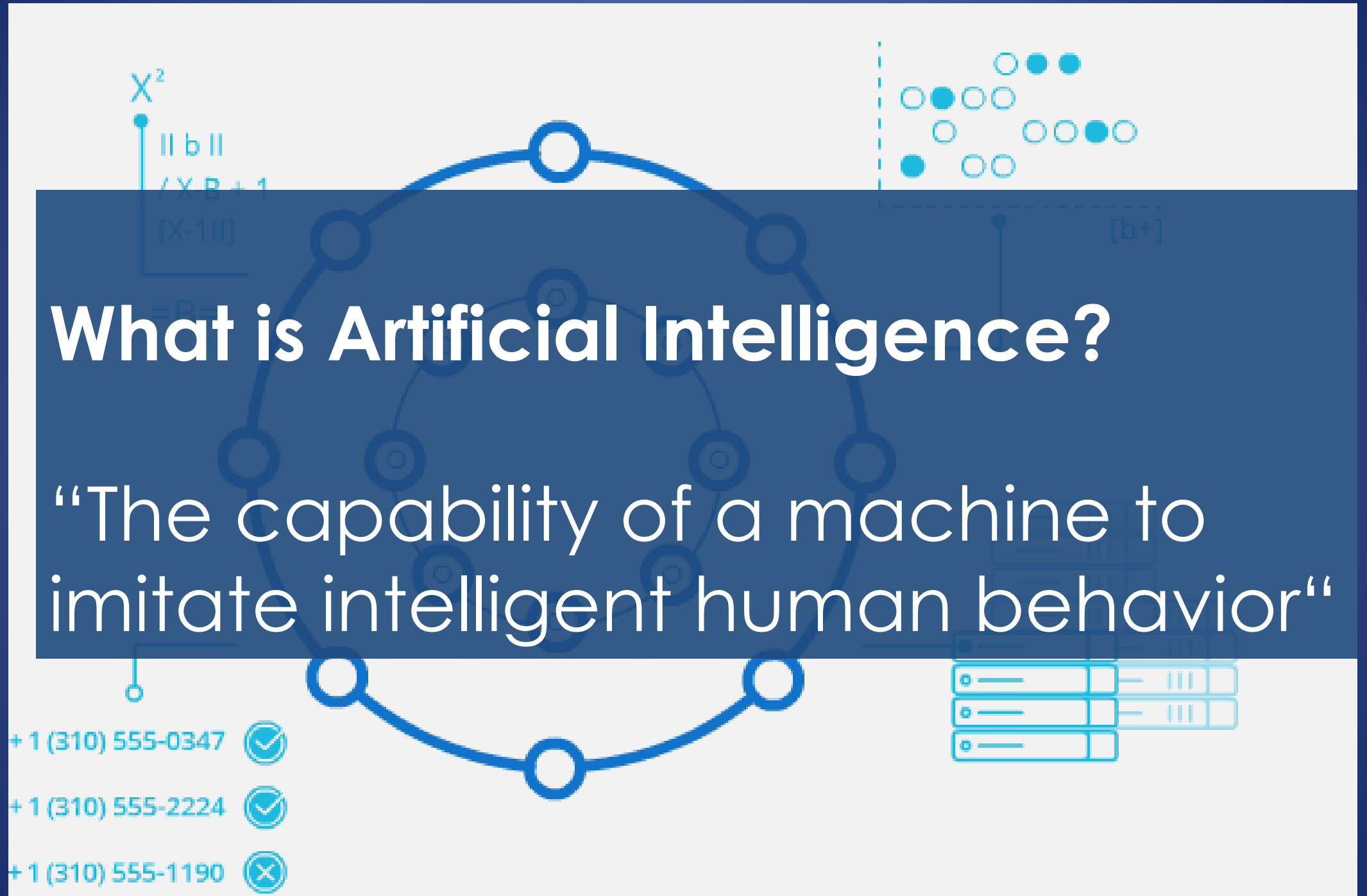
Artificial Intelligence



What is Artificial Intelligence?

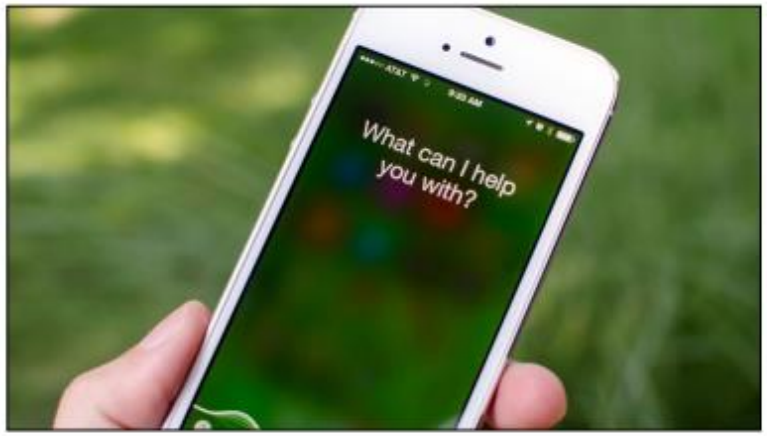
"The capability of a machine to imitate intelligent human behavior"

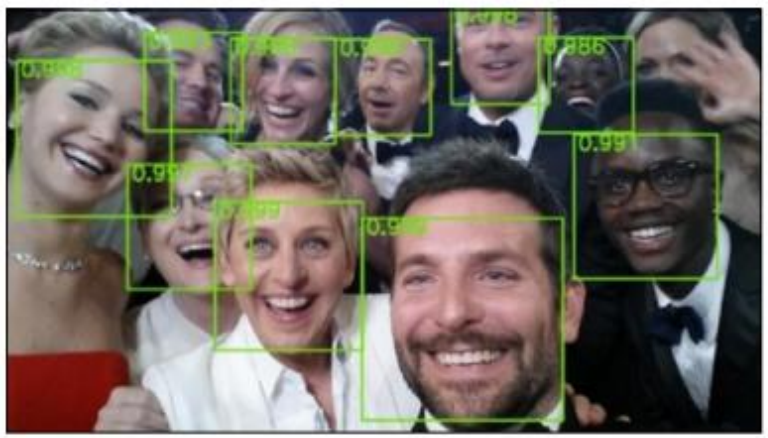
What is Artificial Intelligence?

