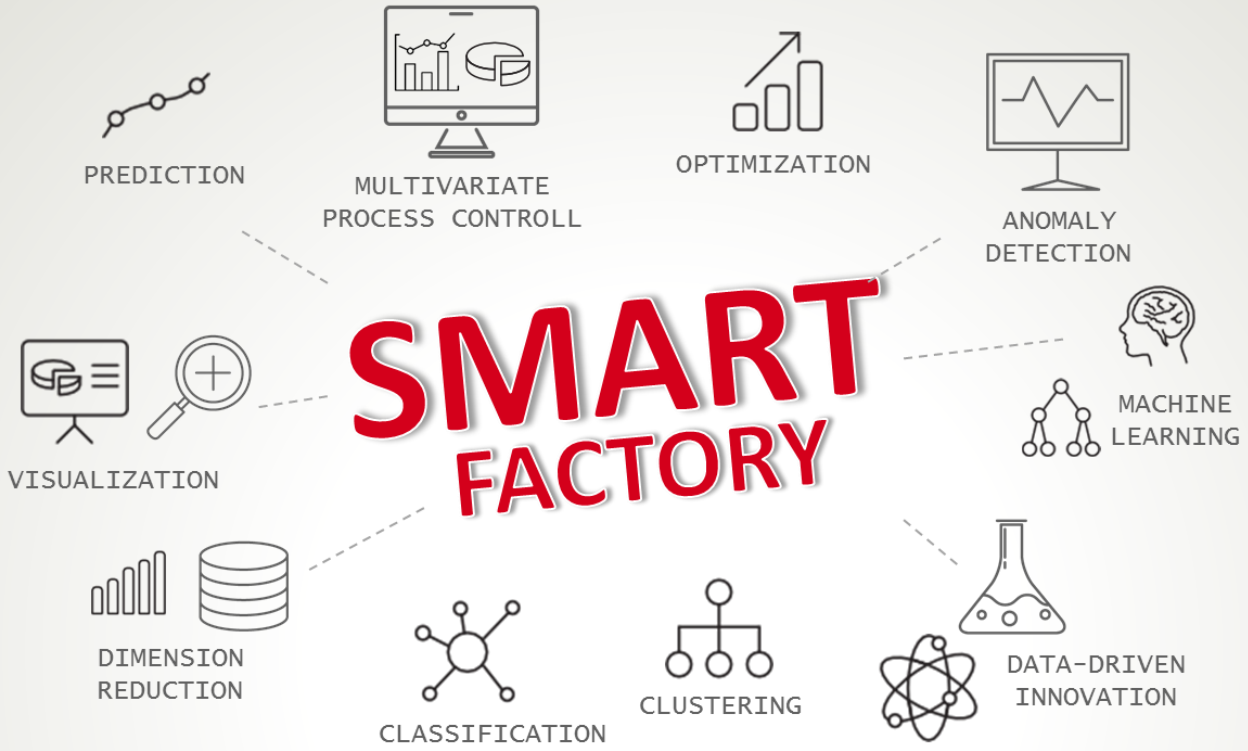


COME TRASFORMARE I DATI IN INNOVAZIONE

Relatore: Alessio Passalacqua
www.produzioneperfetta.it | info@produzioneperfetta.it

Correlatore: Alessandro Tronchin
ICT Manager at Haemotronic

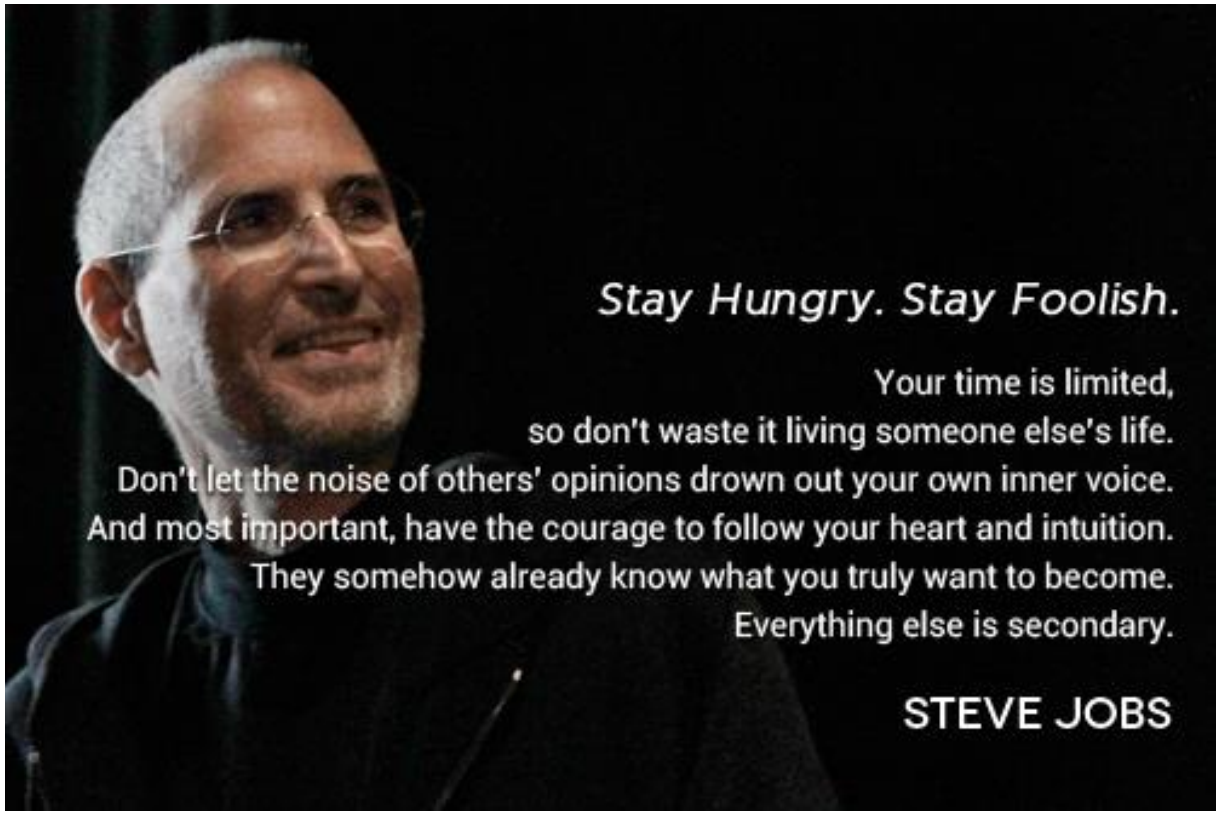
LIFT [SPACE]

PRODUZIONE PERFETTA™
Trasforma i tuoi dati in innovazione

CONFINDUSTRIA PADOVA
Delegazione di Cittadella

Non smettere di imparare…

per innovare bisogna saper cambiare



ANALISI DATI E’ UN LAVORO DI SQUADRA

CONDIVISIONE OBIETTIVO

Bisogna giocare di squadra se si vuole arrivare ad un obiettivo comune

INTRO

Ribattere le responsabilità da un’altra parte è solo una perdita di tempo

«ATTRAVERSO IL SUCCESSO DEGLI ALTRI OTTENGO IL MIO SUCCESSO»

Ing. Mazzola

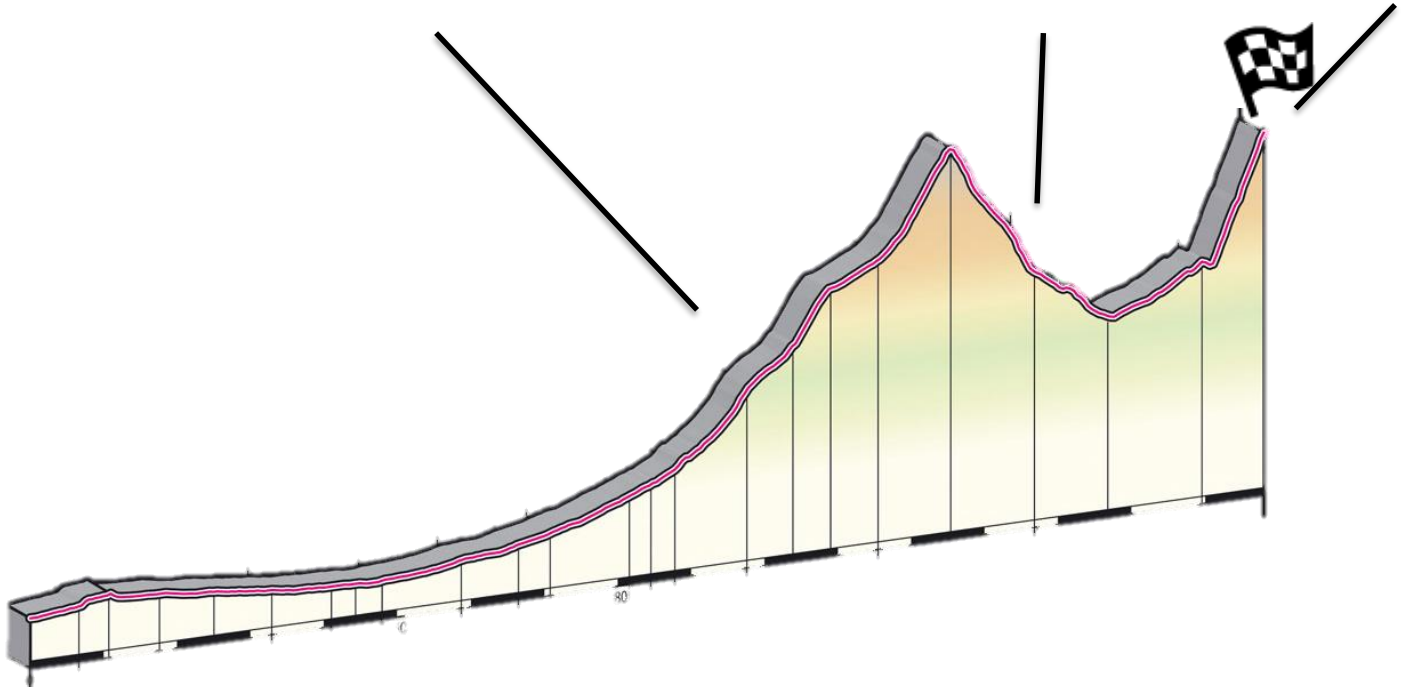
Ex Test Team Manager FERRARI

ANALISI DATI E’ UN PERCORSO A TAPPE

INIZIO FATICOSO

INTERMEDIO RISCHIOSO

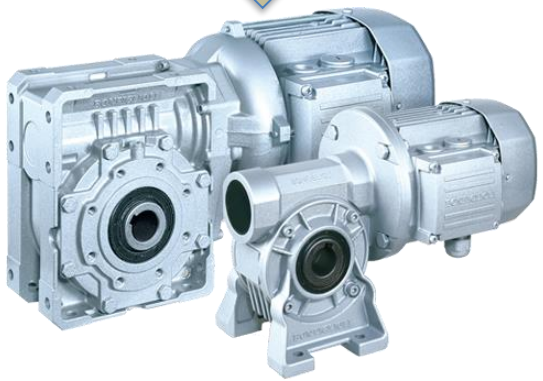
FINALE GLORIOSO



INTRO

"Big data is often misunderstood by CFOs as a risk or cost rather than an asset." Dez Blanchfield, IT consultant

ANALISI DATI: LA FILIERA



BI vs. Data Science

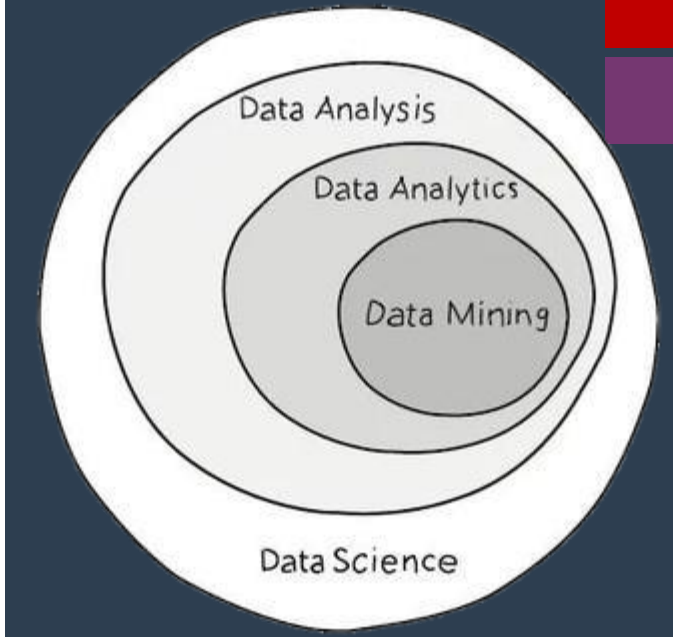
- **Broader skillset** and **broader analytics spectrum**.

SQL Analytics	Descriptive Analytics	Data Mining	Predictive Analytics	Simulation	Optimization
- Count - Mean - OLAP	Univariate Distribution Central tendency Dispersion	- Association rules - Clustering - Features extraction	- Classification - Regression - Forecasting - Spatial - Machine learnings - Text analytics	- Monte Carlo - Agent-based modeling - Discrete event modeling	- Linear optimization - Non-linear optimization

Business Intelligence

Advanced Analytics

DATA SCIENCE



ANALISI DATI: LE PROFESSIONI

DATA ANALYST
'DATA DETECTIVE'

Role
Collects, processes and performs statistical data analyses

Mindset
Intuitive data junkie with high "figure-it-out" quotient

Languages
R, Python, HTML, Javascript, C/C++, SQL

Skills & Talents
- ✓ *Spreadsheet tools (e.g. Excel)*
- ✓ *Database systems (SQL and NO SQL based)*
- ✓ *Communication & visualization*
- ✓ *Math, Stats, Machine Learning*

HIRED BY
IBM hp DHL

DATA SCIENTIST
'AS RARE AS UNICORNS'

Languages
R, SAS, Python, Matlab, SQL, Hive, Pig, Spark

Skills & Talents
- ✓ *Distributed computing*
- ✓ *Predictive modeling*
- ✓ *Story-telling and visualizing*
- ✓ *Math, Stats, Machine Learning*

Role
Cleans, massages and organizes (big) data

Mindset
Curious data wizard

HIRED BY
Google Microsoft Adobe

DATA ENGINEER
'SOFTWARE ENGINEERS BY TRADE'

Role
Develops, constructs, tests and maintains architectures (such as databases and large-scale processing systems)

Mindset
All-purpose everyman

Languages
SQL, Hive, Pig, R, Matlab, SAS, SPSS, Python, Java, Ruby, C++, Perl

Skills & Talents
- ✓ *Database systems (SQL & NO SQL based)*
- ✓ *Data modeling & ETL tools*
- ✓ *Data APIs*
- ✓ *Data warehousing solutions*

HIRED BY
Spotify a

DATA AND ANALYTICS MANAGER
'DATA SCIENCE TEAM LEADER'

Role
Manages a team of analysts and data scientists

Mindset
Data Wizards' Cheerleader

Languages
SQL, R, SAS, Python, Matlab, Java

Skills & Talents
- ✓ *Database systems (SQL and NO SQL based)*
- ✓ *Leadership & project management*
- ✓ *Interpersonal communication*
- ✓ *Data mining & predictive modeling*

HIRED BY
coursera slack MOTOROLA SOLUTIONS

BUSINESS ANALYST
'CHANGE AGENT'

Languages
SQL

Skills & Talents
- ✓ *Basic tools (e.g. MS Office)*
- ✓ *Data visualization tools (e.g. Tableau)*
- ✓ *Conscious listening and storytelling*
- ✓ *Business Intelligence understanding*
- ✓ *Data modeling*

Role
Improves business processes as intermediary between business and IT

Mindset
Resilient project juggler

HIRED BY
UBER DELL ORACLE

DATABASE ADMINISTRATOR
'DATABASE CARETAKER'

Role
Ensures that the database is available to all relevant users, is performing properly and is being kept safe

Mindset
Master of Disaster Prevention

Languages
SQL, Java, Ruby on Rails, XML, C#, Python

Skills & Talents
- ✓ *Backup & recovery*
- ✓ *Data modeling and design*
- ✓ *Distributed Computing (Hadoop)*
- ✓ *Database systems (SQL and NO SQL based)*
- ✓ *Data security*
- ✓ *ERP & business knowledge*

HIRED BY
+ableau reddit

DI COSA PARLEREMO

INTRO

- **“The Era of Data”:** L’inizio della quarta rivoluzione industriale
- **“Data-Driven Innovation”:** 4 steps per trasformare i dati in innovazione
- Confronto con i metodi di **analisi statistica Six-Sigma**
- Presentazione del **software open-source R**
- Presentazione dei metodi di **analisi statistica avanzata** e di **“Machine Learning”**
- **Case studies**

“The Era of Data”:
L’inizio della quarta rivoluzione industriale

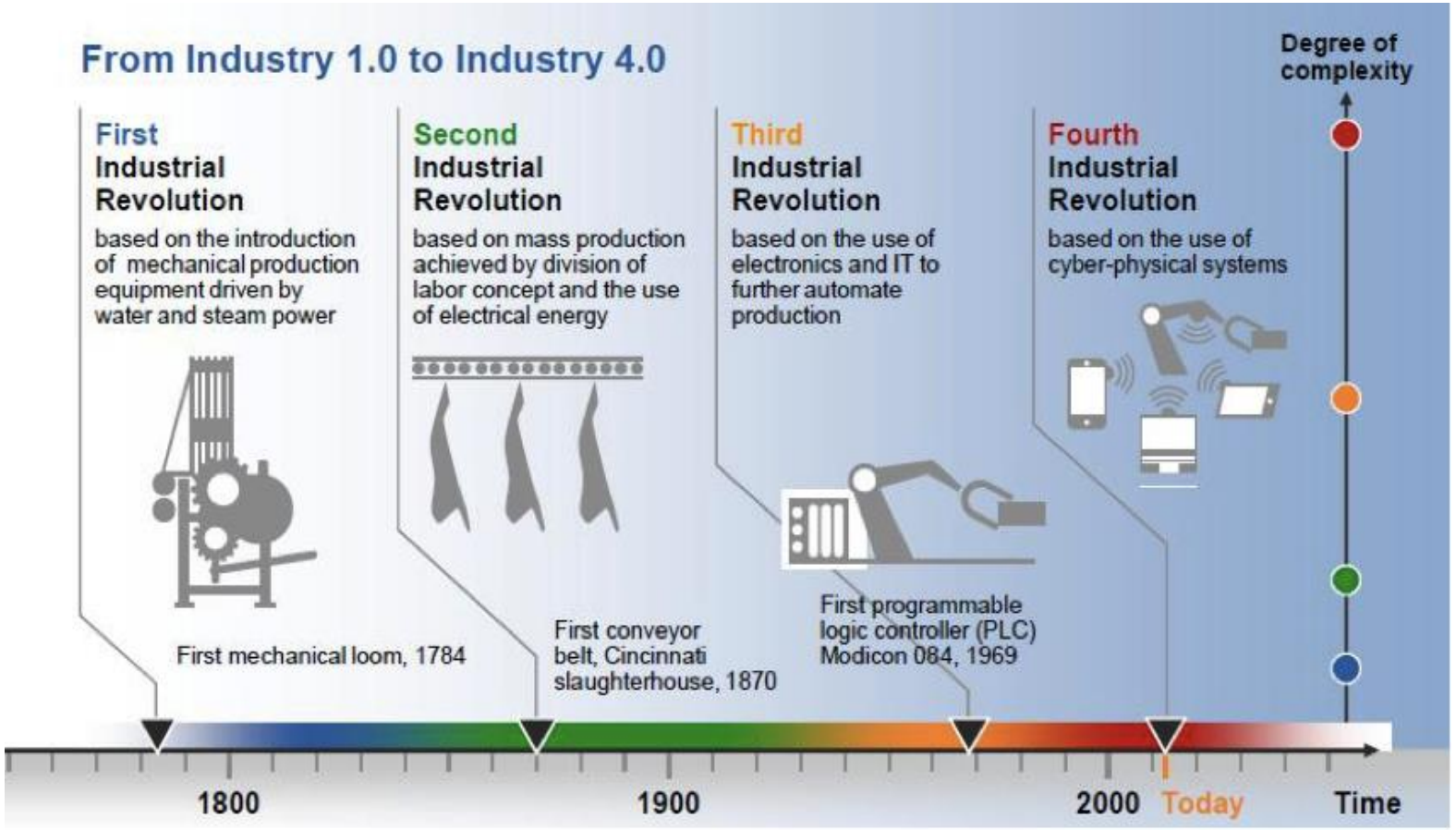
THE DATA ERA

RAW MATERIALS

THE DATA ERA

"Information is the oil of the 21st century, and Analytics is the combustion engine."

