IBM Machine Learning for z/OS

Turning data into insight and insight into opportunity
“Insight-driven businesses bring insight, not just data, into every decision, and they know exactly how to use them for the greatest advantage across the entire customer life cycle. For these firms, digital insights and what they do with them are their secret weapons --- to disrupt your market and steal your customers.”

Forrester Research
AGENDA

- Innovation is vital
- Data is at the core of innovation and transformation
- Machine learning enables transformation
- Understanding machine learning
- Challenges of machine learning
- Unique advantage of IBM Machine Learning
- Learn more
INNOVATION IS VITAL
for transformation

New competitors challenge traditional businesses
- Largest hospitality business does not own a single hotel room
- Largest car service does not own a single car
- Fintechs’ provide differentiated services to broader demographics

The pace has quickened
- Fraud tactics evolve rapidly
- Every second of IT downtime means lost opportunity

Large organizations have constraints
- Labor and cost controls
- Profitability guidelines
- Existing infrastructure
ORGANIZATIONS MUST INNOVATE
to transform and disrupt the competition

• Personalize every interaction
• Detect fraud before a transaction completes
• Extend demographic reach
• Improve employee and operational productivity
• Drive down costs
• Convert insight into opportunity
A FORRESTER SURVEY CONFIRMS...

67% IT MANAGERS see the value of integrating real-time analytics within transactions

85% DATA SCIENTISTS want access to customer transactional data for analysis

63% IT MANAGERS have security concerns about data movement

Source: study conducted by Forrester Consulting of 268 IT managers and data scientists exposes and resolves their top challenges to get real-time insights.
DATA IS AT THE CORE INNOVATION AND TRANSFORMATION
new IT approaches support improved insight

DATA GRAVITY
Analyze data where it originates to minimize cost and complexity while improving integrity

HYBRID TRANSACTION/ANALYTICAL PROCESSING
Enable simplified infrastructure and drive faster innovation and agility

MACHINE LEARNING
Drive greater customer service, improve productivity and drive innovation
Machine learning is enabling companies to **expand their top-line growth and optimize processes** while improving employee engagement and increasing customer satisfaction.

*Source: May 31, 2017 Harvard Business Review*
IBM z Analytics

Data originated are too slow and potentially harmful.

Insights gleaned are outdated.

Decision made is poor.

Action taken is impotent or harmful.

Traditional Analytics Infrastructures are too slow and potentially harmful.

Business Value

Positive

Negative

Time to Action

Data originated

Analytics performed

Insights gleaned

Outdated Insights

Poor Decision

Impotent / Harmful actions

FORRESTER
MACHINE LEARNING IS EVERYWHERE
influencing nearly everything we do

Netflix
personalized movie recommendations

Waze
personalized driving experience

7 out of 10 financial customers would take recommendations from a robo advisor
UNDERSTANDING machine learning

Identify Patterns not readily foreseen by humans

Score or Predict Behavior with the deployment models

Build Models of behavior from those patterns

Traditional Programming
- data
- program
- computer
- output

Machine Learning
- data
- output
- computer
- Program (model)
COMMON APPROACHES to machine learning

Unsupervised (Investigative) outcomes not labeled
- Clustering: Goal is to group data into clusters for better organization
  - Example: Categorize banking customers by behavior in order to understand how to market and what products to sell

Supervised (Predictive) outcomes are labeled
- Classification: Goal is to predict a category
  - Binary-classification (yes/no)
    - Examples: Fraud, Churn, Purchase, Spam email detection
  - Multi-classification (which of several items to recommend)
    - Examples: Netflix, Amazon recommendations, Ad recommendations for products
- Regression: Goal is to predict a value
  - Examples: Customer lifetime value, Stock prices prediction
DERIVING INSIGHTS FROM MACHINE LEARNING involves many steps, can become iterative and time consuming.

**What needs to be done to the data in order to feed the model?**
Example:
- Join claims information with member info, aggregate fields such as claim amounts, classify/bin fields such as age for higher value statistical meaning
- Define and execute data preparations

**Select model and train with historical data**
Example:
- Break data into training set vs. testing
- Evaluate different combinations of algorithm, features & hyperparameter
- Determine best balance of true positive (recall) to false positive (false-out)

**What data is needed?**
Example:
- Need claims info, perhaps code look up tables, historical tables, member info, etc.
- Attain access to tables & data (multiple data formats...DB2, VSAM...)
- Add in new data sources as needed iteratively

**Select appropriate algorithm, inputs, parameters**
Example:
- Does logistic regression, random forest or K-nearest-neighbor produce most accurate results
- Identify model features (input)
- Identify hyper-parameters (algorithm characteristics like depth of tree, # of leaves, etc.)

**Choose deployment methodology to score, integrate with applications**
Example:
- Evaluate performance and SLA impacts
- Identify frequency of scoring needed for business application
- Identify process for ongoing refresh, model management and governance

What about accuracy and degradation?
### IBM MACHINE LEARNING
Platform agnostic functionality with the same look and feel across deployment options

Integrates the most popular open source tools such as Spark, Python, R, Jupyter & Scala.

