



# Optimizing Multivariate Models: From Data Collection to Optimal Conditions and Scoring Models

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JMP Discovery Summit

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# To Cover

- • Background: Who is ADM
- Multivariate workflow
- Load data into JMP
- Clean data
- Explore model space
- Run analysis on demand
- Putting model online

JMP  
Demo

See the [Discovery Summit Americas 2021 Presentations](#) post for more detail on each step, and links to each add-in.



# Unlocking the power of nature, to enrich the quality of life.



# ADM by the Numbers

## FUNDAMENTALS



**~800**

Facilities



**61**

Innovation Centers



**321**

Food & Feed Processing Locations



**200**

Countries Served



**449**

Crop Procurement Locations



**39,100**

Employees

## FINANCIALS



**\$64B**

CY20 Revenue



**\$26B**

Market Cap as of 12/31/2020



**\$3.4B**

CY20 Adjusted Segment OP



**89**

Consecutive Years of Dividends



**\$3.7B**

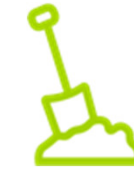
CY20 Adjusted EBITDA



**\$3.59**

CY20 Adjusted EPS

## CREDENTIALS



**1902**

Founded



**ADM**

NYSE Since 1924



**A**

Credit Rating

# To Cover

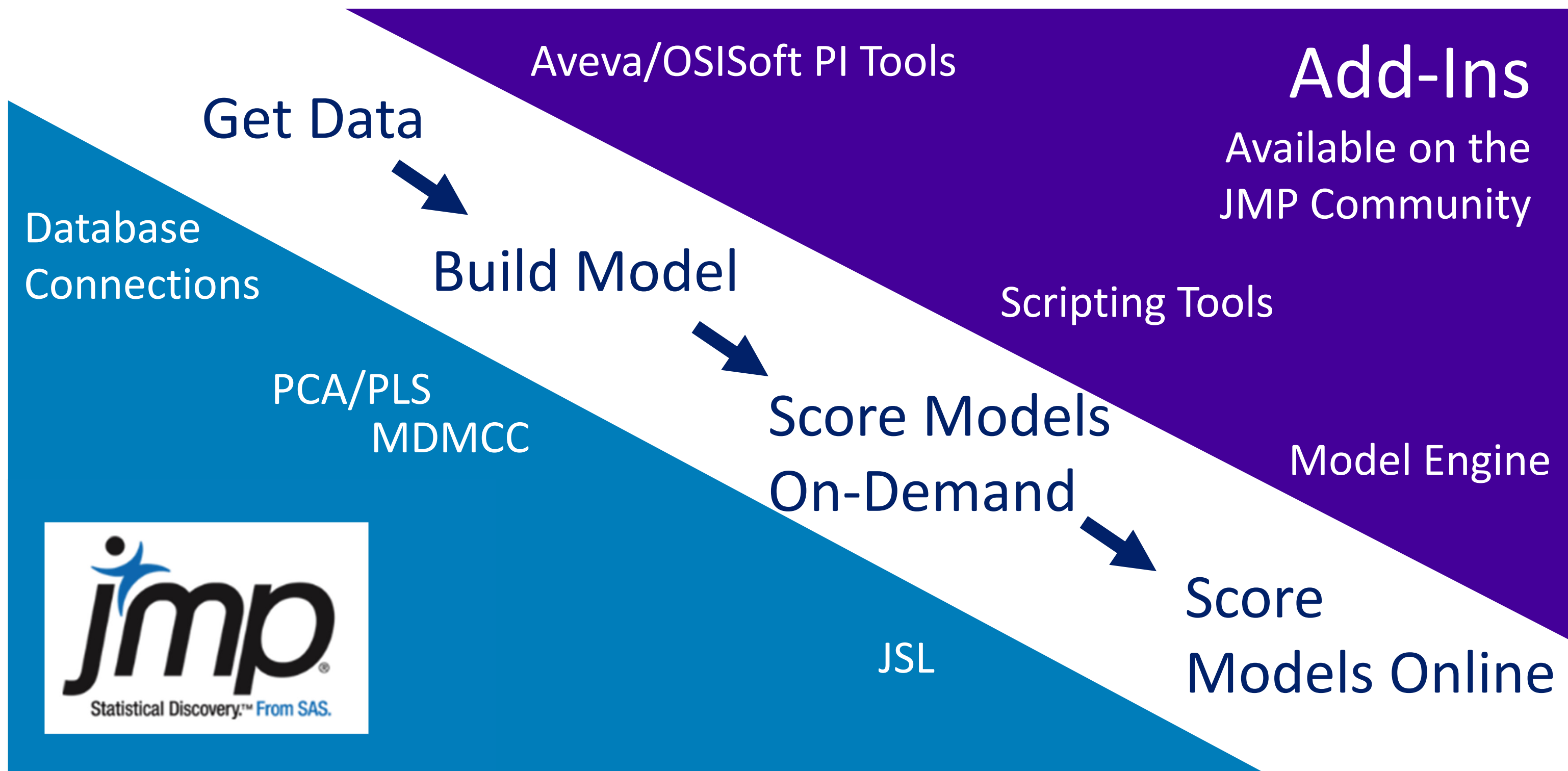
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# Multivariate Workflow in JMP