INDUSTRY 4.0



THE DATA ERA

Applications of Data Analysis

- Marketing
  - Analysis of consumer behavior
  - Advertising campaigns
  - Targeted mailings
  - Segmentation of customers, stores, or products
- Finance
  - Creditworthiness of clients
  - Performance analysis of finance investments
  - Fraud detection
- Manufacturing
  - Optimization of resources
  - Optimization of manufacturing processes
  - Product design based on customer requirements
- Health Care
  - Discovering patterns in X-ray images
  - Analyzing side effects of drugs
  - Effectiveness of treatments

By analyzing all the data available, decision-makers can better assess competitive threats, anticipate changes in customer behavior, strengthen supply chains, improve the effectiveness of marketing campaigns, and enhance business continuity.

THE DATA ERA

According to a recent study by the MIT Sloan School of Management, organizations that use analytics are twice as likely to be top performers in their industry as those that don't.

ANALISI DATI: COME CREARE VALORE

sapere esattamente cosa vuole il cliente (customer insight)

*(DATI+SERVIZIO)*CLIENTE*

Creare valore al cliente / rendere la vita più semplice (make the word a better place)

INNOVATING NEW BUSINESS MODELS AND SERVICES

THE DATA ERA

"Consumer data will be the biggest differentiator in the next two to three years. Whoever unlocks the reams of data and uses it strategically will win."

Sophisticated analytics can substantially improve decision-making, minimise risks, and unearth valuable insights that would otherwise remain hidden.

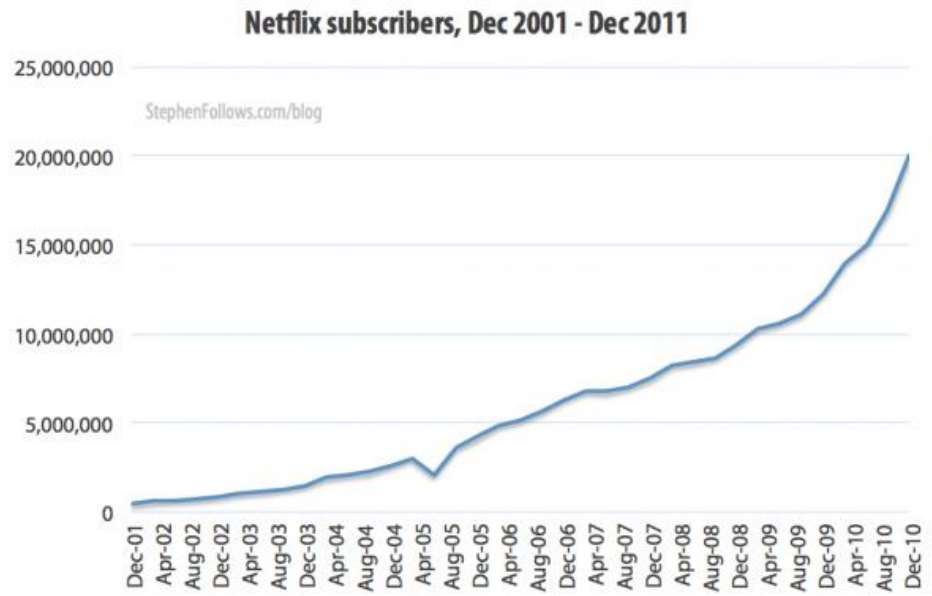
NETFLIX

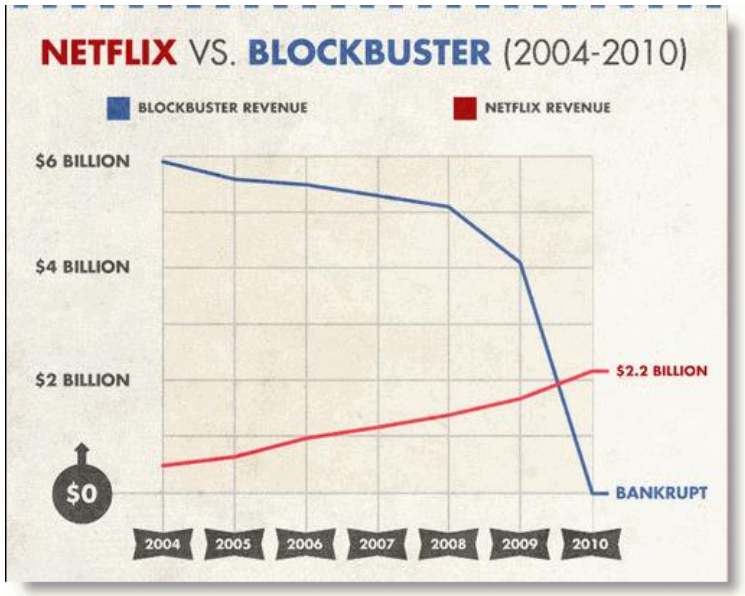
(DATI+SERVIZIO)*CLIENTE

THE DATA ERA

Netflix is the world's leading Internet television network with over 75 million members in over 190 countries

- In 2000, Blockbuster refused to buy Netflix for $50m.
- In 2013, Netflix generated $4.4 billion in revenue.
- In just three months (July to Sept 2014) Netflix spent $1.2 billion acquiring new content for its streaming service and a further $16 million on new DVDs.
- In 2013 Netflix spent $470m marketing its streaming service and just $0.2m promoting its DVD service.





(DATI+SERVIZIO)*CLIENTE=RECOMMANDER

"WE ARE LEAVING THE AGE OF INFORMATION AND ENTERING THE AGE OF RECOMMENDATION"

- Reccomandation: Estimate a utility function that automatically predicts how a user will like an item.
- As even improving recommendations a little bit could lead to dramatically increased revenue due to smaller churn
- Netflix spends $150 million on content recommendations every year

THE DATA ERA

"In 2006 and 2009, Netflix announced a $1M prize competition to advance recommendation algorithms.

It is the combination of this data with cutting edge analytical techniques that makes Netflix a true Big Data company.

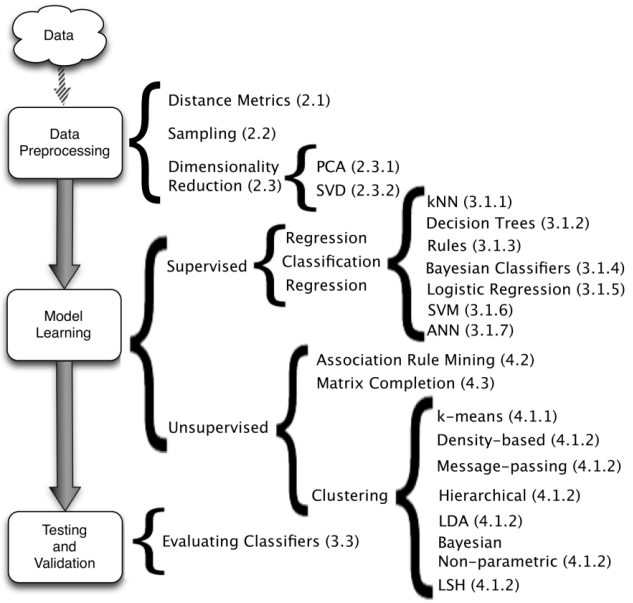
(DATI+SERVIZIO)*CLIENTE=RECOMMANDER

"WE ARE LEAVING THE AGE OF INFORMATION AND ENTERING THE AGE OF RECOMMENDATION"

THE DATA ERA

The core of the Recommendation Engine can be assimilated to a general data mining problem

(Amatriain et al. Data Mining Methods for Recommender Systems in Recommender Systems Handbook)



Over **75%** of what people watch comes from a recommendation

NETFLIX

Xavier Amatriain – August 2014 – KDD

RECOMMENDER

E-Commerce: Amazon.com, Ebay, Etsy.
Music: Spotify, Pandora.
Movie: Netfilx, IMDB.
News: Digg, Summly.
Social Networks: LinkedIn, Facebook, Quora, YouTube
Apps: Playstore, Cover

ANALISI DATI: COME CREARE VALORE

INNOVATING PRODUCTS

THE DATA ERA

*(DATI+PRODOTTO)*INNOVARE*

Manufacturers are using data obtained from sensors embedded in products to create innovative after-sales service offerings such as proactive maintenance to avoid failures in new products.

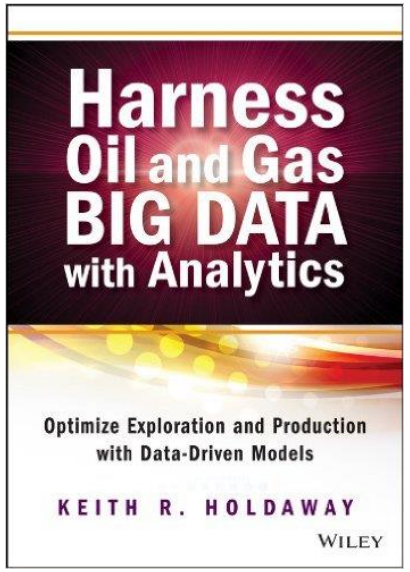
ANALISI DATI: COME CREARE VALORE

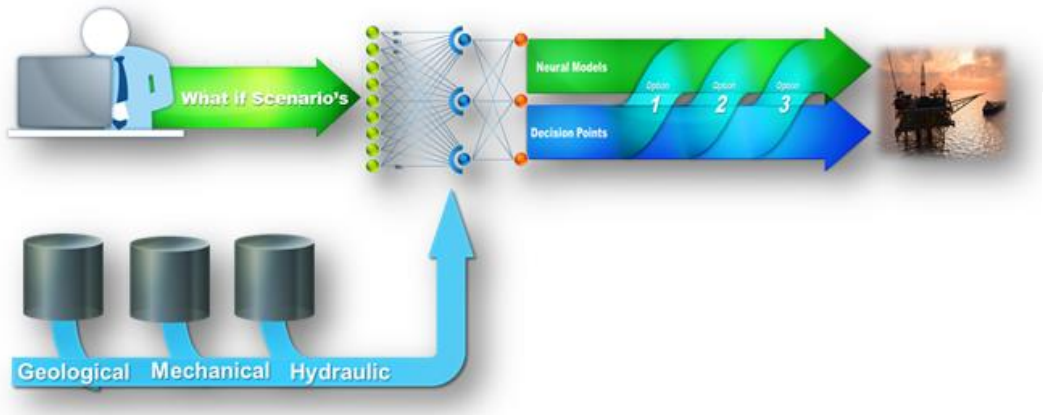
For instance, tire manufacturer Pirelli collects data on tire pressure, temperature and wear-and-tear on trucks using sensors in its tires. This data gives Pirelli competitive advantage and help to improve Tyre quality, maintenance but it can also be monetize externally.

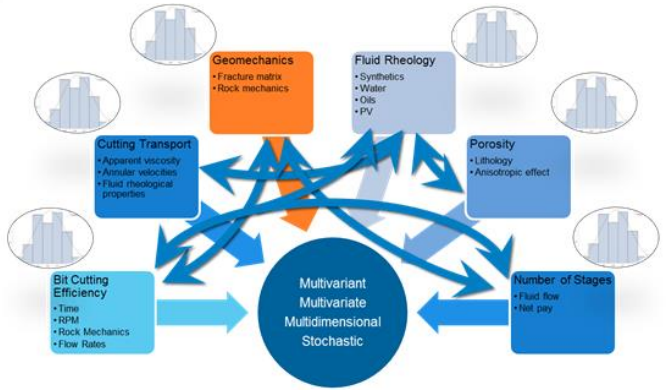
Car manufacturer can buy this data to understand driving patterns to improve there service.
Pirelli also offers that data as an add-on service for fleet managers and insurers, InfoWorld reports.

ANALISI DATI: COME CREARE VALORE

Data from any prospective oil field can then be compared alongside that from thousands of others around the world, to enable geologists to make more accurate recommendations about where to drill.





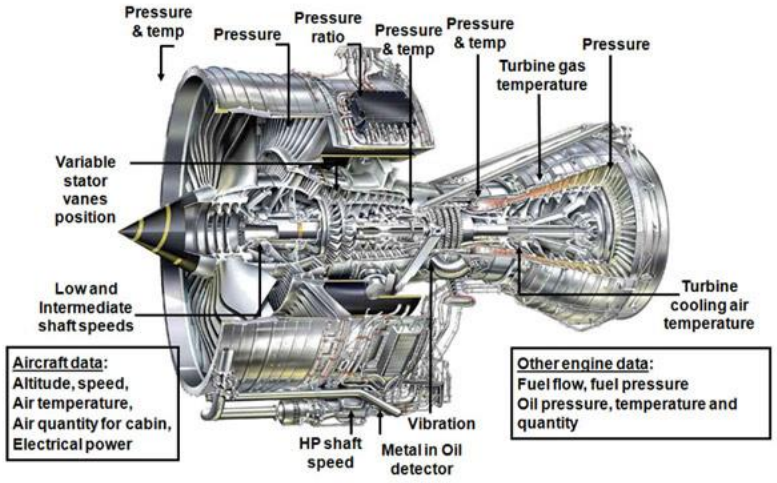


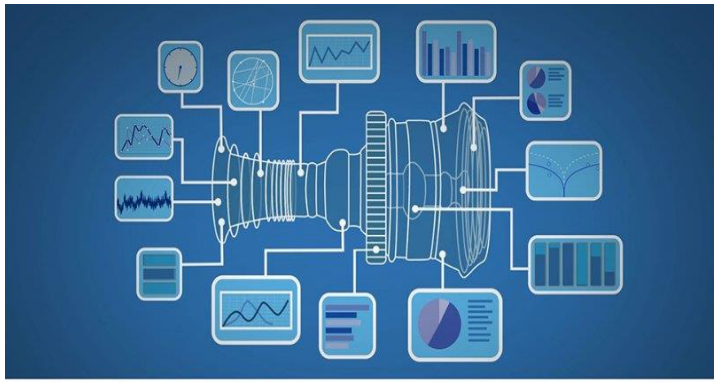
Shell also uses Big Data to ensure its machines are working properly and spending as little time as possible offline due to breakdowns and failure.

ANALISI DATI: COME CREARE VALORE

Engine health management

Rolls Royce uses Engine Health Management (EHM) to track the health of thousands of engines operating worldwide, using onboard sensors and live satellite feeds.





200 sensors across the turbine generate 300 data points per second of performance and operation every hour.

EHM is a pro-active technique for predicting when something might go wrong and averting a potential threat before it has a chance to develop into a real problem.

ANALISI DATI: PROSPETTIVE FUTURE

The Technology Opportunity: Monetize Big Data, Underpinned by the Cloud

#	Priority	2016	2015	2014	%
1	BI/Analytics	39%	41%	50%	▼
2	Infrastructure and Data Center	27%	31%	37%	▼
3	Cloud	25%	27%	32%	▼
4	ERP	21%	26%	34%	▼
5	Digitalization/Digital Marketing	21%	17%	11%	▲
6	Mobile	20%	24%	36%	▼
7	Security	15%	13%	11%	▲
8	Networking, Voice and Data Communications	10%	12%	12%	▼
9	Legacy Modernization	10%	7%	7%	▲
10	Industry-Specific Applications	9%	9%	10%	◆
11	CRM	9%	11%	8%	▼

Note: Percentages represent the proportion of CIOs citing each priority as one of their top three areas of new IT spending.

#GartnerSYM

Gartner. SYMPOSIUM ITXPO 2015

THE DATA ERA

"Analytics is not a technology issue. It's a strategy and operational issue." Chris Mazzei, EY

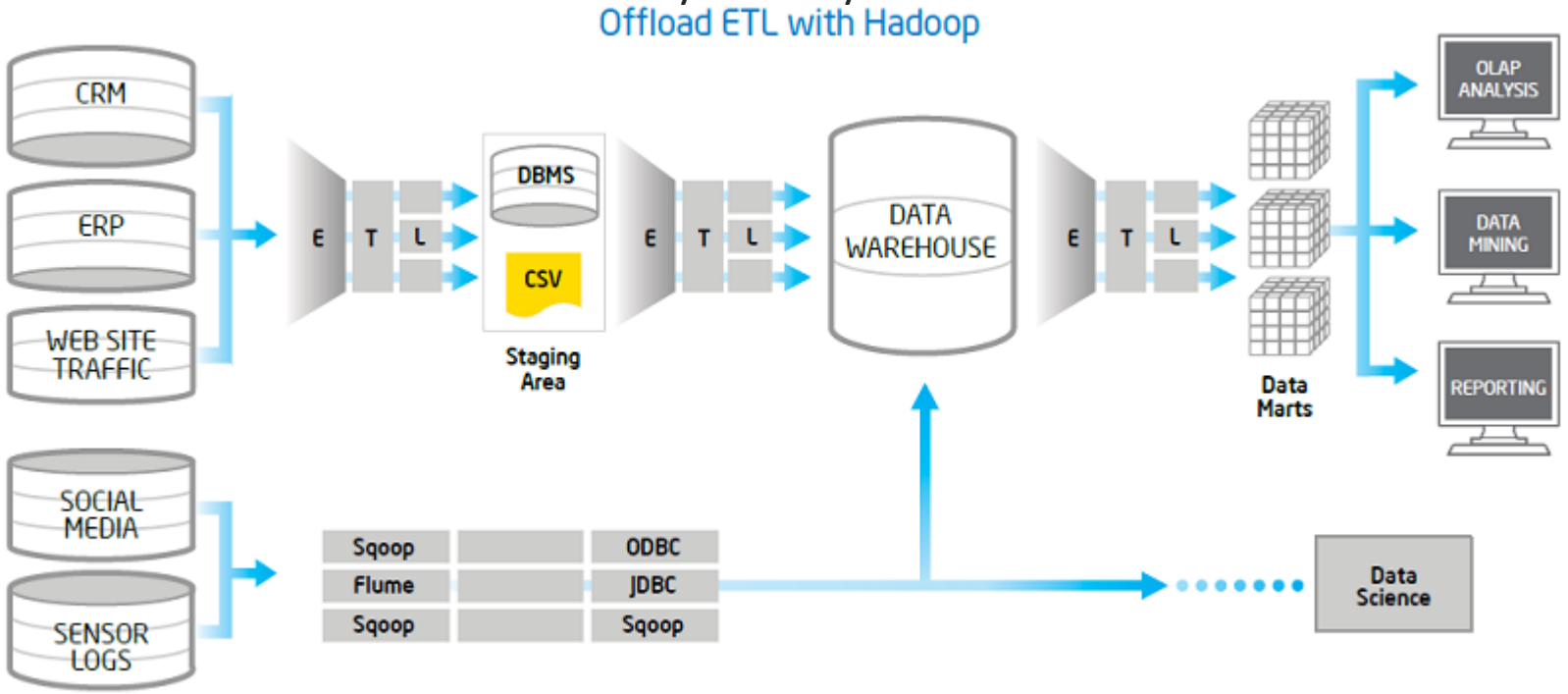
What is big data?

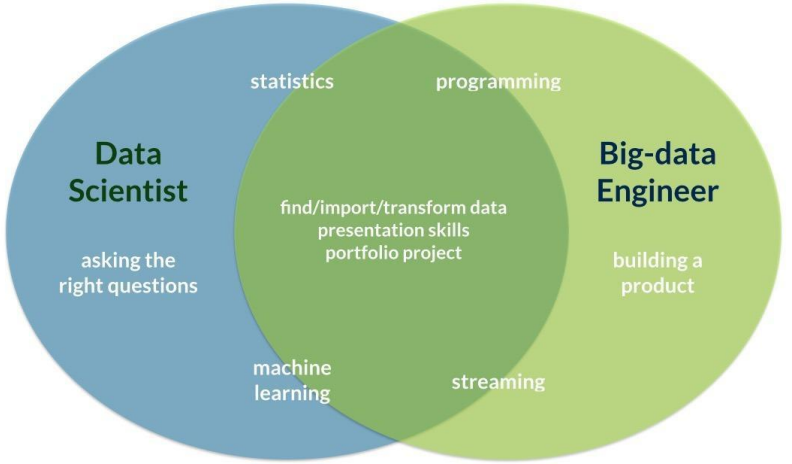
THE DATA ERA

Big Data is essentially a special application of data science, in which the data sets are enormous and require overcoming ***logistical challenges*** to deal with them. The primary concern is efficiently capturing, storing, extracting, processing, and analyzing information from these enormous data sets..

