

SAS® Platform Overview of SAS Viya



SAS is a leader in:



Data science
platforms



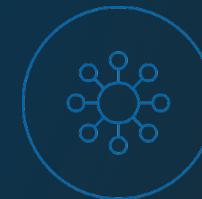
Customer
analytics



Digital
marketing
analytics



Merchandise
Assortment
Planning &
Sizing
Optimization



Multi-channel
campaign
management

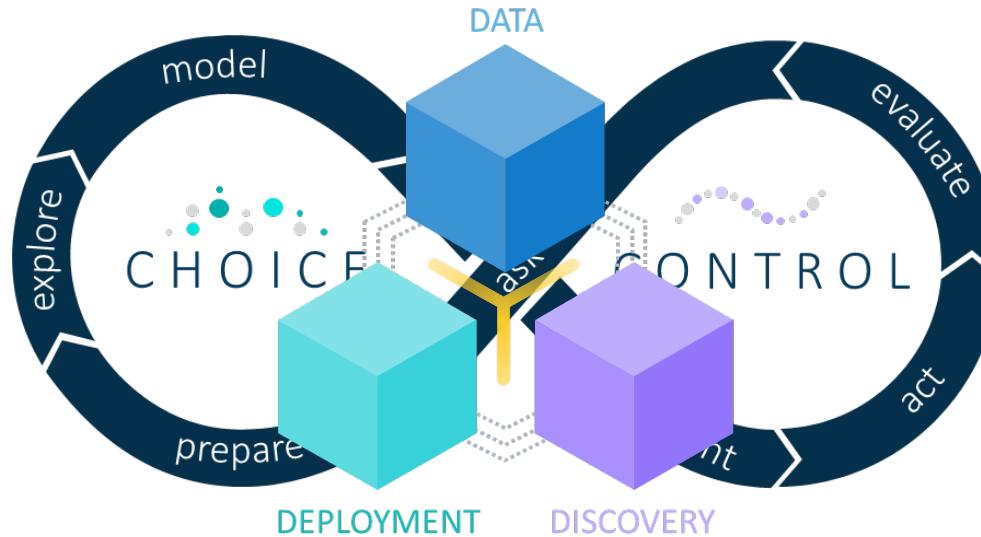


Data quality /
Data
integration

Empowering Enterprise Analytic Initiatives

HOW
Do You Achieve
Value?