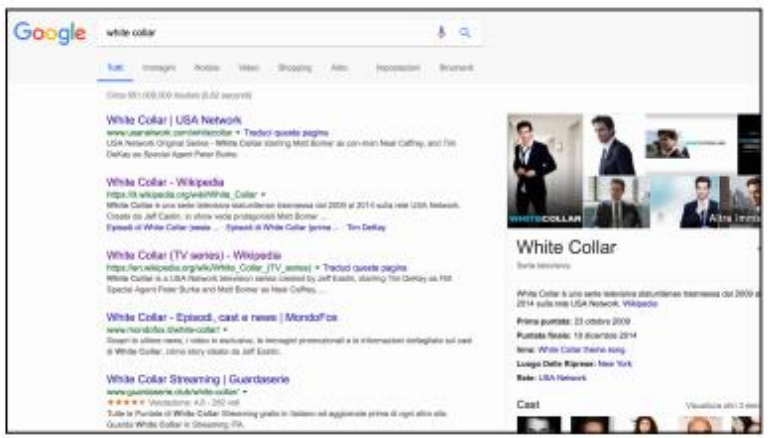
Machine or Computers + Intelligence = Artificial Intelligence

What is Artificial Intelligence?

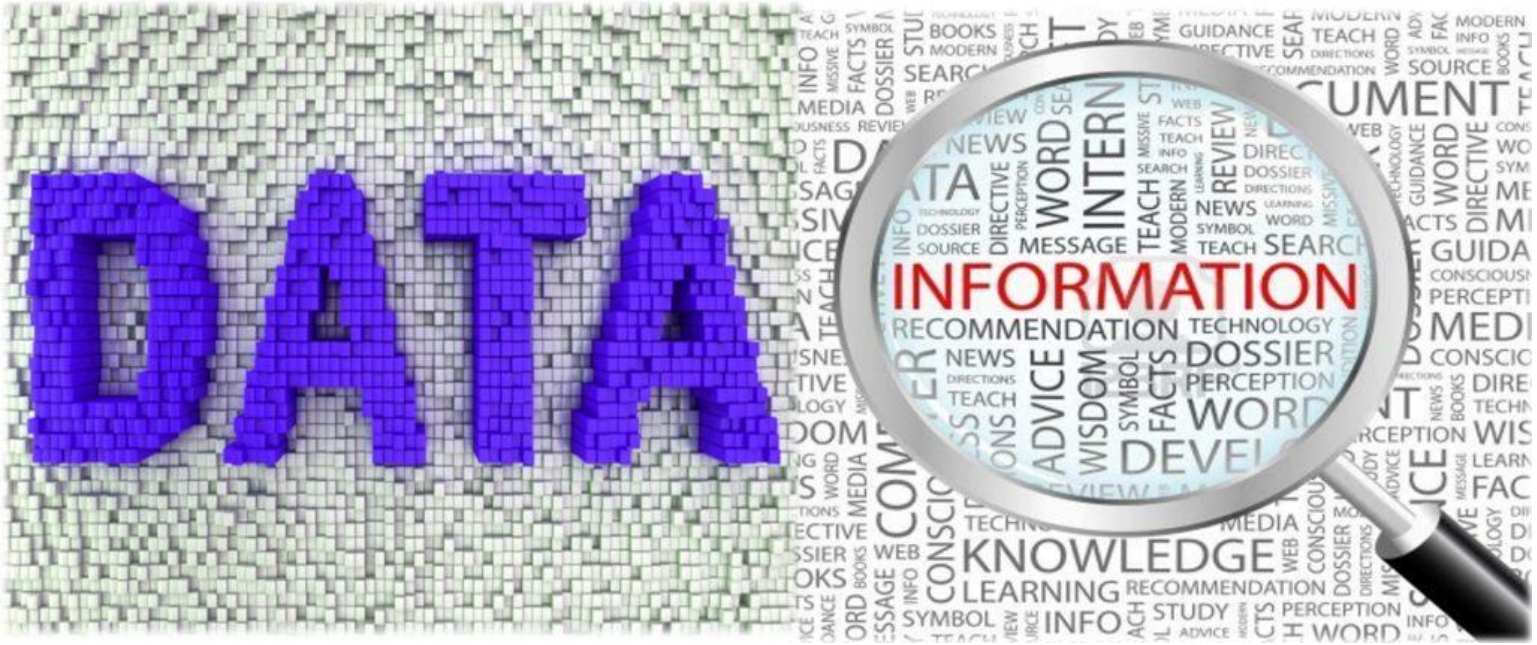
Artificial Intelligence in everyday products