Hadoop is a technology of big data word.

Instead of using a database with structure, indexes and accelerated queries, the data is just dumped into hadoop, and when you have figured out what to do, you re-read all your data and extract the information you really need





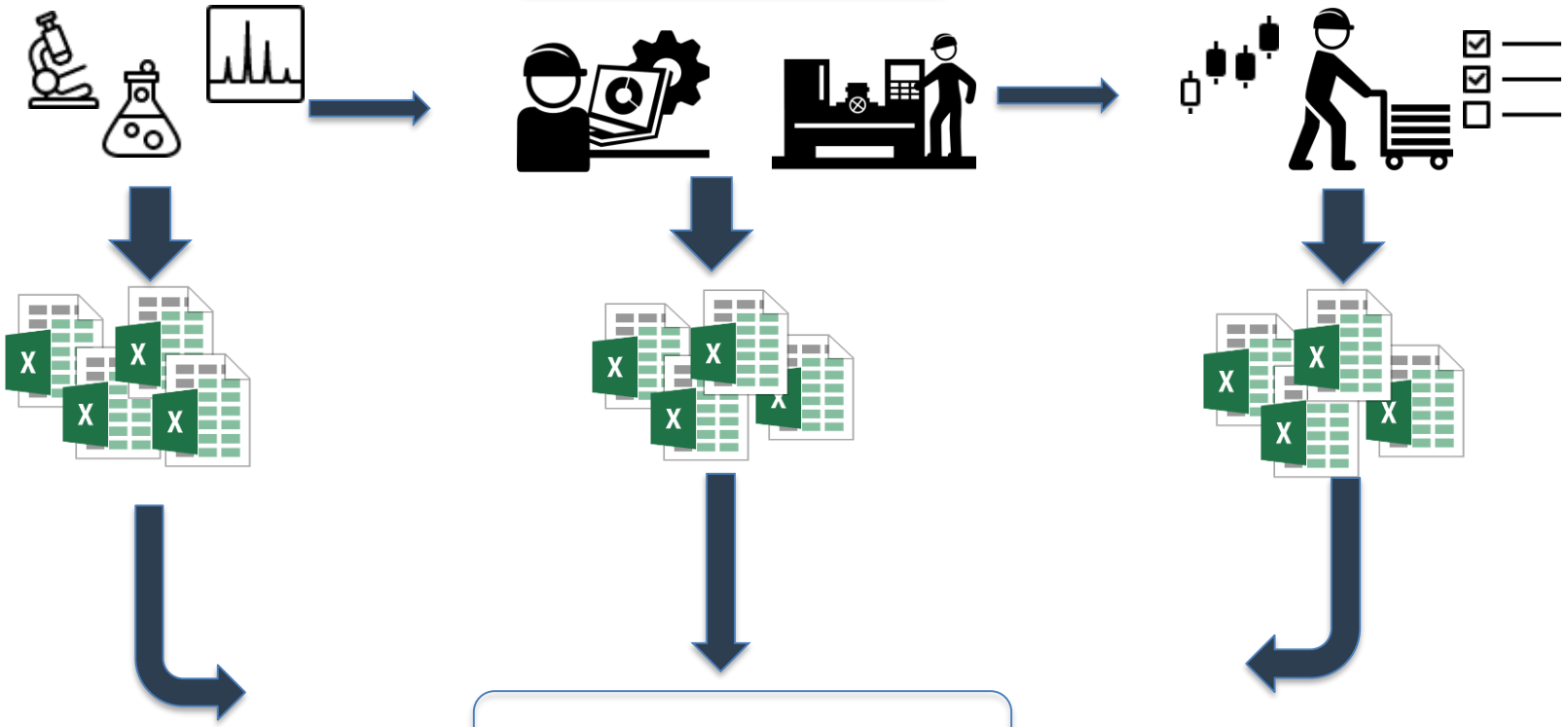
FACTORY

TODAY

RAW MATERIALS

MANUFACTURING PROCESS

FINISHED PRODUCTS



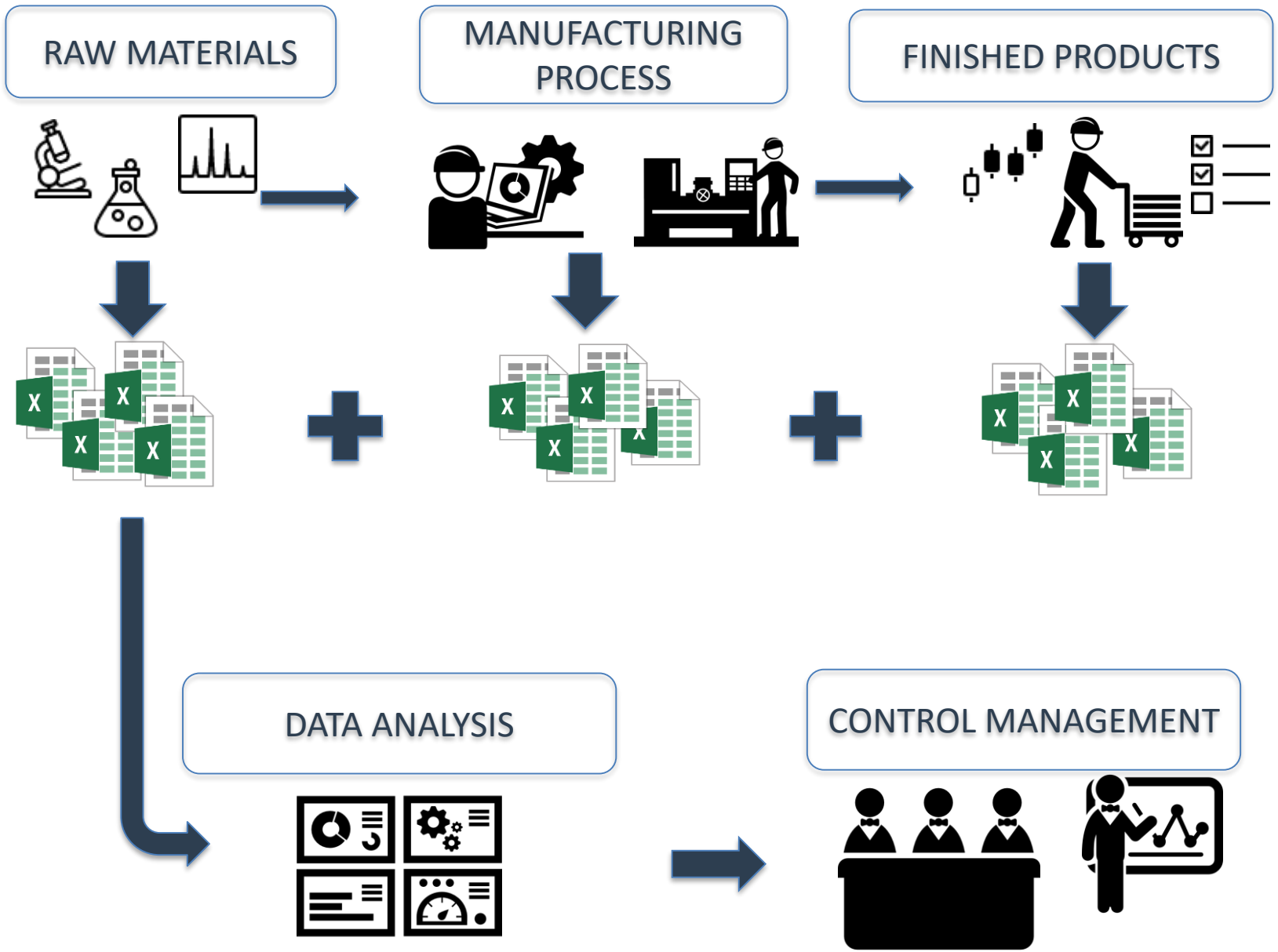
CONTROL MANAGEMENT

THE DATA ERA

SMART FACTORY

TOMORROW

THE DATA ERA



“Data-Driven Innovation”:
4 steps per trasformare i dati in innovazione

ANALISI DATI

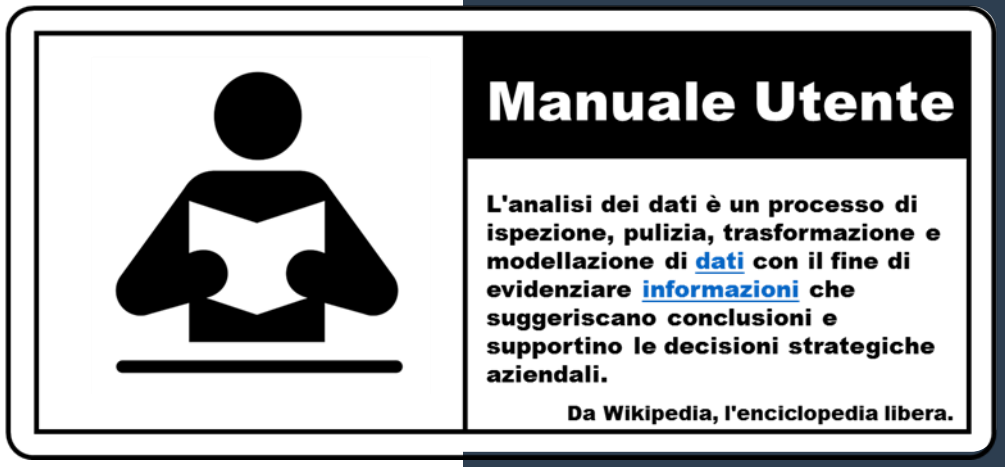
- Non c’è alcuna formula sicura e replicabile
- L’80% del lavoro di analisi viene svolto per raccogliere organizzare, ripulire e trasformare i dati
- L’80% dei software in commercio svolgo solo una parte dell’attività di analisi: la modellizzazione
- I risultati saranno contro-intuitivi e mai certi al 100%.

DATA DRIVEN INNOVATION

ANALISI DATI

FROM DATA TO BUSINESS

DATA DRIVEN INNOVATION



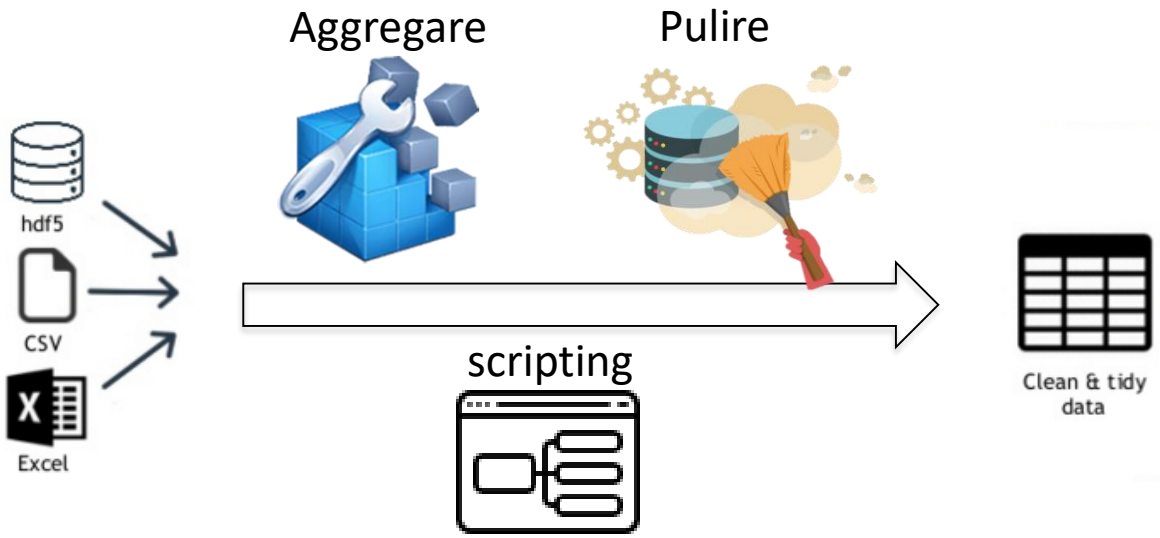
I DATI

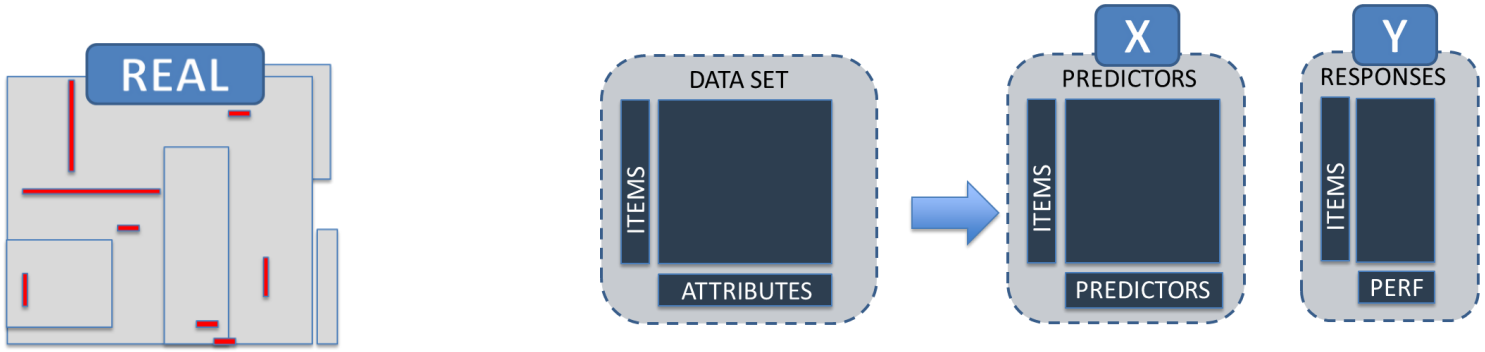
Data Format

Data Source	Structured	Unstructured
Internal	**Human-Generated** • Survey ratings • Aptitude testing **Machine-Generated** • Web metrics from Web logs • Product purchase from sales Records • Process control measures	**Human-Generated** • Emails, letters, text messages • Audio transcripts • Customer comments • Voicemails • Corporate video/communications • Pictures, illustrations • Employee reviews
External	**Human-Generated** • Number of Retweets, Facebook likes, Google Plus +1s • Ratings on Yelp • Patient ratings ratings **Machine-Generated** • GPS for tweets • Time of tweet/updates/postings	**Human-Generated** • Content of social media updates • Comments in online forums • Comments on Yelp • Video reviews • Pinterest images • Surveillance video

DATA DRIVEN INNOVATION

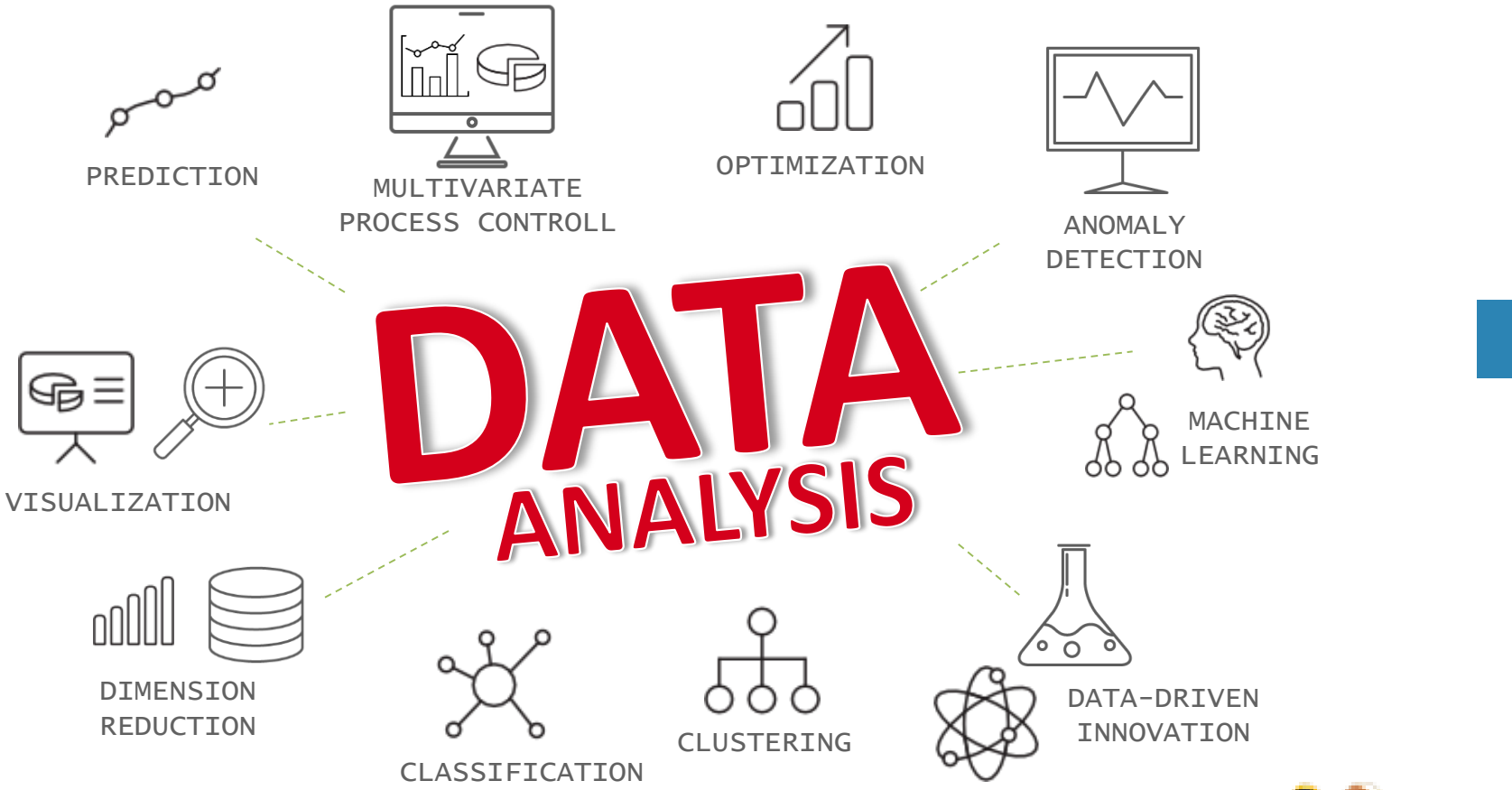
Preparazione Dati





Selezionare
Aggregare
Manipolare
Pulire

ANALISI DATI: TOOLBOX

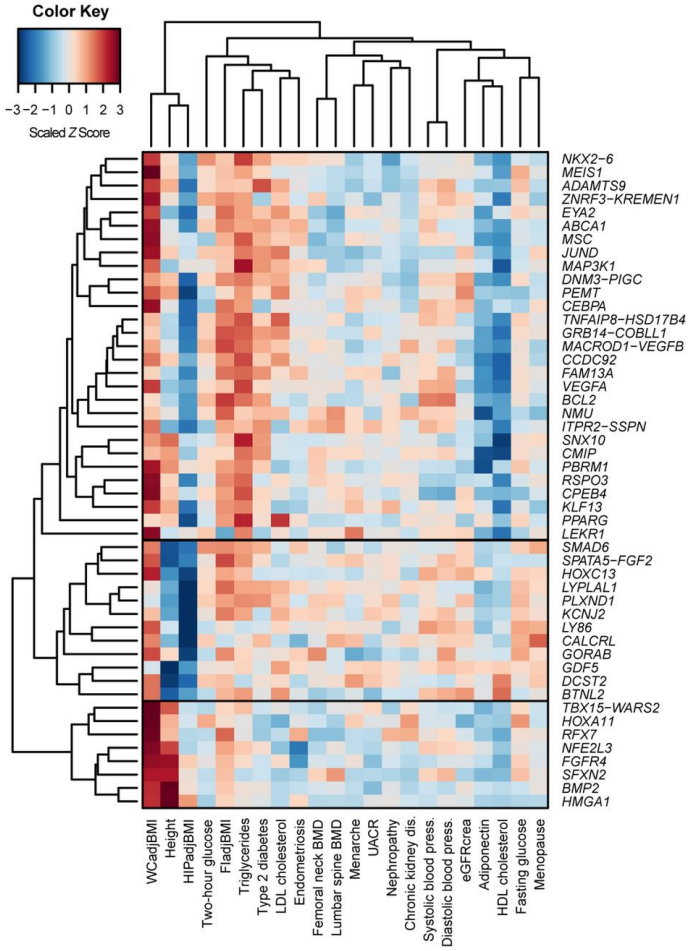


DATA DRIVEN INNOVATION

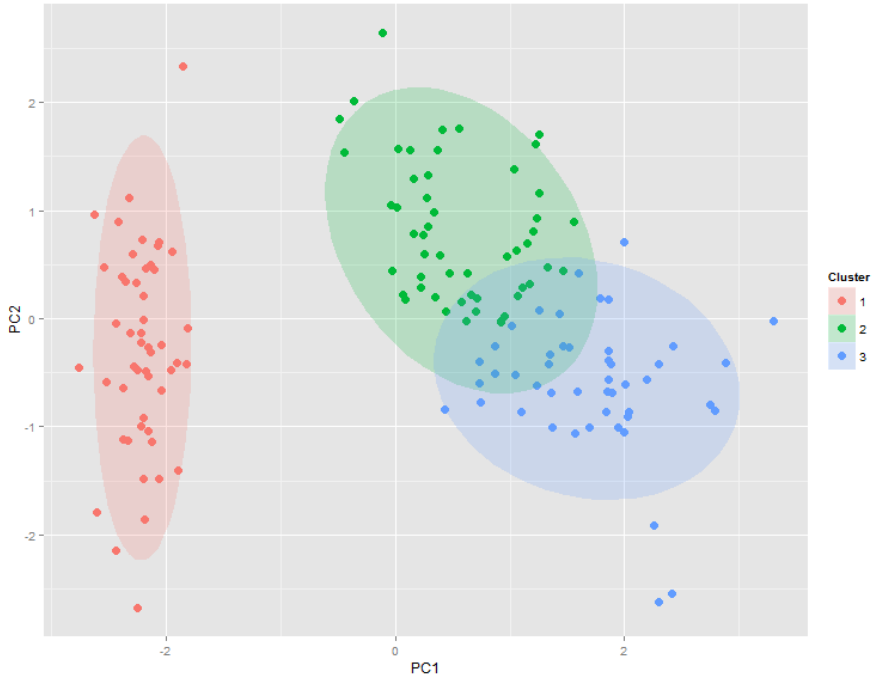
Analisi Esplorativa

Unsupervised

Find underlining relations in data by observing the raw data only (without the expected output).



