

ANALYTIX LABS

Introduction to Business Problems & Predictive Modelling

Disclaimer: This material is protected under copyright act AnalytixLabs ©, 2011-2016. Unauthorized use and/ or duplication of this material or any part of this material including data, in any form without explicit and written permission from AnalytixLabs is strictly prohibited. Any violation of this copyright will attract legal actions

**What are the Typical Business problems
which we encounter?**

What are the Typical Business problems?

- How to attract new customers?
- How to make those new customer to be profitable?
- How to avoid high risk/bad customers?
- How to understand the characteristics of current customers?
- How to make your unprofitable customers more profitable?
- How to retain your profitable customers?
- How to win back your existing customers?
- How to improve customer satisfaction?
- How to increase sales/profit and reduce expenses?
- How to recommend products to customers?
- How to optimize marketing expenses?
- How to take decision for offering credit card?
- How to increase credit line for given customer?
- How to optimize collection process?
- How to detect fraud transaction/customer?
- How to price the product?
- How to identify visitor will click or not?
- How to identify to employees who attrite?
- How to identify when customer stops buying/using product?
- How to predict how much customer make purchase?
- How to predict how much loss given the customer stop using product?
- how to calculate the impact of sales/volume given the price change?
- How to forecast the sales for next two quarters?
- How to optimize cash flows and funds utilization?
- How to optimize cash in ATMS?
- Does income of individual depend on demographics (Age and Years of education) and others?
- Which of the retail image levers drives footfalls or conversions?
- What drives satisfaction among branch users?
- What causes high performance of bank branch on the basis of financial parameters?

Lets deep dive some of the problems!

Example

In a credit card business. Applications have come for new card, bank has to take decision on whether to approve the credit or not and decide how much credit line need to be granted for given application?

Question

- Should we grant him/her the card?
- how much credit line need to be offered?

Non-deterministic information (Y)

- Chances that the customer will default on his/her payments
- The maximum amount (\$) that we may approve

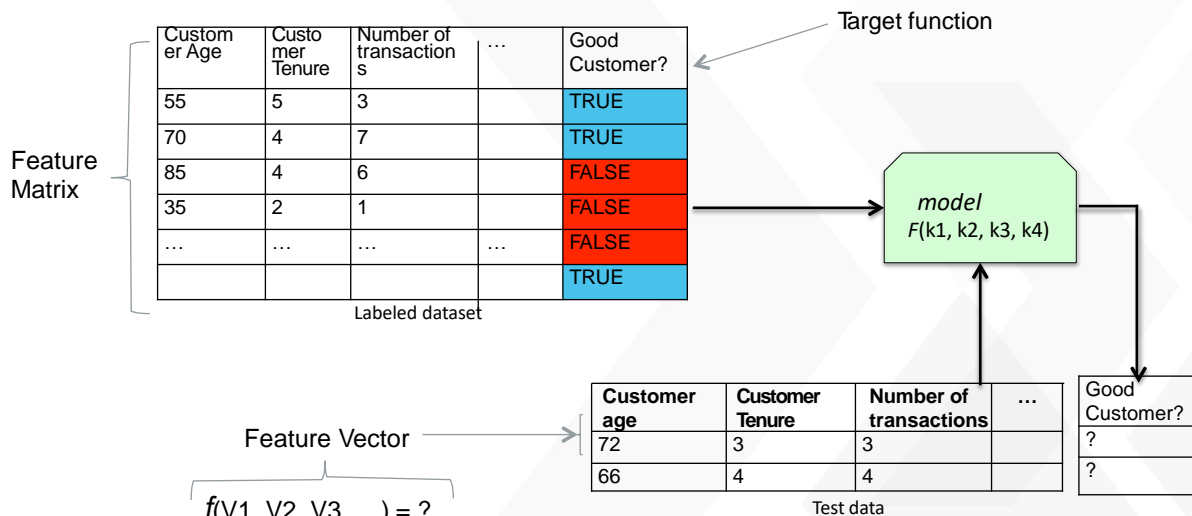
Known information (X)

- Information on credit history, past transactions, financial status of the customer.

