PREDICTIVE ANALYTICS – AN OVERVIEW

Predictive analytics deals with extracting information from data and using it to **predict future trends and behavior patterns**. The core of predictive analytics relies on capturing relationships between explanatory variables and the predicted variables from past occurrences, and exploiting it to predict future outcomes.

Predictive analytics encompasses a variety of techniques from statistics, data mining and game theory that analyze current and historical facts to make predictions about future events.

In business, predictive models exploit patterns found in **historical and transactional data** to **identify risks and opportunities**. Models capture relationships among many factors to allow assessment of risk or potential associated with a particular set of conditions and guides decision making.

Predictive analytics is used extensively in many industries such as **Banking, Financial services, Insurance, telecom, retail, travel, healthcare, pharmaceuticals** and many other industries.

Originally predictive analytics was focused on **predictive modeling and forecasting**, however, increasingly it is being used to cover **descriptive modeling, decision modeling** and even **optimization**. All these involve rigorous data analysis, and are widely used in business for segmentation and decision making, but have different purposes and the underlying statistical techniques utilized vary. A brief narrative of each of these is presented below.

Predictive models - Predictive models analyze past performance to assess how likely a future event may happen (predict) so as to enable decision making. For example, a company may analyze past customer purchase data and try to predict customer's likely future purchase pattern and buying behavior. These models may be built to work either off-line or live-time so as to guide decisions.

Descriptive models - Descriptive models quantify relationships in data such as to classify the data into segments or groups. Descriptive models help inter-relationships between entities in a data base For example; descriptive models are used to classify or categorize customers by their product preferences, age, profession, education and other such parameters. Descriptive modeling tools can serve as useful inputs to build predictive models and facilitate effective decision making.

Decision models - Decision models describe the relationship between all elements of a decision — the known data, the decision and the forecast results — in order to predict the results of decisions involving many variables. Decision models are used in optimization, maximizing certain outcomes while minimizing others. Decision models help develop decision logic or set of business rules that will produce the desired action for a circumstance or entity. For example, a

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company may build a decision model to decide whether to upgrade a credit card to existing customer based on known data such as past usage, payment pattern, considering their future forecasted pattern, family dependencies, and personal financial needs and so on.

Predictive Analytics – Application areas

Predictive analytics is being used in numerous high impact areas and has huge potential for application in currently underexplored or unexplored areas as well. A few examples of how predictive analytics is used in industry are outlined below.

Customer Relationship Management (CRM) and Cross Selling – Customer information, sales transactional data, spend behavior, product or service usage data is analyzed and utilized to take decisions for building engaging customer relationships through cross-selling, launching product variants or customizing offerings, segmenting customers and targeting products thereby improving profitability per customer and strengthening of the customer relationship.

Collection analytics - Predictive analytics can help optimize the allocation of collection resources by identifying the most effective collection agencies, contact strategies, legal actions thus significantly increasing recovery at the same time reducing collection costs.

Customer retention - Predictive analytics can lead to proactive retention strategies and reducing silent attrition (reduced usage of a product or service by customers) whereby regular tracking and analysis of customer's service usage, service performance, spend and other behavior patterns can determine likelihood of a customers migrating out. Organizations can deploy tactics to retain customers or offer upgrade options accordingly.

Fraud detection - Fraud is a big problem for many businesses typically like wrong data during application, deliberate fraudulent transactions, theft of identity and false compensation claims. Frauds increase business risk, affect profitability and damages reputation. Predictive models help identify potential risks and fraud possibilities by concurrent data analysis and help alert business.

Product, Service or Economic prediction - Companies use analytics to predict product sales, industry demand, future sales, planning inventories, price fluctuations and much more. This helps in better business planning, developing suitable strategies and more predictable business operations.

Underwriting - Many businesses have to account for risk exposure such as an auto insurance provider need to determine the premium amount to charge, bank needs to assess borrower's potential to pay before granting loan, health insurance provider to predict how expensive an insured could be in the future. Predictive analytics can help better judge risks discover the appropriate pricing, and speeds up decision making

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Predictive Analytics – Tools and Techniques

The approaches and techniques used to conduct predictive analytics can broadly be grouped into regression techniques and machine learning techniques.

Regression Techniques - Establish a mathematical equation as a model to represent the interactions between the different variables in consideration. A wide variety of models are applied in performing predictive analytics. Some of the popular methods used here are:
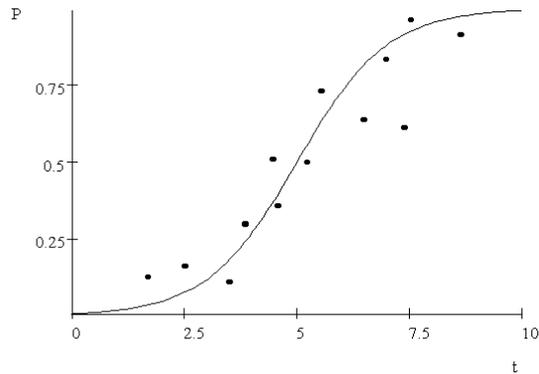
- Linear Regression Model – Simple and Multiple Linear
- Discrete choice models – Logistic, Multinomial Logit and Probit models
- Time series Forecasting models – Auto-regressive, moving average and Box-Jenkins (ARMA), ARIMA, ARCH and GARCH
- Survival or duration analysis – Hazard rate, Kaplan-Meier, Cox (non-parametric)
- Classification and regression trees (CART) – Random Forest / Multinomial logit
- Multivariate adaptive regression splines (non-parametric)