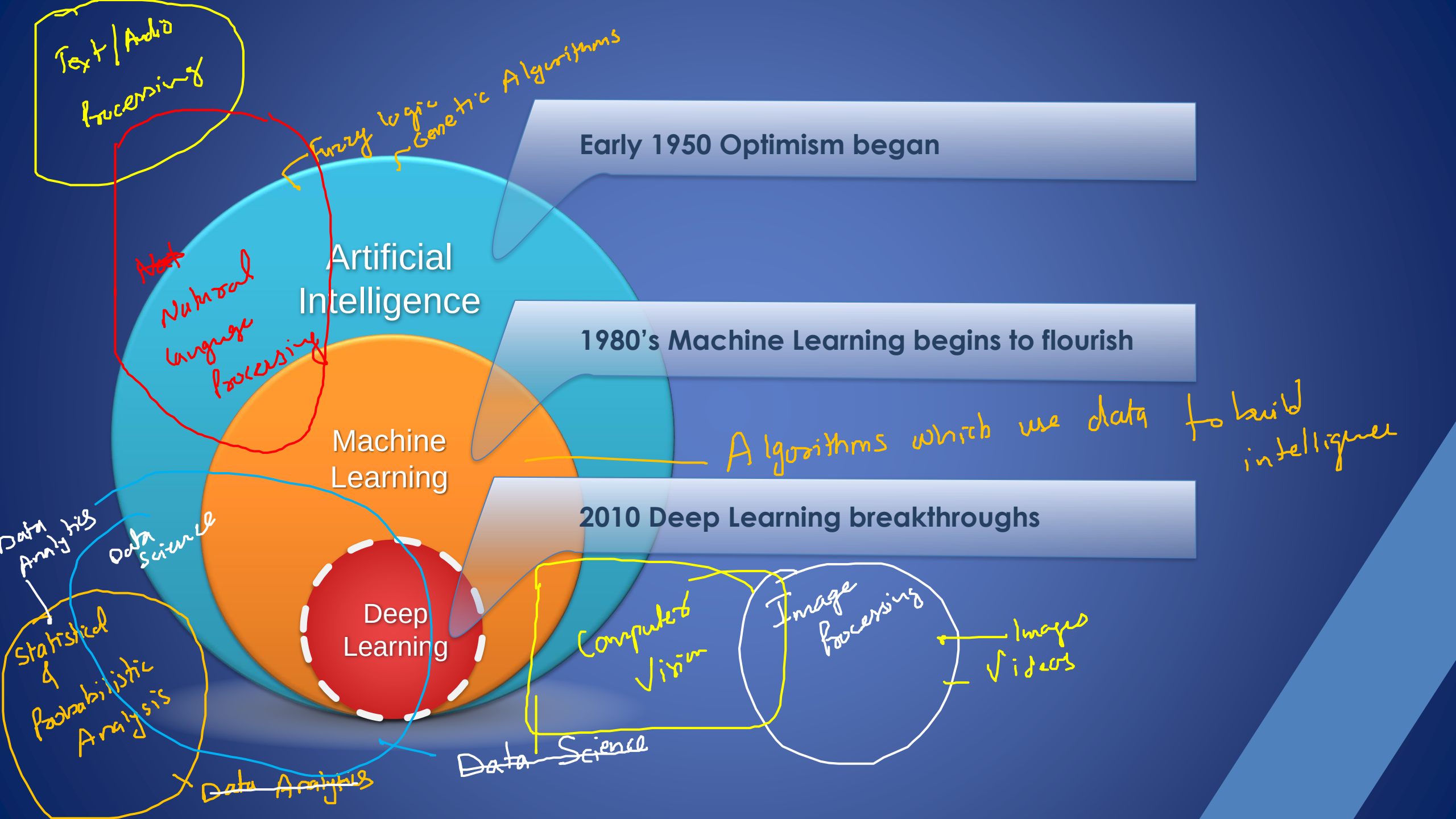


What is Data?