A Functional relationship between X and Y helps deciding whether to approve the credit request

ANALYTIX LABS

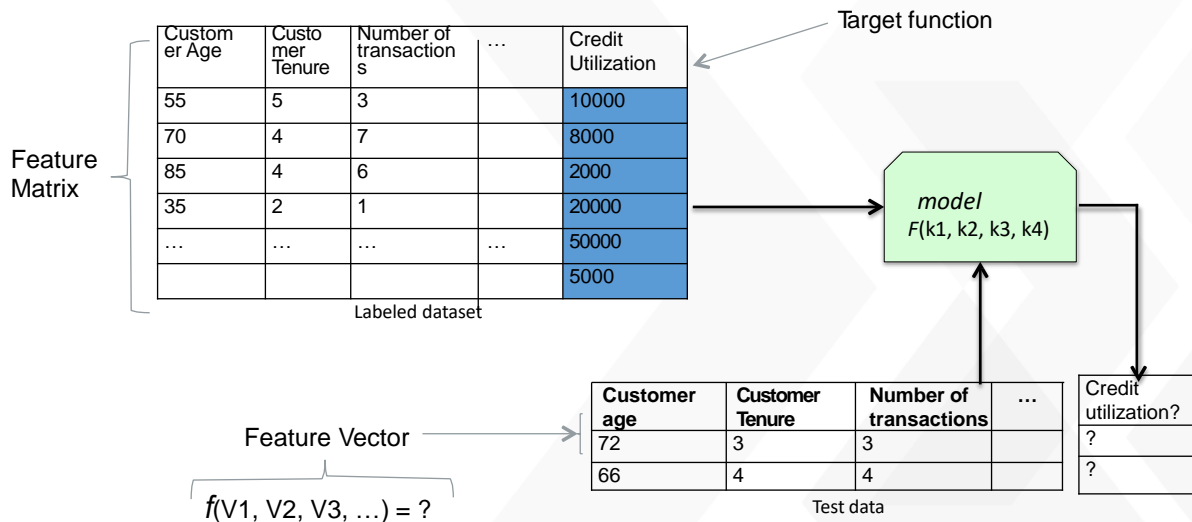
Example- should we grant him credit card?



Are we predicting who is good/bad customer?

ANALYTIX LABS

Example – How much credit line need to be offered?



Are we predicting how much card utilization by given customer?

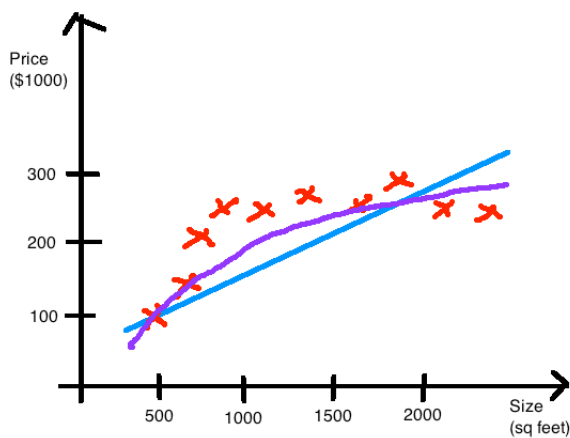
How to classify these problems?

Business problems – Types:

- **Regression Problems** – predicting a value
- **Classification problems** – predicting an event or predicting a category
- **Segmentation problems** – classifying the data when we don't have target variable(Un-supervised classification)
- **Forecasting problems** – Predicting future value(It is similar to regression however one of the independent variable is time)
- **Others** – rest of all like optimization problems, survival problems etc...

Regression Problems

Regression: predict a continuous value



Some techniques:

- Linear Regression / GLM
- Decision Trees
- Support vector regression
- SGD
- Ensembles

Regression Example: Ad Click-Through Rates in Ad Search

The screenshot shows a Google search for "flights to Miami". The search bar is at the top with the text "flights to Miami" and a search button. Below the search bar, there are tabs for "Web", "Images", "Maps", "Shopping", "News", and "More". The "Web" tab is selected. The search results show 4 personal results and 30,900,000 other results. The first result is "Miami @ \$147 Round Trip" from cheapoair.com. The second result is "Flights To Miami - Low Fares on American Airlines - AA.com". The third result is "Find Flights To Miami" from kayak.com. The fourth result is "Flights from San Francisco, CA (SFO) to Miami, FL (MIA)" from google.com/flights. To the right of the search results, there are several advertisements, including "JetBlue - Official Site", "Find Flights to Miami, FL", "\$49 Miami Flights", "Miami Flights From \$99", "Flights to Miami from \$136", and "\$49* to Miami".

$$\text{Rank} = \text{bid} * \text{CTR}$$

Predict CTR for each ad to determine placement, based on:

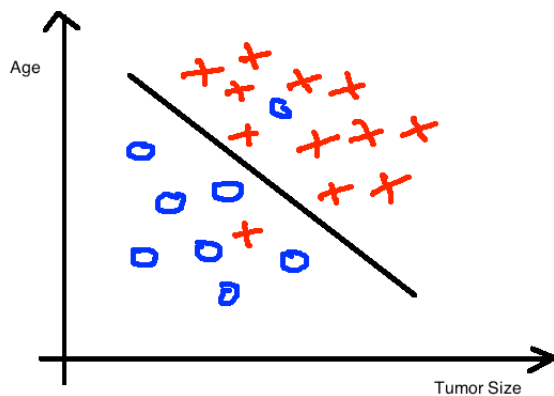
- Historical CTR
- Keyword match
- Etc...

