Innovate with Data

Presenter

Raj Dalal, Founder & Principal, BigInsights

• Raj is acknowledged as a trusted go-to authority for companies who want to drive data-led business innovation. He helps companies craft and executes digital transformation strategies that increase shareholder value using advanced data & AI technologies and techniques.

• In 2013, Raj set up a boutique Big Data analytics research & advisory firm, BigInsights in Sydney, Australia. He has authored research reports, case studies and is regularly briefed by vendors such as IBM, Cloudera, Google, AWS and others on their strategic direction in Data Analytics, AI and IoT

• Founded BigInsights Data Innovation Awards: Recognise leaders in industry that are driving innovation and business value using Data & AI. (see www.dataawards.org)

Twitter: @BigInsights
Innovate with Data

Case Studies of SAS® in a Hadoop, AI, Machine Learning, and IoT World
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SAS®
GLOBAL FORUM
2018

April 8 – 11 | Denver, CO
Colorado Convention Center

#SASGF
“In God We Trust – All Others Must Bring DATA”

“Without DATA You’re Just another person with an opinion”

W. Edwards Deming
Data Scientist
Tom Cruise: Mission Impossible (without Data)
Why now

• Everything is being instrumented and collecting data

• Cost of storing and computation costs have reduced

• Democratisation of AI & Data Science tools & techniques

• Customer Experience & Expectations

• Digital transformation for business, a survival necessity
Innovate with Data & AI

Industry Applications
FSI * Manufacturing * Retail, * Government * Healthcare * Telecoms/Media * Utilities

Acquire, Grow & Retain Customers
Personalization * Profitability * Acquisition * Retention * 720 degree view of customer

Optimize Supply Chain * Reduce Fraud * Predictive Maintenance

Security / IT Infrastructure Ops

Data Innovation Platform
WarGaming

We deliver legendary online games. Globally. With passion

• Leaders in the free-to-play Massively Multiplayer Online game (MMO) market across all gaming platforms with over 150 million registered users. Their first blockbuster was World of Tanks, launched in 2010. now has a suite of games involving aircraft and warships.

• Pioneer in the ‘free-to-play’ concept of games.

• Make money from up-selling items to make the game more enjoyable and provide a personalized experience..

• Phenomenal growth – Has over 4000 employees working across 15 offices worldwide
“The Big Data”

• Three of its mainline games - together generate 550 million ‘events’ a day

• Every game consists of over 15 different main data sources (battle, session, account, logs)

• Players are located in different time zones across Europe, North America, CIS and Asia

• Its team has to process over 3TB of raw data daily
Analytics Objectives

• Improve the gaming experience
• Customer segmentation and KPI dashboards
• In-game player targeting with offers in real time
• Personalised marketing campaigns
• User research using predictive analytics
• Understanding players and their needs
• Game tracking and game design
Enterprise Data Warehouse Infrastructure Telemetry and real-time monitoring

Channels | Injection/Integration | Long Term Storage (Data Reservoir) | Optimized Storage | Presentation
--- | --- | --- | --- | ---
SQL | FTP/SSH | Syslog | Social | 3rd Party Partners | Kafka | Cloud

Data Orchestration

Raw Storage Layer
- Semi cleaned

Performance Layer
- Joins
- Denormalized

Aggregation Layer
- Current
- Archived

Real-time/Batch Scoring

ETL/Information Archival

Reports/Dashboards

PUSH Intelligence

Advanced Viz.

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Real Time Recommendation - Results

About 80% of the over 100 million users play the games for free. An important focus for the Wargaming is to increase the percentage of users that “pay-to-play”, and then increasing their LTV.

The Data-driven Real-time Rules Engine (DDRRE) analyzes large amounts of data in real time and allows personalization of game interaction with players through recommendations.

Using complex machine learning algorithms, they identify and predict potential paying customer and then run recommender algorithms to up sell players on items from the premium store. (E.g. The latest tank or aircraft for battle)

Wargaming was able use personalized communication and recommendation made in real time with players to increase LTV compared to those players who weren't contacted at all. This campaign effectiveness was measured at 5-10% across their business when compared to non-personalized interactions.