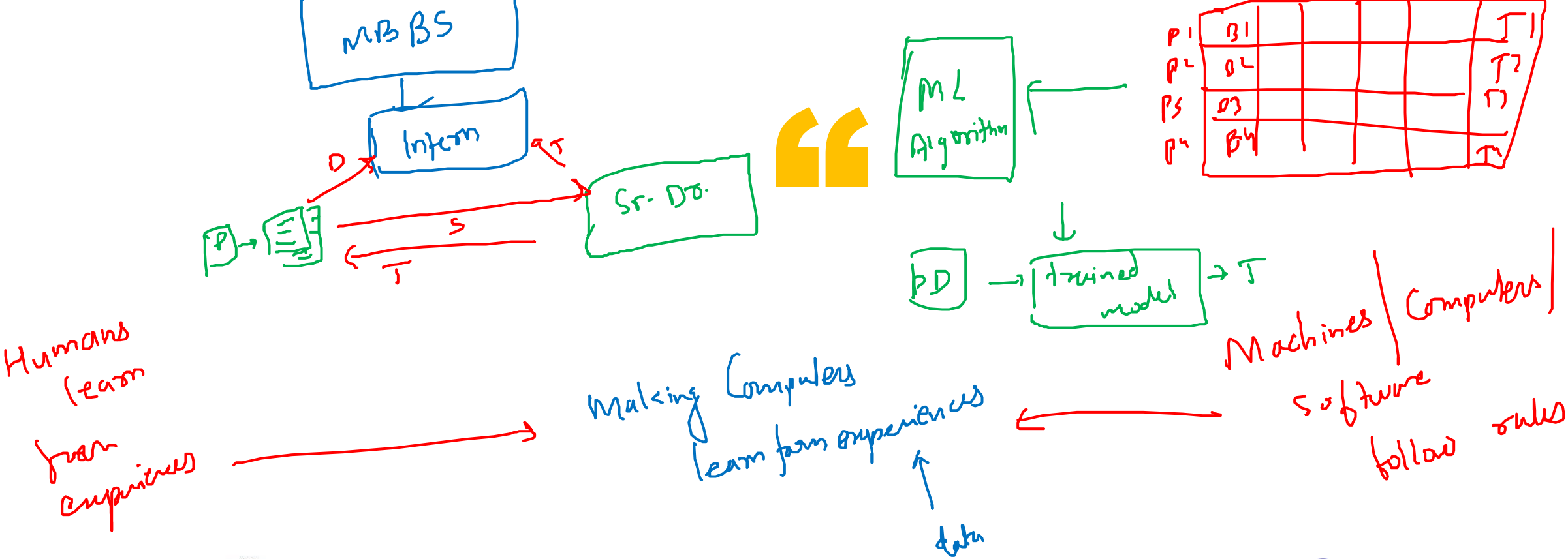
Structured
- Business Data, Excel, CSV

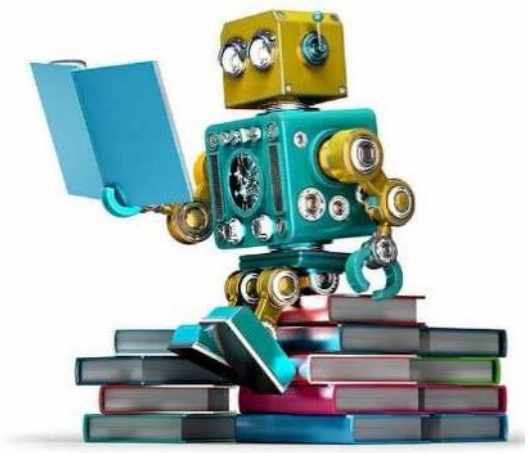
Unstructured
- Text, Images and Speech

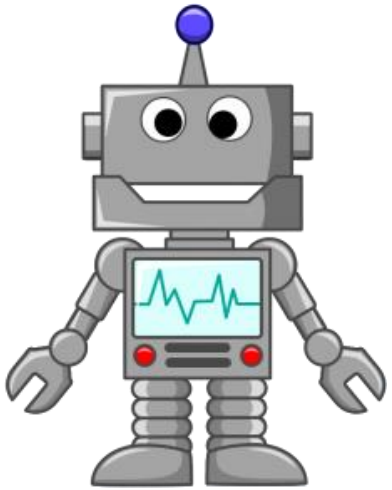

Text / Audio Processing
Fuzzy logic
Genetic Algorithms
Early 1950 Optimism began
Artificial Intelligence
Natural Language Processing
1980's Machine Learning begins to flourish
Machine Learning
Algorithms which use data to build intelligence
2010 Deep Learning breakthroughs
Deep Learning
Data Analysis
Data science
Statistical & Probabilistic Analysis
Computer Vision
Image Processing
Images
Videos
Data Science
Data Analysis

AN INTRODUCTION TO

MACHINE LEARNING


MBBS
Intern
D
T
P
S
T
Sr. DO.
ML Algorithm
P1 B1 T1
P2 B2 T2
P3 B3 T3
P4 B4 T4
PD
Trained model
T
Humans learn from experiences
Making Computers learn from experiences
data
Machines | Computers
Software follow rules





Machine learning is a field of computer science that gives computers the ability to learn without being explicitly programmed.

—Arthur Samuel, 1959

“Classical” decision making

(explicit instructions)

Feature	Input	Procedure	Output

F0	[0.8]	if F1 > 0.5 and F2 * F3 < 0.3:
		  if (F4 – F5) / F6 < 1:
		  do A
		  else:
		  if F7 * F0 < 0.3:
		  do B
		  else:
		  do C
		  else:
		  do D
			“A”

F1	[0.2]		
F2	[0.9]		“B”
F3	[0.2]		
F4	[0.0]		“C”
F5	[0.4]		
F6	[0.3]		“D”
F7	[0.1]		

Requires ‘a priori’ knowledge

ML decision making

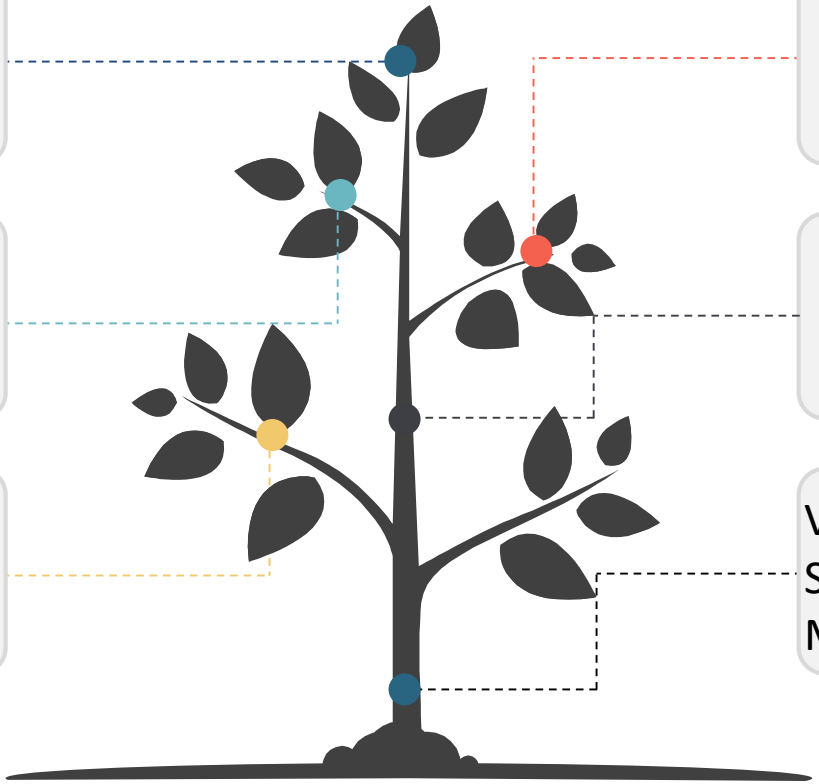
Feature	Input	Procedure	Output
F0	[0.8]	Output = MATRIX * Input (Linear Regression) Output = g(M2 * f(M1 * Input)) (Neural Network with one hidden layer)	“A”
F1	[0.2]		
F2	[0.9]		“B”
F3	[0.2]		
F4	[0.0]		“C”
F5	[0.4]		
F6	[0.3]		“D”
F7	[0.1]		

Applications of Machine Learning

Financial Predictions,
Fraud Detections
Loan Approval

Predictive Maintenance
Ad plus user
information

Churn Prediction,
Customer Segmentation,
Sales Forecasting



Data Mining – Web Click
Data, Medical Records,
Diagnosis

Computer Vision – Face
Recognition, Self Driving
Cars, OCR

Voice recognition, Chatbots,
Sentiment Analysis,
Machine Translation

What Machine Learning Can Do

A simple way to think about supervised learning.