Machine Learning techniques – Is a branch of artificial intelligence, was originally employed to develop techniques to enable computers to learn. It includes number of advanced statistical methods for regression and classification, wherein the underlying relationships can be quite complex and the mathematical form of the dependencies unknown. Hence, machine learning techniques that simulate human cognition and learn from training examples to predict future events. Some of the popular methods used here are:
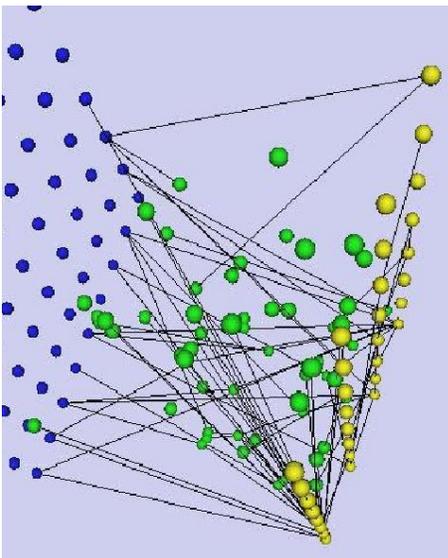
- Neural networks – Backpropogation, conjugate gradient descent, projection operator, Delta-bar-delta, perceptrons, Kohonen, Hopfield networks
- Radial basis functions (RBF)
- Support vector machines - Kernel based Linear, polynomial, sigmoid
- Naïve Bayes – Conditional probability (for dimensionality constraints)
- k-nearest neighbours (KNN)
- Geospatial predictive modeling

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Predictive Analytics – Software applications

There are numerous software applications available in the market to help with the execution of predictive analytics. These range from those which need very little user sophistication to those that are designed for the expert practitioner. The difference between these tools is often in the level of customization and heavy data analysis features built in. Leading applications such as **SAS, SPSS, R (Free), Ms-Office** + Solver / add-ins**, MATLAB, S-Plus, Minitab, BMDP,** Databases with integrated BI and analytics features can be used to perform fairly simple to highly complex predictive analytics and build a wide range of models. In addition to these cross domain applications, there are specialized applications for industry specific needs as well.
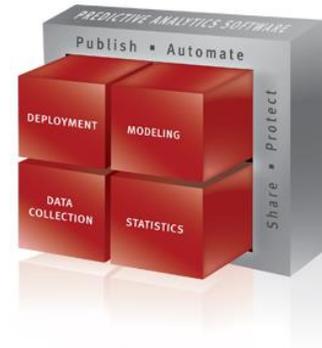
Interested in implementing Predictive Analytics based strategic performance management in your organization?

Corporate / In-House programs

eXample Consulting Group's "Strategy and Analytics" Corporate programs can help your organization to **learn, design, deploy, manage and benefit** from a structured **Predictive Analytics** initiative through the following engagement programs i.e.,

- **Certified Predictive Analytics Professional (Basic)**
Create **Predictive Analytics trained professionals** who can be part of the organizational team to scope, design, deploy and manage Predictive Analytics initiatives in your organization or business divisions. Practitioner program blends classroom training with On-site project guidance to develop **Certified Predictive Analytics practitioners**

- **Predictive Analytics (Basic) Training and Certification**
Introduce Basic concepts and techniques of Predictive Analytics to junior and mid-management to enable them contribute to scientific decision making driving strategy and operational initiatives

- **Predictive Analytics (Advanced) Training and Certification**
Impart Advanced concepts and techniques Predictive Analytics to junior and mid-management to enable them align and drive scientific decision making driven initiatives at the strategic and operational levels

(Program coverage may include a blend of **Consulting, Training, Assessment, Certification, Onsite (or) Offsite Project Guidance, Audit and Advisory services** customized for client specific needs)

For details of our Balanced Scorecard and Predictive Analytics – Corporate / In-house programs, reach us at training@examplecg.com

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Public Workshops

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Professionals (Individual or Company sponsored) with (or) without work experience keen to acquire **Predictive Analytics skills and certification** may visit:

For details and brochure**, http://www.examplecg.com**
(If there is no program scheduled at your city, drop a line to **training@examplecg.com** with **Name and City** preference and we shall keep you updated on future workshops)

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Institutional / Student Programs

eXample Consulting Group plays a key role in developing the next generation of management professionals by imparting **Strategy and Analytics** competencies to **students** at **Management, Technology, Engineering and Academic institutions** with our world class short to medium term training and certification courses. Educational institutions interested to offer **Strategy and Analytics certification** programs in-campus can reach us at training@examplecg.com

eXample Consulting Group enables excellence in **organizations, professionals and institutions** with **Strategy (Net Promoter Score, Balanced Scorecard, Strategy Models), Process and Operational excellence (Six Sigma, Lean, DFSS), Business and Data Analytics, E-Business (ERP, SCM, CRM, DW and BI), Outsourcing and Offshore** consulting, advisory, training and certification programs.

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