Using machine learning approach enabled them increased the number of campaigns being run simultaneously by 10 time as it minimized the need for a marketing expert to manually design targeted campaigns.
Octo Next Generation Platform

- 186 Billion Miles
- 11 Billion Data Points/ Day
- 5.4 Million Connected Cars
- World’s Largest Insurance Telematics Database
- 50% Reduction in Time to launch UBI
- New Product Capabilities
Data to Insights

CONTINUOUS INNOVATION

Data collection

- Comprehensive set of real-time driving data from connected cars...

Advanced analytics

- ...feeding into a proprietary analytics platform...

Insights for insurance companies

- ...transforming auto insurance with our telematics solutions...

Software, data and analytics

- Raw data is processed into actionable intelligence
- Risk correlation and actuarial capabilities support industry leading driver scoring models and pricing algorithms

Insurance Solutions

- Risk Assessment
- Pricing Services
- Crash Reconstruction
- Claim Management
- Emergency Call
- Stolen Vehicle Recovery
- Digital Solutions

Collecting over 2,000 parameter combinations

Location

Road Type

Cornering

Distance

Braking

Collision

Duration

Direction

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Insurance Value Chain

<table>
<thead>
<tr>
<th>Technical pricing</th>
<th>Policy underwriting</th>
<th>Portfolio management</th>
<th>Claims management</th>
<th>Reserving</th>
<th>Risk management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suggesting best product to buy based on driver's habits (e.g., deductibles, additional benefits)</td>
<td>Implementing driver's score-based portfolio pruning</td>
<td>Assessing claims settlement based on accident dynamics data</td>
<td>Reducing variability in the best estimate liabilities/SCR by enhanced prediction of ultimate claims cost</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Consolidated market practice/established use cases
- Enhancing current business model
  - Enhancing motor technical pricing (incl. severity)
  - Consulting support
- Enabling new profit levers
  - Innovative products:
    - Pay per use
    - Real time risk score based
- New business opportunities based on carrier data
  - Feedback to drivers
  - Effective reward programs
  - Driver identification/Distracted Driving

Forecasting claim size
Octo Platform Architecture
Data led Innovation at AMEX

- 104 Million Card Members
- $1 Trillion in spending per annum
- 25% of Credit card spend
- Multi-PB scale of data
- 100s of PhDs and data scientists

Myoffers:
- Mobile coupons based on location data
- Personalized Restaurant recommendations

Fraud Minimization
- Make decision in 2-3 milliseconds to approve, reject or automatically trigger alerts to phone, email, text for the cardholder

New Customer Acquisition
- Direct mail campaigns (90%) to online (40%)
Logistics & Warehousing

• Second largest cold storage warehousing company in North America with over 100 warehouses

• Storage of all major food commodities in their gigantic refrigerators.

• Act as “buffer” for seasonal produce and major spikes in demand (ie Thanks giving and Christmas for Turkey and Ham)

• Cost of cold storage is 3-4X at room temperature so all inefficiencies are magnified
Warehouse optimisation - Before
Warehouse Optimisation: After
Business Outcome

• 25% increase in warehouse density
• Re-configure warehouse at 10% cost of building new warehouse
• Reduce number of aisles traversed from 5 to 2

Data Science Team

The analytics team is led by visionary data scientist. (Mathematics and statistics background). The team now consists of several PhDs in physics, computer science and master level engineers from different disciplines. It maintains close relations with research departments at universities to bring in specialist skills when required.
SAS & Hadoop - Architectural patterns

SAS & Hadoop intersect in many ways:

• SAS pulling data FROM Hadoop, when it is more convenient

• SAS can work WITH Hadoop, lifting data into a purpose-built advanced Analytics in-memory environment

• SAS can work directly IN Hadoop, leveraging the distributed processing capabilities of Hadoop
Data Processing Options

Traditional SAS

Data Store

Data

FROM

SAS

In-Cluster

Data Store

Data

IN

SAS

In-Memory

Data Store

Data

WITH

SAS

Memory

These approaches are complementary & can be combined for maximum effect
# HOW SAS INTERACTS WITH HADOOP