INPUT A	RESPONSE B	APPLICATION
Picture	Are there human faces? (0 or 1)	Photo tagging
Loan application	Will they repay the loan? (0 or 1)	Loan approvals
Ad plus user information	Will user click on ad? (0 or 1)	Targeted online ads
Audio clip	Transcript of audio clip	Speech recognition
English sentence	French sentence	Language translation
Sensors from hard disk, plane engine, etc.	Is it about to fail?	Preventive maintenance
Car camera and other sensors	Position of other cars	Self-driving cars

Source – ANDREW NG

!!

Point your camera at the menu during your next trip to Taiwan and the restaurant's selections will magically appear in English via the Google Translate app.

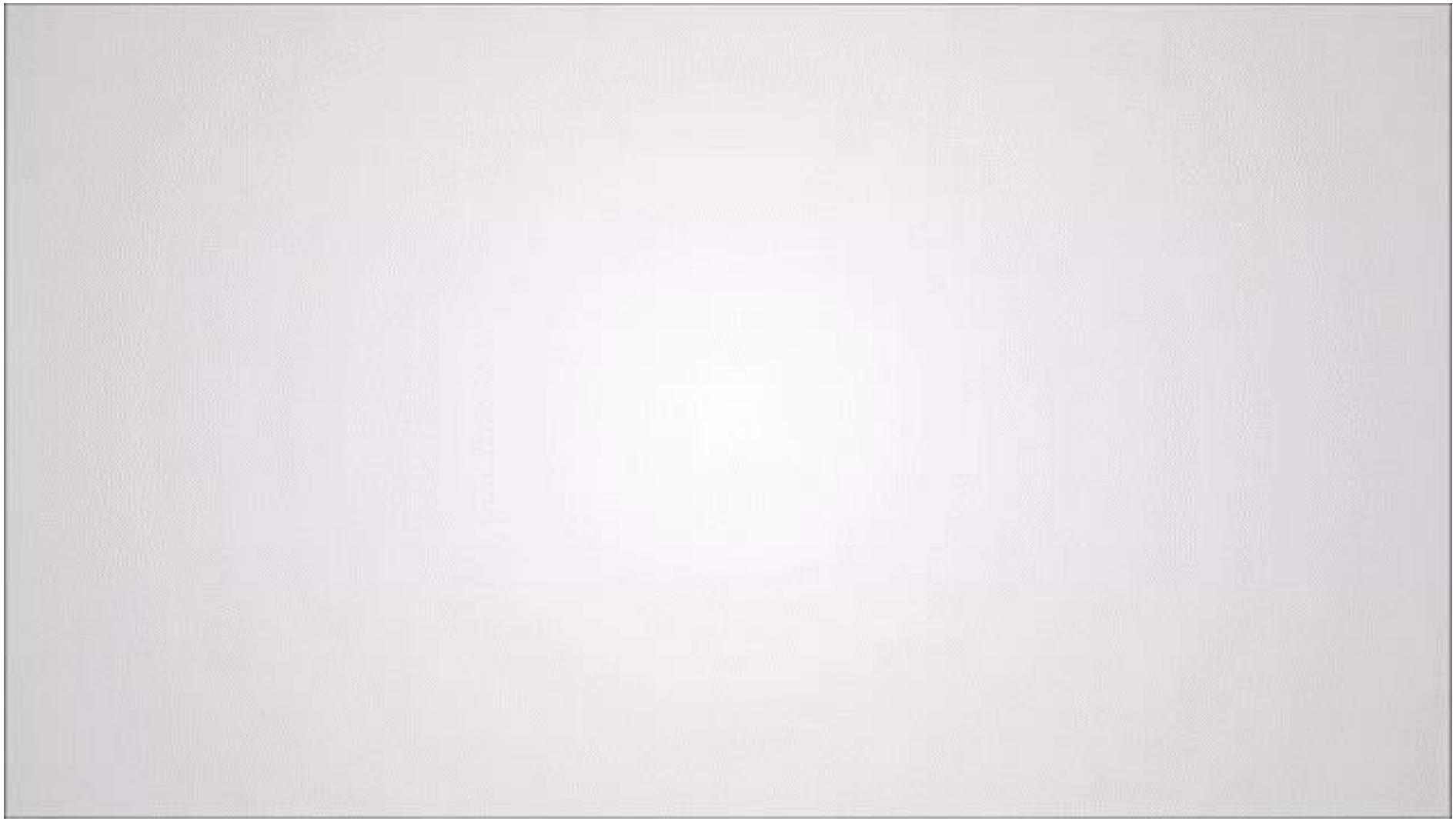
Google Translate overlaying English translations on a drink menu in real time using convolutional neural networks.