DATA DRIVEN ANALYTICAL APPROACH



AGNOSTIC MODEL ORCHESTRATION

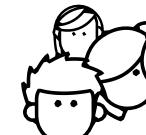
SAS VALUE

MARKET LEADER
Deep & Broad Product Portfolio:
Expertise in Analytics



DEMOCRATISED ANALYTICS

Visual & Coding Interfaces for a
Variety of Languages



SPECIALISED KNOWLEDGE

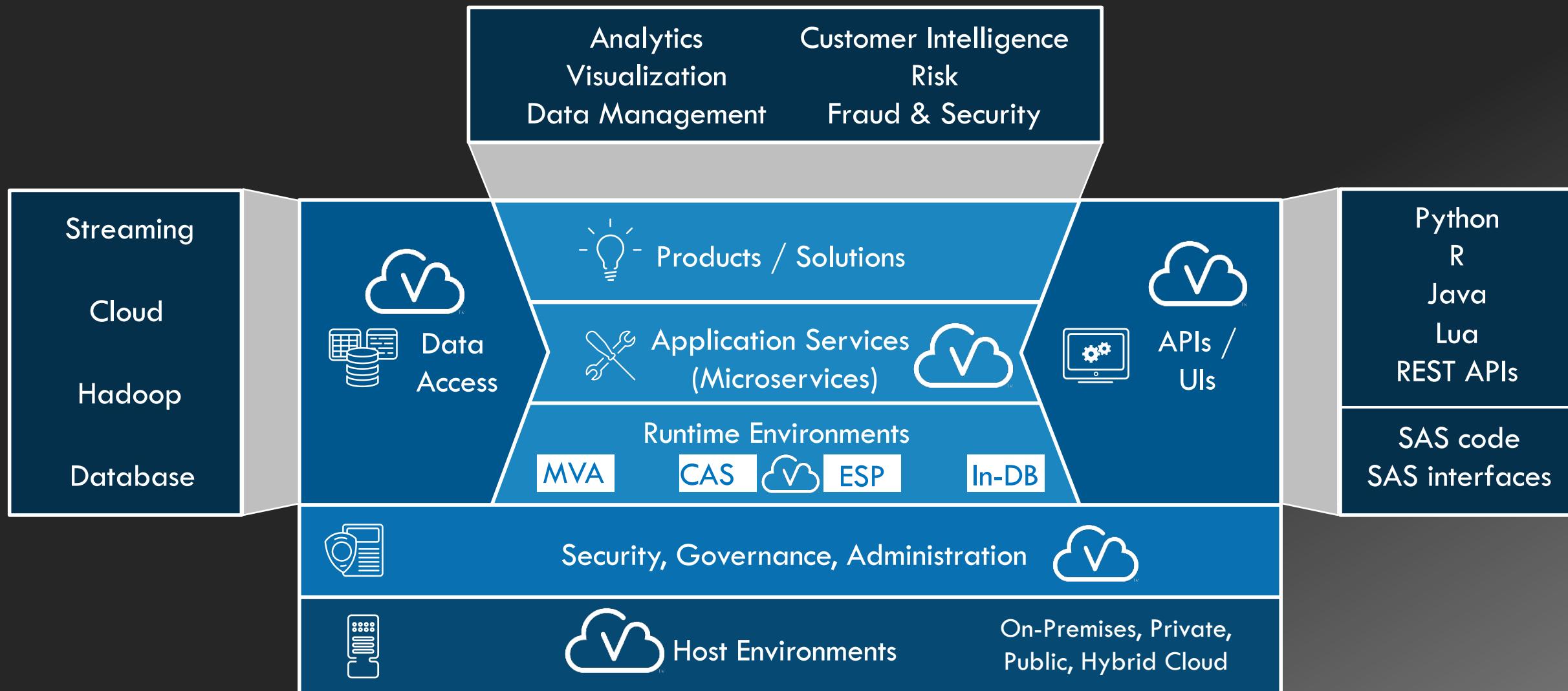
Business & Industry Specific Solutions
fuelling mission critical applications

