



Drools & Predictive Analytics

Follow Your Rules and
Listen to Your Data

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Zementis, Inc.

Outline



- 1) Rules + Predictive Analytics - **Why?**
- 2) **How?** ADAPA Decision Engine
- 3) Drools Extensions
- 4) Sample Solution & Demo

Predictive Analytics + Rules

Enhanced Decisioning

Rules = *Expert Knowledge*

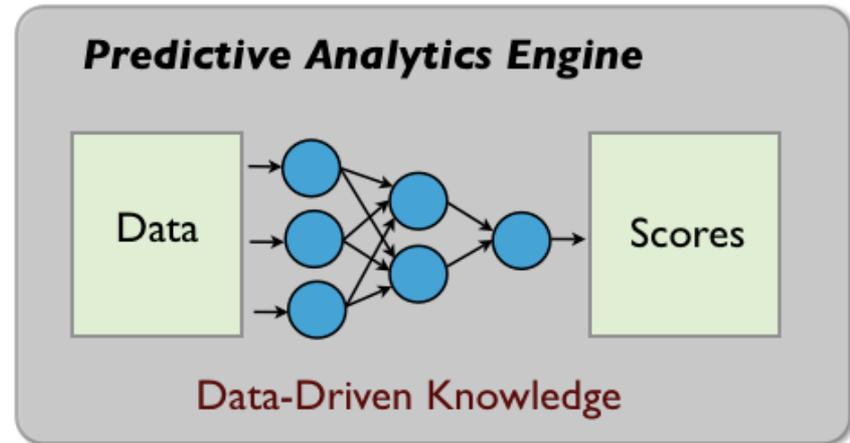
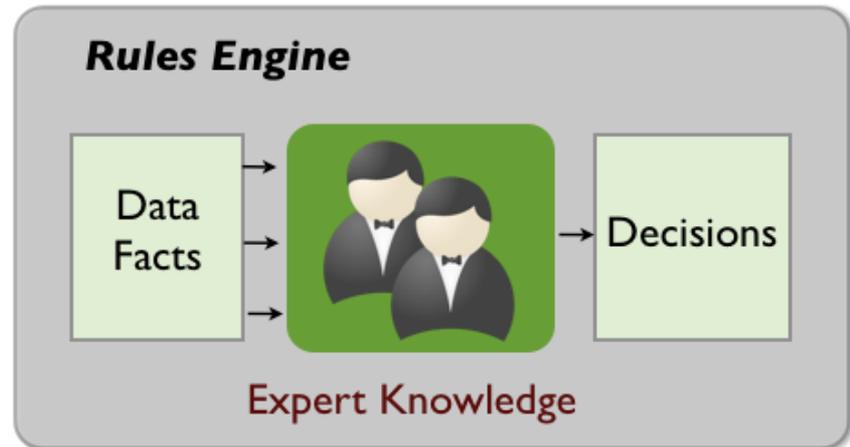
Logic used by experts to solve problems can be represented as business rules:

When body temperature more than X AND blood pressure more than Y, then ...