Manufacturing	Retail	Financial Services
Predictive maintenance or condition monitoring Warranty reserve estimation Propensity to buy Demand forecasting Process optimization Telematics	Predictive inventory planning Recommendation engines Upsell and cross-channel marketing Market segmentation and targeting Customer ROI and lifetime value	Risk Analytics and Regulations Customer Segmentation Cross-selling and up-selling Sales and marketing campaign management Credit worthiness evaluation

Travel and Hospitability	Health Care and Life Sciences	Energy, Feedstock and Utility
Aircraft scheduling Dynamic pricing Social media — consumer feedback and interaction analysis Customer complaint resolution Traffic patterns and congestion management	Alerts and diagnostics from real-time patient data Disease identification and risk stratification Patient triage optimization Proactive health management Healthcare provider sentiment analysis	Power usage analytics Seismic data processing Carbon emissions and trading Customer-specific pricing Smart grid management Energy demand and supply optimization

Netradyne

Netradyne's Driveri, a powerful camera that analyses driving patterns and can help determine the cause of an accident. The soap-bar-sized device is attached to a vehicle's rear-view mirror and rests on the inside of the windscreen, pointing towards the road.



Nebulaa

http://www.nebulaa.in/

Powering Agriculture with Machine Learning

MindMeld

Deep-Domain Conversational AI to Power the Next Generation of Voice and Chat Assistants

Programming Languages -

Python	R

Machine Learning Cloud Platforms -

Microsoft Azure ML Studio
https://azure.microsoft.com/en-us/services/machine-learning-studio/

Amazon Machine Learning
https://aws.amazon.com/aml/

SAP Leonardo Machine Learning
https://www.sap.com/india/products/leonardo/machine-learning.html

Google ML Platform
https://cloud.google.com/products/machine-learning/

IBM Machine Learning
https://www.ibm.com/analytics/data-science/machine-learning

What to learn in machine Learning?

Programming and Tools

Python/R, spark etc.

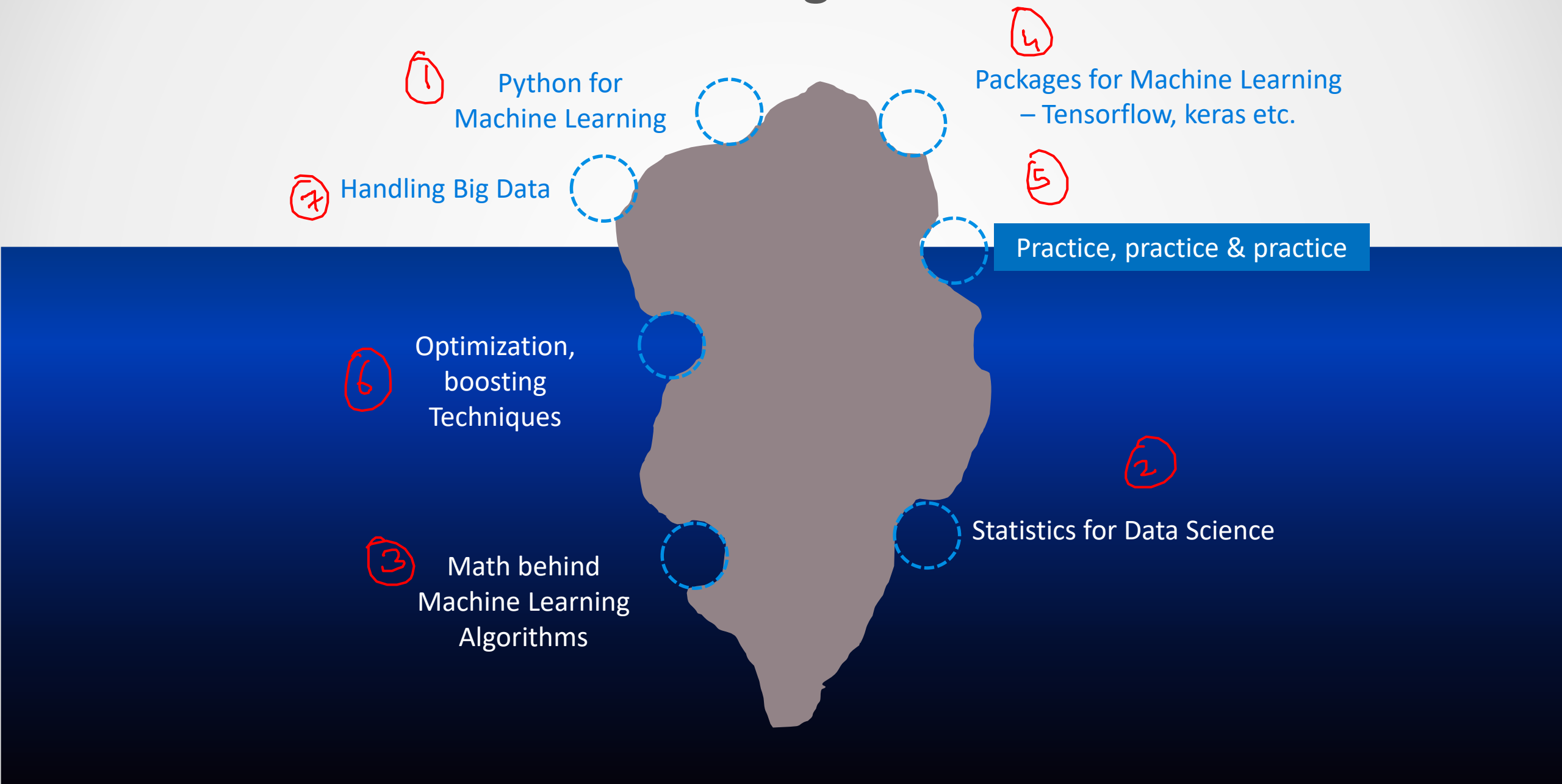
30%

The Math behind Machine Learning

Probabilistic Theory, Statistics and Linear Algebra

70%

What to learn in Machine Learning?



