Predictive Analytics

Predictive Analytics → future

- Process **involves use of proper classification and clustering tool which helps us in managing big dataset generated by the IoT appliances.**
- Predictive analytics is the use of **data, statistical algorithms and machine learning techniques to identify the likelihood of future outcomes based on historical data**.
- Ex: Predictive analytics models **may be able to identify correlations between sensor readings.**
- Ex: The temperature reading on a machine correlates to the length of time it runs on high power, those two combined readings may put the machine at risk of downtime. Predict future state using sensor values.

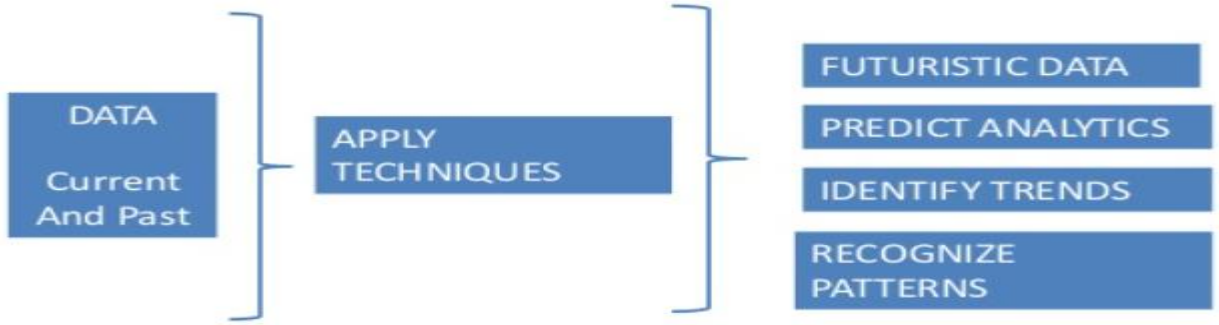
Predictive Analytics

- Predictive analytics is **a way to predict future events based on past behavior**.
- Combination of many techniques from data mining, statistics, machine learning, and artificial intelligence to analyze current data and build models to predict the future.
- Predictive analytics is the area of data mining concerned with ***forecasting probabilities and trends.***
- predictive analytics on IoT not only helps us in achieving the goal of smart IoT devices but also **reduces the time required to configure the IOT appliances.**
- predictive analytics in **marketing, manufacturing, real estate, software testing, healthcare.**
- Companies use the tools to learn all about their customers

How Predictive Analytics really work?

