Analytics for Banks

September 19, 2017

Outline

About AlgoAnalytics

Problems we can solve for banks

Our experience

Technology

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About AlgoAnalytics

Analytics Consultancy

- Work at the intersection of mathematics and other domains
- Harness data to provide insight and solutions to our clients

Led by Aniruddha Pant

- +30 data scientists with experience in mathematics and engineering
- Team strengths include ability to deal with structured/ unstructured data, classical ML as well as deep learning using cutting edge methodologies

Expertise in Mathematics and Computer Science

- Develop advanced mathematical models or solutions for a wide range of industries:
- Retail, economics, healthcare, BFSI, telecom, …

Work with Domain Specialists

- Work closely with domain experts – either from the clients side or our own – to effectively model the problem to be solved

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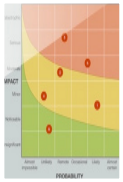
Banking Problems We Can Solve

Credit score

Customer segmentation

Sentiment analysis

Analytics and loans



Portfolio Anaytics

Predicting balances in current, savings account

Fraud detection – establishing and predicting patterns and raising an alert when anomaly is noticed

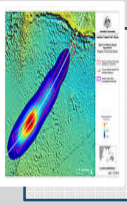
Risk aggregation reporting for Basel III and Dodd Frank

Operations optimization like reducing duplicative systems, IT costs and others

Predicting default probabilities on a particular loan in next 12-18 months

Alternative modes of credit rating those will enable micro loans at lower default rates

Liquidity measures by predicting in and out flows of individual customer deposits



Heat maps suggesting what loans can be offered in what areas

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Internal Credit Scoring Models

Credit scores are available from commercial credit rating agencies. However, organizations can significantly improve performance and profit potential with internal statistical credit scoring modes

Three aspects of credit score	Benefits of credit score	Technical Aspects
• **Application scoring** - helps decision making regarding acceptance of an application	• Application scoring results in granting credit to right customer and at right price	• Data set required – monthly income, no. of dependants, demographics, open credit lines, loans, past repayment history, etc.
• **Behaviour scoring** - predict the likely default of customers that have already been accepted	• Behavioural credit scores of customers help in early detection of high-risk accounts and perform targeted.	• Classification models - Decision trees/ neural networks
• **Collection scoring** - predict the likely amount of debt that the lender can expect to recover	• Collection scores are also used for determining the accurate value of a debt book before it is sold to a collection agency.	

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Customer Segmentation

- Customer segmentation includes using techniques like clustering, decision trees or regression analysis to divide your customers in key segments that reflect both your current customer base and your targets. If you can understand qualitatively different customer groups, then they can be given different treatments (perhaps even by different groups in the company). Answers questions like: what makes people buy, stop buying etc

Segmentation enables offering right product to right customer at right time and at right price. It also enables cross selling and up selling

It enables company to retain customers by knowing about churn in advance and taking necessary steps

Customer segmentation will enable a bank to design a recommender system which will suggest products, royalty programs etc to be designed for valuable customers

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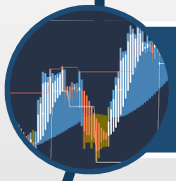
Sentiment Analysis

- Applies NLP, text analysis and computational linguistics to source material to discover what folks really think

Capture client feedback

Analyze unstructured voice recordings from all centers and recommend ways to improve customer relations



Build algorithms around market sentiments data

Track trends, monitor launch of new products, response issues and improve overall brand perception

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Analytics and loans

- Predictive analytics helps monitor loan origination and performance activity by product or region
- Using techniques like heat map loan provider can choose to concentrate on a particular geographical area

Origination

- Predicting if profits would increase by reducing interest rates for a particular borrower
- Advanced data science techniques could enable institutions to improve underwriting decisions and increase revenues while reducing risk costs.

Pricing

- Real estate pricing models and impact on delinquency rates
- Valuation of loan portfolio

What else?

