IBM Analytics Optimization and SPSS

A seminar at the IBM Innovation Center at Silicon Valley
Agenda

10:00: Welcome and Introduction (Lennart)
   • Overview and goals

10:30: Product and Architecture Overview (David)

11:00: Building a Data Warehouse (Chris)
   • Infrastructure
   • ETL Process
   • Data Warehouse Appliances and Software
   • Big Data and data in motion

11:45 Lunch

1:00: IBM Product Overviews (Chris, David, Lennart)
   • Cognos
   • ILOG
   • SPSS

1:30: Use Cases (Chris)
   • Use Cases: Cognos
   • Use Cases: ILOG

2:00 Break (15 minutes)

2:15: Use Cases: (Lennart)
   • SPSS

3:00 Wrapup (Lennart, David, Chris)
   • Engaging with IBM in the Business Analytics space
SPSS and Predictive Analytics

- SPSS = Statistical Package for the Social Sciences, was released in 1968 after being developed by Norman H Nie and C. Hadlai Hull. SPSS was acquired by IBM in 2009.

- With SPSS predictive analytics software, you can predict with confidence what will happen next so that you can make smarter decisions, solve problems and improve outcomes.

- Predictive models exploit patterns found in historical and transactional data to identify risks and opportunities.
  - Process a customer’s credit history, loan application, customer data, etc., to find the likelihood of him making future credit payments on time. (FICO score).

- Models capture relationships among many factors to allow assessment of risk or potential associated with a particular set of conditions.

Historical data and trends

Data model

Applying a predictive model to a set of data is referred to as scoring the data.
Examples of the use of Predictive Analytics

- **Classification**
  Identifying to which of a set of categories a new observation belongs, on the basis of a training set of data containing observations whose category membership is known
  - Computer vision
    - Medical imaging and medical image analysis
    - Optical character recognition
    - Video tracking
  - Drug discovery and development
    - Toxicogenomics
    - Quantitative structure-activity relationship
  - Speech recognition
  - Handwriting recognition
  - Biometric identification
  - Statistical natural language processing
  - Document classification
  - Internet search engines
  - Credit scoring
  - Pattern recognition

- **Forecasting**
  - Weather Forecasting
  - Political Forecasting
  - Bayesian Inference
  - Demand Forecasting
Example usage of Baysean Statistics and The Slater School in Fresno, CA

A Bayesian network could represent the probabilistic relationships between diseases and symptoms. Given symptoms, the network can be used to compute the probabilities of the presence of various diseases.


- Teachers and staff were concerned about the two high-voltage transmission lines that ran past the school. **Observed: 8 cases of cancer**
- **Expected: 4.2 cases** (according to the 145 years of employment of teachers, staff & National Cancer Institute statistics)

http://www.math.umass.edu/~lavine/whatisbayes.pdf
IBM SPSS Statistics integrates with a broad range of capabilities for the entire analytical process.
IBM SPSS modeler brings predictive analytics to solve challenges of customer, operational, and threat & risk analytics.
IBM Analytical Decision management

IBM Analytical Decision Management does this by creating an analytical foundation for an organization’s entire decisionmaking ecosystem. The platform relies on three key products:

- IBM SPSS® Modeler (predictive engine),
- IBM SPSS Decision Management (local rules and optimization)
- IBM SPSS Collaboration and Deployment Services (scoring).

IBM Analytical Decision Management employs predictive models, analytics, localized rules, scoring and optimization techniques to generate real-time recommendations for the best next action in a given situation.

The platform acts as a “closed loop” system, using automated modeling and scoring to feed the result.

**Scoring data with predictive models**

The process of applying a predictive model to a set of data is referred to as scoring the data. IBM® SPSS® Statistics has procedures for building predictive models such as regression, clustering, tree, and neural network models.

Once a model has been built, the model specifications can be saved in a file that contains all of the information necessary to reconstruct the model.

You can then use that model file to generate predictive scores in other datasets.

