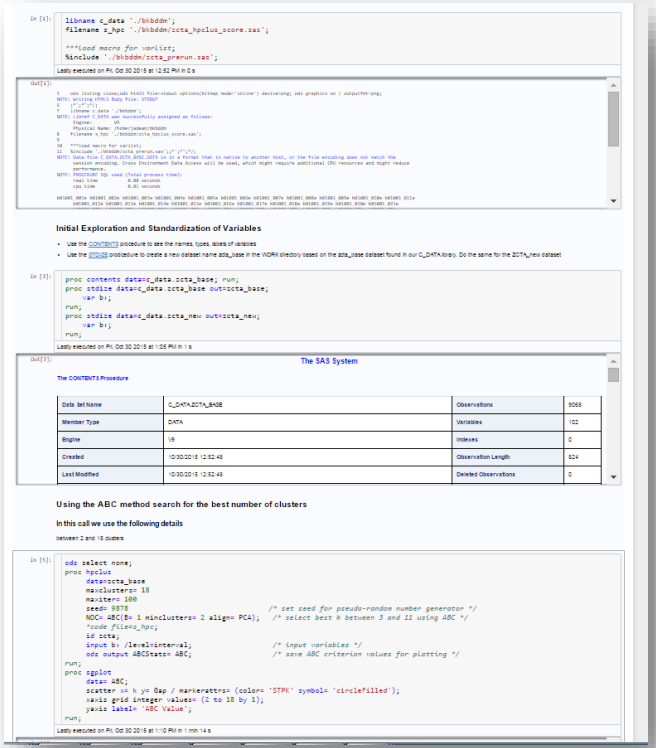




Actions are at the heart of every CAS procedure

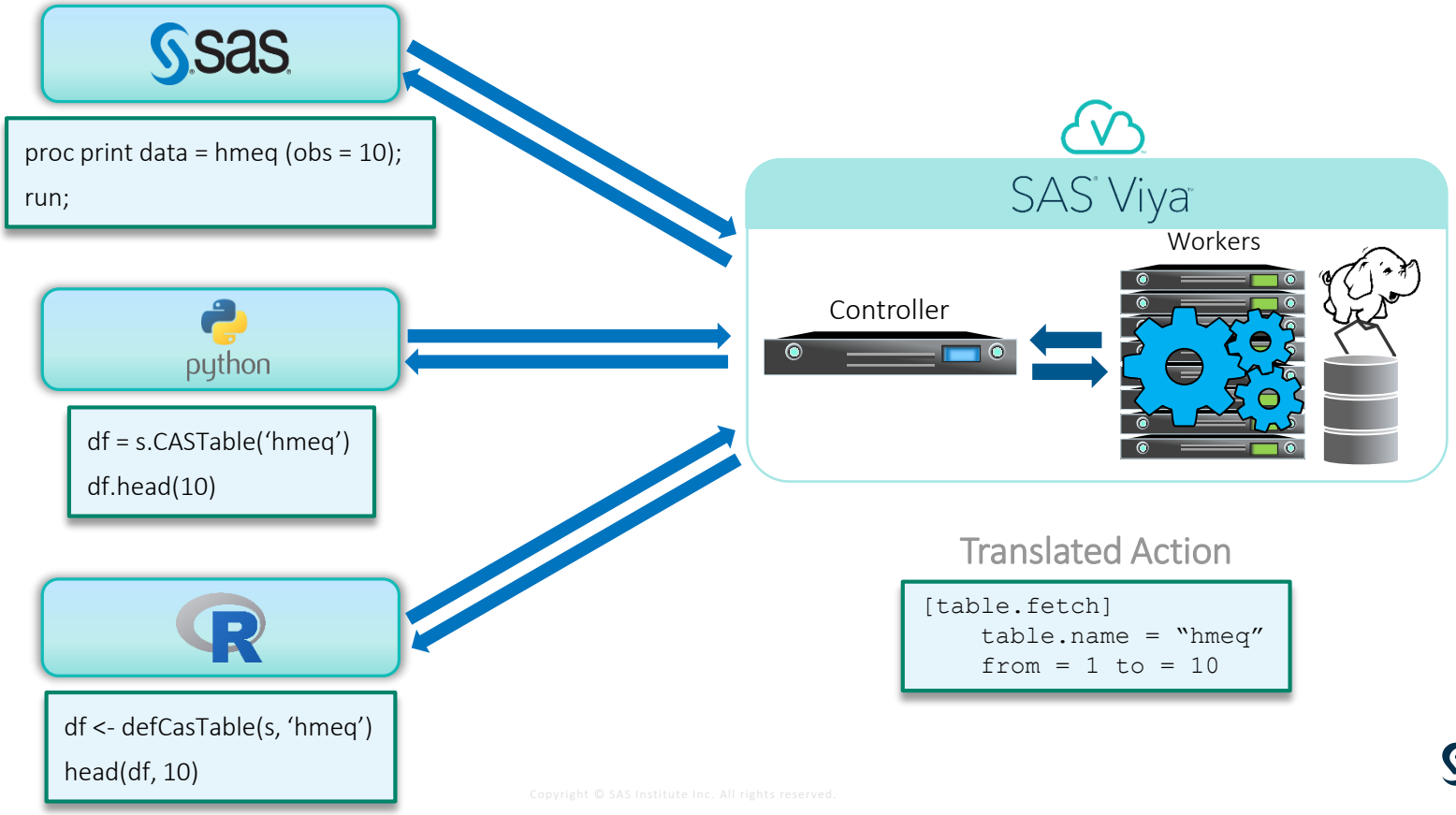
SAS® Viya™ and Open Source

- SAS Scripting Wrapper for Analytics Transfer (SWAT) package is an API from Python or R to CAS.
- SWAT allows users to load data into memory and apply CAS actions to transform, summarize, model and score the data
- Integration of SAS Analytics in Python/R code
- Jupyter Notebook support