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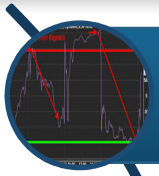
Our Other Analytics Projects



Algorithmic Trading and Strategy Development

- Quantitative strategies in Indian markets
- Improvements to pre-existing algorithmic strategies

Text Analytics

- News/social media analytics
- Multi-language sentiment analysis

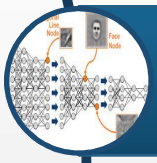


Image analytics using deep learning

- Predicting diabetic retinopathy
- object/ image recognition

Performance Manager

- Forecast various KPIs concerning operational performance

Clickstream Analysis

- inherent features of users based on website logs

Mutual Fund Action Predictor

- Our product predicts the changes a portfolio manager is likely to make to his portfolio

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Our Product: The Mutual Fund Action Predictor

Predictive Algorithm
- The product offers insights into portfolio changes that MFs are likely to make

Trade initiation
- Intermediaries can use the information to identify counterparties for their clients or to initiate trade between two parties

Reducing impact cost
- A brokerage can target different mutual funds proactively for buying or selling a large position in stock with minimum market impact

Buy – Sell pressure
- One can also use this to compute expected buy sell pressure on stocks in near future

http://mutualfunds.algoanalytics.com:8181/sharefunds

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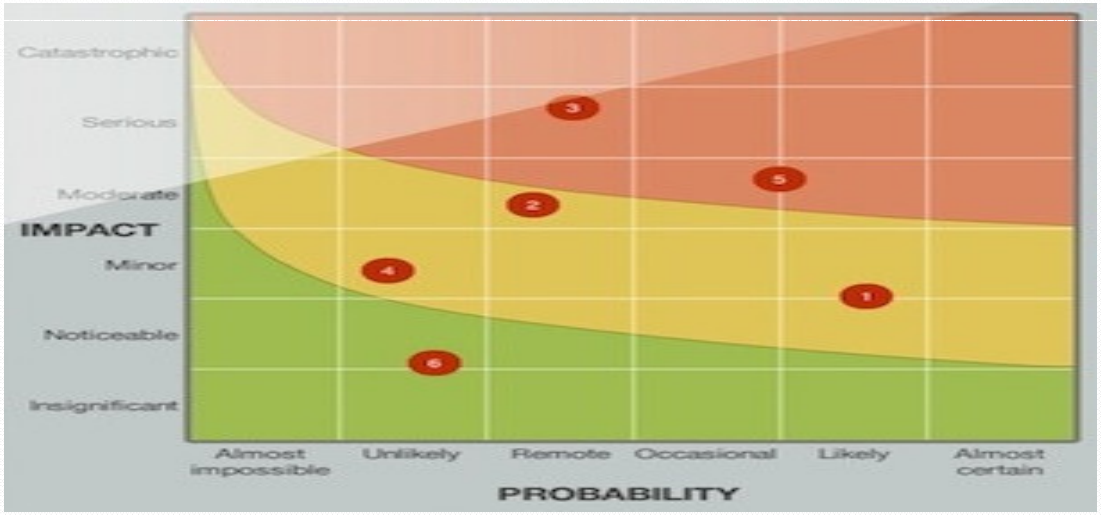
Portfolio Risk Analytics

- This involves reviewing existing portfolio, understanding risks and defining problem areas.
- Provision of insights and suggestion for improvement
- Automated analysis and suggestion to a client to undertake an appropriate course of action for eg. What area should I focus on to drive my growth
- Scalable and cost effective solution for variety of individual portfolios



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CEO Profile

Aniruddha Pant

CEO and Founder of AlgoAnalytics

PhD, Control systems, University of California at Berkeley, USA 2001

Highlights

- 20+ years in application of advanced mathematical techniques to academic and enterprise problems.
- Experience in application of machine learning to various business problems.
- Experience in financial markets trading; Indian as well as global markets.

Expertise

- Experience in cross-domain application of basic scientific process.
- Research in areas ranging from biology to financial markets to military applications.
- Deep experience in building and guiding 20+ people teams working in quantitative applications.
- Close collaboration with premier educational institutes in India, USA & Europe.
- Active involvement in startup ecosystem in India.

Prior Experience

- Vice President, Capital Metrics and Risk Solutions
- Head of Analytics Competency Center, Persistent Systems
- Scientist and Group Leader, Tata Consultancy Services

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SOME RELEVANT CASE-STUDIES

Analytics and Gold Loan

Gold Loans Characteristics

- Associated with unorganized sector
- Required for short duration
- Amount of loan required is usually small

Problem Statement

- Using data across branches, it could be predicted if profits would increase, by decreasing interest rate for a borrower meeting certain standards

This can be used for any consumer credit in order to increase the profitability.