### SPSS 1.5: Entity analytics - example

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Integration with Netezza

Scalable performance
- 10-100X complex analytics performance at petascale
- Built on unique AMPP™ architecture

Appliance simplicity
- Parallelism without parallel programming
- Extremely simple to deploy and manage
- Eliminate complexity from analytics infrastructure

Tremendous flexibility
- Easiest, most flexible development platform
- Embedded analytics

Robust ecosystem
- Extensive analytic application support
- Broad choice of standard or custom analytics
Integration with Cognos BI analytics

1) Leveraging BI, identify problem or situation needing attention

2) Use SPSS predictive analytics & feed results back into the BI layer

3) Results widely distributed via BI for consumption by Business Users
**Predictive Analytics and Maximo**

**Asset Management System**
A powerful ‘rear view mirror’ view for Monitoring, Reporting & Managing based on past and very recent events

**IBM Maximo**
- Financial Data
- Performance logs
- Sensor Data
- Incident Logs
- Environment Data
- Maintenance Logs

**Predictive Analytics System**
Analytics for ‘through the windscreen’ view. Predictive insights improve Management and refine business rules

**IBM SPSS**
- Produce Scores & Recommendations
- Integrate with Maintenance Planning
- Optimization: Define decision optimization
- Business Rules: Make expert knowledge explicit
- Predictive Models: Likelihood of failure based on multiple methods

**IBM Cognos**

**BI System**
For dashboarding from Maintenance Mgt system and for distribution of predictive analytics results

**Actionable Insights**
IBM Content and Predictive Analytics
Summary

Modeler brings repeatability to ongoing decision making with predictive modeling. Unique ability to leverage structured and unstructured data provides the most accurate predictive insight.

IBM SPSS Modeler
- Provides ability to use predictive intelligence in decisions across all levels of the organization – strategic, operational and tactical for the executive.
- Provides insight into the factors that drive outcomes and the relationships therein to better mitigate risk and drive improvements for the business manager.
- Intuitive visual interface, automation and simplified graphical views for the business analyst.
- Offers high performance, rich feature/functionality and integration for the expert analyst.
- An open, platform agnostic architecture that “snaps into” any existing IT environment for the IT analyst.
- Accelerates the data mining lifecycle by virtue of integration with IBM Netezza.
Predictive operational analytics with IBM SPSS Modeler to understand and manage retail product mix

- Point of sale transaction data
- Demographics
- Interactions
- Attitudes

Results:
- Improved inventory management
- Better cross-/ up-sell rates
Predictive customer analytics with IBM SPSS Modeler to optimize marketing campaigns

- Campaign history
  - Contact data
  - Response/decline
  - Test/control group

- Interaction data
  - Call center
  - Website visit data
  - Service request

- Customer Data
  - Demographics
  - Account activity
  - Product holdings
  - Survey data

Analyses
Predict who is likely to respond, based on each customer's profile

Scoring
Apply model to new customers

Marketing campaign process
Use models to identify who should receive what offer

Results:
- Lower mailing costs
- Higher response rates
- Improved profits
- Better cross-/up-sell rates

Predictive customer analytics with IBM SPSS Modeler to optimize marketing campaigns

Results:
- Lower mailing costs
- Higher response rates
- Improved profits
- Better cross-/up-sell rates
Predictive operational analytics with IBM SPSS Modeler for customer retention

Customer data:
- Demographics...

Transaction & billing data:
- Calls, SMS, MMS, mobile internet, ...

Interaction data:
- Website usage, call center interactions, ...

Attitudinal data:
- Satisfaction;
- Net promoter score, ...

Analyses
- Look at customers who have churned
- Segments
- Profiles
- Scoring models

Scoring
- Apply model to new customers

Results:
- Reduction in churn due to proactive reach-out
- Maintenance of market share
- Issue identification

Targeted retention offers through (e)mail

Targeted in-store promotions

Retention offers in the call center
Efficiencies and speed-to-results are realized when transformations, preparation, and mining occur close to the data.
IBM SPSS Modeler’s interface provides visual confirmation that SQL pushback is occurring during execution.