- ✓ Clustering
- ✓ Dimensionality reduction



DATA DRIVEN INNOVATION

Comprendere

Visualizzare

Ridurre le variabili

Gestire gli outliers

Data clustering

Goal: discover natural groupings among given data points

Unsupervised learning (unlabeled data)

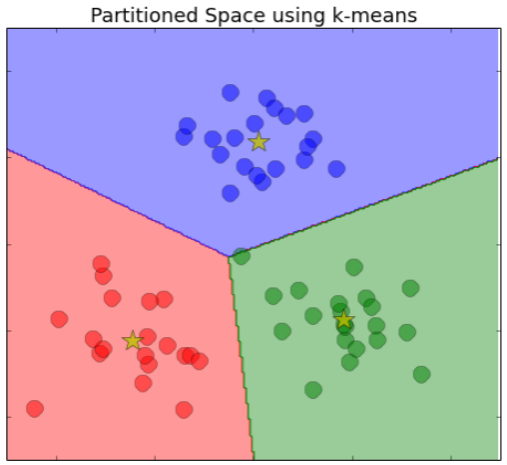
Exploratory analysis (without any pre-specified model/hypothesis)

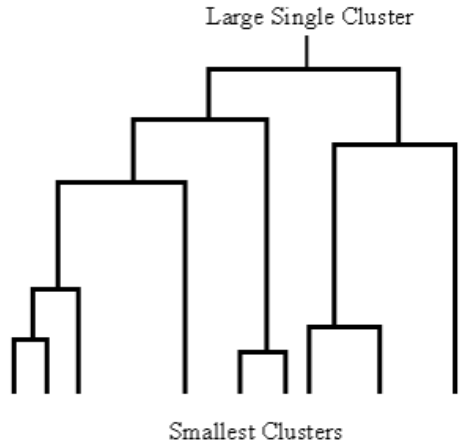
Usages

- Gain insight from the underlying structure of data (salient features, anomaly detection, etc)
- Identify degree of similarity between points (infer phylogenetic relationships)
- Data Compression (summarizing data by cluster prototypes, removing redundant patterns)

Partitional vs. Hierarchical

1. **Partitional algorithms (k-means)**
   Partition the data space
   Finds all clusters simultaneously
2. **Hierarchical algorithms**
   Generate nested cluster hierarchy
   Agglomerative (bottom-up)
   Divisive (top-down)
   Distance between clusters:
   Single-linkage, complete linkage, average-linkage

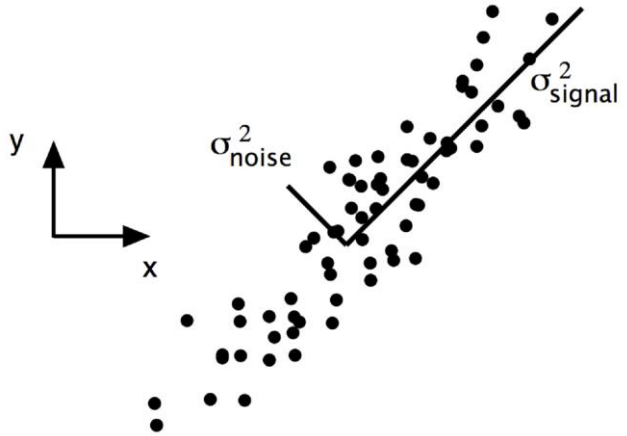




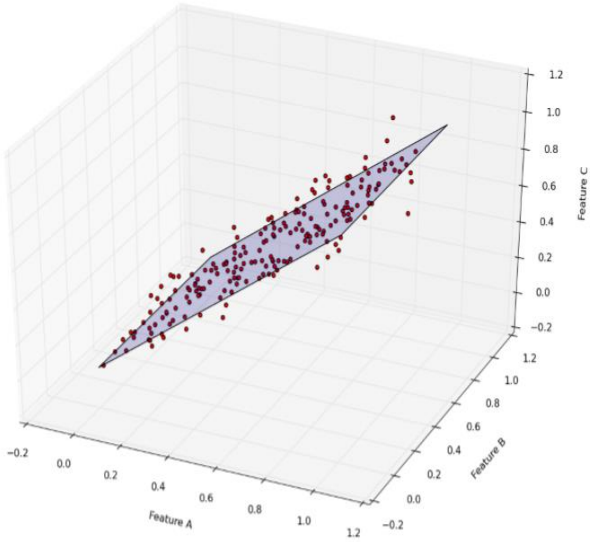
PRINCIPAL COMPONENT ANALYSIS

TECNICA DI RIDUZIONE E INTERPRETAZIONE DEI DATI

LA PCA è una trasformazione geometrica. Una rotazione degli assi.
PCA ricerca delle direzioni privilegiate che massimizzano la variazione dei dati ed elimina le correlazioni



DATA DRIVEN INNOVATION



MASSIMIZZA L'INFORMAZIONE, misurata dalla varianza
MINIMIZZA LA RIDONDANZA, misurata dalla covarianza

TRASFORMAZIONE SPAZIALE

TOGLIE la ridondanza

FILTRA il rumore

LINEAR EXAMPLE: PCA

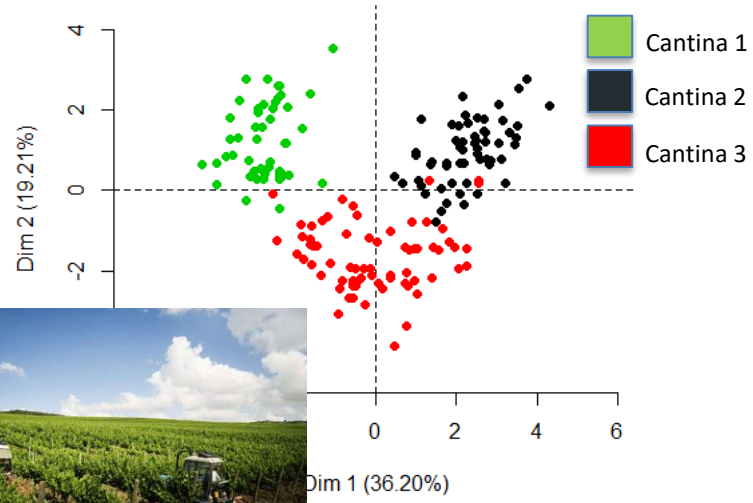
SPACE TRANSFORMATION

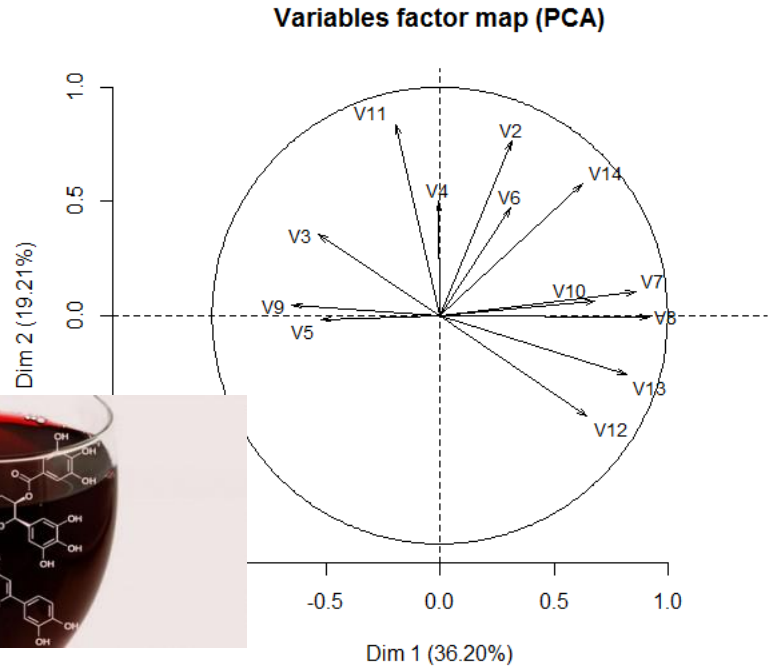
DATA DRIVEN INNOVATION

La trasformazione geometrica evidenza maggiormente la struttura dei dati

Interpretare il fenomeno attraverso il significato assunto dalle componenti principali

WINE DATA SET

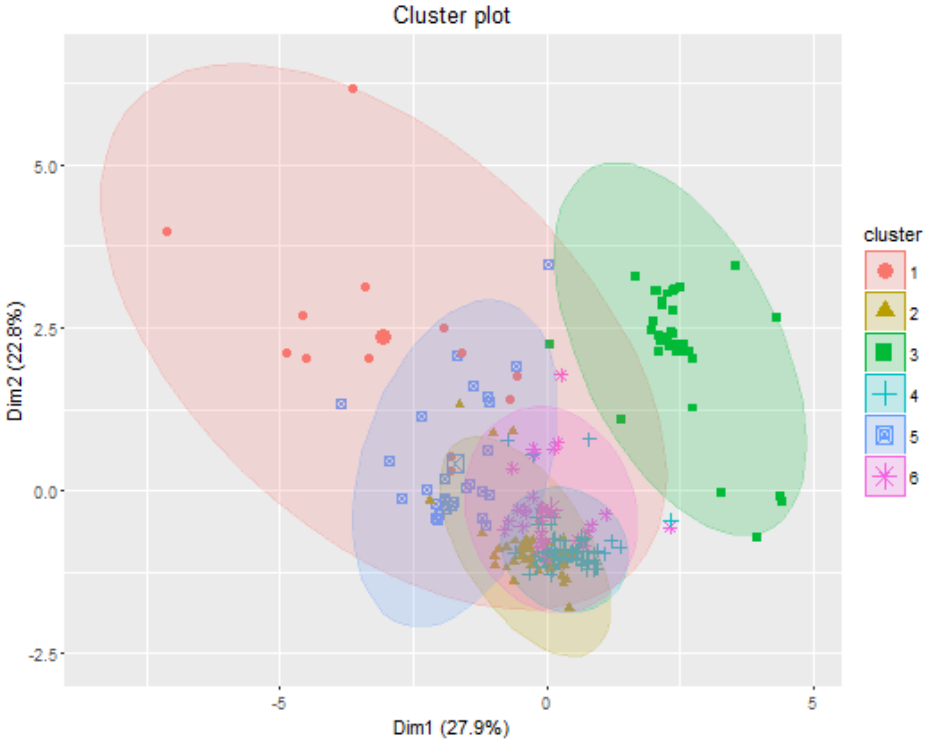


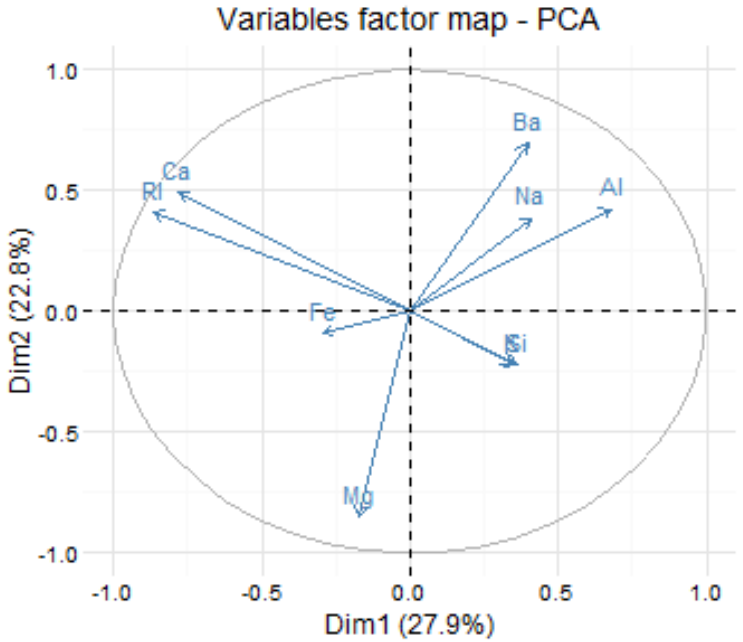


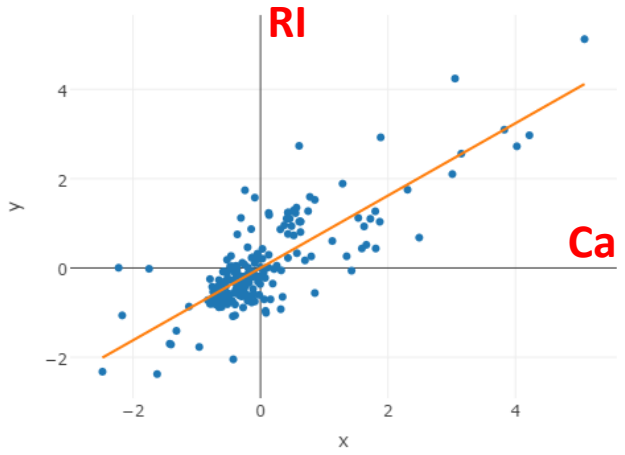
RIVELA LE CARATERISTICHE PIU' IMPORTANTI
E RIDUCE LE DIMENSIONI

Analisi Esplorativa

CLUSTERING



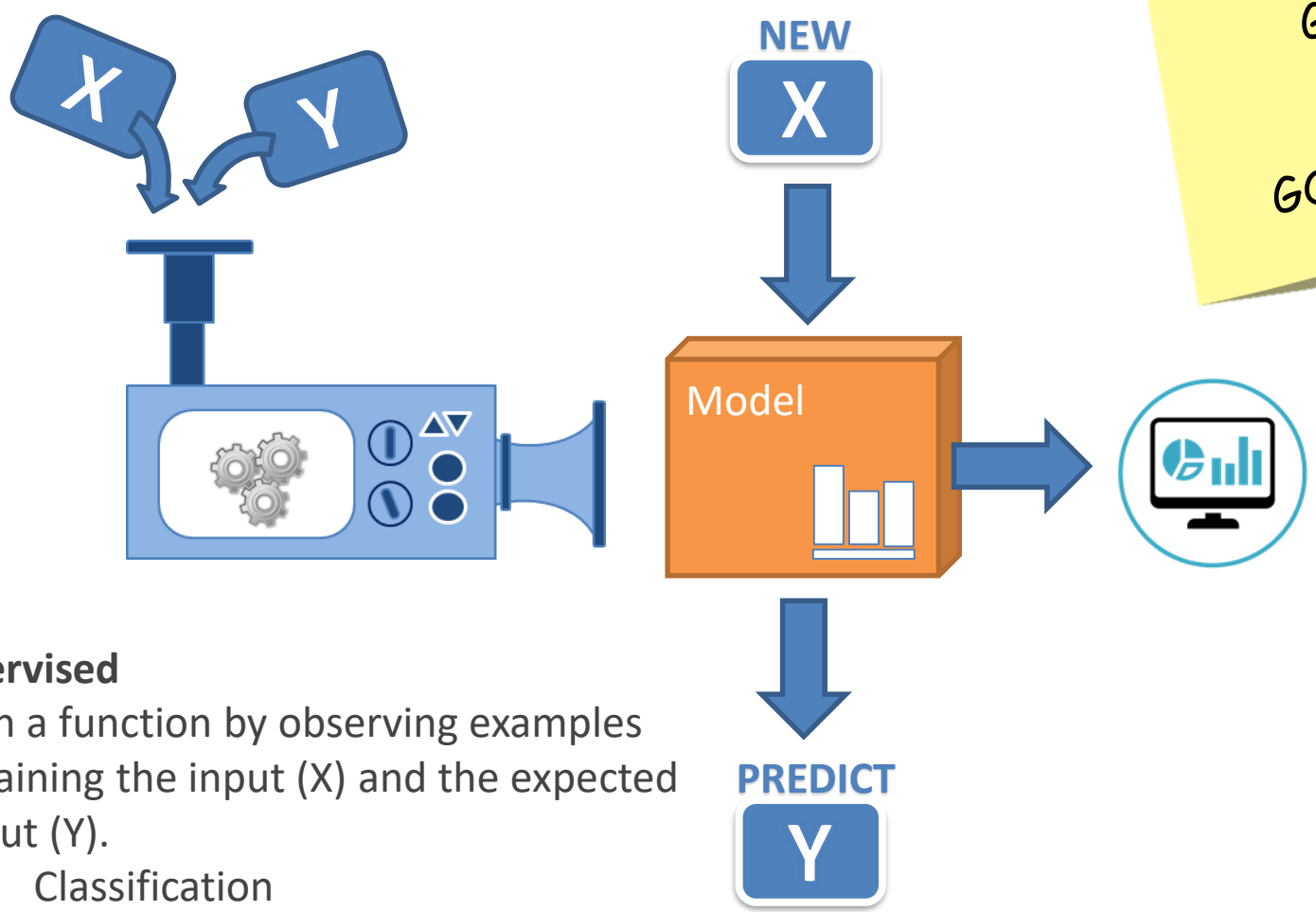


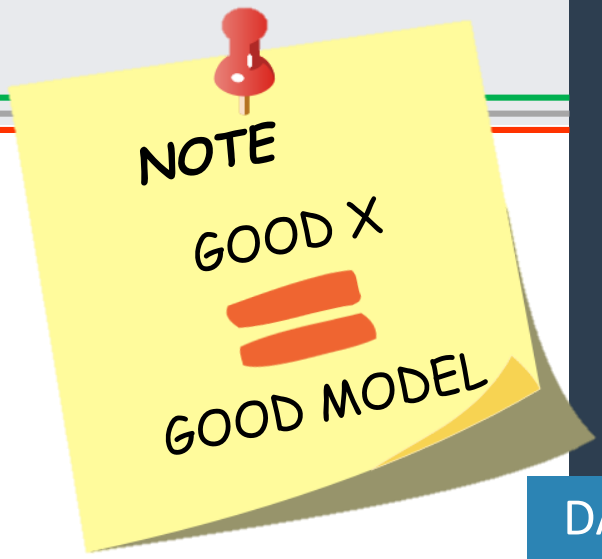


DATA DRIVEN INNOVATION

The dataset is collection of chemical analysis performed on glass samples. The main field of application of this analysis is criminological investigation, where the correct identification of the origin of a glass fragment can be very important.