## Some

<table>
<thead>
<tr>
<th>Description</th>
<th>HiveQL &amp; Other operations</th>
<th>Data Storage</th>
<th>Analytics &amp; other activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>SAS operations performed as SQL which run <em>inside</em> the data store</td>
<td>SAS Solutions <em>maintaining</em> data in Hadoop</td>
<td>SAS products using Hadoop platform to perform analytics &amp; other processing.</td>
</tr>
</tbody>
</table>
| Examples    | • Pushdown processing of some SAS Procedures by SAS/Access into HiveQL  
• SAS Data Integration (DI) generates HiveQL for ELT transformations  
• Explicit use of MR, Pig Latin, HiveQL | • SAS Asset Performance Analytics  
• SAS Financial Crimes  
• SAS Anti-Money Laundering | • SAS Scoring Accelerator  
• SAS Code Accelerator  
• SAS Data Quality Accelerator  
• SAS Data Loader for Hadoop  
• SAS Visual Analytics & Visual Statistics  
• SAS High-Performance Analytics  
• SAS Visual Investigator  
• SAS VDMML |

Data Science Tools

The More Popular Data Science Software (>250 Jobs)

Source: r4stats.com/articles/popularity/
AI/ML Cheat sheet

Data Analytics /BI

Dashboards/Reporting

What has happened

Big Data

Numerical/Text

Voice, Speech

Images, Video

IoT Sensors

Smell

Touch

Taste

Al : Application of intelligence to automate tasks

Machine Learning (ML)

Supervised ML

Why did that happen

Predictive Analytics

Deep Learning/Capsule Networks

Unsupervised ML

Find structures & grouping in Data

Reinforcement ML

Learning rules of Game

AI : Application of intelligence to automate tasks
Cloud Wars: Data & AI Innovation Platforms

- AI Assistants (SW or HW devices)
- AI API’s (Vision, Language, Speech)
- AI Platform Services (Machine Learning studios and tool kits)
- AI Frameworks (MxNet, TensorFlow, Theano, Caffe2, MSFT CNTK)
- Analytics & Visualisation tools
- IoT & ETL
- Hadoop, Spark, Relational, Columnar (DW), NoSQL,
- Servers & Storage (CPU, GPU, Object)
Focus on Critical Business Challenges

Gather all Relevant Data/Instrument everything

Store in Raw format in central data platform

Analytical & AI tools & models

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Methodology

Test & Verify

Integrate with operational process

PoV - Refinement of Hypothesis

Incremental Improvement
Building a Data & AI Innovation Team

- Business Analysts
- Data Science (AI/ML) Maths/Stats
- Data Engineering & SW Development
Thank You

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@BigInsights
Hyper personalisation

Hyper Personalised Customer Interactions

- Web experience
- Mobile experience
- Email
- Contact Center Inbound/Outbound
- Online Re-marketing
- Product / Service Recommendations
- Persona based pricing
- 720deg View
  - Transactions
  - Interactions
  - Social

Source: BigInsights (www.BigInsights.co)
Novantas: Persona-Based Deposit Pricing- A Practical, Powerful Application of Big Data Analytics

Traditionally banks have offered unprofitable “honeymoon rates” to attract new deposits.

Novantas has recognized that individual customers have a “money persona” which falls within a broad price elastic curve. Among the personas Novantas has characterized are:

• The Promotion Hopper: Constantly looking for best rates and may switch for even 25 basis point difference in rate
• The Occasional Shopper: Shops around occasionally or when there is a trigger like receiving a bonus
• The Convenience Seekers: Values the entire relationship with bank and does not shop for best in class products and/or rates in the market
Approach

Novantas has developed an analytical model that maps individuals’ personas by looking at:

• Shopping behavior (how often they shop)
• Rate sensitivity (how much of a premium needs to be offered to initiate action)
• Retention period (how long they are likely to keep monies with bank)

This model, or more accurately series of models, enables banks to better predict which of their customers are likely to be profitable to attract for the banks deposit products and which groups can be repriced in a manner (and at what rate) where the gains from additional rate overcome any incremental balance losses.
ANALYTICAL WORKFLOW

- Bank proprietary data
- Third party data
- Novantas derived data

- Data harmonization
- Standard banking ontology
- Optimized storage model for efficient data access

- Reusable feature store on Spark/Hadoop
- Customizable descriptive metrics
- Parameterized predictive models

- Scoring systems reflecting behavioral economic drivers for asset and liability management
- Customer level algorithms for propensity, up-lift, attrition, price elasticity, product usage, risk, collectability, profit, life-time value, etc.

- Customer Relationship
- Customer Life-time and Potential Value
- Score quantile based

- Create and target fine-grained offers based on actionable intelligence of customer behavior
- Improved segmentation drives higher revenue for promotional campaigns

Source: Novantas