The purple nodes indicate that SQL pushback is occurring in the database.
SQL pushback and in-database mining are key to performance

Push processing of big data into the database
Critical for optimal scoring performance
Connect the dots for near real-time decisions
Eliminate recoding of the model for scoring
No delays – push the button and score from validated model
Examples of databases where IBM SPSS Modeler can leverage in-database mining for improved performance

Microsoft Time Series

Microsoft Sequence Clustering

Oracle Attribute Importance
Comprehensive and integrated analytic capabilities that span from personal to enterprise

- Business Intelligence
- Predictive/Advanced Analytics
- Content Analytics
- Risk Analytics
- Financial Performance Management

Leveraging all information, all people, all perspectives and enabling all decisions
Improved Integration with Netezza includes - Netezza nodes and Tier 1 level database support

In-database mining support for Netezza Analytics
  • New Netezza nodes available at release
  • Ongoing development and improved/enhanced integration

Netezza databases supported at the Tier 1 Level
  Tier 1 level database support =
  • All possible SQL pushback is available, with database-specific SQL optimization
  • E.g. record operations like select, sample and sort
  • E.g. field operations like type, filter and derive

Enhanced support for SQL generation with the sample node in the Netezza database (specifically simple sampling)
Improved Netezza/Modeler integration from a functionality perspective

Modeler connects directly to the Netezza appliance to access the data.

Data manipulation and preparation – like the merging of tables and the creation of new fields occurs entirely within the Netezza appliance next to the data.

In-database mining occurs entirely within the Netezza appliance next to the data (this example is segmentation and classification).
Using SPSS Modeler as a front-end is a primary benefit of the Netezza integration

Using Modeler as a front-end enables easy connection to Netezza data.

Data manipulation and preparation can be implemented visually without programming.

A visual front-end coupled with SQL pushback means rapid preparation – especially for data sets with tens of millions of records.

Using Modeler as a front-end enables easy and rapid fine-tuning of the In-Database Analytics that is running inside the Netezza appliance.

Modeler’s various output nodes provide an easy way to interact with analytics running within the Netezza appliance.
Accelerating the data mining process is a major benefit of a Netezza/Modeler solution.
Access IBM Cognos BI data

Users interact with familiar data view and minimize need for IT involvement for data access and preparation.
Export predictive intelligence to IBM Cognos BI

Export directly to IBM Cognos BI
Add predictive intelligence to business intelligence dashboards and reports using familiar IBM Cognos BI tools.
Business intelligence infused with predictive analytics

Compare current state to predicted result and measure by effect of key factors on predicted outcome. Focus efforts around the future – anticipate, rather than react.
Our portfolio consists of four product families which are designed to work together to help you meet your research and business goals.

The four families are:

- **The Statistics family** – Consisting of IBM® SPSS® Statistics and its modules, the most widely used suite of statistical software in the world.

- **The Modeling Family** – Including IBM® SPSS® Modeler Professional for data mining and IBM® SPSS® Modeler Premium for text analytics, both of which are consistently positioned as leaders in the analytics space.

- **The Data Collection Family** – Comprising the feature-rich suite of survey research software, IBM® SPSS® Data Collection, that helps you obtain a detailed view of customer attitudes and opinions.

- **The Deployment Family** – Including both the platform and the delivery products needed to bridge the gap between analysis and action, this family includes IBM® SPSS® Collaboration and Deployment Services and IBM® SPSS® Decision Management.

This unified portfolio is built on a proven technology foundation that will help your organization continue to use analytics for improved outcomes.

What if you could capture insight into people’s attitudes, preferences and opinions to improve and direct decisions? IBM SPSS Data Collection enables you to create and deliver compelling surveys, integrating feedback results into your decision-making through a centralized and secure framework.