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Application of Our Experience For Banks

- An example of the flow of analytics…

Get the probability of each client becoming dormant – this can be used to predict defaults for FCs

Place clients at risk within their corresponding segments to view where they stand in the firm – Predicting customers who might remain good and turn bad

Dormancy Prediction

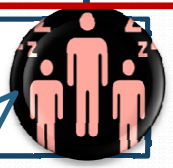
Obtain predictions

Customer Segmentations

Identify clients at high risk

Identify clients not at high risk

Personalized Recommendations



High probability of dormancy

High probability of high loss to the firm

Provide usual support

Employ recommender systems using customer profiles to identify appropriate products to suggest- can be used to enable a firm to develop personalized collection effort

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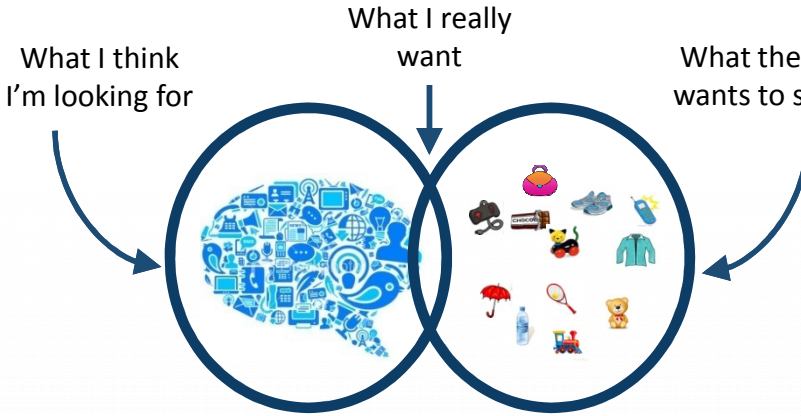
Recommender System

What is RecSys?

- Aims to predict user preferences based on historical activity and implicit / explicit feedback

- Helps in presenting the most relevant information (e.g. list of products / services)

Value of Recommendation



RecSys Modeling and Applications

Collaborative filtering: User's behavior, similar users

Content-based filtering: using discrete characteristic of items

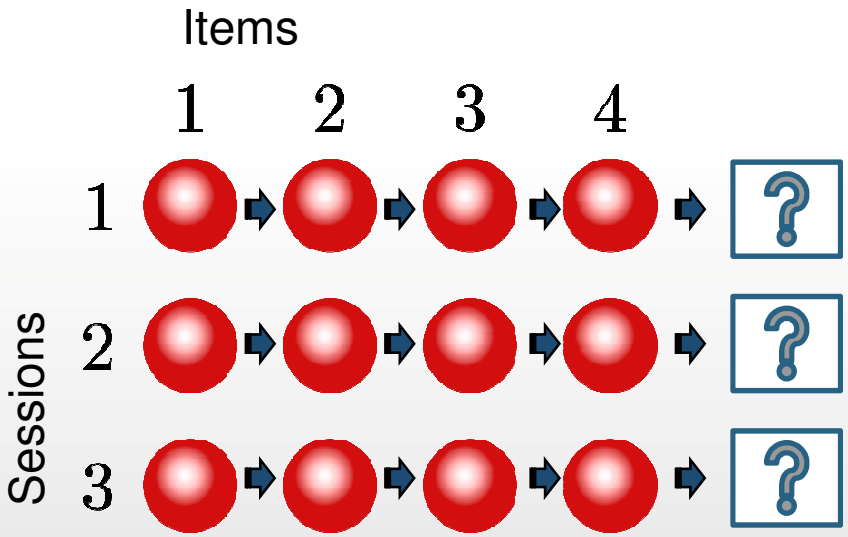
- Nearest Neighbor modeling
- Matrix factorization and factorization machines
- Classification learning model

*
Movies, music, news, books, search queries, social tags, etc.

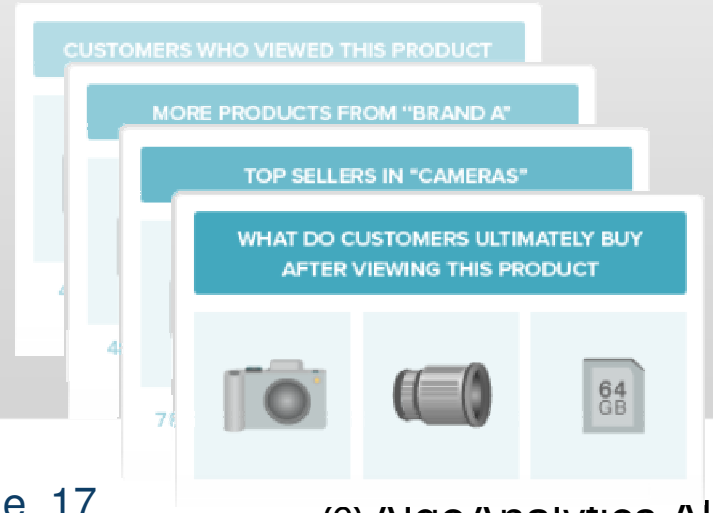
* Financial services, insurance Intel business unites (BUs), sales and marketing