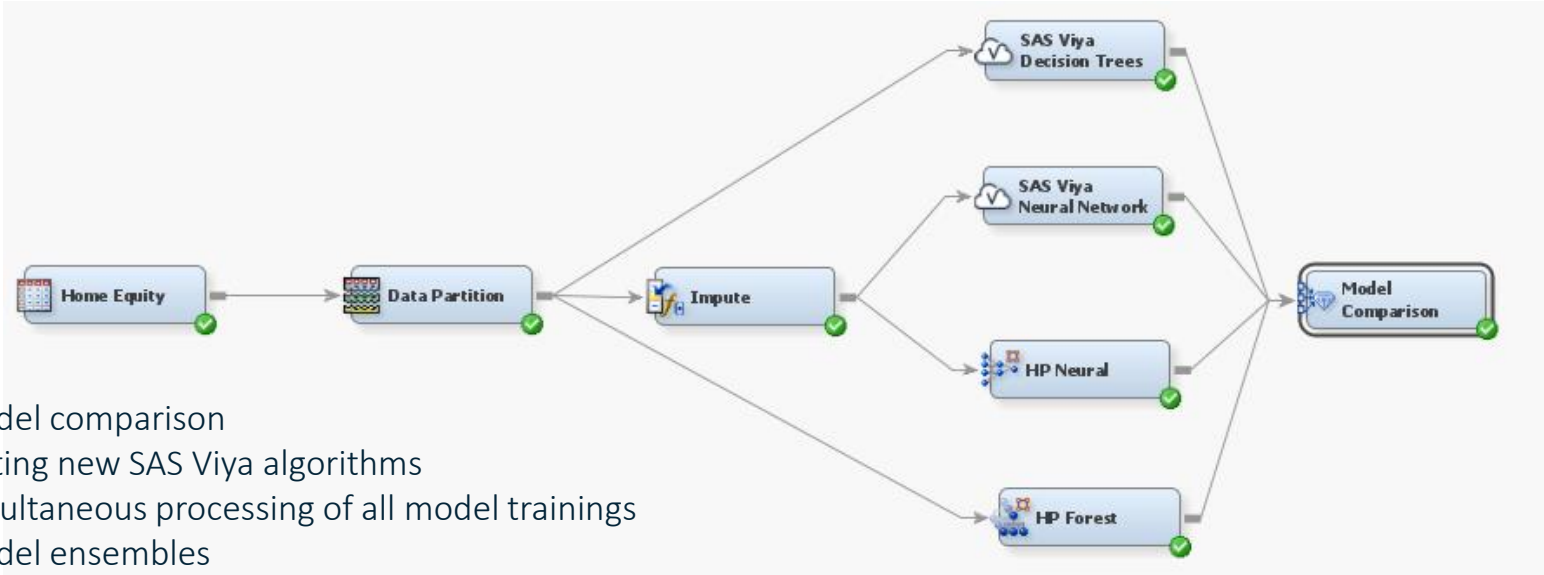
SAS® Viya™: New Interface APIs

Different Languages – Same Power



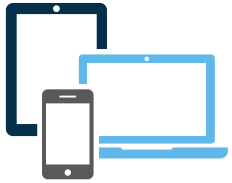
SAS® ENTERPRISE MINER VIYA™ NODE

Increase the Reach

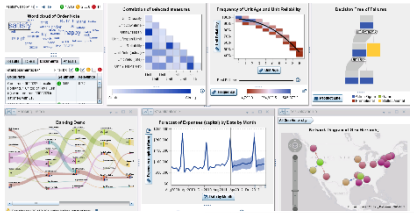


- Model comparison
- Testing new SAS Viya algorithms
- Simultaneous processing of all model trainings
- Model ensembles
- Integration with SAS Enterprise Miner Metadata
- Management, deployment und monitoring of SAS Viya models