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# JMP Demo

Reference the journal for notes.





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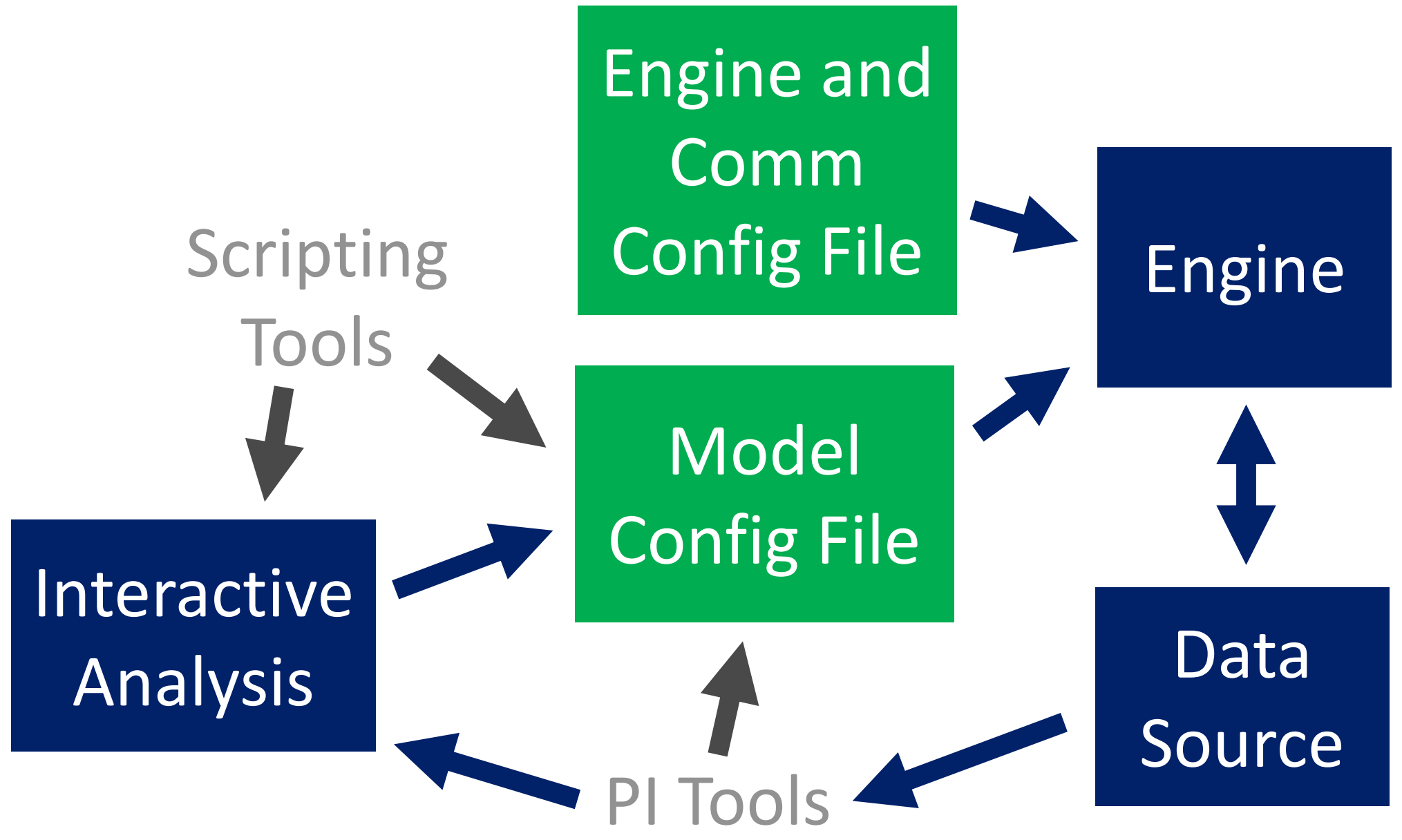
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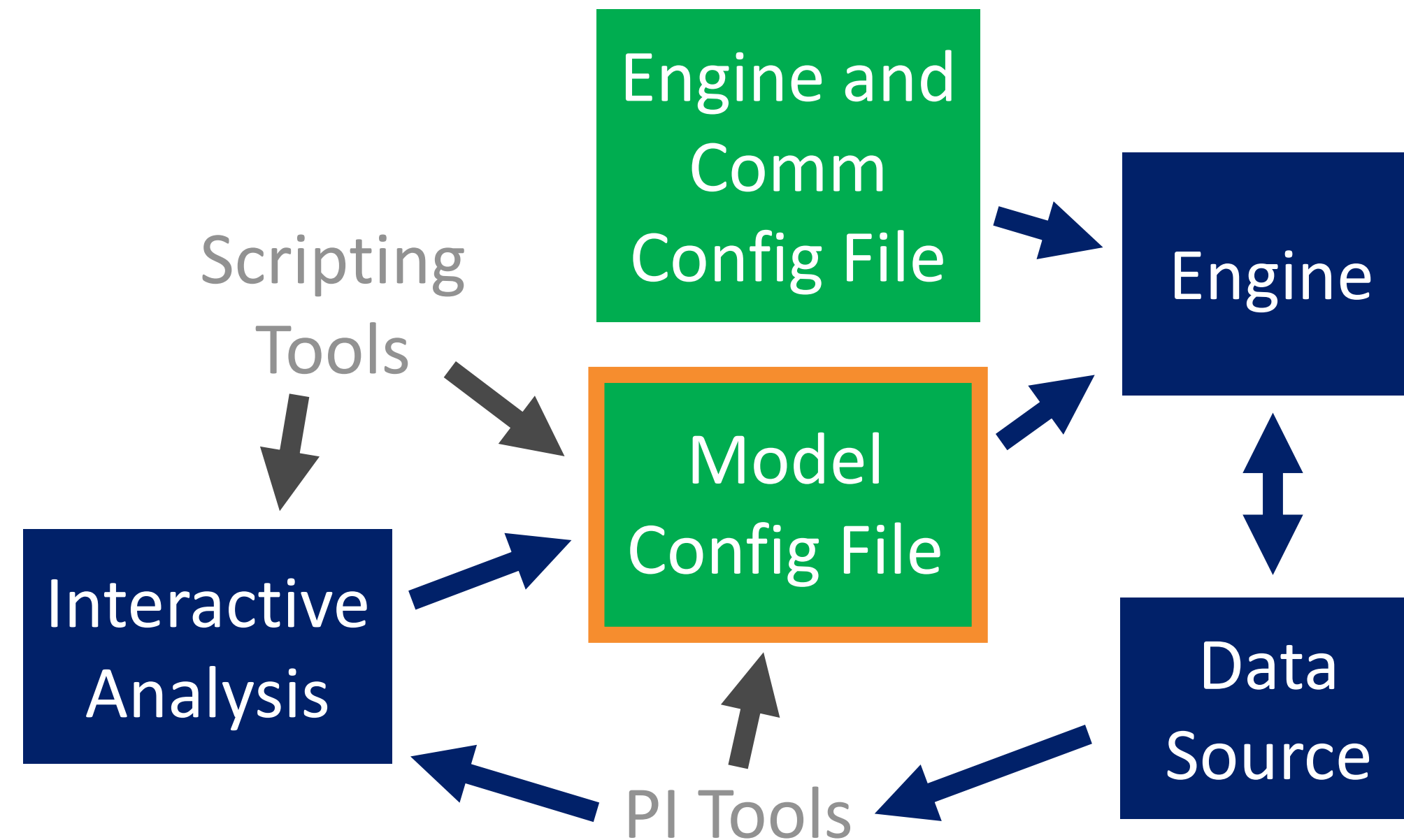
# Scoring a model 'online'

Within JMP we can quickly make predictions using multivariate and other models, and we can also identify abnormal conditions using T2 and DModX contributions. How to get this in front of operators?