MODELING





Supervised
Learn a function by observing examples containing the input (X) and the expected output (Y).

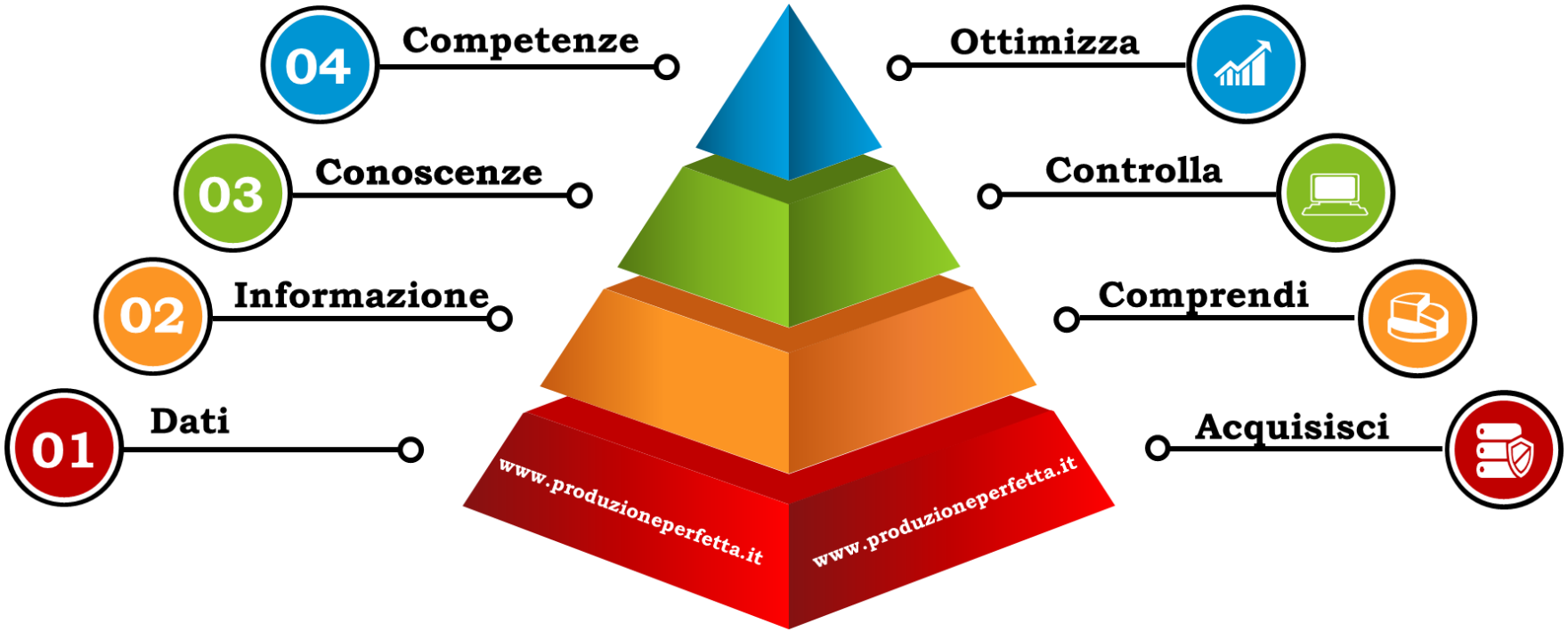
- Classification
- Regression

DATA DRIVEN INNOVATION

il segreto del successo dell'analisi dati è avere dati di qualità. Il modello è una rappresentazione approssimata del sistema reale. Se i tuoi dati descrivono al meglio il tuo sistema allora il tuo modello descriverà al meglio la realtà.

DATA DRIVEN INNOVATION

TRASFORMA I TUOI DATI IN INNOVAZIONE



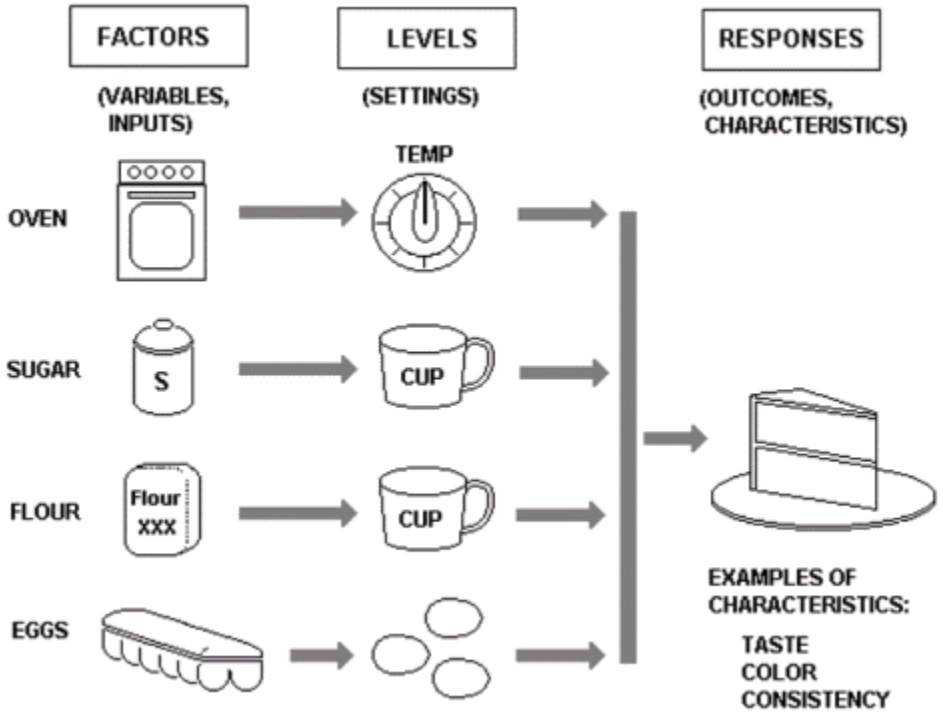
PIRAMIDE DELL'INNOVAZIONE

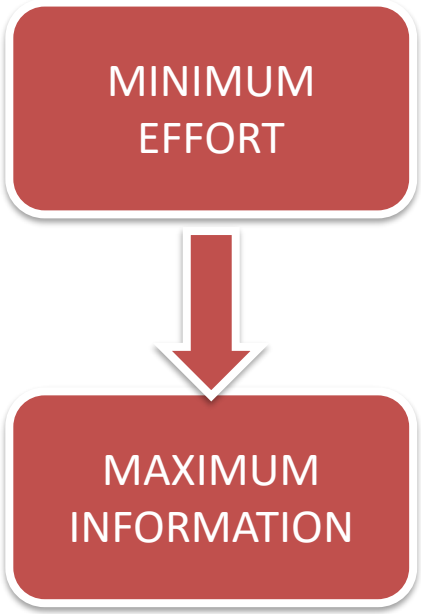
DATA DRIVEN INNOVATION

Quality is the consequence of knowledge

DESIGN OF EXPERIMENTS

Experimental design can be used at the point of **greatest leverage** to reduce design costs by speeding up the design process, reducing late engineering design changes, and reducing product material and labor complexity.





DATA DRIVEN INNOVATION

DOE in general is a useful method to problem solving, optimization, designing products, and manufacturing and engineering.

COFFEE BREAK THE PROJECTS

10 MINUTES BREAK

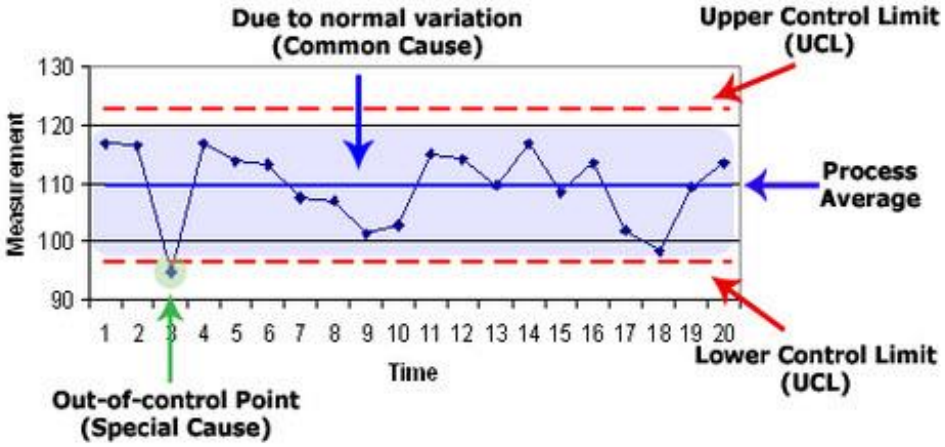
Confronto con i metodi di analisi statistica Six-Sigma

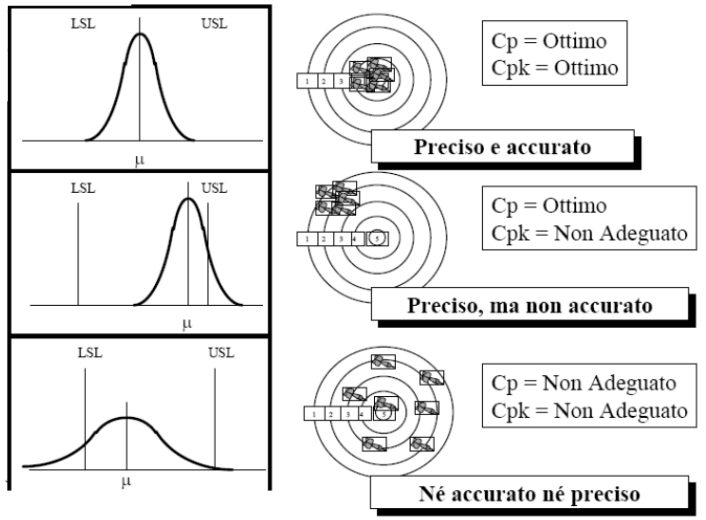
Control Chart

STATISTICAL PROCESS CONTROL

La **centerline** rappresenta la media della caratteristica di qualità corrispondente allo stato “in controllo. Ci sono poi altre due linee orizzontali che rappresentano i limiti di controllo: superiore e inferiore (UCL = ***upper control limit***, LCL = ***lower control limit***). I limiti di controllo sono scelti in modo tale che, se il processo `e in controllo, la gran parte dei punti sta tra questi limiti (in genere si sceglie il 99.7% della variabilità naturale che, nel caso gaussiano, significa ±3σ dalla media). La carta di controllo viene usata per monitorare nel tempo eventuali modifiche della variabilità statistica che rivelano la presenza di cause speciali.

Se **Cp** >1 il processo è capace perché la **variabilità** naturale è inferiore a quella delle specifiche e questo garantisce che il processo fornisca prodotti che soddisfino le specifiche. L’indice Cp non tiene conto di dove è localizzata la media del processo rispetto alle specifiche.
Per tenere più accuratamente conto della **centratura** del processo è definito il **Cpk**, che si tratta di un indice unilaterale rispetto al limite di specifica più vicino alla media.
Mentre l’indice Cpk misura la capacità effettiva del processo, l’indice Cp misura la capacità potenziale del processo.

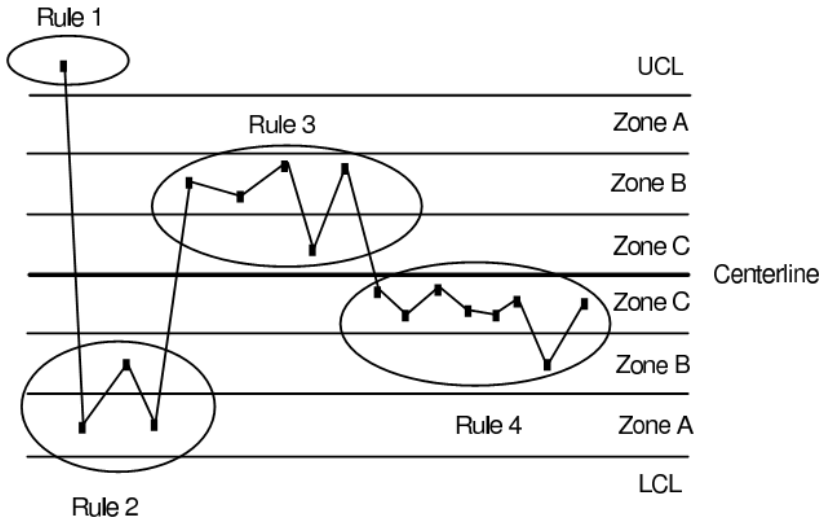




STATISTICAL PROCESS CONTROL

Se il processo è in controllo, allora i punti rappresentati sulle carte di controllo devono avere un andamento aleatorio. Ci sono 4 regole comunemente usate per vedere se un processo è fuori controllo (Western Electric Rules, 1956):

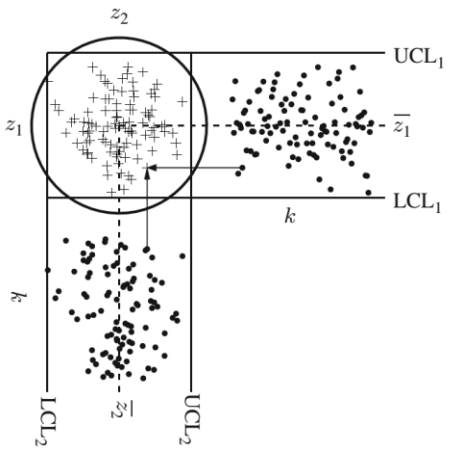
1. uno o più punti fuori dai limiti di controllo;
2. due punti su tre consecutivi fuori dai “warning limits (banda ±2σ);
3. 4 punti su 5 consecutivi fuori dalla banda ±σ;
4. 8 punti consecutivi dallo stesso lato della centerline.



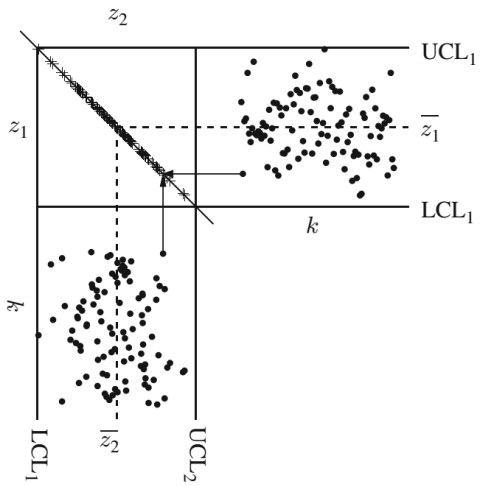
LIMITATION

Their ease of use, implementation and interpretation make them very popular in practice. Besides the literature describing univariate SPC is very widespread. Unfortunately, **traditional (Shewhart) control charts are not suitable for monitoring many variables** mainly because of separate significance level for any chart, **not taking into account a relationship** between variables and “organizational mess” connected with using separate control charts for every important process/product variable.

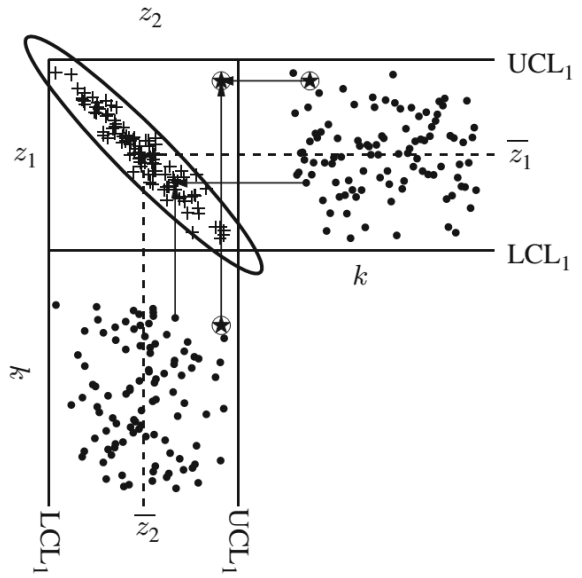
No correlation



Perfect correlated

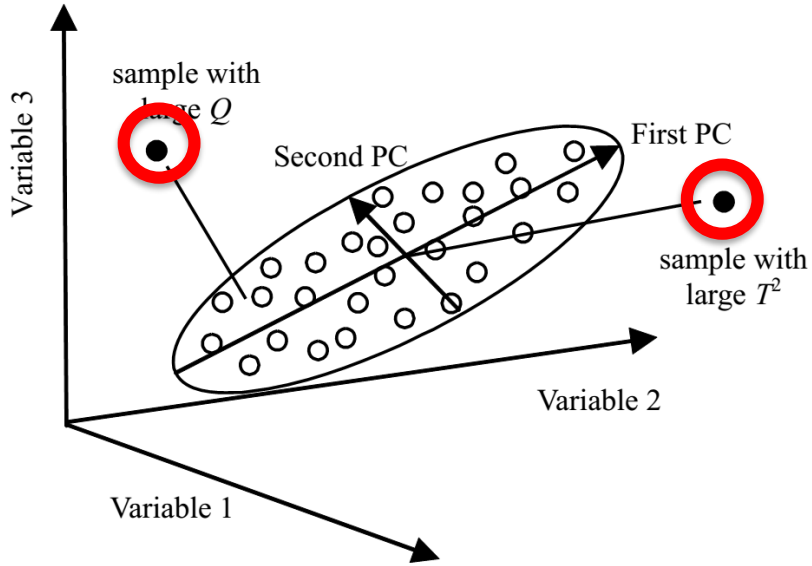


Highly correlated

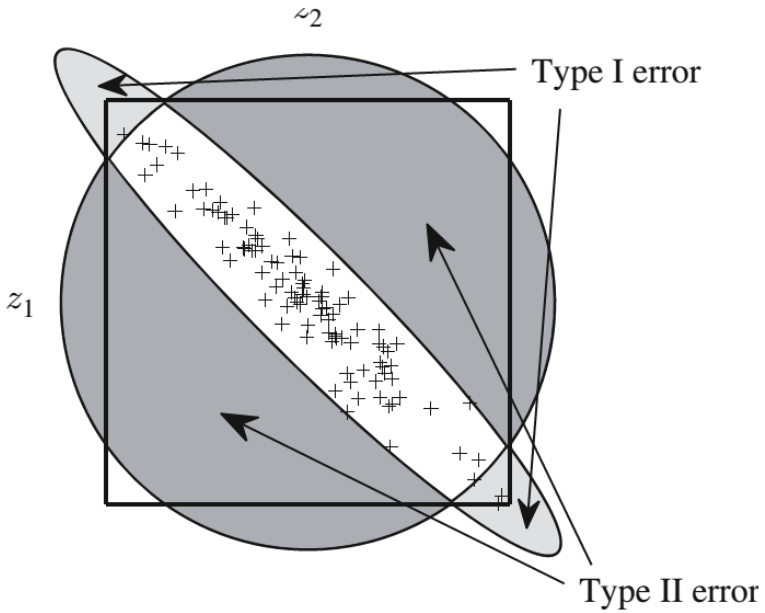


MULTIVARIATE STATISTICAL PROCESS CONTROL

Changes in relationships between variables



unusual variability within the normal subspace.



- The outliers are not detected until you look at the combination of the variables
- The information is found in the correlation pattern - not in the individual variables!

MULTIVARIATE STATISTICAL PROCESS CONTROL

MONITORING

NEW Measurement

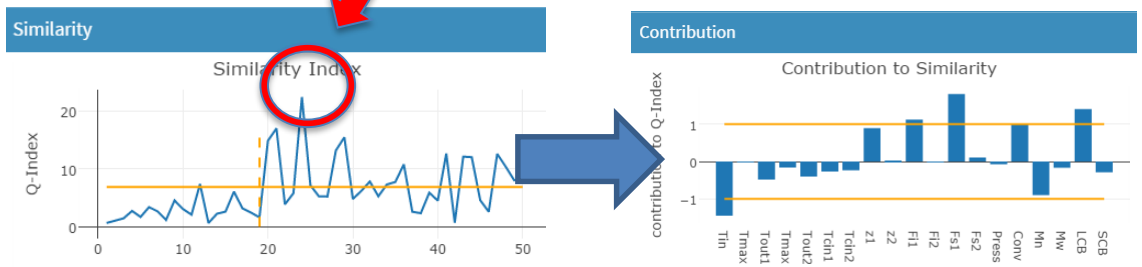
X

Model

Normal Operation Condition

X

Suspect point



Root causes analysis

Operator intervention

STATISTICAL PROCESS CONTROL

procedures to monitor multivariate process variation over time, to determine whether the process is stable, and to detect and diagnose changes in a stable process.