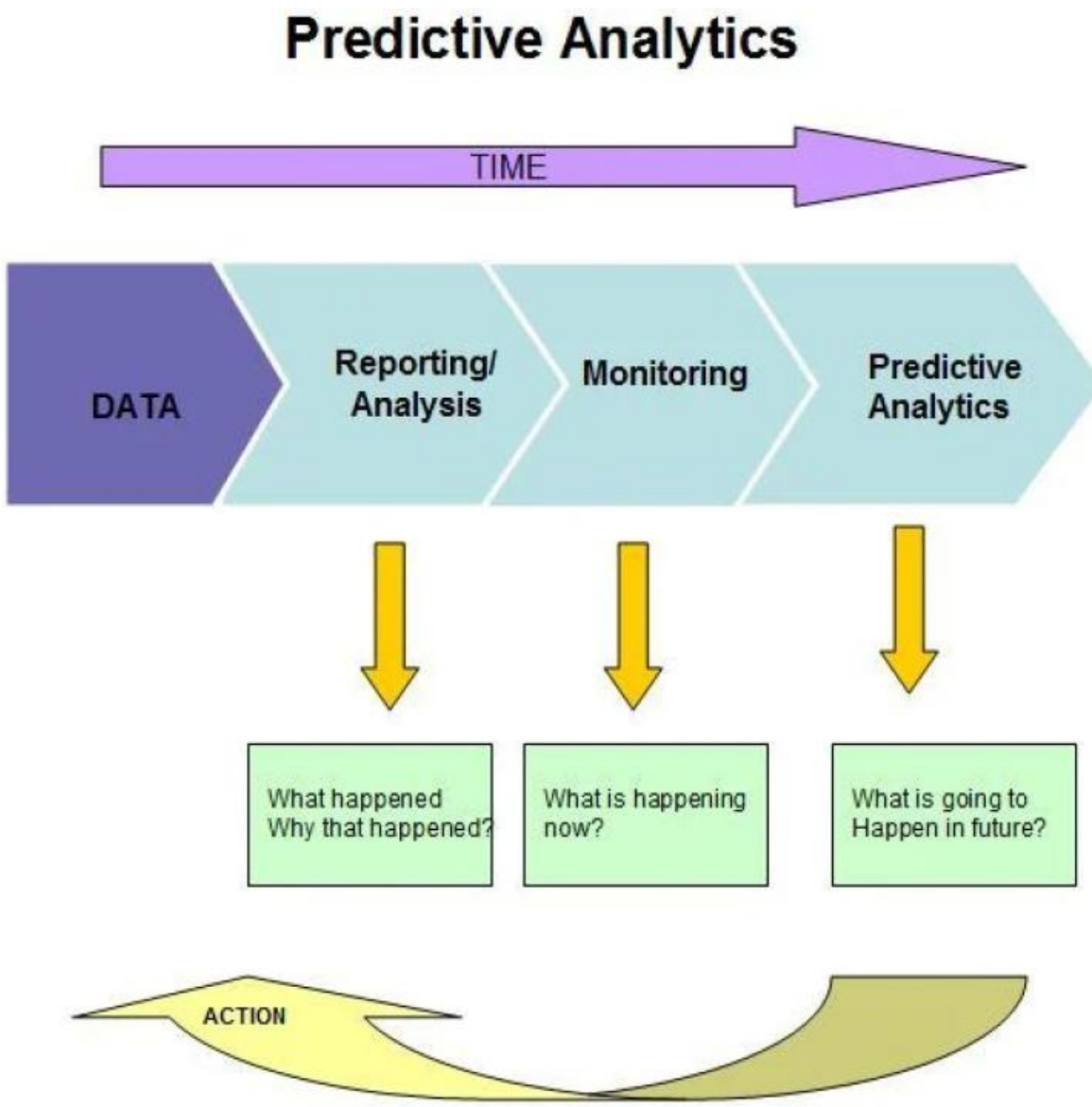
Predictive Modelling

- Predictive modeling is a **process** used in predictive analytics to create a statistical model of future behavior.
- Predictive modeling is the process of creating, testing and validating a model to best predict the probability of an outcome. A number of modeling methods from ML, AI & statistics are available in predictive analytics
- Predictive analytics is the area of data mining concerned with ***forecasting probabilities and trends.***
- For example: predictive modeling could help identify customers **who** are likely to purchase our new Apple phones over the next 90 days



Predictive Modelling

- A model is reusable and is created by training an algorithm using historical data
- Further, saving the model for reuse purpose to share the common business rules which can be applied to similar data, in order to analyze results without the historical data, by using the trained algorithm
- Most of the predictive modeling software solutions has the capability to export the model information into a local file in industry standard **Predictive Modeling Markup Language (PMML) format** for sharing the model with other PMML compliant applications to perform analysis on similar data



Predictive Analytics Value Chain

Predictive Modelling

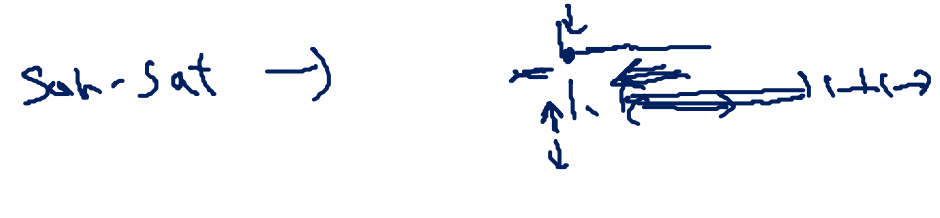
- Predictive modeling is a technique that uses mathematical and computational methods to predict an event or outcome.
- Ex: **regression models for predicting airline traffic volume or predicting fuel efficiency.**
- **Fraud detection systems:** Predictive modeling can be used to predict the probability of a customer terminating his/her services. Identify high risk transactions.