# Scoring a model: Model Config

A model configuration file stores everything needed to score a model: source tag information, calculated columns or other scripts, and which columns contain info to write to other systems.



'value Flow 4 (tag655)' in table 'Training data'

Column Name

Lock

Data Type

Modeling Type

Format  Width

Use thousands separator (,)

Column Properties ▾

PI tag

PI Original Column Name

PI call type

PI interval

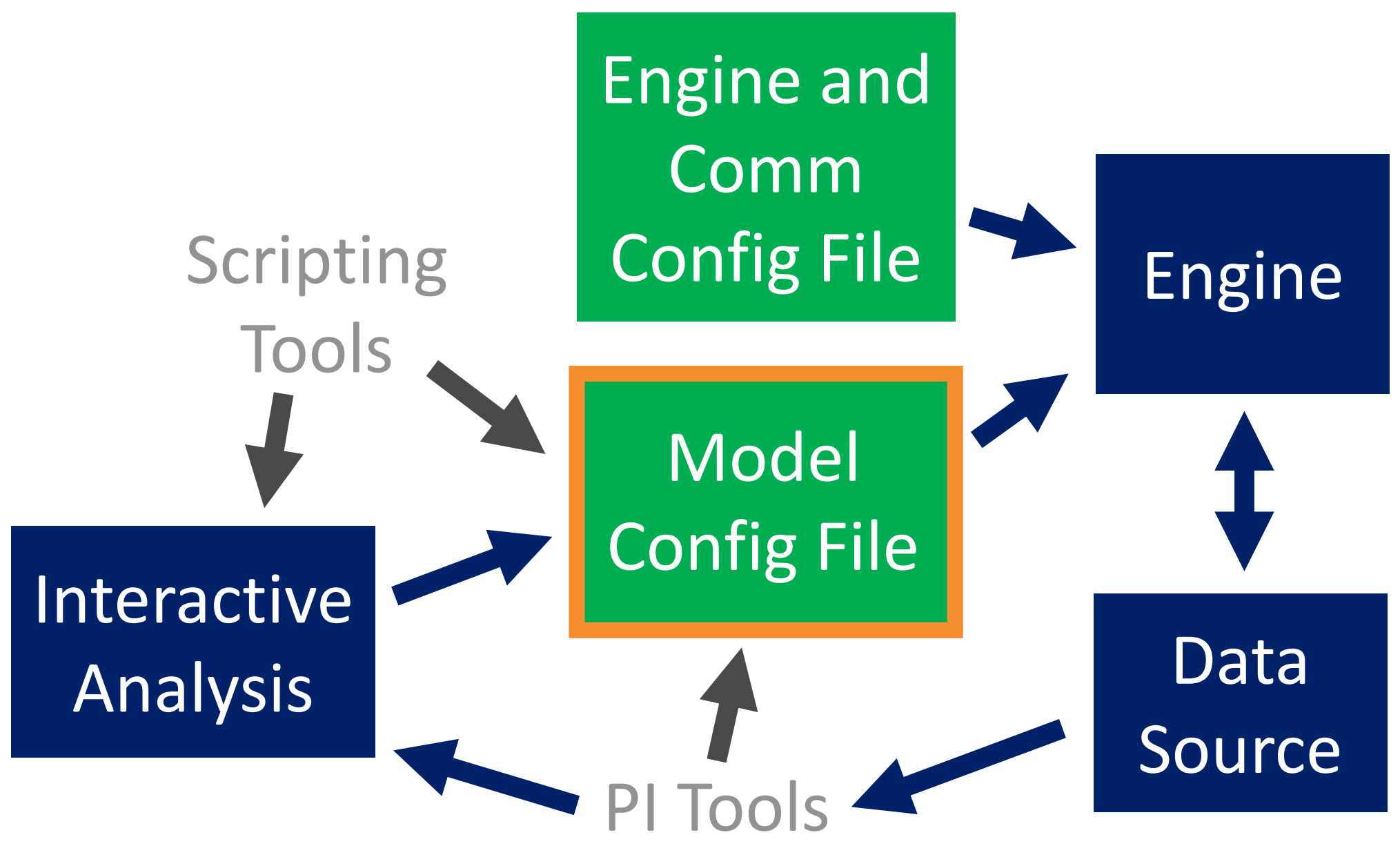
PI DSN

PI tag

"tag655"

# Scoring a model: Model Config

Most info needed for the model config file was in column attributes from the PI Tools add-in, or the script was created using the Scripting Tools add-in.