APP per il monitoraggio di Processo

MONITORING

STATISTICAL PROCESS CONTROL

Intuitive web-based interface for operators, engineers and managers

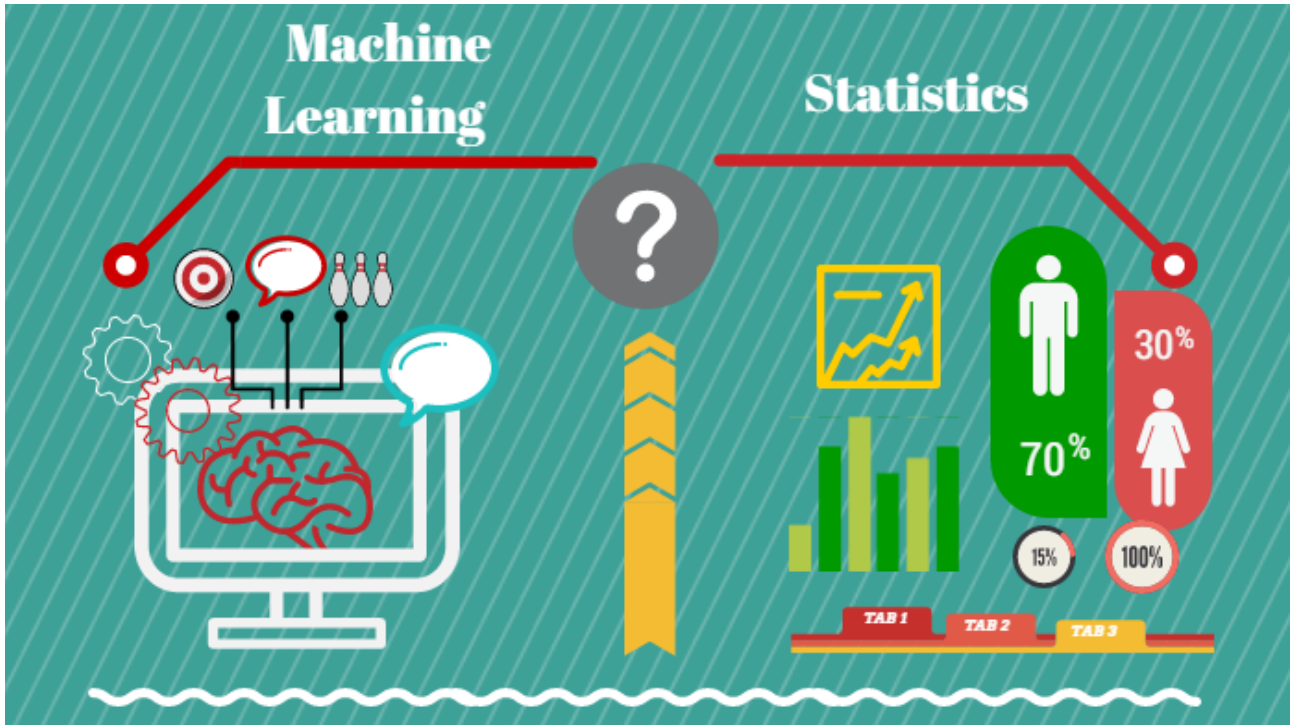
Interactive

Easy to Use

Web-based

Confronto tra i metodi di analisi statistica avanzata e di “Machine Learning”

MACHINE LEARNING



"Learning is any process by which a system improves performance from experience."

"Machine learning is a very hot topic for many key reasons, and because it provides the ability to automatically obtain deep insights, recognize unknown patterns, and create high performing predictive models from data, all without requiring explicit programming instructions."

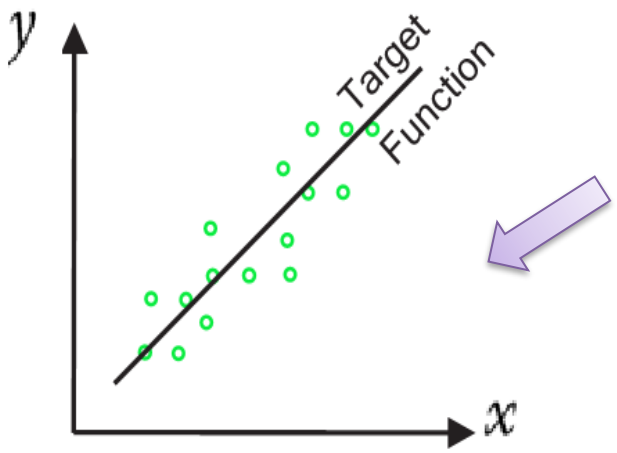
STATISTICS VS MACHINE LEARNING

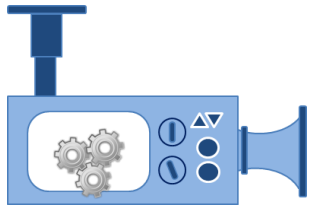
MODELING

STATISTICAL MODEL VS MACHINE LEARNING

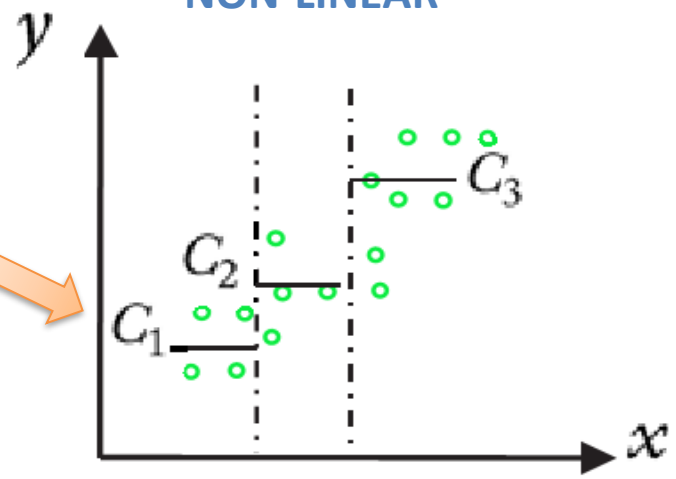
STATISTICS VS MACHINE LEARNING

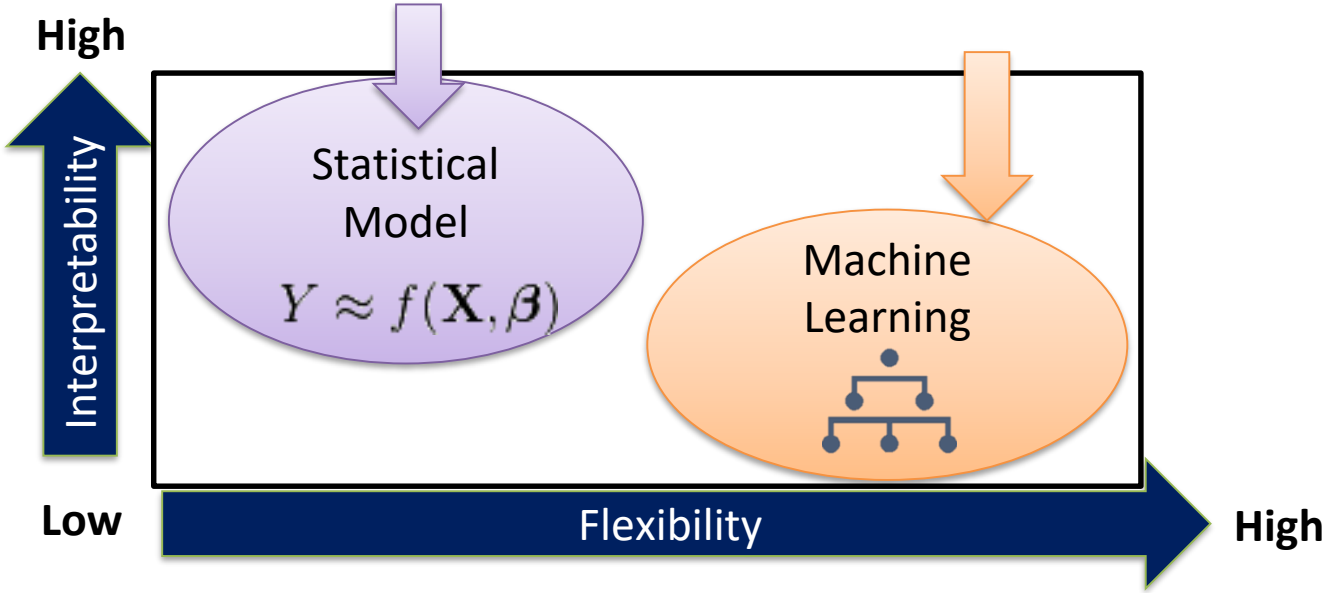
LINEAR



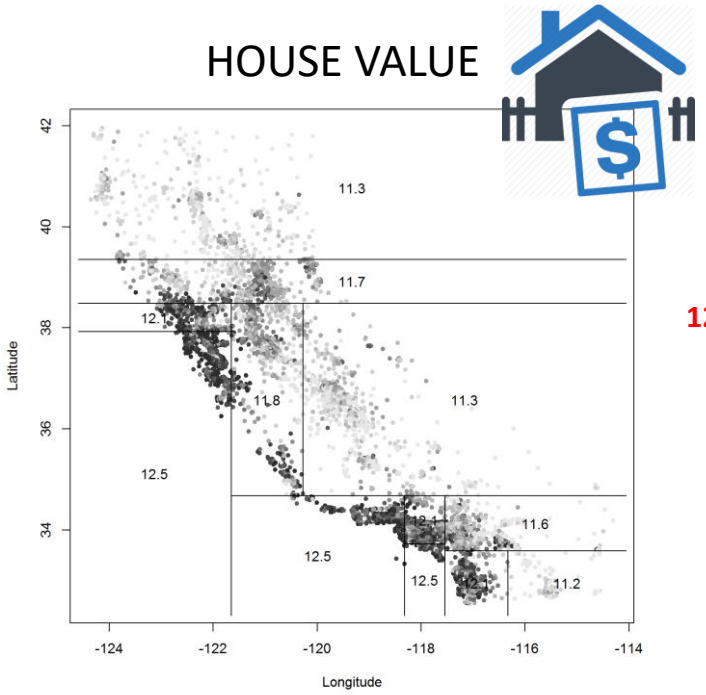


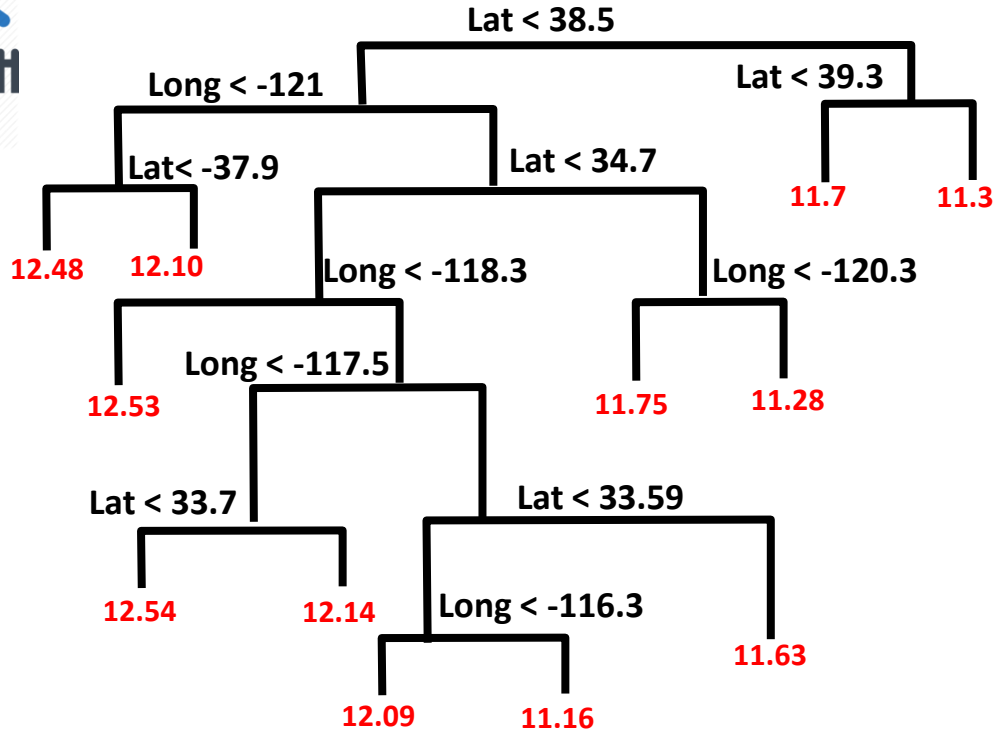
NON-LINEAR

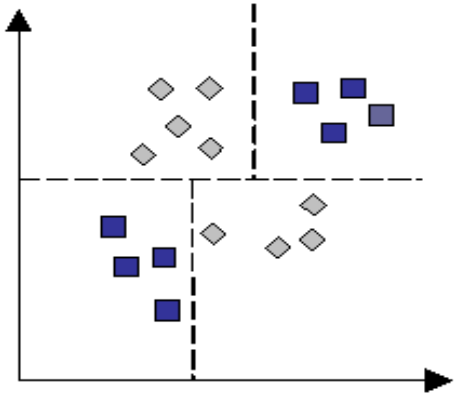




MACHINE LEARNING: DECISION TREES





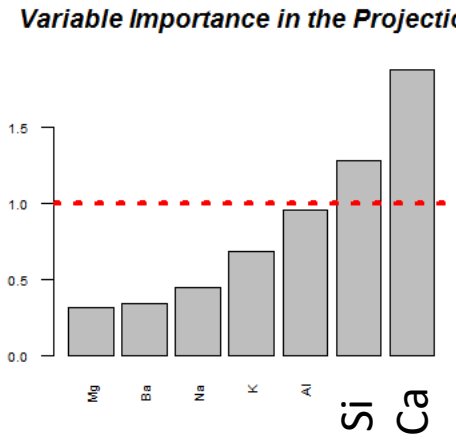


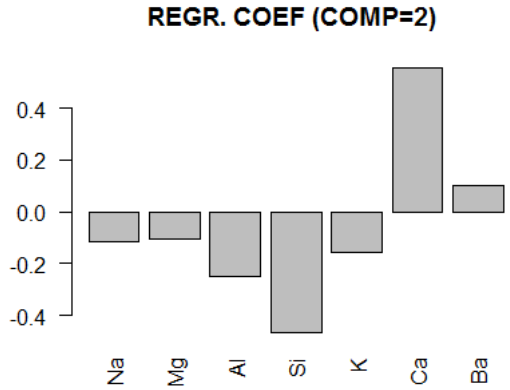
- Decision trees partition the feature space by splitting the data
- Learning the decision tree consists in finding the order and the split criterion for each node

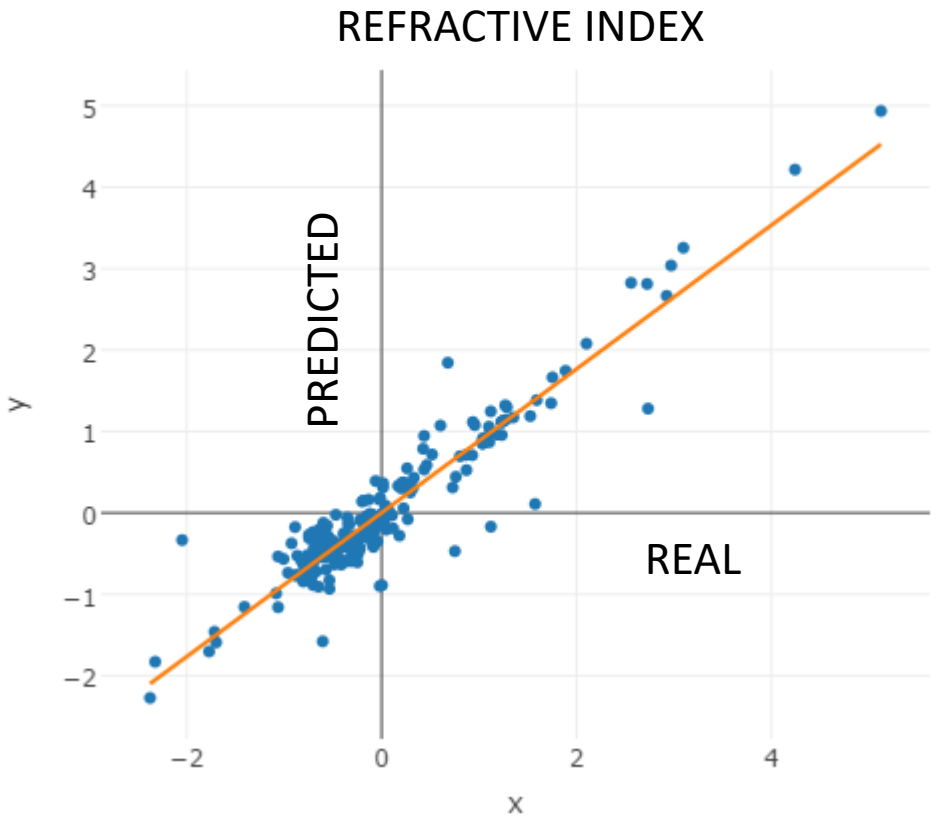
STATISTICS VS MACHINE LEARNING

NON LINEAR

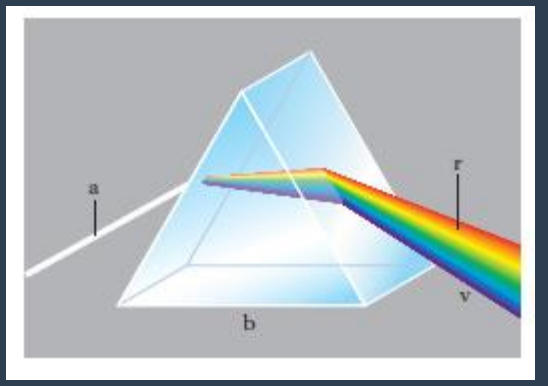
VIRTUAL METROLOGY







STATISTICAL MODEL

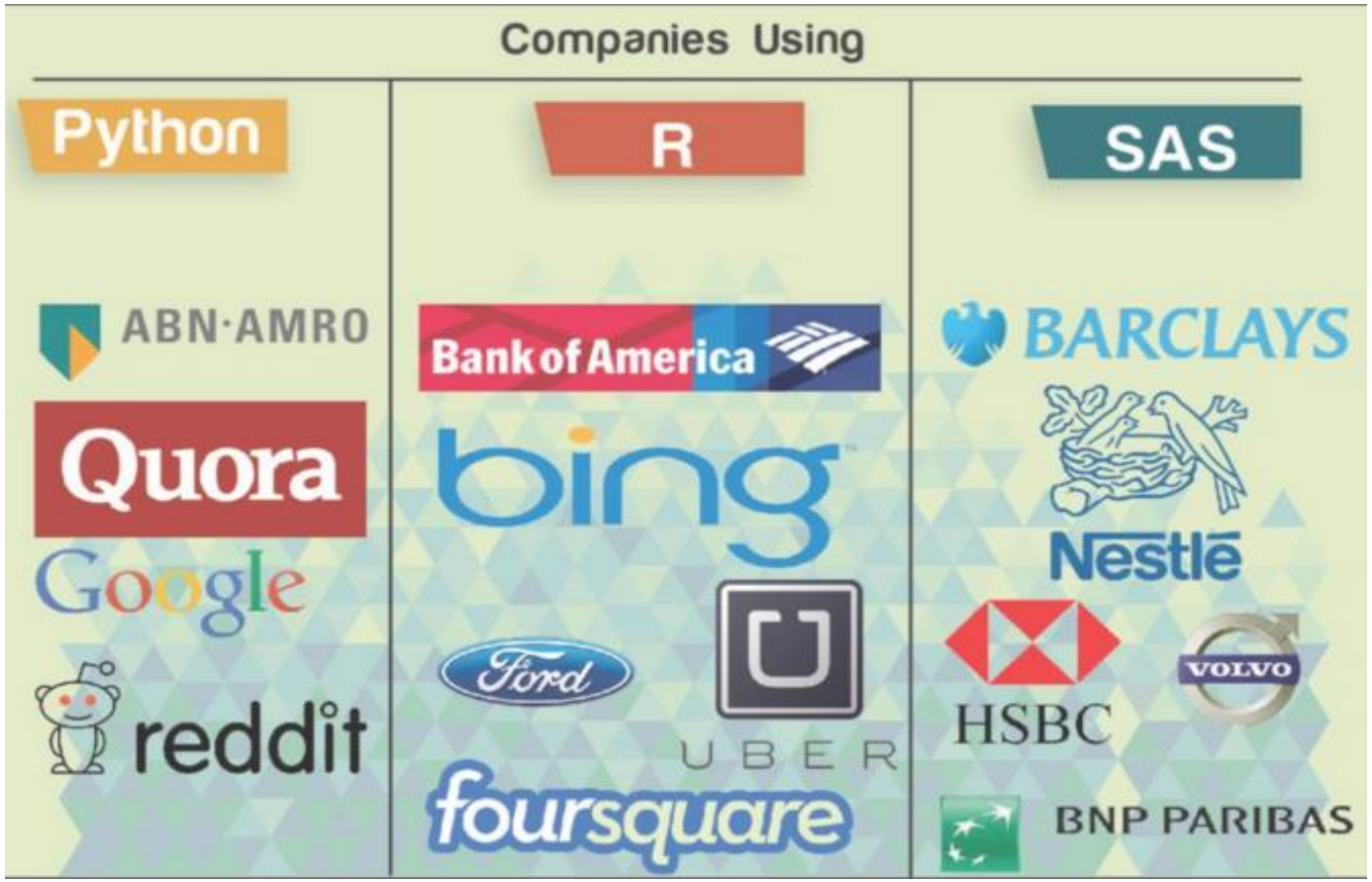


STATISTICS VS MACHINE LEARNING

PREDICT PERFORMANCE FROM PROCESS STATE VARIABLE

Sotware open-source R, il più potente e diffuso software per l’analisi statistica.