Machine Learning Techniques

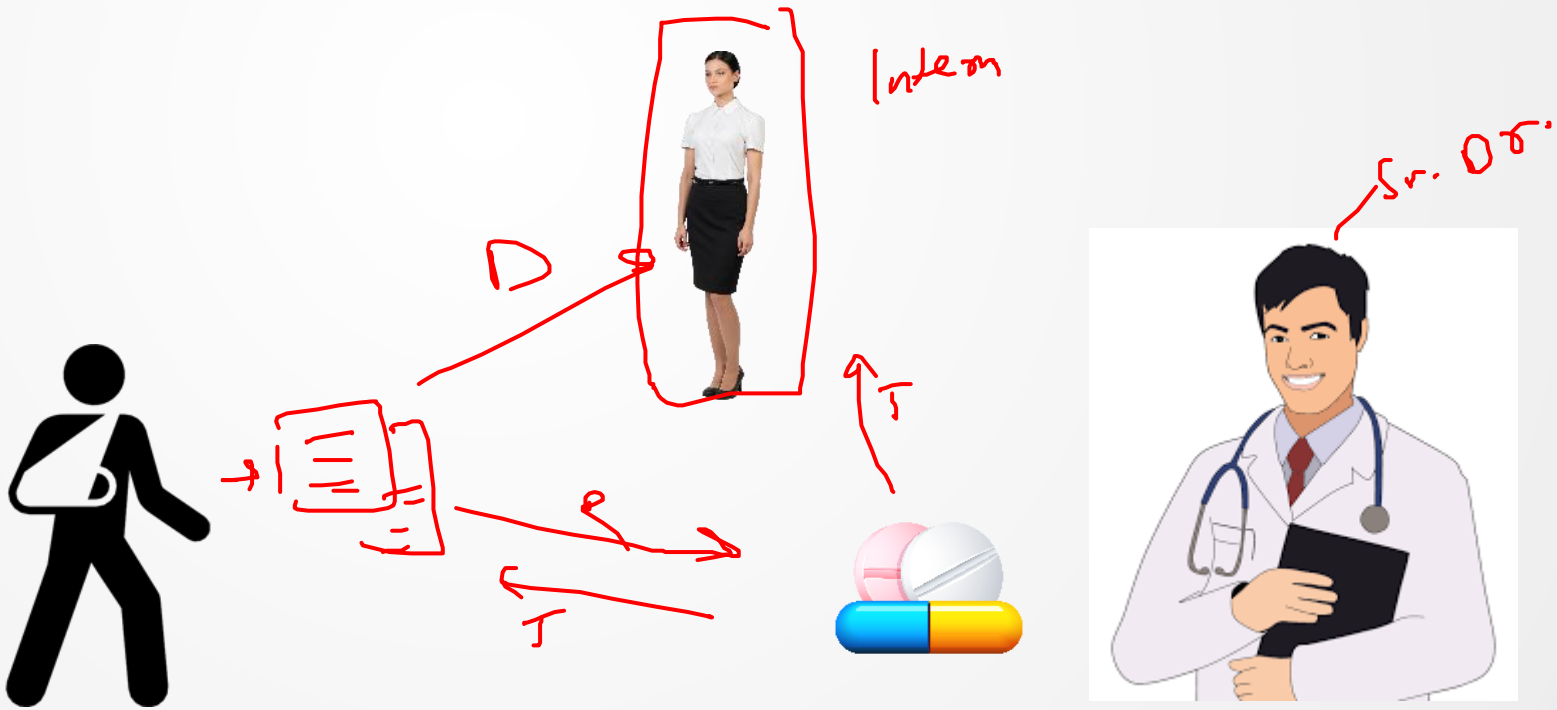
Anshu Pandey

Supervised Learning	Unsupervised Learning	Reinforcement Learning
Learning with a labeled training set.	Discovering patterns in unlabeled data.	Learning based on feedback or reward.
Email spam detector with training set of already labeled emails.	Cluster similar documents based on the text content.	Learn to play chess by winning or losing.

Supervised Learning

- We know what we are trying to predict. We use some examples that we (and the model) know the answer to, to “train” our model. It can then generate predictions to examples we don’t know the answer to.

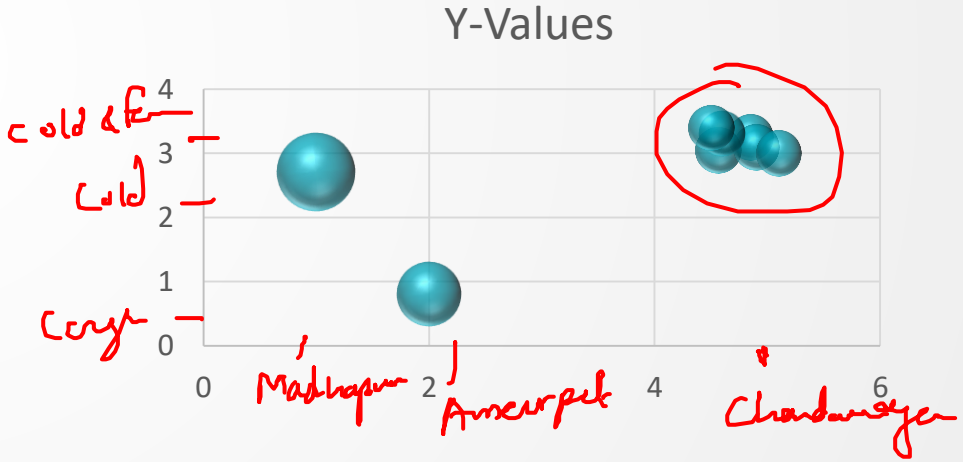
- Examples: Predict the price a house will sell at. Identify the gender of someone based on a photograph.