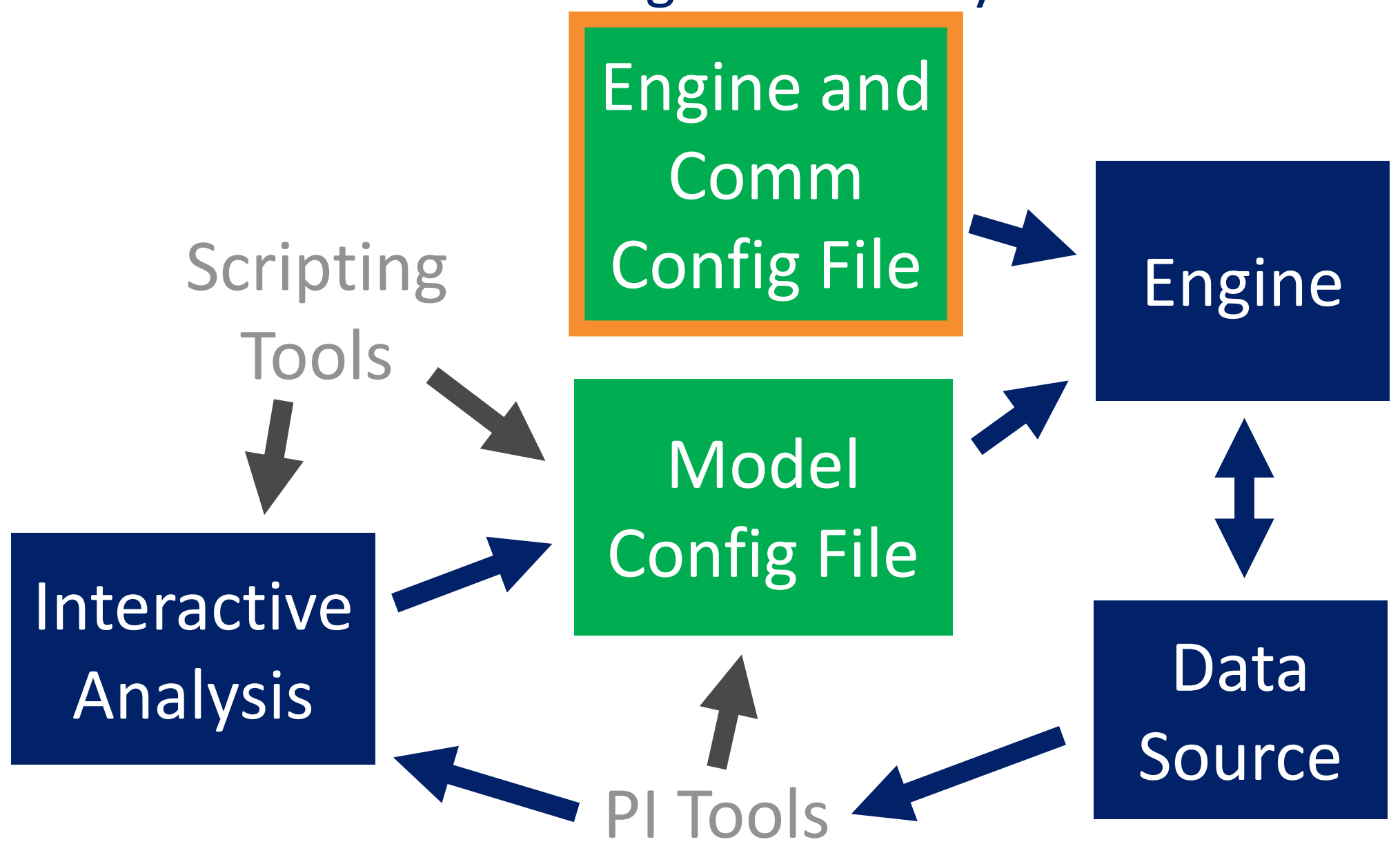


```

New Column("PLS Quality Model Rev 1 - X Score 2", Numeric,
[
-0.0823771738147631 -0.025322861623348 0.038331293260529
0.313839327185991 0.499687887201424 0.651872785602037 0
-0.0943616001586177 -0.184526310944616 0.170890340356830
0.305560324306571 -0.266723765344842 -0.042566984419332
[
-0.145612140245434 -0.126004146713756 -0.093013475045650
0.369080786484831 0.580358256095006 0.574165637988807 -0
-0.359497652412094 -0.269913052711544 -0.077036749337854
0.201922863796648 0.0149661419840396 0.0687396864977474
New Column("PLS Quality Model Rev 1 - X Score 3", Numeric,
[
-0.0823771738147631 -0.025322861623348 0.038331293260529
0.313839327185991 0.499687887201424 0.651872785602037 0
-0.0943616001586177 -0.184526310944616 0.170890340356830
0.305560324306571 -0.266723765344842 -0.042566984419332
[
-0.145612140245434 -0.126004146713756 -0.093013475045650
0.369080786484831 0.580358256095006 0.574165637988807 -0
-0.359497652412094 -0.269913052711544 -0.077036749337854
0.201922863796648 0.0149661419840396 0.0687396864977474
New Column("PLS Quality Model Rev 1 - X Score 4", Numeric,
[
-0.0823771738147631 -0.025322861623348 0.038331293260529
0.313839327185991 0.499687887201424 0.651872785602037 0
-0.0943616001586177 -0.184526310944616 0.170890340356830
0.305560324306571 -0.266723765344842 -0.042566984419332
[
-0.145612140245434 -0.126004146713756 -0.093013475045650
0.369080786484831 0.580358256095006 0.574165637988807 -0
-0.359497652412094 -0.269913052711544 -0.077036749337854
0.201922863796648 0.0149661419840396 0.0687396864977474
New Column("PLS Quality Model Rev 1 - Pred value Flow Target
New Column("PLS Quality Model Rev 1 - Pred value Quality 1