Regression – Typical Applications

- **Typical Applications:**
 - Stock market: predict the share price for the future
 - Does income of individual depend on demographics (Age and Years of education) and others?
 - Which of the retail image levers drives footfalls or conversions?
 - What drives satisfaction among branch users?
 - What causes high performance of bank branch on the basis of financial parameters?
 - Energy demanding in a dam
 - Wind speed: eolic energy
 - Travel time prediction: for the planning of transport companies
 - Level of water in a river: for safety & prevention
 - Tax income: public budget
 - ...

Classification Problems

Classification: predicting a category



Some techniques:

- Naïve Bayes
- Decision Tree
- Logistic Regression
- SGD
- Support Vector Machines
- Neural Network
- Ensembles

Detailed list of classification Techniques

Classical Techniques

- Logistic Regression
- Decision Trees (CHAID/CART)
- Linear Discriminant Analysis (LDA)
- Quadratic Discriminant Analysis(QDA)

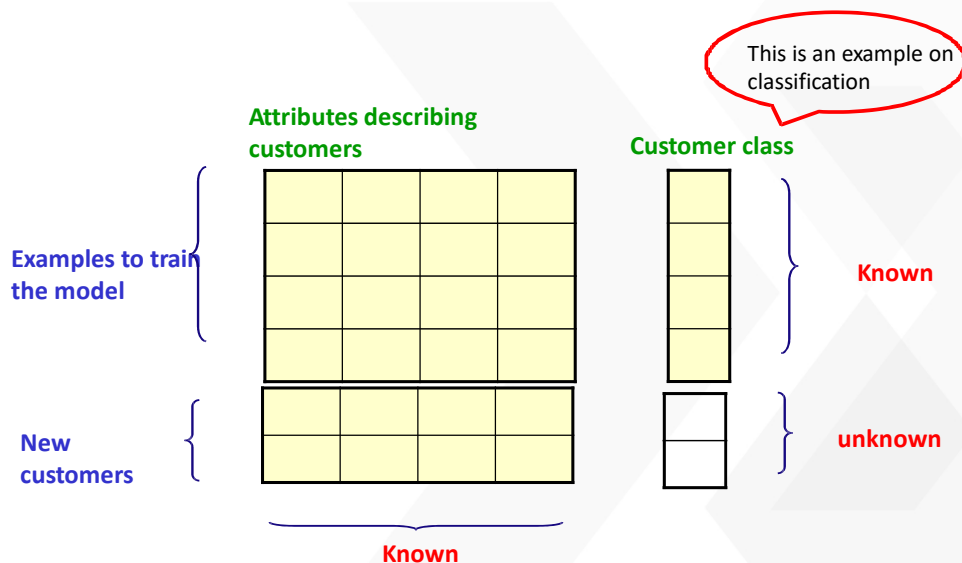
Machine Learning Techniques

- K-Nearest Neighbours (KNN)
- Naïve Bayes
- Artificial Neural Networks (ANN)
- Support Vector Machines (SVM)

Ensemble Learning

- Bootstrapped Aggregation(Bagging)
- Boosting (AdaBoost/Gradient Boosting Machines)
- Random Forest

Classification Example

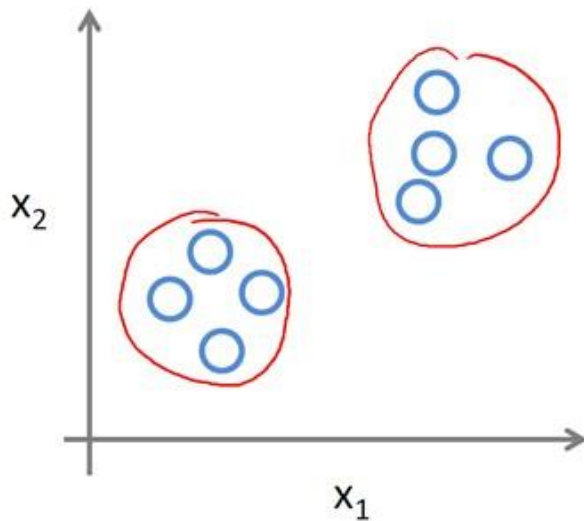


Classification – Typical applications

- **Typical Applications:**
 - Credit approval: classifies credit application as low risk, high risk, or average risk
 - Determine if a local access on a computer is legal or illegal
 - Target marketing (send or not a catalogue?)
 - Fraud Detection: Fraud Vs. Not Fraud
 - Collections: Identify cardholders that are likely to default and thus need collection effort (Payment Projection Models)
 - Insurance: Identify claims that are Fraud or Not Fraud
 - Marketing & Sales: Identify to responders to promotional campaigns(Response/Non Response, Buying/Not Buying)
 - Operations: Models to identify to employees who attrite(Attrition/ Retention)
 - Website: Models to identify to weather visitor will click or not(Click/Not Click)
 - Gaming: Models to identify to who will win(Win/Loss)
 - Health Care: Models to identify to cure or not cure(Cure/ Not Cure)
 - Text classification (spam, not spam)
 - Text recognition (Optical character recognition)
 - ...