Predictive Modelling

- Predictive analysis aims to foretell problems or issues before they occur.
- The historical values of temperatures for the truck engine, predictive analysis could provide an estimate on the remaining life of certain components in the engine. components to be replaced before failure occurs.
- The temperature values of the truck engine start to rise slowly over time, this could indicate the need for an oil change or some other sort of engine cooling maintenance.

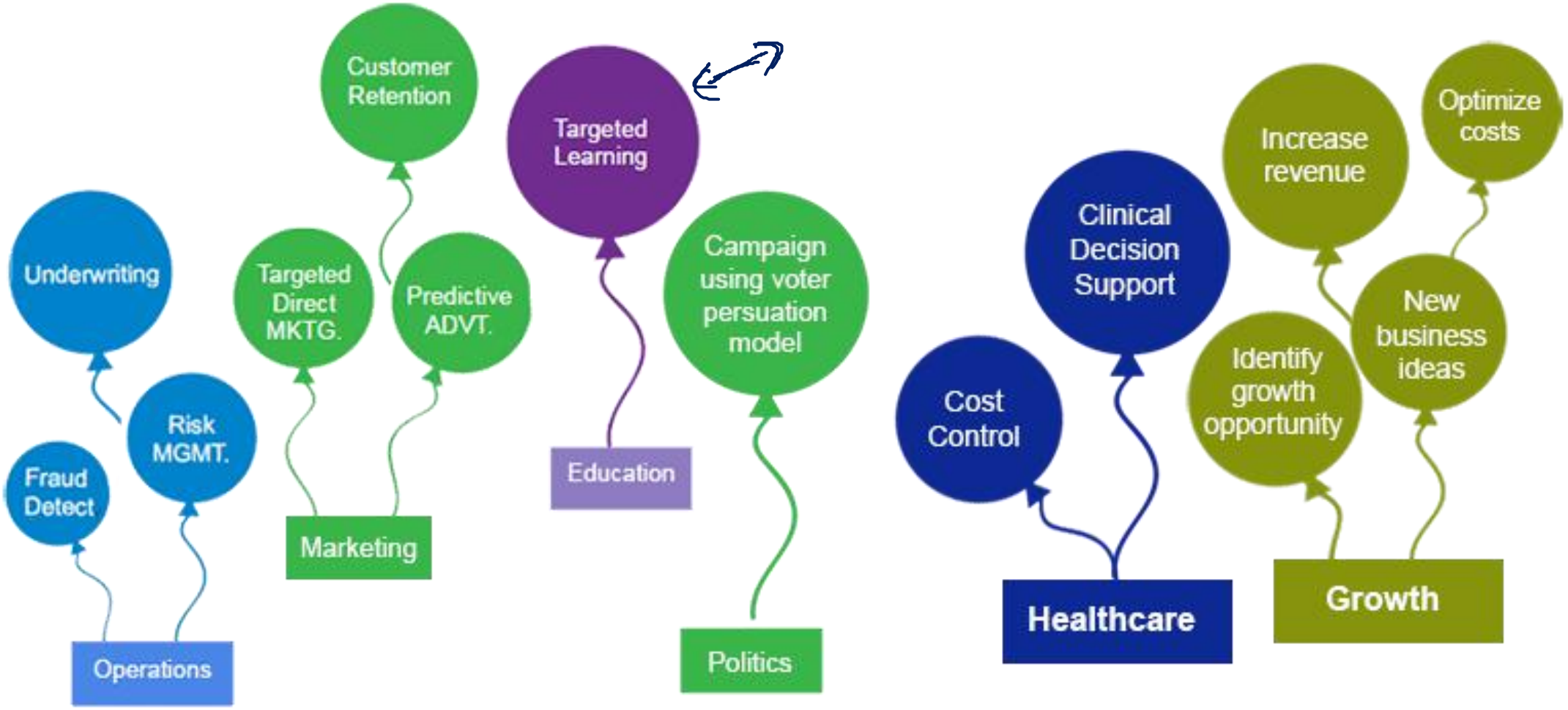
Predictive Modelling- air quality, energy, traffic