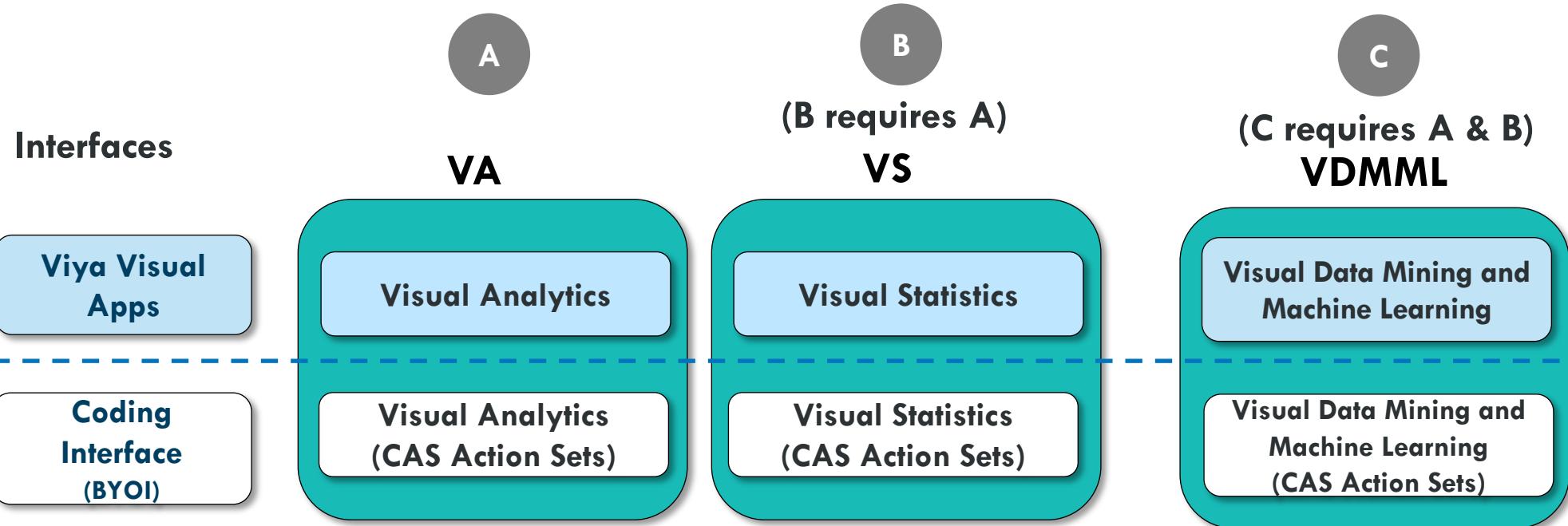


SAS Platform for Industrialized Analytics



SAS Viya – High Level View





Only a handful of products shown for illustration purposes

Technical Benefits

- ✓ Huge shared memory
- ✓ Specially written multi-threaded software
- ✓ Blazingly fast speeds
- ✓ Amazing agility
- ✓ Current machine learning techniques
- ✓ Cloud-ready
- ✓ Increased accessibility



SAS[®] Viya[™]



Viya is Language Agnostic, Interface Agnostic

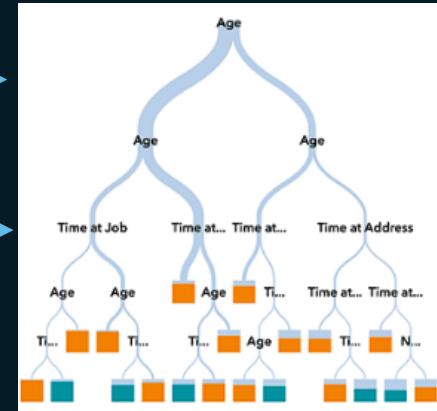
Visual Interfaces



Programming Interfaces



API Interfaces





Core Analytics: Value Prop Highlights

Engines exist for data prep, *discovery* and *deployment*

Objects created by *discovery* processes

Core Methods use optimized **tech** for interacting with engines.

'Open' Wrappers for accessing core tech

Python

Pandas Data Frame **Data Frame**

describe()

Pandas

R

Data Frame

summarize()

dplyr

CAS

CAS Table

summary()