Segmentation Problems

Segmentation: detect similar instance groupings / detect natural patterns



Some techniques:

- k-means
- Hierarchical clustering
- Spectral clustering
- DB-scan

Segmentation Example: Market Segmentation

Age	State	Annual Income	Marital status
25	CA	\$80,000	M
45	NY	\$150,000	D
55	WA	\$100,500	M
18	TX	\$85,000	S
...

No labels

Model

Naturally occurring (hidden) structure

Example: market segmentation



ANALYTIX LABS

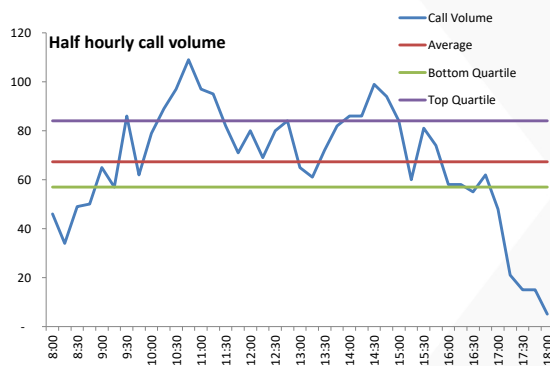
Segmentation – Typical applications

- **Typical Applications:**
 - Improve customer retention by providing products tailored for specific segments
 - Increase profits by leveraging disposable incomes and willingness to spend
 - Grow you business quicker by focusing marketing campaigns on segments with higher propensity to buy
 - Improve customer lifetime value by identifying purchasing patterns and targeting customers when they are in the market
 - Retain customers by appearing as relevant and responsive
 - Identify new product opportunities and improve the products you already have
 - Optimize operations by focusing on geographies, age groups etc. with the most value
 - Increase sales by offering free shipping to high frequency buyers
 - Offer improved customer support to VIP customers
 - Gain brand evangelists by incentivising them to comment, review or talk about your product with free gifts or discounts
 - Reactivate customers who have churned and no longer interact with you
 - ...

ANALYTIX LABS

Forecasting Problems

Forecasting: predict a continuous value for future(eg: next two quarters)



Some techniques:

- Averages
- Smoothing
- Decomposition
- ARIMA/SARIMA
- ARIMAX
- ARCH/GARCH
- VAR

etc...

Forecasting – Typical applications

- **Typical Applications:**
 - Call volume demand in call centers
 - Average handle time trends
 - Demand for seasonal maintenance
 - Event based demand for field services
 - Estimation of cash requirement in ATMs and Branches
 - Number of transactions for tellers
 - Footfall estimation in consumer retail
 - IT manpower requirement over months
 - ...

Other Problems

Example: Affinity Analysis- identifying frequent item sets

	Item 1	Item 2	Item 3	Item 4	Item 5	...
Tx 1	Y	N	N	Y	N	
Tx 2	Y	N	N	Y	N	
Tx 3	Y	Y	N	Y	N	
Tx 4	N	N	Y	Y	Y	
Tx 5						
...						

➔

	Item 1	Item 2	Item 3	Item 4	Item 5	...
Tx 1	Y	N	N	Y	N	
Tx 2	Y	N	N	Y	N	
Tx 3	Y	Y	N	Y	N	
Tx 4	N	N	Y	Y	Y	
Tx 5						
...						

Goal: identify frequent item set
Techniques: FP Growth, a priori

Example: Affinity Analysis



Use affinity analysis for

- store layout design
- Coupons

Contact us

Visit us on: <http://www.analytixlabs.in/>

For course registration, please visit: <http://www.analytixlabs.co.in/course-registration/>

For more information, please contact us: <http://www.analytixlabs.co.in/contact-us/>

Or email: info@analytixlabs.co.in

Call us we would love to speak with you: (+91) 88021-73069

Join us on:

Twitter - <http://twitter.com/#!/AnalytixLabs>

Facebook - <http://www.facebook.com/analytixlabs>

LinkedIn - <http://www.linkedin.com/in/analytixlabs>

Blog - <http://www.analytixlabs.co.in/category/blog/>