DATA ANALISI: IL LIGUAGGIO



R

HOME PAGE | TODAY'S PAPER | VIDEO | MOST POPULAR | U.S. Edition

The New York Times

Business Computing

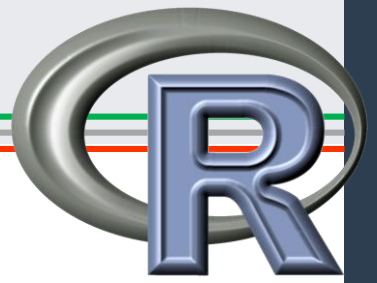
WORLD | U.S. | N.Y. / REGION | BUSINESS | TECHNOLOGY | SCIENCE | HEALTH | SPORTS | OPINION

Data Analysts Captivated by R's Power

Left, Stuart Isett for The New York Times; right, Kieran Scott for The New York Times

R first appeared in 1996, when the statistics professors Robert Gentleman, left, and Ross Ihaka released the code as a free software package.

R



What is R?

- Most widely used data analysis software
  - Used by 2M+ data scientists, statisticians and analysts
- Most powerful statistical programming language
  - Flexible, extensible and comprehensive for productivity
- Thriving open-source community
  - Leading edge of analytics research

R

There are packages for nearly any analysis task in nearly any field. Music analysis, text analysis, image analysis, clinical trials, experimental design, astrostatistics, crop science, online marketing, bioinformatics, financial analysis are just some of the fields for which numerous packages exist. Packages have been written to facilitate other aspects of data analysis; for instance to download (scrape) data from the internet, or to download tweets for text or sentiment analysis.

R & Friends

Because R packages are contributed by the community, traditional software vendors are having to adapt by embracing R instead of competing against it. R is now integrated throughout the enterprise analytics stack.

SQL Server 2016 will include the capability of running R directory "inside" the database

PowerBI adds support for R

R

R consortium

LINUX FOUNDATION

Working with the R Foundation

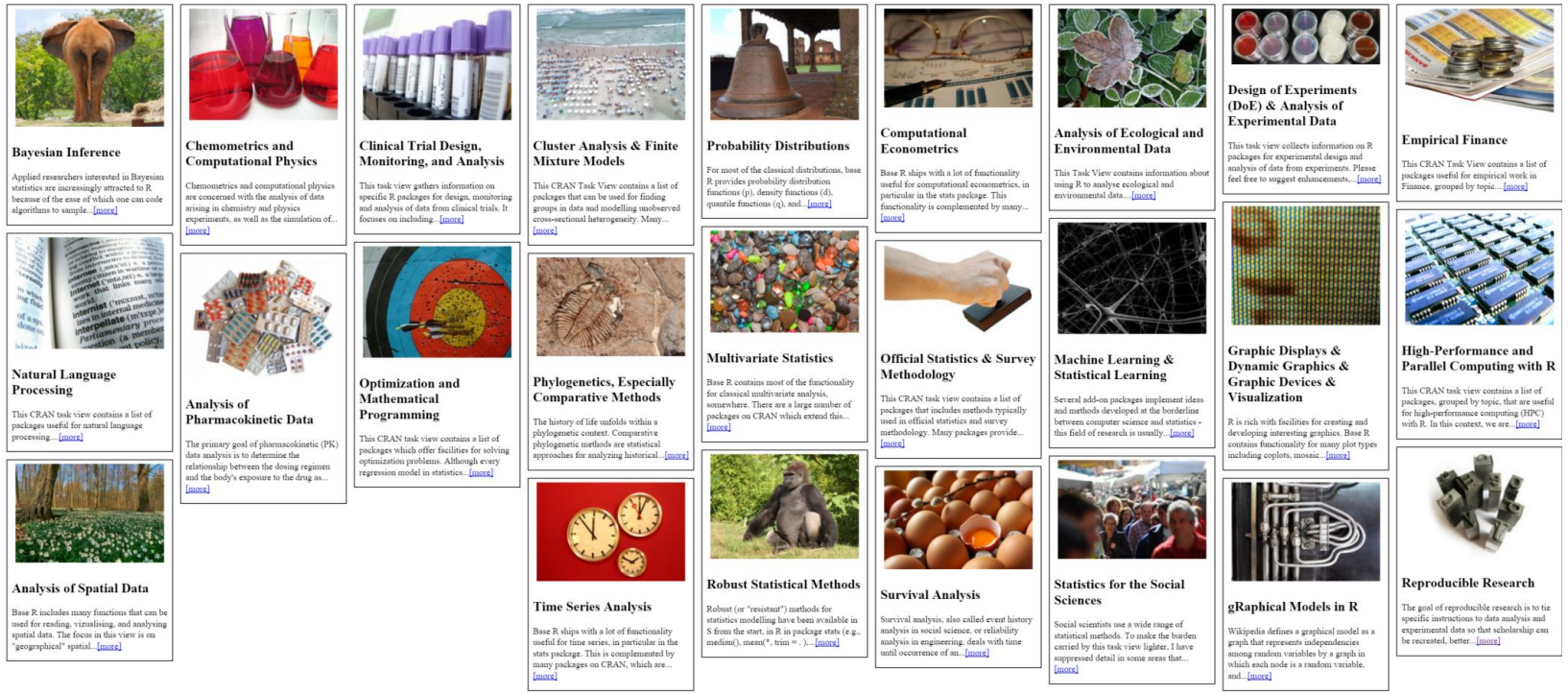
Supporting the R user community

Continuing the growth of the R Project

Linux Foundation collaborative project

Non-profit trade organization

CRAN: 7000+ add-on packages for R



Bayesian Inference

Applied researchers interested in Bayesian statistics are increasingly attracted to R because of the ease of which one can code algorithms to sample... [more]

Natural Language Processing

This CRAN task view contains a list of packages useful for natural language processing... [more]

Analysis of Spatial Data

Base R includes many functions that can be used for reading, vizualising, and analysing spatial data. The focus in this view is on "geographical" spatial... [more]

Chemometrics and Computational Physics

Chemometrics and computational physics are concerned with the analysis of data arising in chemistry and physics experiments, as well as the simulation of... [more]

Analysis of Pharmacokinetic Data

The primary goal of pharmacokinetic (PK) data analysis is to determine the relationship between the dosing regimen and the body's exposure to the drug as... [more]

Clinical Trial Design, Monitoring, and Analysis

This task view gathers information on specific R packages for design, monitoring and analysis of data from clinical trials. It focuses on including... [more]

Optimization and Mathematical Programming

This CRAN task view contains a list of packages which offer facilities for solving optimization problems. Although every regression model in statistics... [more]

Cluster Analysis & Finite Mixture Models

This CRAN Task View contains a list of packages that can be used for finding groups in data and modelling unobserved cross-sectional heterogeneity. Many... [more]

Phylogenetics, Especially Comparative Methods

The history of life unfolds within a phylogenetic context. Comparative phylogenetic methods are statistical approaches for analyzing historical... [more]

Time Series Analysis

Base R ships with a lot of functionality useful for time series, in particular in the stats package. This is complemented by many packages on CRAN, which are... [more]

Probability Distributions

For most of the classical distributions, base R provides probability distribution functions (p), density functions (d), quantile functions (q), and... [more]

Multivariate Statistics

Base R contains most of the functionality for classical multivariate analysis, somewhere. There are a large number of packages on CRAN which extend this... [more]

Robust Statistical Methods

Robust (or "resistant") methods for statistics modelling have been available in S from the start, in R in package stats (e.g., median(), mean(*, trim = .), ... [more]

Computational Econometrics

Base R ships with a lot of functionality useful for computational econometrics, in particular in the stats package. This functionality is complemented by many... [more]

Official Statistics & Survey Methodology

This CRAN task view contains a list of packages that includes methods typically used in official statistics and survey methodology. Many packages provide... [more]

Survival Analysis

Survival analysis, also called event history analysis in social science, or reliability analysis in engineering, deals with time until occurrence of an... [more]

Analysis of Ecological and Environmental Data

This Task View contains information about using R to analyse ecological and environmental data... [more]

Machine Learning & Statistical Learning

Several add-on packages implement ideas and methods developed at the borderline between computer science and statistics - this field of research is usually... [more]

Statistics for the Social Sciences

Social scientists use a wide range of statistical methods. To make the burden carried by this task view lighter, I have suppressed detail in some areas that... [more]

Design of Experiments (DoE) & Analysis of Experimental Data

This task view collects information on R packages for experimental design and analysis of data from experiments. Please feel free to suggest enhancements... [more]

Graphic Displays & Dynamic Graphics & Graphic Devices & Visualization

R is rich with facilities for creating and developing interesting graphics. Base R contains functionality for many plot types including coplots, mosaic... [more]

gRaphical Models in R

Wikipedia defines a graphical model as a graph that represents independencies among random variables by a graph in which each node is a random variable, and... [more]

Empirical Finance

This CRAN Task View contains a list of packages useful for empirical work in Finance, grouped by topic... [more]

High-Performance and Parallel Computing with R

This CRAN task view contains a list of packages, grouped by topic, that are useful for high-performance computing (HPC) with R. In this context, we are... [more]

Reproducible Research

The goal of reproducible research is to tie specific instructions to data analysis and experimental data so that scholarship can be recreated, better... [more]

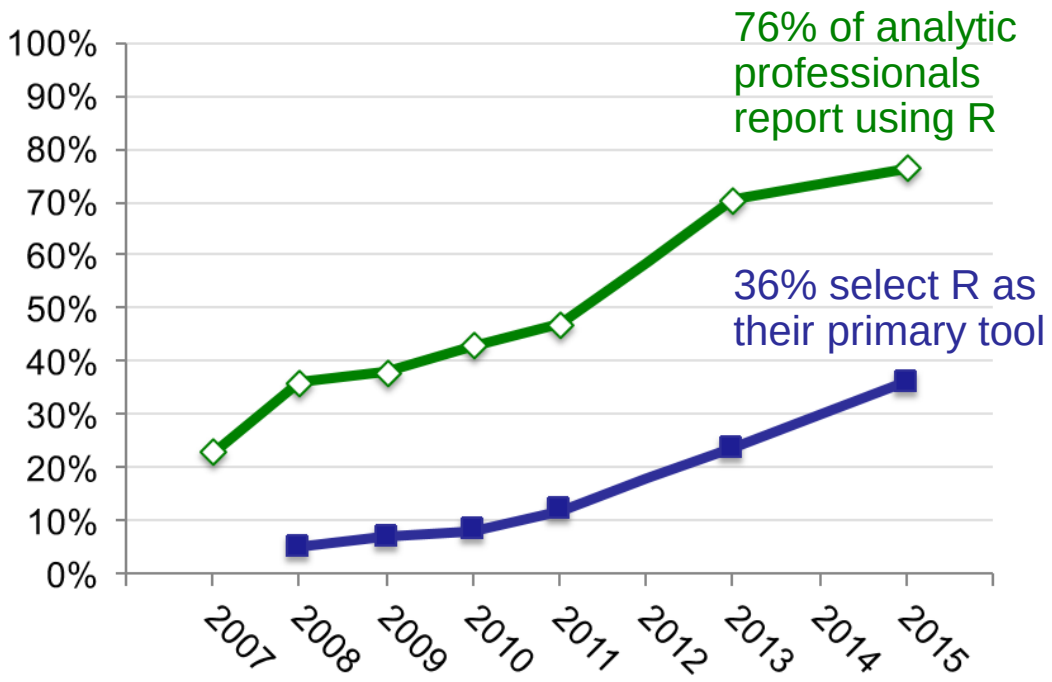
R

CRAN Task View by Barry Rowlingson: http://www.maths.lancs.ac.uk/~rowlings/R/TaskViews/

R: The #1 software for Data Science

R Usage Growth

Rexer Data Miner Survey, 2007-2015



R

Case studies

RAPID PROTOTYPING

16 Impresa & territori

La questione industriale. Carenza di materie prime e pezzi alle stelle mettono in ginocchio il settore della trasformazione

Tensione nella filiera della plastica

Allarme per il fermo impianti e la cancellazione di consegne già confermate

Cristina Casadei

Carenza di materie prime plastiche e prezzi che schizzano alle stelle - fino a triplicare - stanno mettendo in ginocchio i trasformatori di materie prime plastiche che lavorano soprattutto per il settore del packaging e per quello dell'usa. Proprio quando le imprese sono impegnate nella rincorsa del rilancio della produzione. In tutta Europa, come spiega Alexandre Dangis, managing director della European plastics converter. Italia compresa, come ribadiscono da Unionplast, l'associazione italiana dei trasformatori di materie plastiche che fa parte della Federazione della gomma plastica. Germania pure, come dicono dalla Industrievereinigung Kunststoffverpackungen che denuncia la ormai frequente cancellazione di consegne già confermate come anche la sorpresa, al momento della consegna, di un prezzo più alto di quello concordato.

Secondo i produttori tedeschi, in particolare, le cause di questa situazione che interessa soprattutto la componentistica auto e il packaging vanno ricondotte all'uso della Forza maggiore, ossia al fermo di alcuni impianti che producono materie prime plastiche per ragioni di diverso tipo. Possono coincidere con il verificarsi di un evento eccezionale, al di fuori del controllo del contraente, che determina il decadimento dell'obbligazione a fornire una prestazione contrattualmente prevista.

Dalla Federazione della gomma plastica hanno calcolato che da gennaio 2015 in avanti, in Europa (l'Italia non è interessata dal fenomeno) il ricorso allo stato di forza maggiore è stato registrato ben 10 volte e ha coinvolto almeno 5 impianti di polipropilene, 2 di polietilene a bassa densità e 3 di polietilene ad alta densità. Questo ha portato ad un aumento straordinario dei prezzi di polietilene e polipropilene, con importanti contaminazioni anche nei mercati di altre plastiche come il polistirolo. I trasformatori esprimono il sospetto che dietro le chiusure ci sia in realtà un intento speculativo.

Dalla Federazione gomma-plastica spiegano che «la scarsità di informazioni contenute in numerose dichiarazioni di forza maggiore rende difficile accertare se sussistano i criteri per la validità di tale stato. Queste dichiarazioni, nel migliore dei casi, costringono l'industria della trasformazione ad approvvigionarsi altrove con mille difficoltà, alle quali si aggiunge l'euro debole».

Le conseguenze sono molto dannose per i trasformatori perché lo shortage di materie prime crea difficoltà nell'adempiere agli obblighi contrattuali verso i clienti, proprio in un momento in cui il mercato si sta riprendendo. Senza materie prime possono infatti verificarsi delle isolate sospensioni temporanee della produzione che non aiutano il settore nel momento in cui sta cercando di rincorrere il rilancio della produttività e dell'occupazione.

Secondo quanto sostengono i trasformatori di Unionplast, «i produttori di materie prime sanno bene che solo l'esportazione diretta e indiretta dei trasformatori salva una bilancia commerciale di filiera che viceversa sarebbe disastrosa. E proprio per questo dovrebbero essere loro a dimostrare lo spirito di collaborazione che hanno sempre richiesto». E questo è quanto viene lamentato sulla disponibilità delle materie.

Quanto invece ai prezzi, Unionplast spiega che «nel settore dell'imballaggio, il costo delle materie prime incide per oltre il 60% sul totale: se i maggiori oneri non possono essere trasferiti a valle, è a serio rischio la sopravvivenza stessa delle aziende di trasformazione».

DENUNCIA DI UNIONPLAST

«La scarsità di informazioni rende difficile accertare se sussistono i criteri per le dichiarazioni di forza maggiore»

LA PAROLA CHIAVE

Forza maggiore

«La "Forza Maggiore" non ha molto spazio nell'ordinamento giuridico italiano. Può considerarsi come situazione appartenente a questa categoria quell'evento che impedisca la regolare esecuzione del contratto e renda, inefficace qualsiasi azione dell'obbligato diretta ad eliminarlo. Secondo orientamenti giurisprudenziali è caratterizzato da due elementi: straordinarietà e imprevedibilità. Il requisito di straordinarietà ha carattere obiettivo. L'imprevedibilità, invece, ha natura soggettiva.