swat

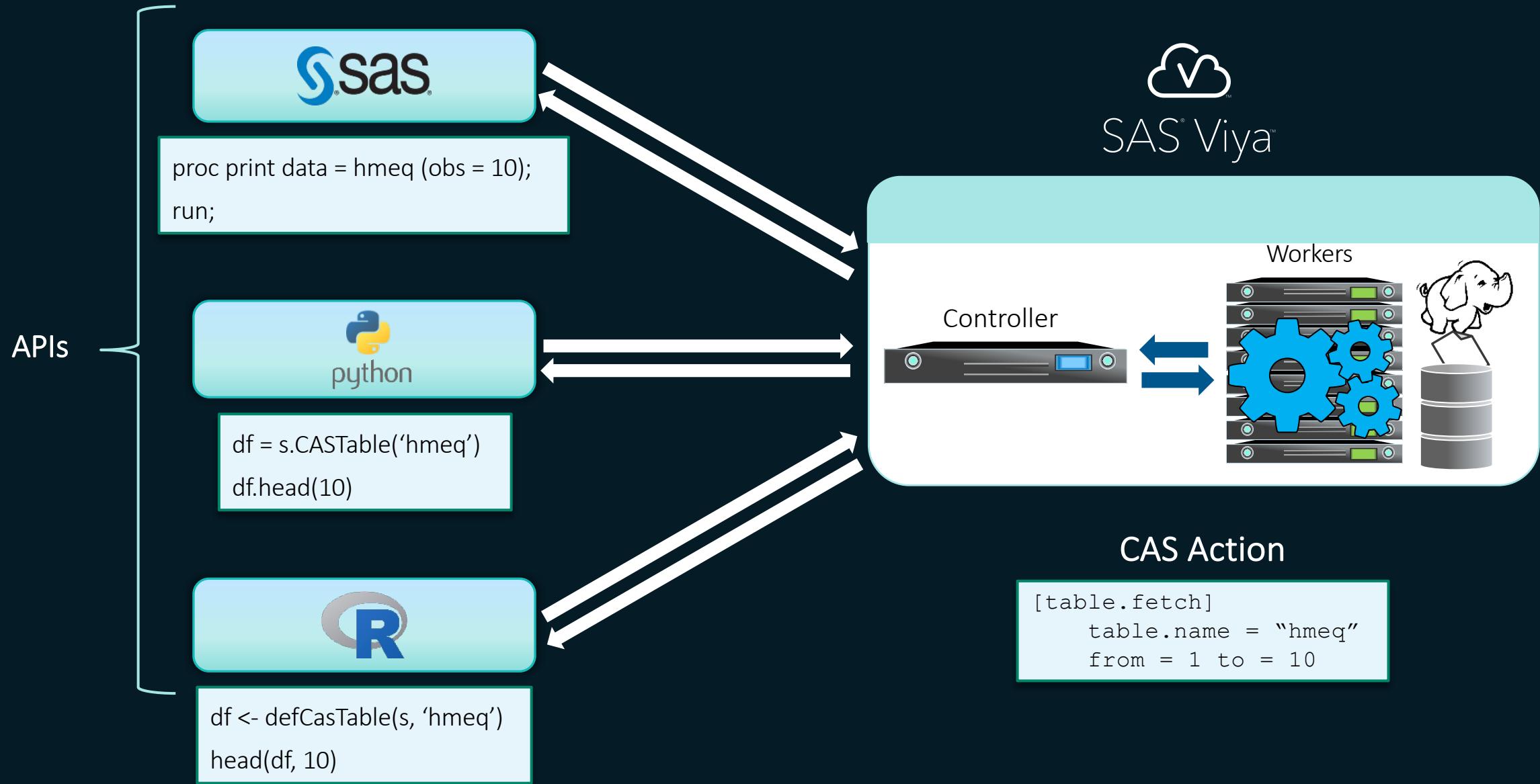
✓ **Scalable**

✓ **Distributed & Fault Tolerant**

✓ **Parallel, Multi-Threaded***

✓ **Fast & Easy**

How does it work





Sample Capabilities

Supervised and Unsupervised Machine Learning:

- Logistic Regression
- Linear Regression
- Generalized Linear Models
- Nonlinear Regression
- Ordinary Least Squares Regression
- Decision Trees*
- Partial Least Squares Regression
- Quantile Regression
- K-means and K-modes Clustering
- Principal Component Analysis
- Random Forest*
- Gradient Boosting*
- Neural Networks*
- Support Vector Machines*
- Factorization Machines*
- Deep Learning*
- Network Analytics/Community Detection
- Text Mining
- Boolean Rules
- Auto-tuned Hyper-parameters
- Assess Supervised Models

Data Manipulation:

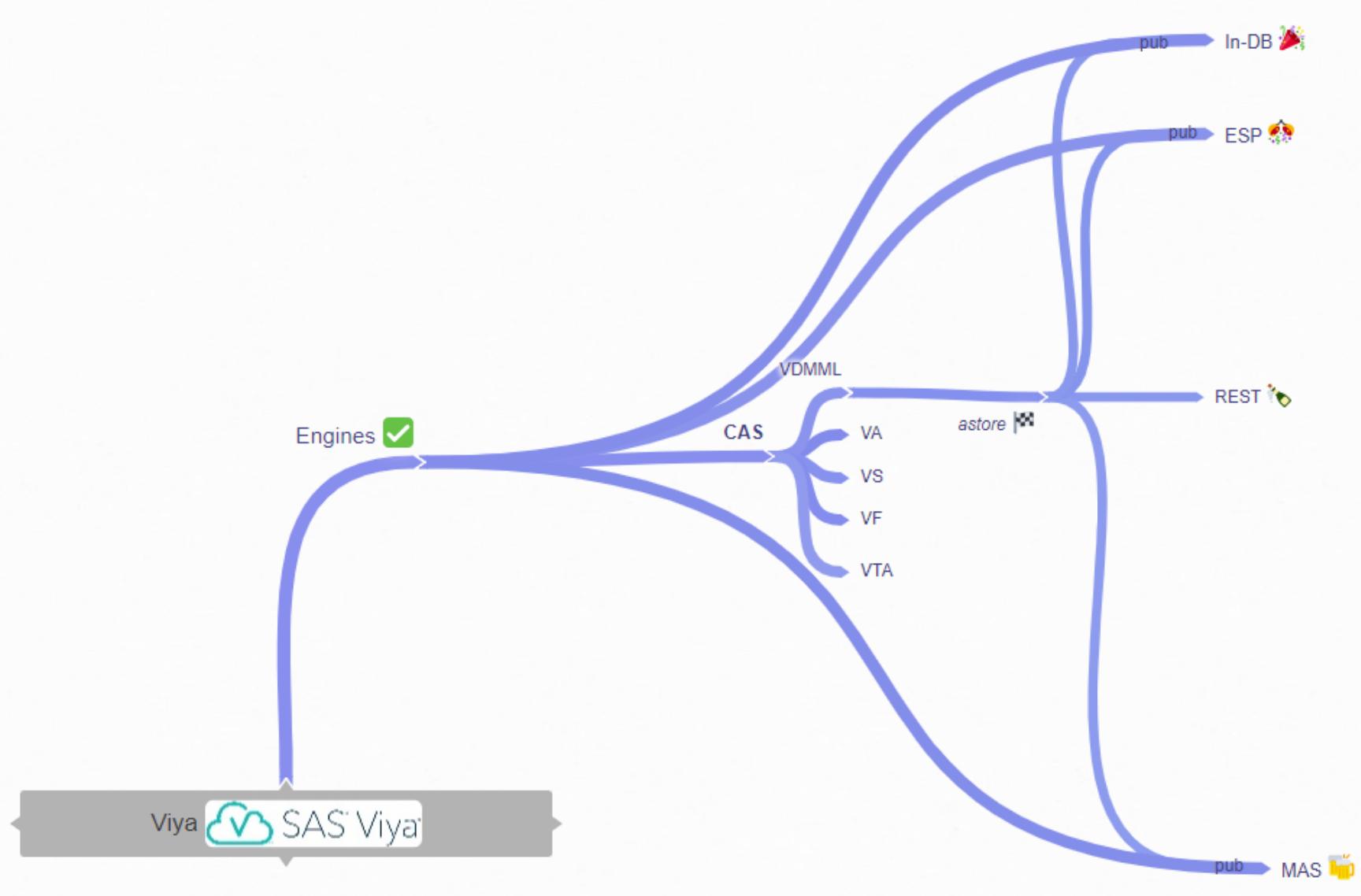
- Transpose
- SQL
- Variable Binning
- Variable Cardinality Analysis
- Sampling and Partitioning
- Missing Value Imputation
- Variable Selection
- In-Memory Data Step (SAS)

Other Notable Capabilities:

- Sentiment analysis
- Recommender System
- Statistical Process Control
- Sampling and Partitioning Schemes
- Mixed Modeling
- Data Science Pilot*
- Explain Model Actions

*Represents the ML techniques where auto-tuning is supported

Create and Deploy :- Tying it all together!



Build Once,
Deploy Anywhere!