- Air Qualification Index can be by developed utilizing Linear Regression, Vector Regression. used to detect air quality from distance in large cities and can assist lower the degree of environmental pollution.
- IoT based applications have been developed in smart homes, smart cities, smart hospitals, and other smart environments. IoT task management mechanism based on predictive optimization for energy consumption minimization in smart residential buildings.
- Optimization module based on prediction and an optimization module for solving energy consumption. energy data is obtained from different appliances to evaluate the proposed predictive optimization approach.



Application of Predictive Analytics

Statistical Data Mining + Recommendation Engine = Predictive Analytics Model (BI)



Application of Predictive Analytics

- **Aerospace:** Predict the impact of specific maintenance operations on aircraft reliability, fuel use, availability and uptime.
- **Automotive:** Incorporate records of component sturdiness and failure into upcoming vehicle manufacturing plans. Study driver behavior to develop better driver assistance technologies and, eventually, autonomous vehicles.
- **Energy:** Forecast long-term price and demand ratios. Determine the impact of weather events, equipment failure, regulations and other variables on service costs.
- **Financial services:** Develop credit risk models. Forecast financial market trends. Predict the impact of new policies, laws and regulations on businesses and markets.
- **Manufacturing:** Predict the location and rate of machine failures. Optimize raw material deliveries based on projected future demands.
- **Law enforcement:** Use crime trend data to define neighborhoods that may need additional protection at certain times of the year.
- **Retail:** Follow an online customer in real-time to determine whether providing additional product information or incentives will increase the likelihood of a completed transaction.

Difference Between Forecasting And Predictive Modeling

Forecasting

- **Forecasting** is a process of predicting or estimating future events based on past and present data and most commonly by analysis of trends
- A forecast refers to a calculation or an estimation which uses data from previous events, combined with recent trends to come up a future event outcome
- **A Forecast is more accurate**. This is because forecasts are derived by analyzing a set of past data from the past and presents trends. The analysis helps in coming up with a model that is scientifically backed and the probability of it being wrong are minimal

Predictive Modeling

- **Predictive modeling** is a form of artificial intelligence that uses data mining and probability to forecast or estimate more granular, specific outcomes.
- A prediction is an actual act of indicating that something will happen in the future with or without prior information.
- **Less accurate**. Ex: if you predict the outcome of a football match, the result depends on how well the teams played no matter their recent performance or players.

In short, all forecasts are predictions but not all predictions are forecasts. Anyone can do a prediction since it does not require any special skills but for one to do forecasting he/she requires special skills.

Difference Between Forecasting And Predictive Modeling (cont.)

FORECASTING	VERSUS	PLANNING
Basis of Comparison	Forecasting	Prediction
Meaning	Process of creating future predictions with relevant data	Process of creating future predictions with or without relevant data
Accuracy	More accurate	Lower probability of happening
Application	Mostly applied in the meteorology, economic and financial sectors	Can be applied almost anywhere
Bias	Forecasts are generated from calculation and data assessment	Is subject to bias
Quantification	Easily Quantified	Can't be quantified
Basis	Done using scientific methods	Arrived at by arbitrary methods e.g. instincts
Application level	Aggregate level	Customer level

Summary of Forecasting vs. Planning

- Forecasting and Prediction are both future-oriented processes
- Forecasting is a process that determines future events using scientific methods that are either qualitative and quantitative in nature
- Predictions use arbitrary methods such as instincts, astrology and superstitions
- Predictions are often less accurate than forecasts as the later uses actual data to generate opinions