Predictive Analytics = *Data-Driven Knowledge*

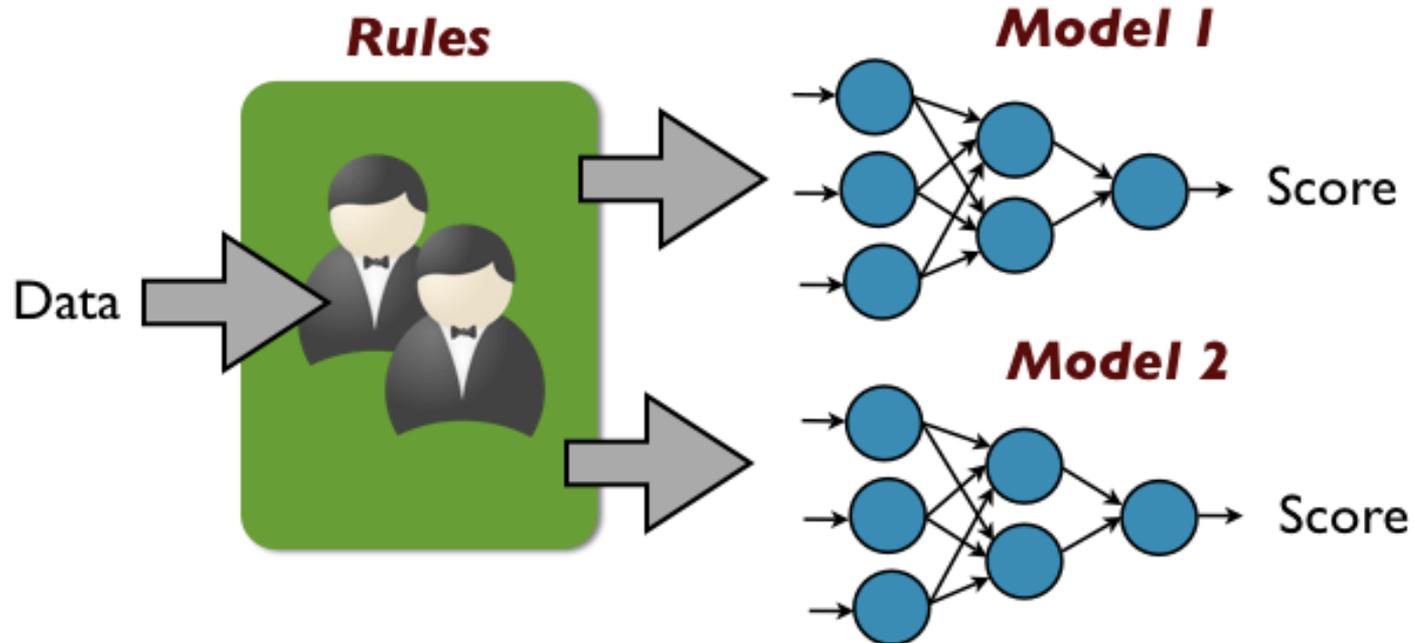
Based on the ability to automatically recognize patterns in data not obvious to the expert eye.

Learn from past behavior present in historical data to predict the future.