Summary

- Use Native Client Libraries to Build Your Own ML Pipelines, App Integrations or Custom Work Flows with SAS

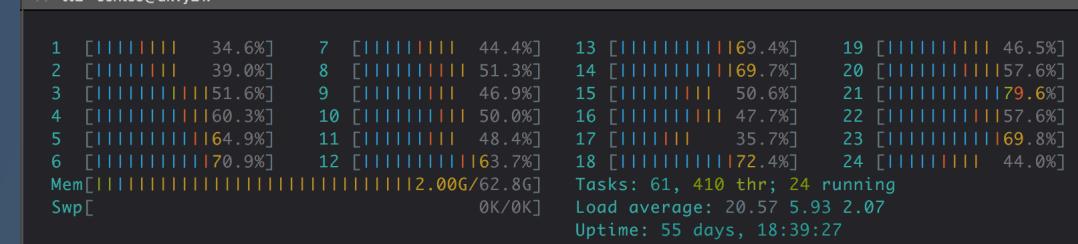
- ✓ PySWAT - Python API for Viya
- ✓ R-SWAT - R API for Viya
- ✓ DLPy - Keras Like API for DL on Viya
- ✓ ESPPy – For Real Time Streaming Projects
- ✓ REST APIs - For Web Apps
- ✓ Others – developer.sas.com

SAS for Developers				Give us your feedback
SAS	REST	Python	iOS and Android	
SAS Viya uses PROC CAS to run CAS actions in SAS Cloud Analytic Services.	REST APIs for any client language to access SAS analytics, data and services.	Python APIs for using SAS Viya CAS actions.	iOS and Android SDKs to create mobile apps that access content in SAS Viya.	
Java	Lua	R		
Java APIs for using SAS Viya CAS actions.	Lua APIs for using SAS Viya CAS actions.	R APIs for using SAS Viya CAS actions.		

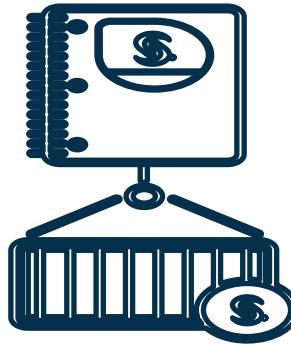
- Integrate Open Source Models with Viya to compare, manage, validate and govern models deployment in SAS
 - ✓ Integration of Python and R Models Through SAS Model Manager for Deployment
 - ✓ Score Python Models with SAS Event Stream Processing
 - ✓ Write your own models Open Source Models in Model Studio

Value Summary

- ✓ Workload Optimized Runtime Environments
 - Eliminate low level engineering for analytic workloads
 - Derive efficiencies from Platform Integrations and capabilities
- ✓ Deployment Focused Development
 - Intelligent automation + Interpretable models
- ✓ Fosters easy collaboration
 - Language Agnostic – Familiar language choice is ok
 - Interface Agnostic - Bring your own Interface
- ✓ “Fit for problem” solutioning mentality
 - True Champion wins across SAS or pure python or R models
 - Bring Model Governance, Versioning if needed
- ✓ Easy to Learn Open APIs
 - Publicly documented, Easy to contribute to and raise issues
- ✓ Easy to incorporate into existing development and deployment practices



Type of SAS containerized applications



Runtime Container:

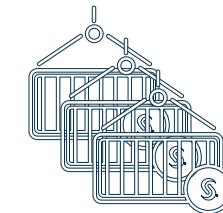
Definition: A single container that has one or more analytics runtime (e.g. SAS9, CAS, R or Python)

Analytics Usage: This can be used for ad-hoc development work or running batch jobs

Utilization: designed to be spun up and down on-demand with fast spin-up time (seconds)

SAS Products: SAS9 MVA, VIYA CAS

IDEs: SAS Studio/Jupyter



Enterprise Grade Applications

Definition: Multi-container deployment with microservices, stateful services and distributed compute

Analytics Usage: User concurrency on interactive visual web clients (exploration, model building and dashboarding)