<table>
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<tr>
<th>Machine Learning on IBM Cloud</th>
<th>Machine Learning in IBM DSX</th>
<th>Machine Learning for z/OS</th>
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<tbody>
<tr>
<td>PayGo consumption with as-a-service delivery, up &amp; running in seconds</td>
<td>Scalable DSX cluster deployed on your private infrastructure</td>
<td>On-premises, IBM Z, scalable Spark cluster deployment on private cloud</td>
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<tr>
<td>Integrated with IBM Spark-as-a-Service for compute, IBM Object Store for data, as well as other platform assets</td>
<td>Can be deployed with Hortonworks Data Platform on-premises</td>
<td>Cost effective strategy for lowest latency and highest degrees of resiliency and security</td>
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<tr>
<td>Immediate cloud collaboration via RStudio and Jupyter notebooks</td>
<td>LDAP integration for user management</td>
<td>DSX is built into the ML for z/OS infrastructure</td>
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<td></td>
<td>Meaningful collaboration via notebooks, IDEs, community, and social features</td>
<td>RACF Integration</td>
</tr>
</tbody>
</table>
OVERCOME CHALLENGES to gain the greatest advantage from machine learning

1. Leverage data in place for real-time insight
   - Keep data in place, encrypted and secure
   - Minimize the latency, cost and complexity of data movement
   - Transform data on platform
   - Improve data quality and governance

2. Apply the same resiliency to analytics as your operational applications

3. Integrate insight from structured & unstructured data from Z and non-Z data sources

4. Optimize existing people, processes and infrastructure productivity
IBM MACHINE LEARNING FOR z/OS

A Hybrid Cloud Approach to Model Lifecycle Management and Collaboration

- Platform agnostic model development
- Enterprise-grade, collaborative, extensible open source software
- Real-time insights embedded with transactions
- Insight from multiple platforms
- Reliability, availability and encryption in a security-rich environment
SOME EXAMPLE USE CASES

IBM Machine Learning for z/OS

Identify and deter fraud
- Augment existing rules based approaches
- Identify fraud as transactions occur
- Learn and adapt quickly as fraud evolves

Improve IT operational productivity (ITOA)
- Have overall view of the mainframe ecosystem over time
- Monitor KPIs and System Resources
- Achieve and maintain the highest levels of confidence to meet business goals and prevent interruption of services
Cognitive Bank

Giving you a smarter banking experience with Watson and Machine Learning for z/OS

Built by: IBM Competitive Project Office
Welcome back, Bruce!
Last login: Feb. 9th, 2017

Cognitive Traveler Rewards Card
.... - 1911

Current Balance: $1,265.87
Available Credit: $8,735.13

Current Miles: 57,892

Last Statement Balance: $1,932.52
Due on March 1st, 2017

View Balance Details
Rewards Center
Make a Payment
# Bruce's Profile:

**Customer Summary:**
- **Gender:** Male
- **Age:** 41
- **Education Level:** Master's degree
- **Negative Tweets:** 12
- **Income:** $316,630.00
- **Investment:** $108,972.00
- **Annual Spending:** $70,682.63
- **Annual Transactions:** 362
- **Average Daily Transactions:** 0.69
- **Average Transaction Amount:** $195.20

**Twitter Profile:**
- **Twitter Username:** Bruce43253
- **Personality:** Openness
- **Values:** Harmony
- **Needs:** Self-transcendence

**Customer Churn:**
- **Prediction:** true
- **Probability:** 93.36%
Current Balance: $1,265.87
Available Credit: $8,735.13

Current Miles: 57,892

Last Statement Balance:
Due on March 1st, 2017
$1,932.52

Transactions:
- Date: 0016-12-29 00:00:00 UTC, Category: Transportation, Amount: $152.19
- Date: 0016-12-22 00:00:00 UTC, Category: Transportation, Amount: $414.23
- Date: 0016-12-19 00:00:00 UTC, Category: Supermarkets, Amount: $564.0
- Date: 0016-12-17 00:00:00 UTC, Category: Dining, Amount: $146.31
Welcome back, Bruce!

Last login: Feb. 9th, 2017

Cognitive Traveler Rewards Card

Current Balance
$1,265.87
Available Credit
$6,735.13

Current Miles
57,892
Welcome back, Bruce!

Hi there, I'm the Cognitive Bank Virtual Assistant! I can help you find a good offer. Interested?

yep

Great! Let's get started... What kind of offers are you interested in? (travel, restaurants, clothing)

travel

Looks like you enjoy adventurous trips! I see you were in Kenya last year. Are you interested in a safari again?
Welcome back, Bruce!
Last login: Feb. 9th, 2017

Cognitive Traveler Rewards Card

Current Balance
$1,265.87
Available Credit
$8,735.13

Current Miles
57,892

50% discount on 1-day Entrance Ticket to Corbett National Park in the foothills of the Himalayas

Since you are traveling in July, can I make another offer?
Welcome back, Bruce!

Last login: Feb. 9th, 2017

Cognitive Bank

Bank Name
Cognitive Traveler Rewards Card

Current Balance
$1,265.87
Available Credit
$8,735.13

Current Miles
57,892

View Balance Details
Rewards Center

Marriott Minimalist Rain Jacket - Men's
$139.73 $200.00 Save $60.27 (30%)

Before you leave, we have something special just for you...
In appreciation of your loyalty, we will waive your foreign transaction fees for this trip!
INNOVATE AND TRANSFORM WITH IBM Machine Learning for z/OS

• Benefit from insight at the point of transaction
• Keep sensitive data in place, encrypted, secure
• Offer the best of open source and unique innovation

• Increase data scientist productivity
• Collaborate across data science teams
• Get better insight to more business teams

• Optimize processes
• Improve employee productivity
• Increase customer satisfaction.
LEARN MORE...

IBM z Analytics
www.ibm.com/analytics/z-analytics

IBM Machine Learning for z/OS

Machine Learning Hub
www.ibm-ml-hub.com/
• 2-day workshop for data scientists
• Train with IBM on IBM framework with your data or IBM industry specific data and use cases