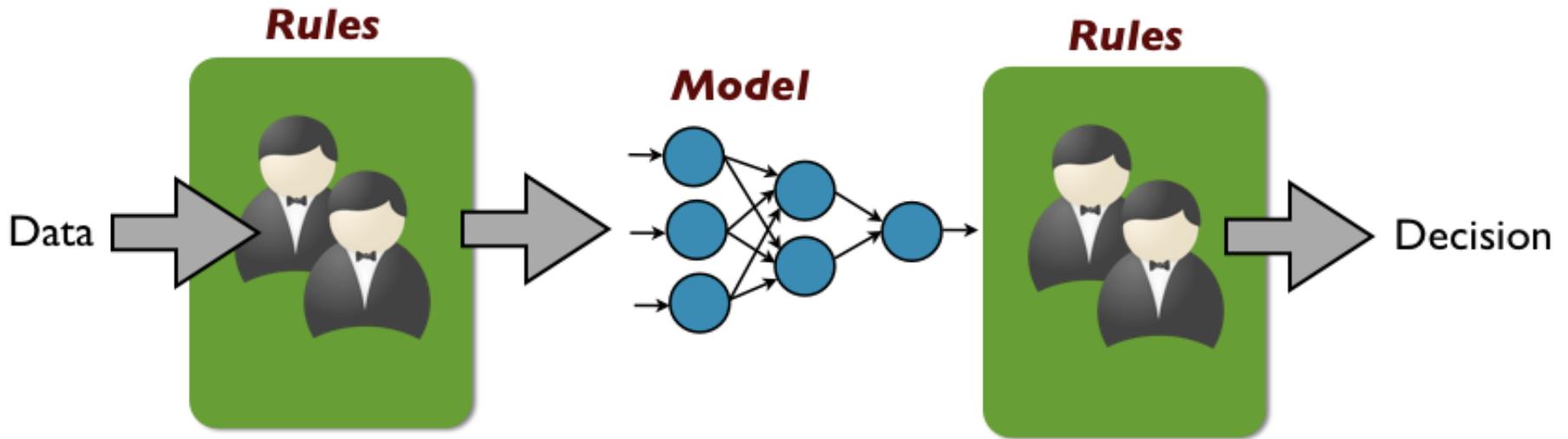
Enhanced Decisioning 1

Predictive Analytics + Rules



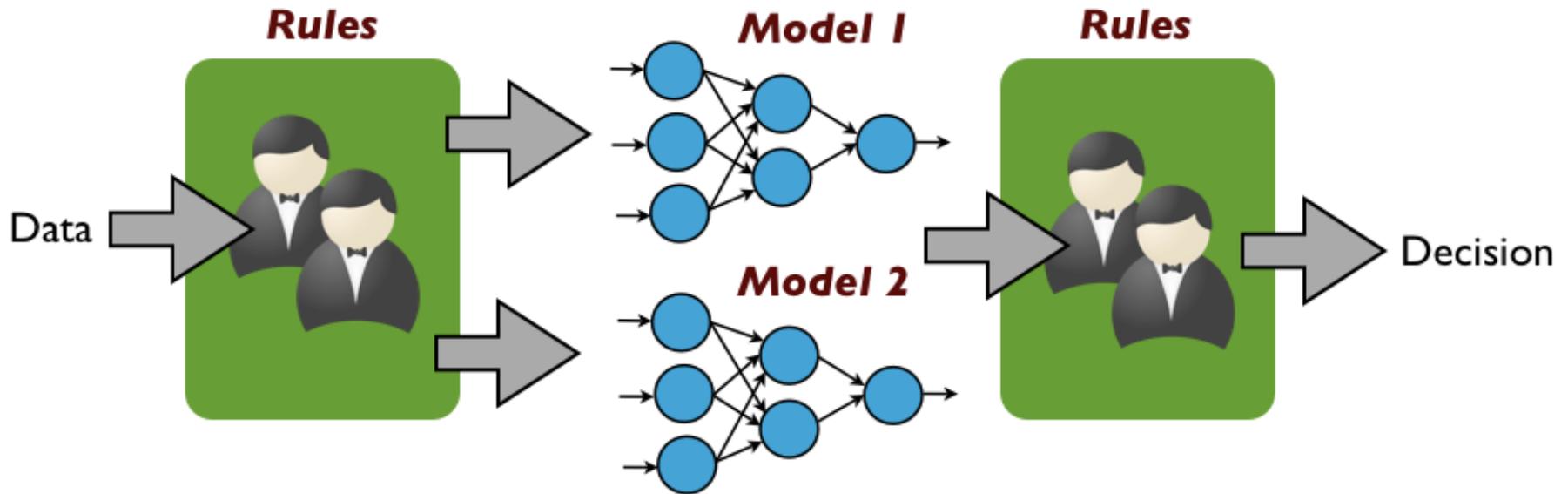
Enhanced Decisioning 2

Predictive Analytics + Rules



Enhanced Decisioning 3

Predictive Analytics + Rules



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ADAPA: Bringing together the power of predictive analytics and rules