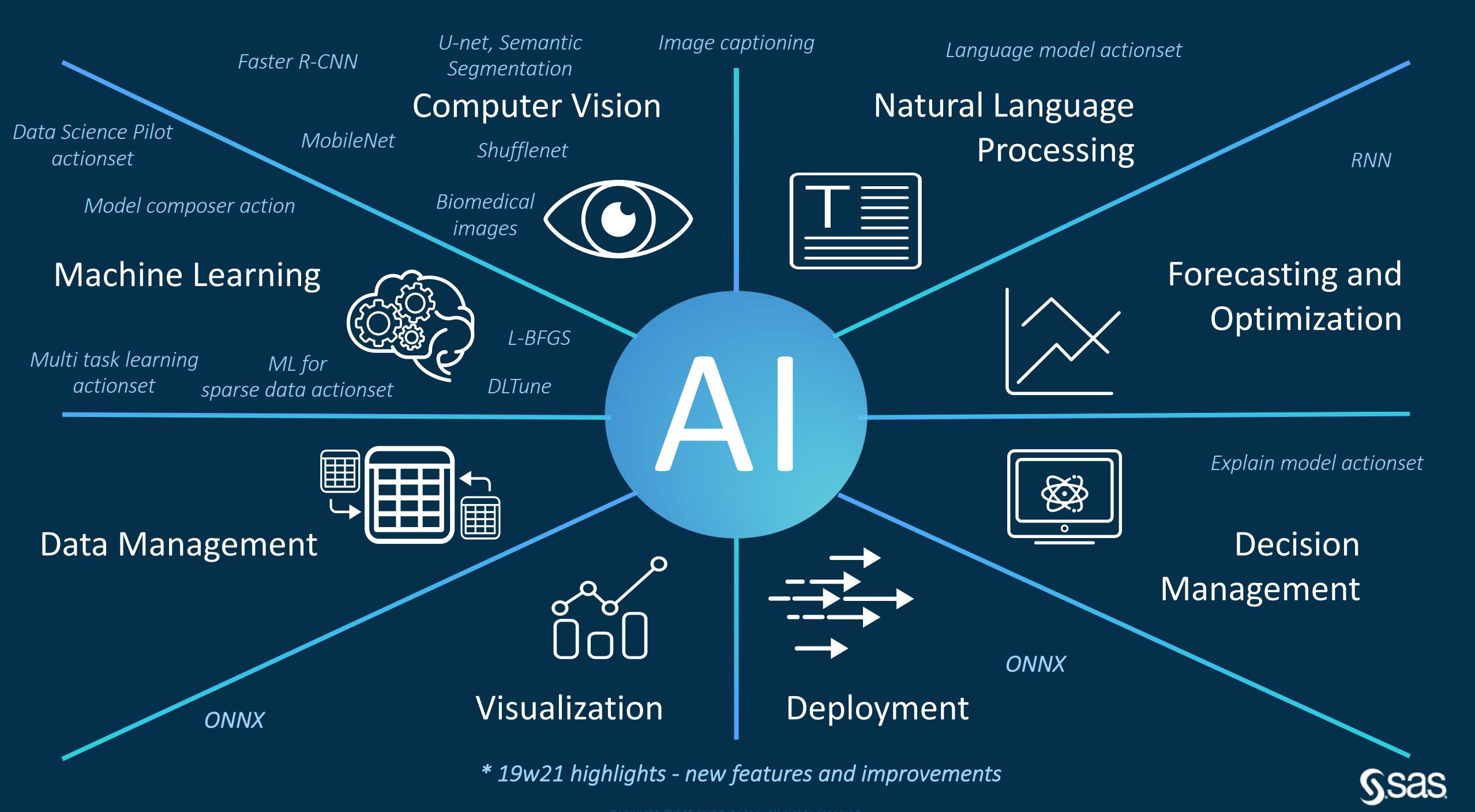
Utilization: The applications are not spun-up/down as often

SAS Applications: VA/VS/VDML - Coming soon:
Data Preparation, Model Management, etc...



