Machine Learning + Decision Management: A standards based approach

Edson Tirelli
Development Manager

Matteo Mortari
Senior Software Engineer
A.K.A.: a Pragmatic Approach to Predictive Decision Automation
Machine Learning - Recap

- Resurgence
  - Data driven
  - Complexity of cases
- Not a one-size-fits-all solution
  - Wide variety of methodologies
  - Wide variety of problems
  - Wide variety of tools/vendors
  - Wide variety of degrees of transparency
  - Wide variety of confidence models
Introduction

Connecting Business Automation and Machine Learning

- Until recently:
  - Possible, but required use of proprietary solutions
  - Lack of transparency and IP ownership
  - Difficulties in integrating best-of-breed products from multiple vendors
Connecting Business Automation and Machine Learning

- Predictive Model Markup Language
  - Data Mining Group standard
  - Enables interchange of predictive models
  - Supports 19 different models (PMML version 4.4)
Connecting Business Automation and Machine Learning

- Business Process Model and Notation
  - Object Management Group standard
  - Enables modeling and interchange of business process models
- (*) adoption was accelerated after BPMN 2.0 was released in 2011
Connecting Business Automation and Machine Learning

- Case Management Model and Notation
  - Object Management Group standard
  - Enables modeling and interchange of business case models
  - Close integration with BPMN
Introduction

Connecting Business Automation and Machine Learning

- Decision Model and Notation
  - Object Management Group standard
  - Enables modeling and interchange of decision models
Use cases

- Efficient Customer Service Management - best next action for representatives
- Predictive Customer Retention
- Upsell appropriate new products
- Fraud detection
- Customer loyalty scoring
- Optimized workforce management
- Personalized experience
- ...

Introduction
Benefits of an integrated, standards-based solution

- Direct consumption of predictive models in decision models
  - No translation needed
- Supports all 19 executable models from PMML (Score cards, Neural nets, Regression, Random Forest, etc)
- Open the AI box - helps with transparency and explanation
- Direct collaboration between Data scientists and Decision Modelers
- Enables event correlation and consolidation - KPI monitoring
Connecting Business Automation and Machine Learning

This is Decision Camp, so let's drill down on the Decision Automation topic
Decision Management

- Typically described as:
  - Decision Identification and Modelling
  - Decision Automation
  - Monitoring and Management
- Typically implemented using:
  - Decision models
  - Business rules
- Typically requires stated rules and/or policies
- May employ a number of processes/methodologies
- Typically not a data driven process
- Although it can be
Predictive Decision Automation - Overview

Introduction
DMN - How to?

**Cardholder Risk Model**

```
Cardholder Risk Model
(=UnDefined)

(age, holder_index, incidents)
```

<table>
<thead>
<tr>
<th></th>
<th>document (string)</th>
<th>&quot;card_holder_risk_linear_regression&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>document</td>
<td>&quot;card_holder_risk_linear_regression&quot;</td>
</tr>
<tr>
<td>2</td>
<td>model</td>
<td>&quot;LinearRegression&quot;</td>
</tr>
</tbody>
</table>

**PMML Indicator**

**PMML Document**

**PMML Model in the Document**
Demo.
Demo Scenario Architecture

Credit Card Dispute System

Customer

Banking Application (Dispute UI)

Client UI/App

Business UI/App

App Engine

Business User

Prometheus

Grafana (dashboards)

Decision Server

Metrics

Process Engine

Decision Engine

Business Analyst

Red Hat Process Automation Manager

Case Models

Decision Models

Predictive Models

Author Test Deploy Manage

OpenShift Container Platform
Demo Recap
A case to manage disputes
A Decision Service to automate low risk disputes

DMN Model

Leveraging Predictive Models

Recap
Using Predictive Models in DMN

1. Choose the PMML file
2. Choose the model within the file
3. Editor automatically shows the parameters the model expects
Recap

Testing DMN models that use Predictive Models

<table>
<thead>
<tr>
<th>#</th>
<th>Scenario description</th>
<th>Age</th>
<th>Cardholder Status</th>
<th>Fraud Amount</th>
<th>Incident Count</th>
<th>Cardholder Risk Rating</th>
<th>Dispute Risk Rating</th>
<th>Process Automatically</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>STANDARD processed automatically</td>
<td>30</td>
<td>&quot;STANDARD&quot;</td>
<td>80</td>
<td>1</td>
<td>value</td>
<td>value</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>STANDARD not processed automatically</td>
<td>30</td>
<td>&quot;STANDARD&quot;</td>
<td>300</td>
<td>3</td>
<td>value</td>
<td>value</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>SILVER processed automatically</td>
<td>30</td>
<td>&quot;SILVER&quot;</td>
<td>80</td>
<td>3</td>
<td>value</td>
<td>value</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>SILVER not processed automatically</td>
<td>30</td>
<td>&quot;SILVER&quot;</td>
<td>500</td>
<td>3</td>
<td>value</td>
<td>value</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>GOLD processed automatically</td>
<td>30</td>
<td>&quot;GOLD&quot;</td>
<td>100</td>
<td>3</td>
<td>value</td>
<td>value</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>GOLD not processed automatically</td>
<td>30</td>
<td>&quot;GOLD&quot;</td>
<td>500</td>
<td>3</td>
<td>value</td>
<td>value</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>PLATINUM processed automatically</td>
<td>30</td>
<td>&quot;PLATINUM&quot;</td>
<td>80</td>
<td>1</td>
<td>&lt; 1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>PLATINUM not processed automatically</td>
<td>30</td>
<td>&quot;PLATINUM&quot;</td>
<td>500</td>
<td>3</td>
<td>value</td>
<td>value</td>
<td>1</td>
</tr>
</tbody>
</table>

- Set the input values
- Each row is a test
- Check expected values
Monitor Processes and Decisions

- Create custom dashboards
- Compare model results
- View Business Metrics, including predictive model results
Thank you

Red Hat is the world's leading provider of enterprise open source software solutions. Award-winning support, training, and consulting services make Red Hat a trusted adviser to the Fortune 500.

linkedin.com/company/red-hat  facebook.com/redhatinc
youtube.com/user/RedHatVideos  twitter.com/RedHat