Different Interfaces for Different User Personas



Mobile



Office Integration

One Integrated Solution for Different User Types

Business Analyst

SAS Statistician

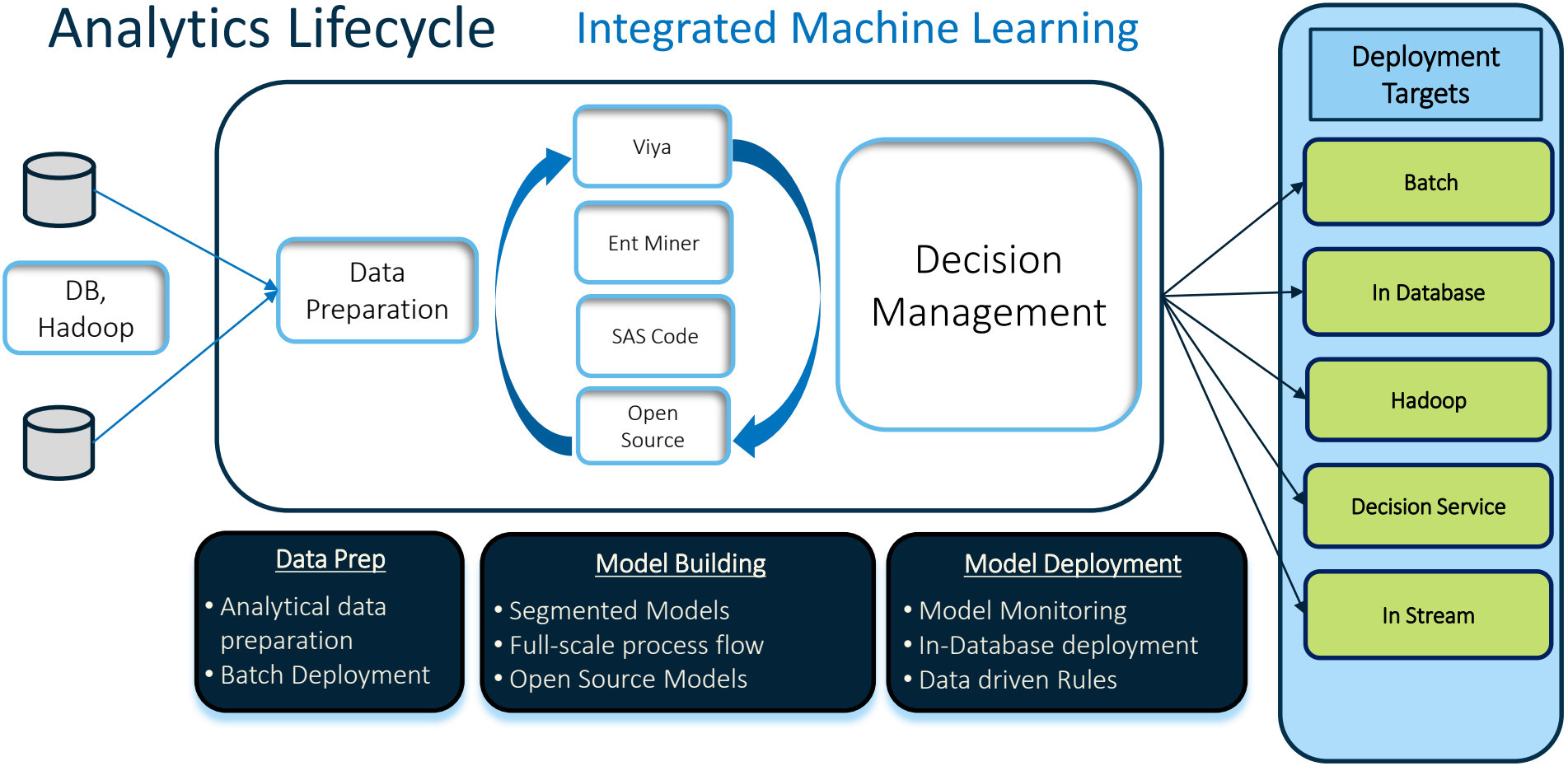
SAS Data Scientist

Open Source Data Scientist

IT and Application Mngt.

Analytics Lifecycle

Integrated Machine Learning



Data Prep

- Analytical data preparation
- Batch Deployment

Model Building

- Segmented Models
- Full-scale process flow
- Open Source Models

Model Deployment

- Model Monitoring
- In-Database deployment
- Data driven Rules

Useful Websites

Developer.sas.com, Communities.sas.com

SAS for Developers

Give us your feedback

Use the power of SAS Viya in your applications.

SAS Viya is an op
One underly

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

Java APIs for using