For example, Cablecom, Switzerland’s largest cable network provider, uses Data Collection to more clearly understand which customers are likely to churn – and why – so it can proactively improve customer retention. As a result, it has reduced its customer churn rates from 19 percent to 2 percent.

Planning
IBM® SPSS® SamplePower®
Easily determine the sample size you need, saving your organization both time and money

IBM® SPSS® Complex Samples
Plan and work with complex sample survey data accurately, using specialized tools and procedures

Questionnaire design

IBM® SPSS® Data Collection Author
Create and test surveys for any mode from your desktop or online, or both

IBM® SPSS® Data Collection Web Interviews
Use a web browser to design questionnaires for fielding online or with the IBM® SPSS® Data Collection Interviewer Phone option

IBM® SPSS® Data Collection Paper and IBM® SPSS® Data Collection Scan
Create paper questionnaires and set them up for electronic scanning

IBM® SPSS® Translation Utility (a feature of IBM SPSS Data Collection Author and IBM SPSS Data Collection Author Professional)
Manage translations of questionnaires and reports

Data Collection family, continued

Data collection
IBM® SPSS® Data Collection Interviewer Desktop
Enter survey responses from your desktop
IBM® SPSS® Data Collection Interviewer
Conduct and manage in-person interviews
IBM® SPSS® Data Collection Paper and IBM SPSS Data Collection Scan
Collect survey data on paper and scan to capture responses
IBM® SPSS® Data Collection Web Interviews
Create and deploy web-based surveys
IBM® SPSS® Data Collection Phone Interviews
Develop and manage virtual or actual call centers

Data preparation and management
IBM® SPSS® Data Preparation
Streamline data preparation with specialized techniques that ensure more accurate results
IBM® SPSS® Text Analytics for Surveys
Categorize text responses quickly and reliably

Reporting, presentation and distribution
IBM® SPSS® Data Collection Base
Automate the creation of tables and reports
IBM® SPSS® Data Collection Survey Reporter
Deliver effective, interactive results that provide more meaningful insights to business users and decision makers
IBM® SPSS® Collaboration and Deployment Services
Achieve more benefits with less labor by automating the secure, centralized management of all your analytic assets and processes

What if, when modeling your business decisions, you could use the “structured” data you hold in data warehouses – and the wealth of the IBM SPSS Modeling family, you can discover hidden relationships in your data and anticipate the outcomes of future interactions.

Powerful model-building, evaluation and automation capabilities help companies acquire customers cost effectively, keep their best customers longer and sell more to them. Sofmap Company, Ltd., one of Japan’s top computer and software retailers, used IBM SPSS Modeler to increase sales by nearly 20 percent and triple the profitability of its online store.

IBM® SPSS® Modeler Professional
Quickly discover patterns and trends in structured numerical data to model outcomes and make predictions that inform business decisions with predictive intelligence. From an intuitive graphical interface, you can incorporate your expertise at every step of the way to create predictive models using powerful association, classification and segmentation techniques.

IBM® SPSS® Modeler Premium
Include information from unstructured data such as web activity, blog content, customer feedback, emails, and articles, along with structured numerical data, to create the most accurate predictive models possible. Advanced natural language processing techniques enable users to extract key concepts, sentiments, and relationships from unstructured data and convert them to a structured format for predictive modeling.

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Deployment family

What if you could be sure that every decision about your customers was the right decision? With the IBM SPSS Deployment family you can drive results-oriented decisions by making analytics an integral part of your business. Integrate analytical results into your operations to improve business processes, predict outcomes and deliver results to decision makers across your organization. For example, Infinity Property and Casualty Corporation uses Deployment family products to improve the productivity and accuracy of its claims handling process. The company’s scoring system for evaluating, routing and managing claims resulted in 33 percent higher returns for subrogation, and a subrogation recovery increase of $10 million a year.