Session Based Recommender System

Use historical sessions data from all customers to recommend products



Deep Learning



- Recommendations are independent of customer profile
- Tracking user is not required
- Ideal recommendations for guest users

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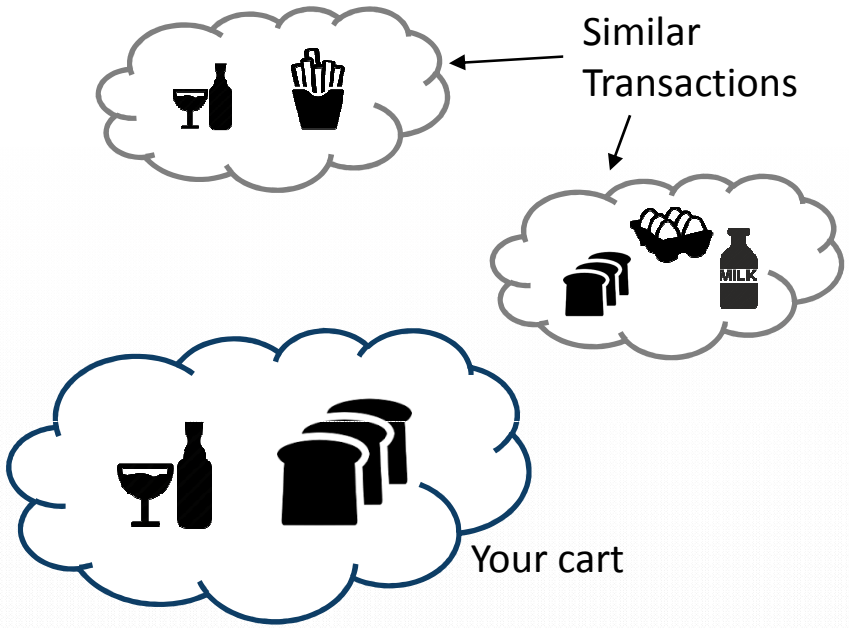
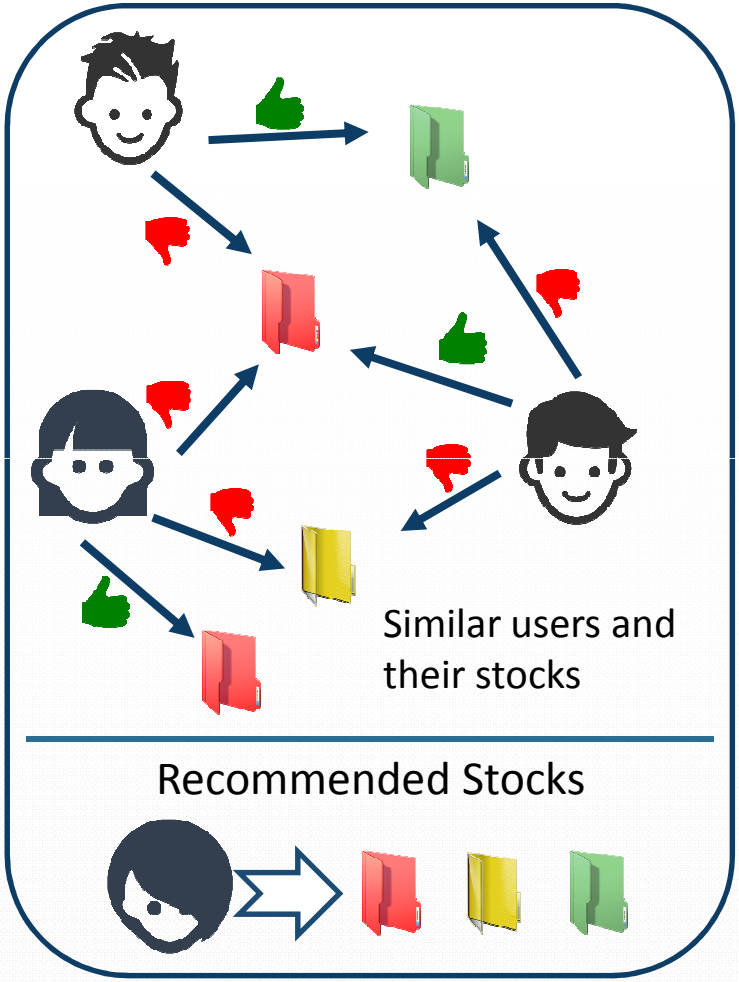
Use Cases