SAS Viya CAS actions.

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MDX for authorization in a cube — 0 New, 6 Replies, 0 Likes

Create a macro to import and merge thousands CSV f...

MEMBERS 115,545 | ONLINE 1,576 | POSTS 309,408

Post a Question

SAS Viya LIVE! LIVESTREAM

USE CASE - Real Time NBA

The customer makes a purchase in a store

Billing system stops the transaction as it exceeds expense limit

Event: *transaction denied* is considered relevant for real-time decision management system

Event

Context information

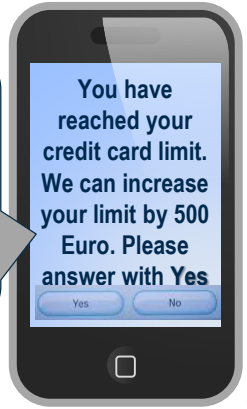
- Customer profile
- Balance account
- Expense limit
- Purchase amount

RT Decision Engine

Instant expense limit increase (500€)

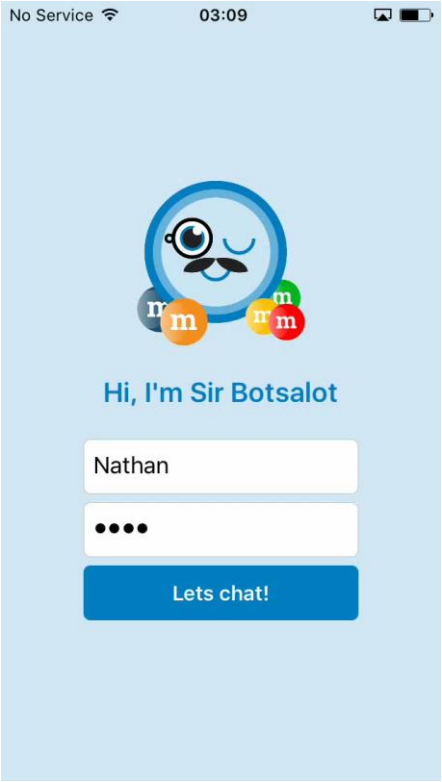
NBA is calculated using: customer profile and eligibility to that specific offer