Materie plastiche: l'industria della trasformazione

PREZZI ALLE STELLE

Variazione % dei prezzi delle materie prime rispetto al 7/1/2015

LLDPE film stretch — HDPE stampaggio — PP omopolimero — PS antiurto — PET

Fonte: Unionplast

CONSUMI ITALIA MATERIE PLASTICHE

Dati 2014, in migliaia di tonnellate

Pvc plastificato
Pvc rigido
Pet
Eps
Pvc compatto
Pp
Hdpe
Ld/Lldpe

CIG/CIGS

Totale ore autorizzate. In milioni

2012 2013 2014

Carenze Materie prime

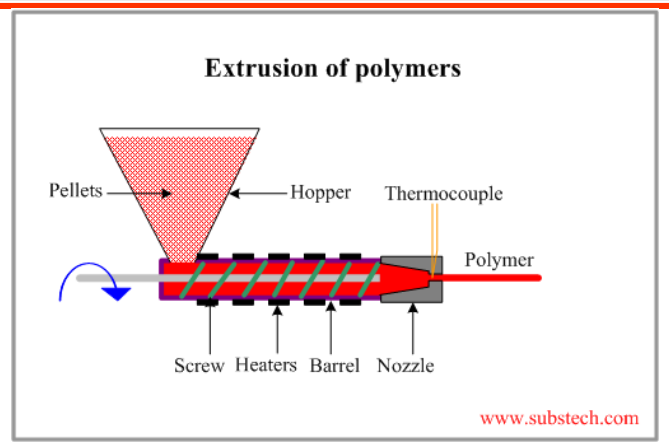
=

Prezzi alle stelle

CASE STUDIES

Plastic covering of mobile

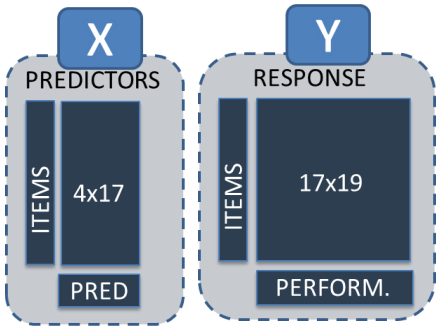
-Industria: **Plastica**



-Processo: **Estrusione+Stampaggio**

-Proprietà di interesse: **Deformazione (-) e resistenza (+)**

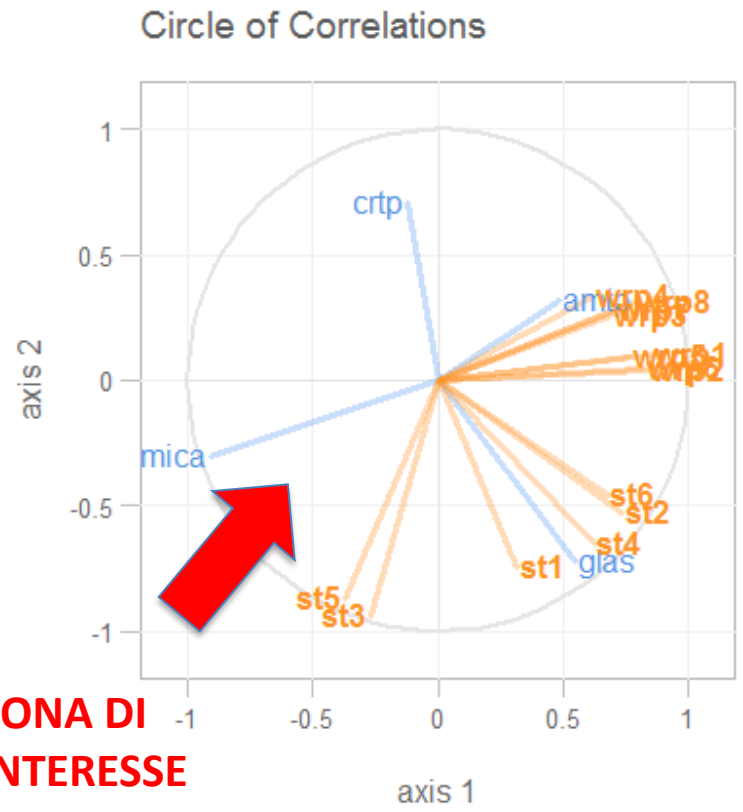
-Esigenze: **Ottimizzazione PROPRIETA' MULTIPLA**



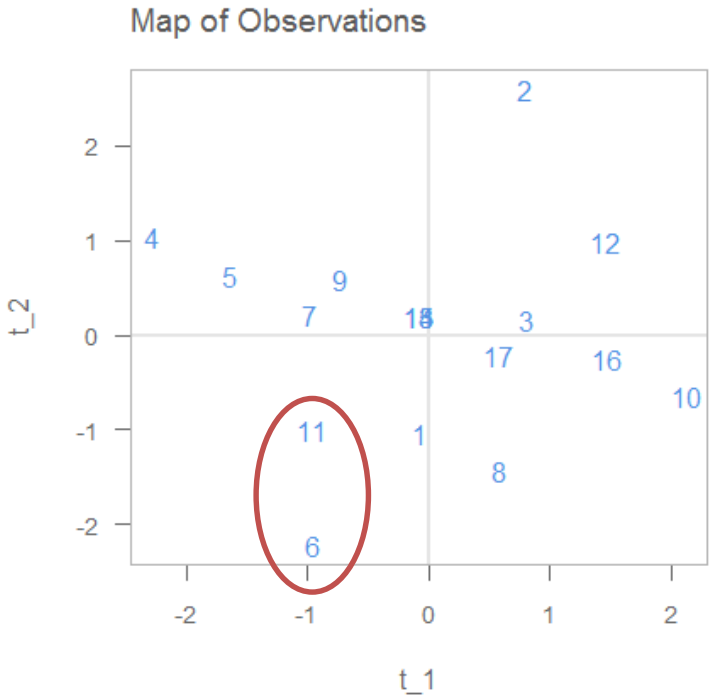
-Dati: **17 formulazioni (DOE)**
4 costituenti:
vetro/mica/crtp/amp
19 proprietà misurate

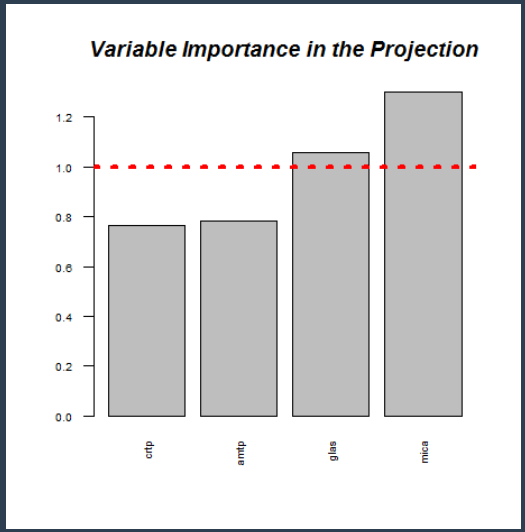
CASE STUDIES

Plastic covering of mobile



ZONA DI INTERESSE



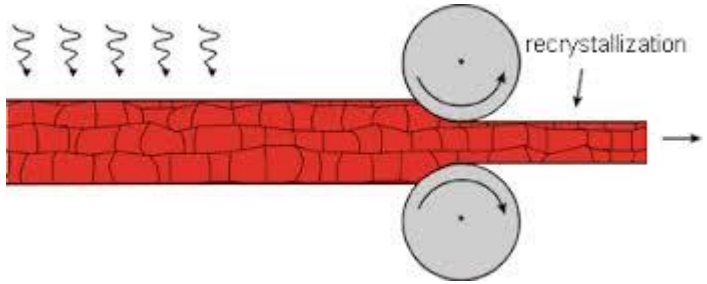


CASE STUDIES

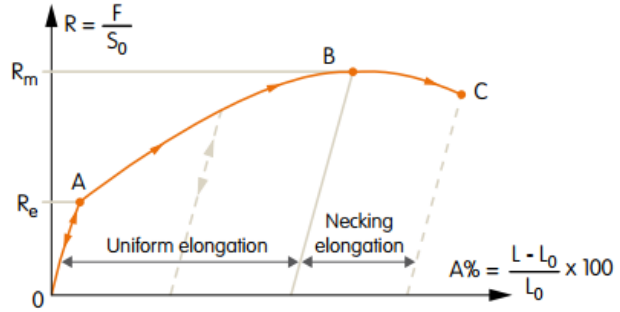
HOT ROLLING

-Industria: **Siderurgica**

-Processo: **Hot rolling steel slabs**



-Proprietà di interesse**: Proprietà meccaniche**

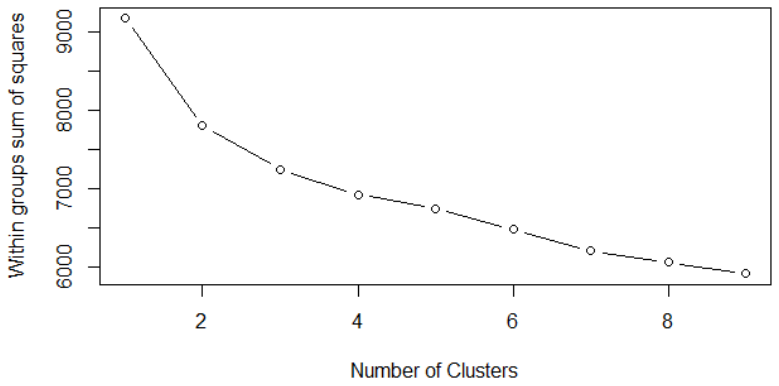


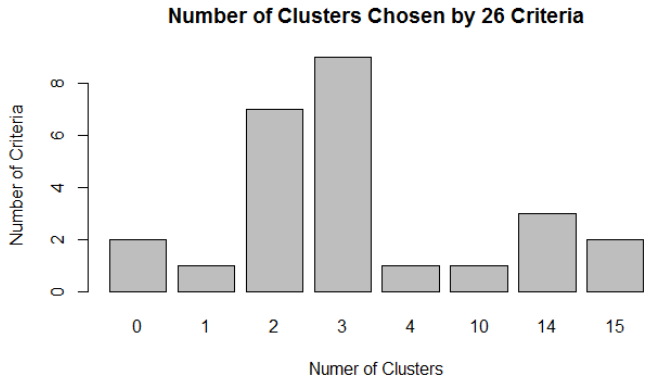
-Esigenze: Acciai dello stesso grado **SAE (SAE steel grades)** proprietà meccaniche diverse

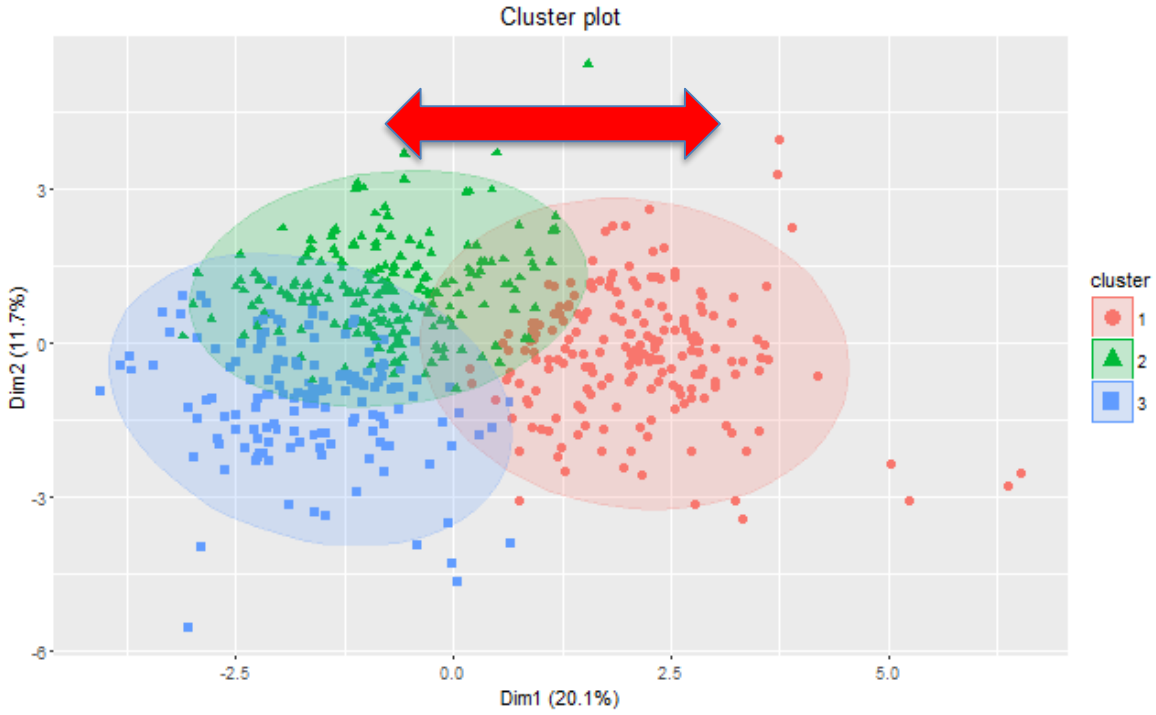
-Dati: **Serie storiche** di processo

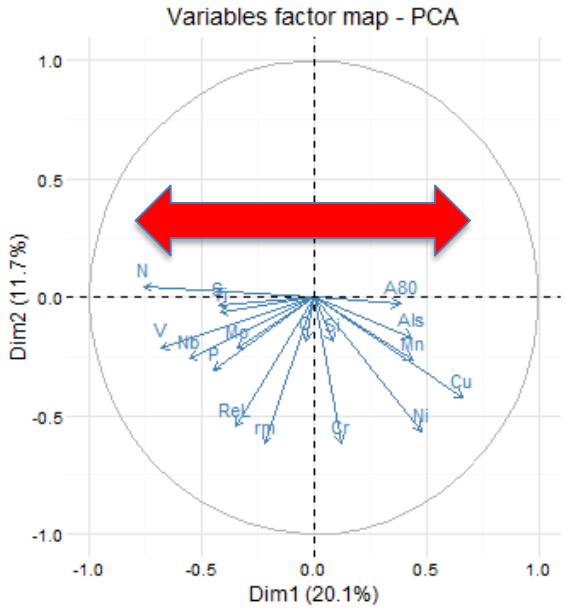
CASE STUDIES

HOT ROLLING







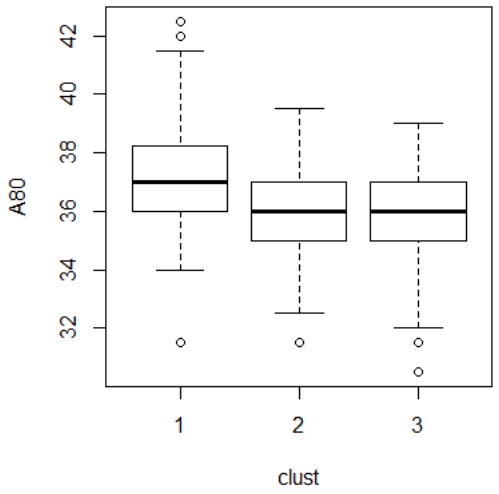


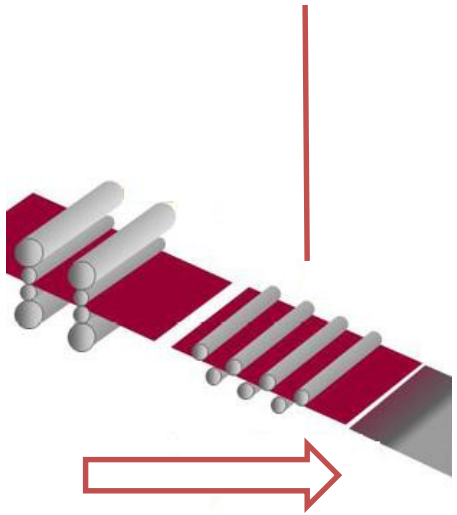
CASE STUDIES

HOT ROLLING

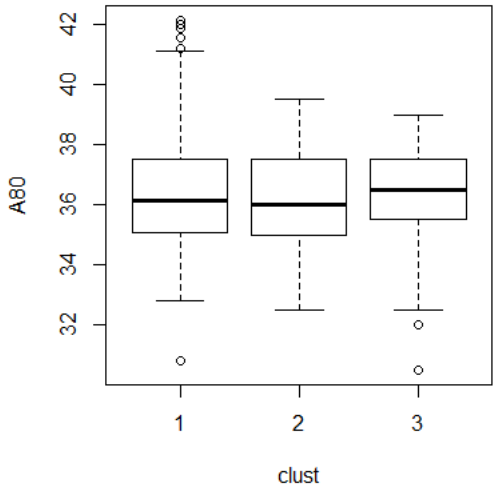
NEW TEMPERATURE SETUP

PRIMA

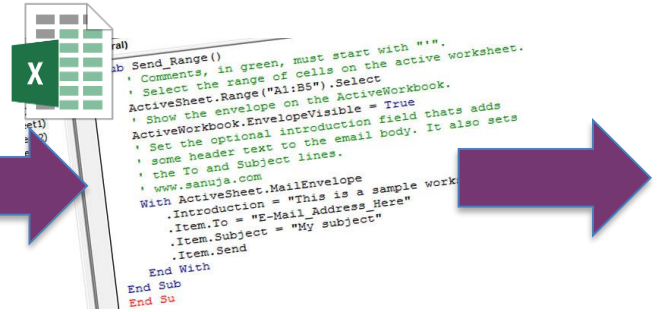




DOPO



SCRIPT PER IL CALCOLO DELLA CLASSE



CICLO TERMICO PER CLASSE

CASE STUDIES

LDPE POLYMERIZATION

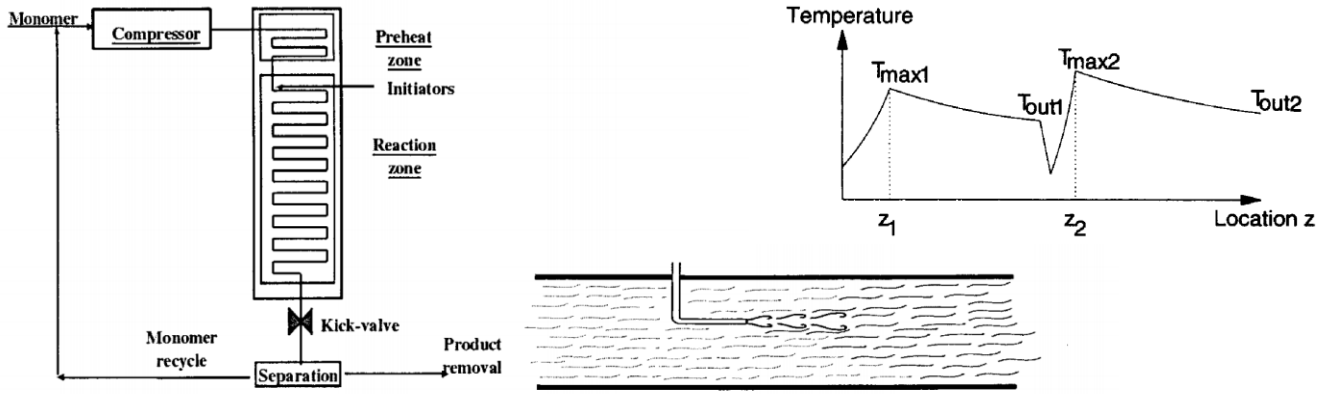
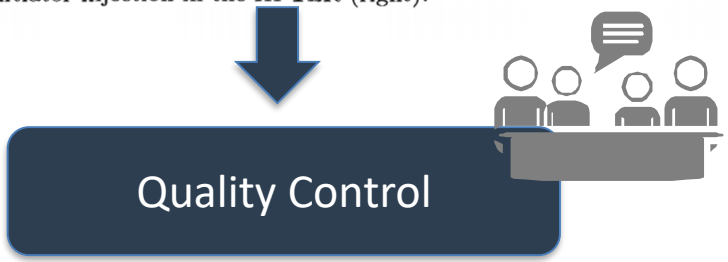


Figure 1.2 Schematic of a high-pressure tubular LDPE reactor (HPTLR) (left) and initiator injection in the HPTLR (right).



Quality Control

PESO DEL POLIMERO

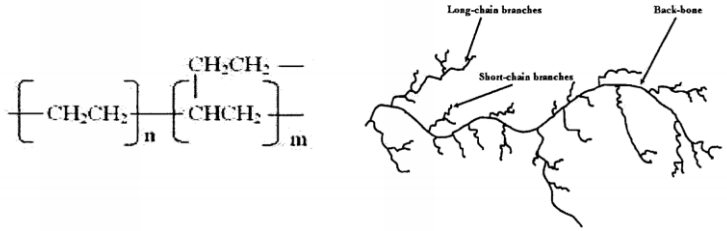
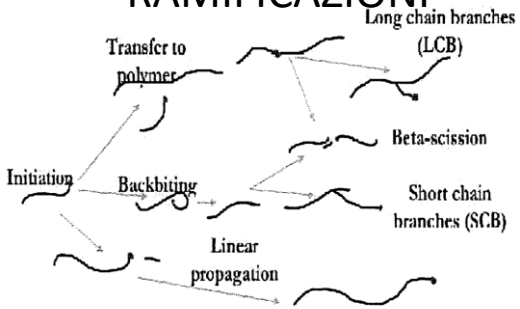


Figure 1.1 Schematic of LDPE chain structure - monomer unit (left); short- and long-chained branches (right).

RAMIFICAZIONI



MULTIVARIATE STATISTICAL PROCESS CONTROLL

CASE STUDIES

Process Monitoring and Diagnosis by Multiblock PLS Methods

Mac Gregor et all,

Process Systems Engineering, 1994.

ANALISI DATI: QUANDO SERVE

RAPID PROTOTYPING

Per sviluppare un nuovo processo e/o un nuovo prodotto
Per supportare lo scale-up

DATA DRIVEN INNOVATION

Per gestire processi intrinsecamente complessi

MULTIVARIATE STATISTICAL PROCESS CONTROL

Analizzare in tempo reale i dati del tuo processo aiutando gli operatori a mantenere il processo sotto controllo.

CLUSTERING

Problemi con materi prime

VIRTUAL METROLOGY

Per prevedere le caratteristiche di un prodotto dai dati di processo

PREDICTIVE MAINTENANCE

Per ridurre i costi delle riparazioni e aumentare l'efficienza

"After careful consideration of all 437 charts, graphs, and metrics,
I've decided to throw up my hands, hit the liquor store,
and get snockered. Who's with me?!"

"Dopo un attento esame di tutte le 437 tabelle, grafici e metriche, ho deciso di arrendermi, fiondarmi in un negozio di liquori e ubriacarmi. Chi sta con me ?!"

THANK YOU

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