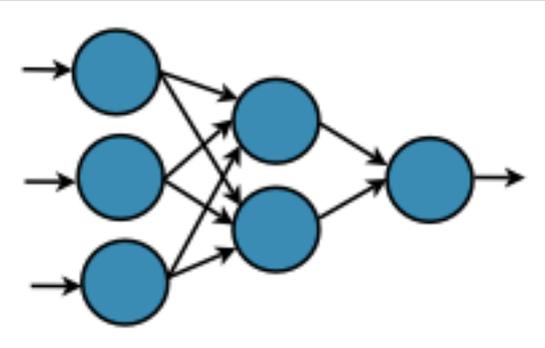
 Drools



Business Rules



PMML



Predictive Analytics

ADAPA & Amazon Cloud



- ❖ ADAPA by Zementis
 - ❖ Predictive Decisioning Platform
 - ❖ Standards-based Predictive Analytics
 - ❖ PMML (www.dmg.org)
 - ❖ Generated by SAS, IBM/SPSS, KXEN, R, KNIME, ...
 - ❖ Drools to integrate business logic
 - ❖ Accessed through web services
 - ❖ Scalable execution platform
- ❖ ADAPA on Amazon Elastic Computing Cloud
 - ❖ Software as a service
 - ❖ Up/Down scaling as needed
 - ❖ Pay-as-you-go, no up-front capital investment
 - ❖ Amazon Payments
 - ❖ Amazon experience & reliability

Invoking Predictive Models from Rules

```
global com.zementis.adapa.models.runtime.ModelInvoker ModelInvoker;

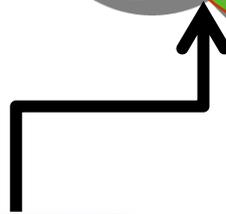
rule "Score Neural Network for ARM Products"
  when
    product:Product(processingStage=="Model Selection", rateType == "ARM")
    borrower:Borrower()
    property:Property()
    ...
  then
    Map record = createRecord(borrower, property, ...);
    product.setAdapaScore( (Double) ModelInvoker.apply("NeuralNetwork_for_ARM", "risk", record));
    ...
    update(product);
end

function Map createRecord(Borrower borrower, Property property, ...) {
  Map record = new HashMap();
  record.put("firstTimeBuyer", borrower.getFirstTimeBuyer());
  record.put("employmentIndicator", borrower.getEmploymentType());
  record.put("borrowersState", property.getState());
  ...
  return record;
}
```

Deployment Options



(Predictive Analytics + Rules)
On the Cloud



(Predictive Analytics *On the Cloud*)
+ (Rules *On Site*)



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Drools Extensions



ADAPA

Predictive Models
Business Rules

DAV - Decision, Acceptance,
and Validation Framework

Lookup Tables

Multisheet Decision Tables

Drools Extensions

DAV Framework

<i>rulesets</i>	<i>ZementisGuideline</i>			
usage	given	given	check	
Test Description	Borrower	LTV	# of Objects	Loan Amount
Case 1	Good Borrower	72	1	900000
Case 2	Good Borrower	80	1	850000
Case 3	Average Borrower	72	1	800000