Notice is sent on the Bank web portal, the bank APP, or via SMS



Automated Decisions

ChatBot



SAS Viya™ Virtual Learning

Get Started with SAS® Viya™ Enablement

Videos	Videos	Videos	Videos
SAS® Viya™ Administration	Transitioning from SAS® 9 to SAS® Viya™	Data Mining and Machine Learning on SAS® Viya™	SAS Visual Analytics 8.1 on SAS® Viya™
Videos	**Videos**	**Workshops**	**Documentation**
SAS Visual Investigator on SAS® Viya™	SAS Econometrics, SAS Optimization, and SAS Visual Forecasting on SAS® Viya™	SAS® Viya™ Analytics Workshops	SAS® Viya™ Documentation

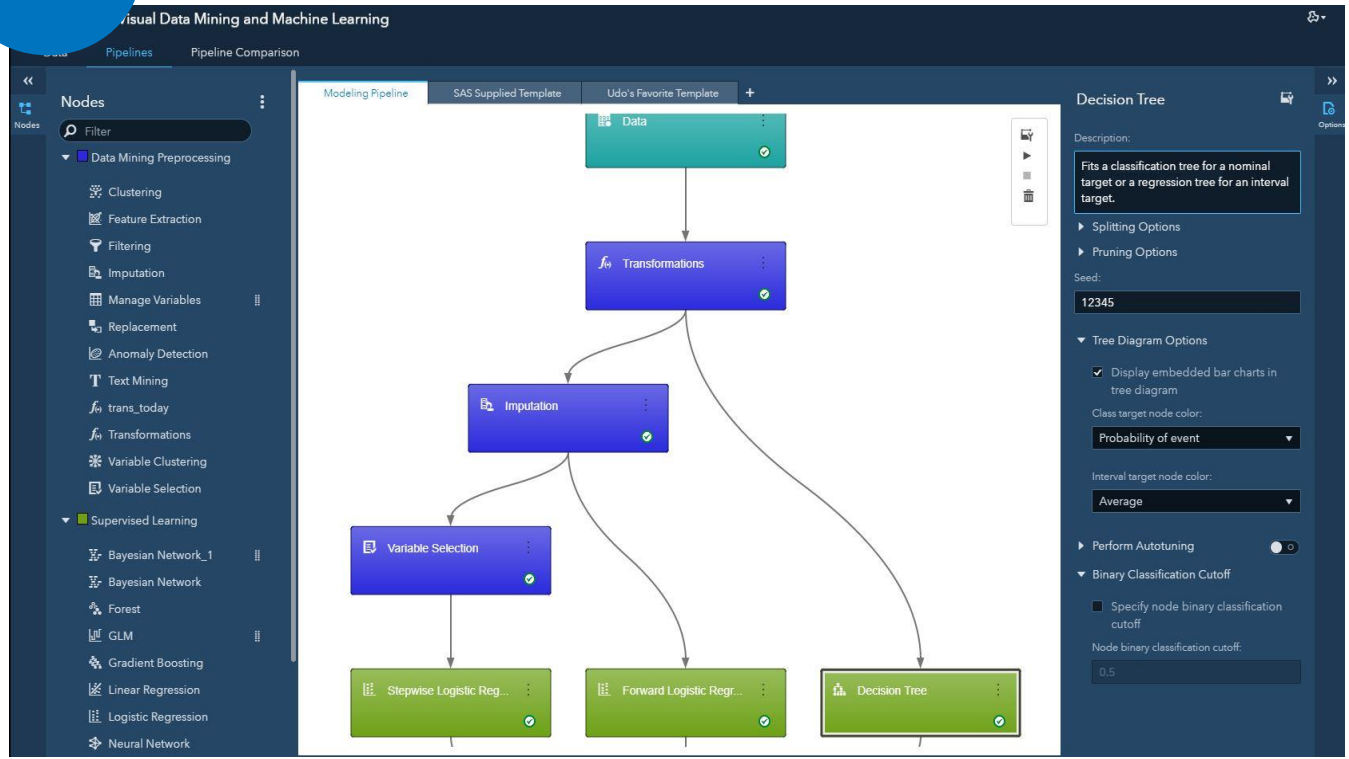
Support your adoption

- Free resources
  - Getting Started training
  - Video Libraries
  - e-Learning
- Topics Include
  - Administration
  - Programming & Analytics
  - SAS Visual Analytics
  - Open Source Integration