What's new and What's coming

Recent Release highlights & Roadmaps



Visual Data Mining and Machine Learning

Recent Release Highlights

Information is subject to change.

- **Integration end-to-end**

- Convert pipelines originating in Visual Analytics to Model Studio (editable) pipelines
- Ability to publish to [MAS for ESP integration](#)
- Post-processing coding within the Code Node

- **Automation**

- Enhanced project creation ([template selection](#))
- [Automated NLI/NLG support for interpretability](#) and assessment plots
- Support for drill down to individual observations in interpretability plots
- New Score Node within Model Studio
- [DataSciencePilot](#): Automated feature engineering and modeling action set
- [ModelComposer](#): Automated modeling with embedded autotuning
- Enhanced SAS Feature Engineering Template (Model Studio)



Visual Data Mining and Machine Learning

Recent Release Highlights

Information is subject to change.

- **Collaboration**

- New [automated insights report](#), including user annotation and NLG
- [ExplainModel](#): Modern interpretability action set
- Pipeline annotations

- **Modernization**

- Cluster Component prefix
- Include misclassification table / confusion matrix in Assessment results
- Ensemble voting method
- Enhancements to Anomaly Detection node - bandwidth options, property to reverse filter
- Target based encoding methods including WOE, freq of target, etc added to Transform Node

Visual Data Mining and Machine Learning

Recent
Release
Highlights

Information is subject to change.

• Additional Methods

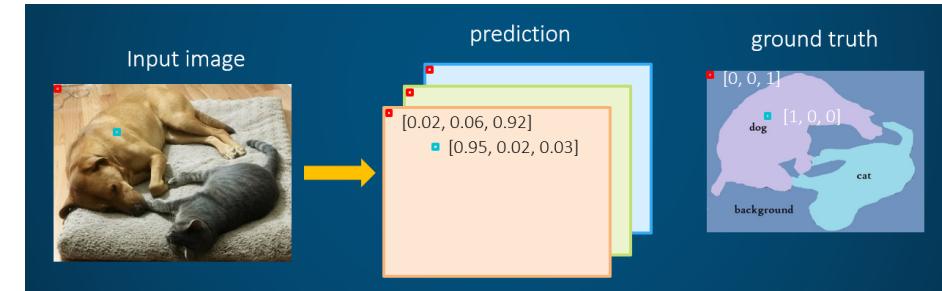
- **Sparse Machine Learning**
 - Semi-supervised learning enhancements
 - Support Vector Regression
 - Gaussian process regression
 - Common interpretability action set, consumable by internal and external calls
- **Automated feature engineering and modeling action set**
 - Autotuning for multi-task learning and T-SNE
 - Gradient Boosting procedure default property changes and additions to autotuning parameters

Visual Data Mining and Machine Learning

Recent Release Highlights

- Deep Learning
 - Framework/Optimization
 - ASTORE supports layer extraction
 - FCMP to define customized learning rate policy
 - LBFGS Improvements
 - dITune improvements
 - Gradient compression
 - CNN Enhancements
 - New convolution layers: Transposed/Depth-wise/Group-wise
 - Multiple task layers
 - Faster R-CNN (Object Detection)
 - Segmentation layer (Semantic Segmentation)
 - RNN Enhancements
 - Word embedding model generates ASTORE
 - Support FC layers in RNN
 - Further GPU memory and speed optimization

Information is subject to change.



Visual Data Mining and Machine Learning

Recent Release Highlights

- Image Analytics / Biomedical Imaging
 - (`ProcessingImage`) New image processing methods
 - padding,
 - morphological gradient
 - New action, `AnnotateImages`.
 - Support the display of Image segmentation.
 - New action `loadDICOMData` for loading generic DICOM data, including DICOM-RT
 - Additions to `processBiomedImages`
 - image-specific parameters
 - Additions to `segmentBiomedImages`:isolated watershed and isolated region growing.
 - New action, `quantifyBiomedImages`

Information is subject to change.