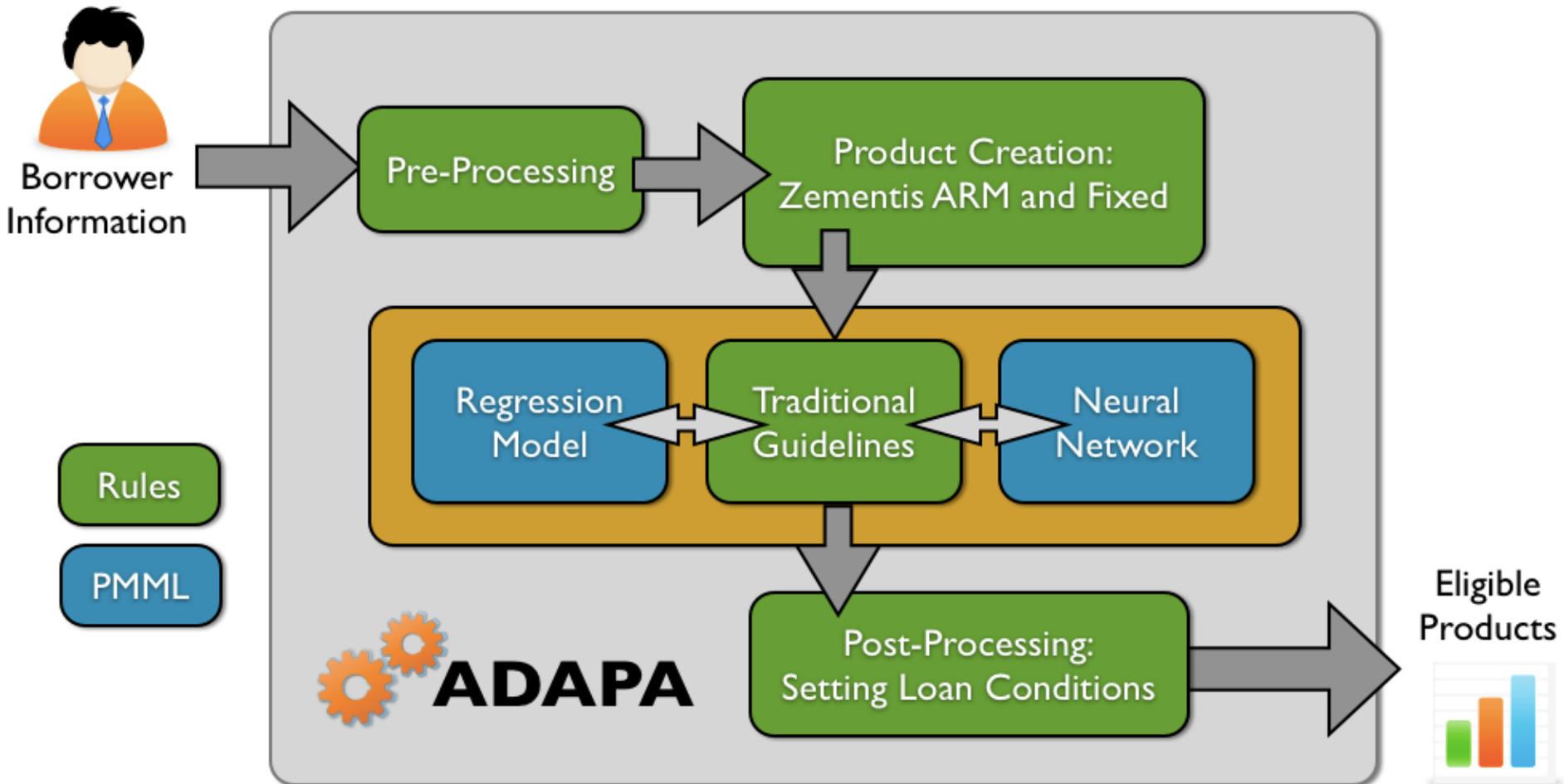
Outline



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Sample Solution:

Zementis Mortgage Company offers ...



ADAPA Solution – Demo

Predictive Models

ZEMENTIS Change Password Help Logout

Predictive Models Rule Sets Reports Resources

Manage Models ?

New Model Upload

PMML File Browse...

Note: ADAPA attempts to upgrade and/or correct uploaded PMML files to version 3.2 as necessary.

Upload Model

Available Models

Name	Actions	Description	Creation Date
AdapaDemoModelARM		This is the ADAPA demo model. It computes risk for loans with ARM rate. The risk is hypothetical and is generated here only for demo purposes.	
AdapaDemoModelFixed		This is the ADAPA demo model. It computes risk for loans with fixed rate. The risk is hypothetical and is generated here only for demo purposes.	
Iris_CT		Classification Tree using the Iris dataset	
Iris_MLR		Multinomial Logistic Regression using the Iris dataset	
Iris_NN		Neural Network for multi-class classification using the Iris dataset	

[RPC Web Service Description \(WSDL\)](#)

Score/Classify Data ?