SAS Viya Visual Data Mining and Machine Learning

Some highlights

W47



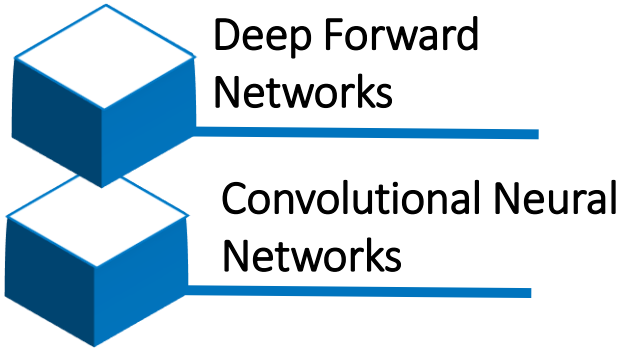
- Custom pipelines
- Parallel execution
- SAS best practice pipelines (i.e. Rapid Predictive Modeler)
- Defining and sharing custom reusable nodes
- Ability to deploy models in to databases directly
- Score code generation and score code APIs
- Import SAS 9.4 score code into pipeline comparison
- SAS Code integration

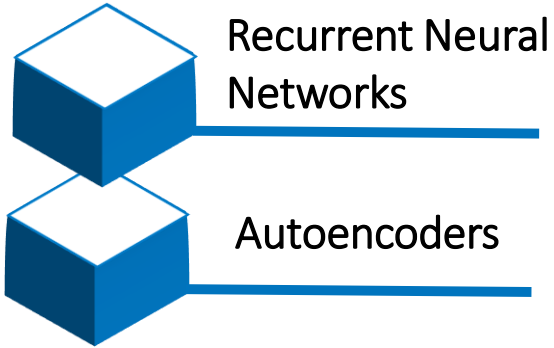
Deep Learning

SAS Vision

Provide market leading platform for the rapid and seamless extraction of knowledge from data of any size, type, or complexity.

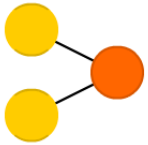
Provide deep learning for SAS Solutions (Fraud, Customer Intelligence and Security Intelligence) and for customers to embed into their applications.



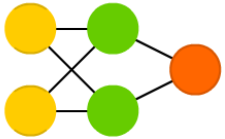


Neural Networks

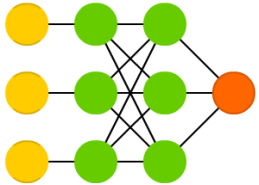
Perceptron



Feed Forward Networks (FF);
Radial Basis Networks (RBF)



Support Vector Machines (SVM)



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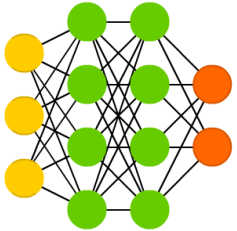
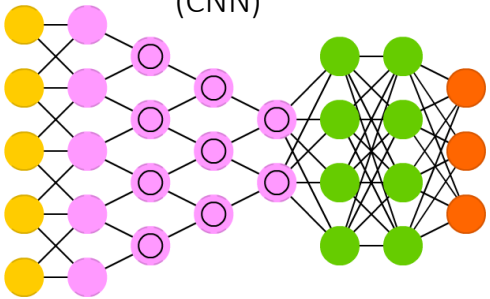
Deep Learning

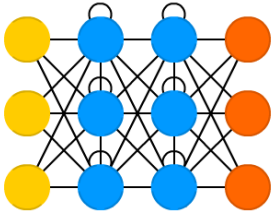
Deep Neural
Network (DNN)



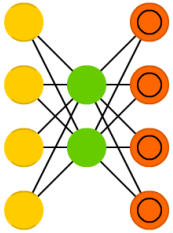
Convolutional
Neural Networks
(CNN)



Recurrent Neural
Networks (RNN)



Auto Encoder
(AE)



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- http://www.asimovinstitute.org/neural-network-zoo/

SAS Approach to Artificial Intelligence

Artificial Intelligence (AI) is the science of enabling computers to perform tasks that typically require human intelligence to complete.

Pattern Recognition ● Prediction ● Classification ● Image Recognition ● Speech to Text ● Natural Language Interaction ● Natural Language Generation

Deep Learning	Natural Language Understanding
Machine Learning	Natural Language Processing

Thank you!

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sas.com

THE POWER TO KNOW.