New Column("PLS Quality Model Rev 1 - Pred value Quality 2
New Column("PLS Quality Model Rev 1 - Pred value Quality 3
New Column("PLS Quality Model Rev 1 - Pred value X1 (tag95)
New Column("PLS Quality Model Rev 1 - Pred value X2 (tag354
New Column("PLS Quality Model Rev 1 - Pred value Flow 1 (tag
New Column("PLS Quality Model Rev 1 - Pred value Flow 2 (tag
New Column("PLS Quality Model Rev 1 - Pred value Flow 3 (tag
New Column("PLS Quality Model Rev 1 - Pred value Flow 4 (tag
New Column("PLS Quality Model Rev 1 - Pred value Flow 5 (tag
New Column("PLS Quality Model Rev 1 - T^2", Numeric, "Contint
  
```

# Scoring a model: Model Config

Engine configuration is done in a separate engine config file which determine show to communicate with the data source (currently only PI is supported), and info needed for high availability.



```

EngineConfig - JMP Pro
File Edit Tables DOE Analyze Graph Tools Adc
1 Associative Array({
2   {"Model Engine Number", Associative
3   {"Engine Directory", "C:/JMPModelEn
4   {"Model Directory", "C:/JMPModelEn
5   {"Communication Method", "PI" },
6   {"Web API URL", "https://piwebserve
7   {"PI Server", "PIServer" },
8   {"Heartbeat", Associative Array({
9     {1, Associative Array({{"tag",
10    {2, Associative Array({{"tag",
11  }) },
12  {"Machine Name", Associative Array(
13    {1, Associative Array({{"value"
14    {2, Associative Array({{"value"
15  }) },
16  {"Update Frequency", Associative Ar
17  {"Credential Method", "CredentialSt
18  {"Credential Store Description", "U
19  {"Log Level", 10 },
20  {"Last Run Check Filename", "lastru
21  {"Force Takeover All Models", 0 },
22  {"Shutdown", 0 }
23  });
  
```

*Thank You*