Product Recommendation



You may also like:

Stock Recommendation



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Retail Analytics: Other areas

Customer Retention and Loyalty Analytics

- Identify customers who will contribute to sales and build high value relationships with customers and reward loyalty

This is a churn problem which is similar to the one we will need to solve in FC

Marketing Analytics

- Understand customer behaviour, predict likelihood of success
- Determine optimal communication channel, develop optimal promotion strategy to reach customer

This is a case of recommender problem, This can be used in designing customized loan packages for customers

Operational Analytics

- Fraud reduction, less shrinkage
- Store analytics – site selection etc

These examples are similar to portfolio analytics functions required in FCs. Predictive analytics will be able to advise about which area and which loans to concentrate on

Risk Management

- Credit score to improve decision making at individual level
- Reduce transaction cost, time lags
- Determine whether a COD customer will pay or not

Classification and score problems, significant from point of view of deciding customers who might default, for FCs

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METHODOLOGY AND TECHNOLOGY

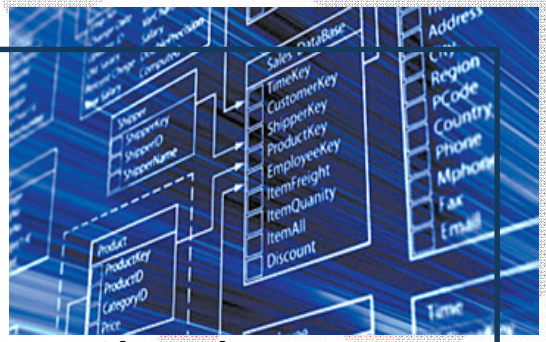
The Analytics Process

Once a client requirement comes in:

Define and outline the problem statement

Business Requirement

Understand data
Data preparation



Data Situation

Develop models
Evaluate performance

Analytics Solution

Seamless Integration

Work with clients to integrate solution

Value-adding Results

Explainable results
Operational outcomes

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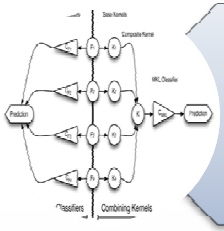
Machine Learning Techniques

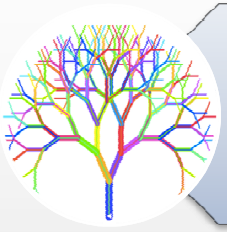
Decision Trees

- Flow-chart like structure
- Maps observations of an item to conclusion on item's target value



Kernel Learning

- SVM extension – different kernel functions for feature subsets
- Effective when data comes from a variety of sources

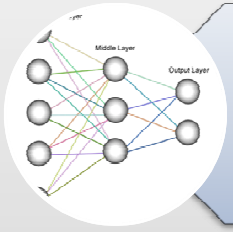


Random Forests

- Extension of classification trees
- High accuracy and efficient on large databases

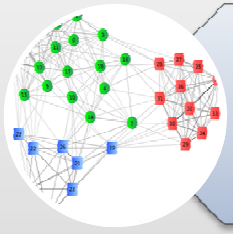
Deep Learning

- Model high level abstractions
- Architecture composed of multiple non-linear transformations



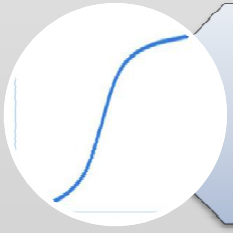
Artificial Neural Networks

- Idea analogous to biological neural networks
- Used to discover complex patterns in data



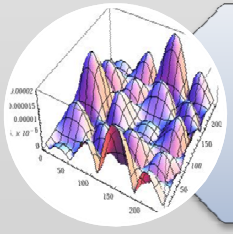
Clustering

- Unsupervised learning to group data into 2+ classes
- Clustering based on similarity or dissimilarity between data points



Logistic Regression

- Probabilistic statistical classification model
- Binary predictor



Optimization

- Modifying a system to make some aspect of it work more efficiently or use fewer resources

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Technology:

scikits learn
machine learning in Python

Microsoft Azure

TensorFlow

python

R

cassandra

mongoDB

php

PostgreSQL

C++

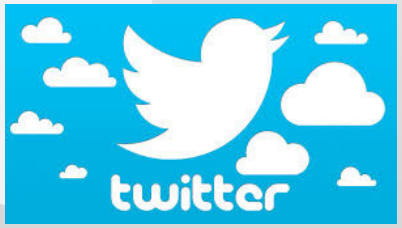
Spark

theano

Google news

Java

Pandas



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