IBM® SPSS® Decision Management
Make consistently better customer-facing decisions and improve outcomes by combining the insights gained from predictive analytics with existing business rules and systems. Your organization can empower business users to develop predictive models and combine them with business processes and rules, resulting in decisions that are beneficial both to your organization and your customers.

IBM® SPSS® Collaboration and Deployment Services
Securely manage diverse analytical assets and foster greater collaboration among those developing and using them. Automate and integrate ongoing analytical processes for more reliable results. And ensure that the right people get the information they need to take timely, appropriate action.

Data Collection family
Data Collection family
Statistics family

What if you could get more sophisticated insights from your data? With the Statistics family of products, you can efficiently analyze information and deliver comprehensive results. Using this powerful suite of analytical tools, organizations have achieved a competitive advantage; financial institutions have saved millions by detecting fraud faster; academic organizations have supported the work of researchers and improved their ability to attract and retain the right mix of students; and government agencies at all levels have improved performance and controlled costs.

The Memphis Police Department (MPD) used IBM SPSS Statistics to enhance its crime fighting techniques, reducing serious crime by more than 30 percent, including a 15 percent reduction in violent crimes.

IBM® SPSS® Statistics Modules
IBM® SPSS® Statistics Base
Take the analytical process from start to finish with IBM SPSS Statistics Base. In addition to the data preparation, data management, output management and charting features now available in all Statistics modules, Base offers the procedures that are used most frequently as the foundation for data analysis.

IBM® SPSS® Advanced Statistics
IBM SPSS Advanced Statistics’ powerful multivariate techniques include generalized linear mixed models (GLMM), generalized linear models (GENLIN), generalized estimating equations (GEE), mixed level models, general linear models (GLM), variance component estimation, MANOVA, Kaplan-Meier estimation, Cox regression, hiloglinear, loglinear and survival analysis.

IBM® SPSS® Amos™
Amos provides you with powerful and easy-to-use structural equation modeling (SEM) software. It enables you to build models that more realistically reflect complex relationships with the ability to use observed variables such as survey data or latent variables like “satisfaction” to predict any other numeric variable.
SPSS Predictive Analytics Solutions

With SPSS predictive analytics software, you can predict with confidence what will happen next so that you can make smarter decisions, solve problems and improve outcomes.

**Customer Analytics**
Uncover hidden insights in your customer data so you can create personalized experiences that win more business while reducing costs and increasing customer loyalty.

- **Customer Acquisition**
  Attract more valuable customers with customer analytics

- **Customer Lifetime Value**
  Maximize customer profitability through up-sell and cross-sell

- **Customer Loyalty**
  Retain valuable customers by improving loyalty

- **Profitability**
  Improve banking profitability with customer analytics

- **Social Media Analytics**
  Unlock the value of customer sentiment in social media

**Operational Analytics**
Ensure your people, processes and assets are aligned and optimized to maximize productivity and profitability.

- **Inventory Management**
  Inventory management succeeds with predictive analytics

- **Predictive Maintenance**
  Predictive maintenance maximizes uptime, minimizes costs

**Threat and Fraud Analytics**
Monitor your business environment, detect suspicious activity, and control outcomes to minimize exposure and loss.

- **Fraud Prevention**
  Uncover fraud and take action before damages and loss occur

- **Public Safety Software**
  Analyze multiple data sources to monitor, measure and predict crime
IBM SPSS Modeler generates predictive intelligence

IBM SPSS Modeler is a high-performance data mining and text analytics workbench that quickly delivers positive ROI by creating the predictive intelligence that allows organizations to proactively and repeatedly reduce costs and increase productivity.
IBM SPSS Modeler Premium enables text analytics on unstructured data such as emails, blogs and notes

IBM SPSS Modeler Professional
- Data access and transformation
- Automatic data preparation
- Modeling algorithms
- Automatic model generation
- Output and visualization

Applying a predictive model to a set of data is referred to as scoring the data.

- IBM SPSS Modeler Premium
  - All of the functionality of Professional
  - Interactive text mining workbench