Knowledge Base Terms of Use Zementis

ADAPA Solution – Demo

Rule Sets

The screenshot shows the Zementis web application interface. At the top left is the Zementis logo. To the right are navigation links: Change Password, Help, Logout, Predictive Models, Rule Sets (highlighted), Reports, and Resources. Below the navigation is a blue header bar with 'Manage Rule Sets' and a help icon. The main content area is titled 'New Rule Set Upload' and contains a text input field for 'XLS or DRL File' with a 'Browse...' button and an 'Upload Rule Set' button. Below this is a section titled 'Available Rule Sets' containing a table with columns for Name, Actions, Description, and Creation Date. The table lists six rule sets: ModelRiskThreshold, PostProcess, PreProcess, ProductCreation, ScoreCard, and ZementisGuideline. Each row has a green download icon and a red delete icon in the Actions column. Below the table is a link for 'Web Service Description (WSDL)'. At the bottom is a blue footer bar with 'Test Rule Sets' and a help icon. Below the footer bar are links for 'Knowledge Base', 'Terms of Use', and 'Zementis'.

ZEMENTIS

Change Password Help Logout

Predictive Models **Rule Sets** Reports Resources

Manage Rule Sets ?

New Rule Set Upload

XLS or DRL File

Available Rule Sets

Name	Actions	Description	Creation Date
ModelRiskThreshold			
PostProcess			
PreProcess			
ProductCreation			
ScoreCard			
ZementisGuideline			

[Web Service Description \(WSDL\)](#)

Test Rule Sets ?

Knowledge Base Terms of Use Zementis

ADAPA Solution – Demo

Resources

The screenshot shows the Zementis ADAPA Resources management interface. At the top left is the Zementis logo. To the right are navigation links: Change Password, Help, Logout, Predictive Models, Rule Sets, Reports, and Resources. Below the navigation is a 'Manage Resources' header with a help icon. The main section is titled 'New Resource File Upload' and contains a 'Resource File' input field with a 'Browse...' button. A note states: 'Note: The resource file can contain custom PMML functions, domain models or lookup tables.' Below the note is an 'Upload Resource File' button. The 'Available Resources' section contains a table with the following data:

File Name	Actions	Content	Resources
AdapaDemo.xsd		Domain Model	Package Names com.zementis.adapa.demo
borrowersStateMappingTable.xls		Lookup Tables	Table Names State

At the bottom of the interface are links for Knowledge Base, Terms of Use, and Zementis.

ADAPA = EDM

Integrating across all systems and processes

Applications



Data



CRM Systems



Computer Systems

Thank You!



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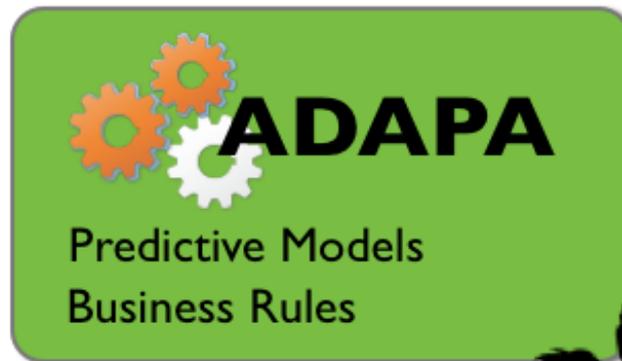
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ADAPA Solution - Demo



Sample Solution:

Invoking models from rules

```
global com.zementis.adapa.models.runtime.ModelInvoker ModelInvoker;

rule "Score Neural Network for ARM Products"
  when
    product:Product(processingStage=="Model Selection", rateType == "ARM")
    borrower:Borrower()
    property:Property()
    ...
  then
    Map record = createRecord(borrower, property, ...);
    product.setAdapaScore( (Double) ModelInvoker.apply("NeuralNetwork_for_ARM", "risk", record));
    ...
    update(product);
end

function Map createRecord(Borrower borrower, Property property, ...) {
  Map record = new HashMap();
  record.put("firstTimeBuyer", borrower.getFirstTimeBuyer());
  record.put("employmentIndicator", borrower.getEmploymentType());
  record.put("borrowersState", property.getState());
  ...
  return record;
}
```