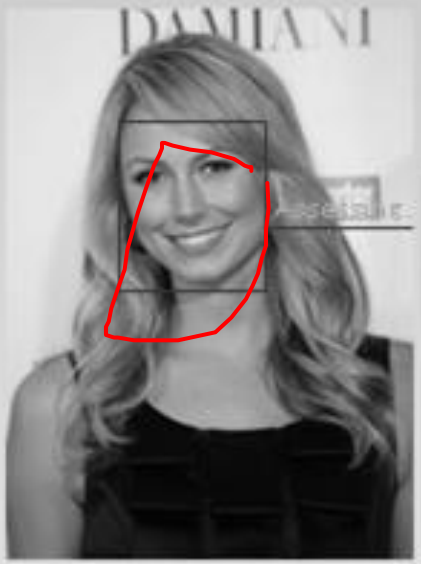
Unsupervised Learning

- We don't know what we are trying to predict. We are trying to identify some naturally occurring patterns in the data which may be informative.

- Examples: Try to identify "clusters" of customers based on data we have on them



Supervised Learning

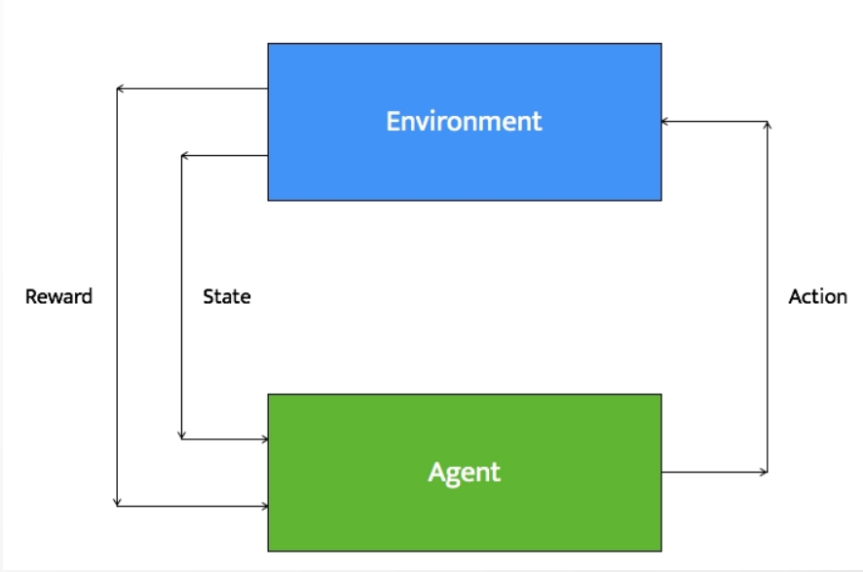


Unsupervised Learning

Reinforcement Learning

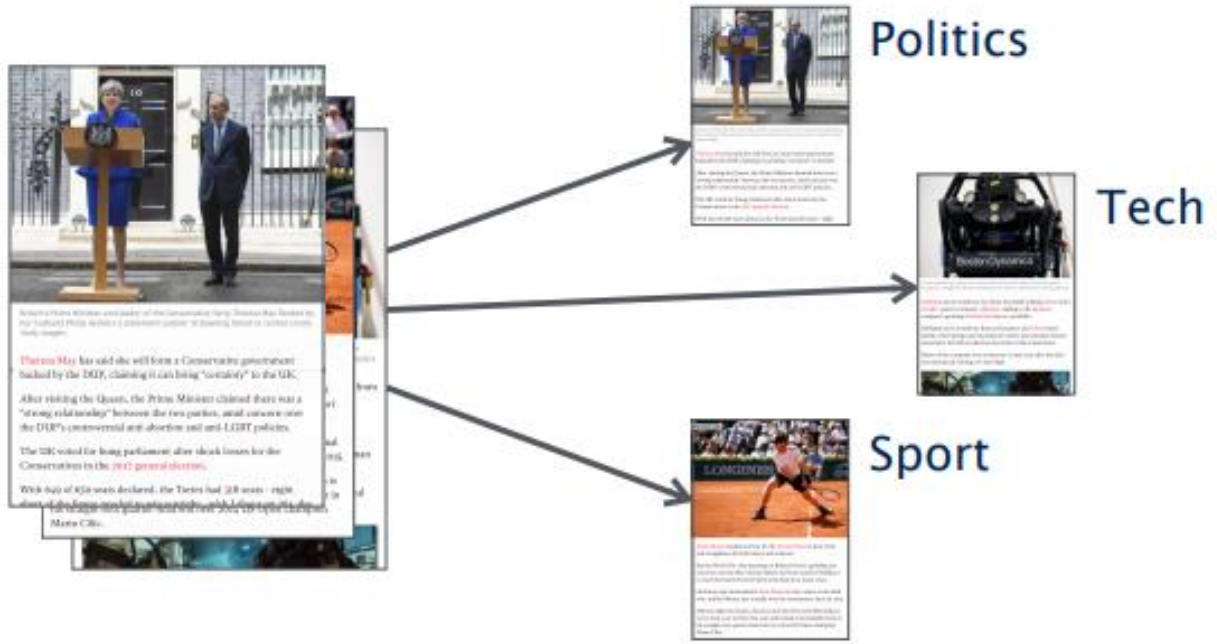
- Reinforcement learning systems can do multiple things simultaneously -- learn by performing a trial and error search, learn the model of the environment it is in, and then use that model to plan the next steps.

- Example: Let's consider a robot whose job is to explore a new building. It has to make sure it has enough power left to come back to the base station. This robot has to decide if it should make decisions by considering the trade off between the amount of information collected and the ability to reach back to base station safely.



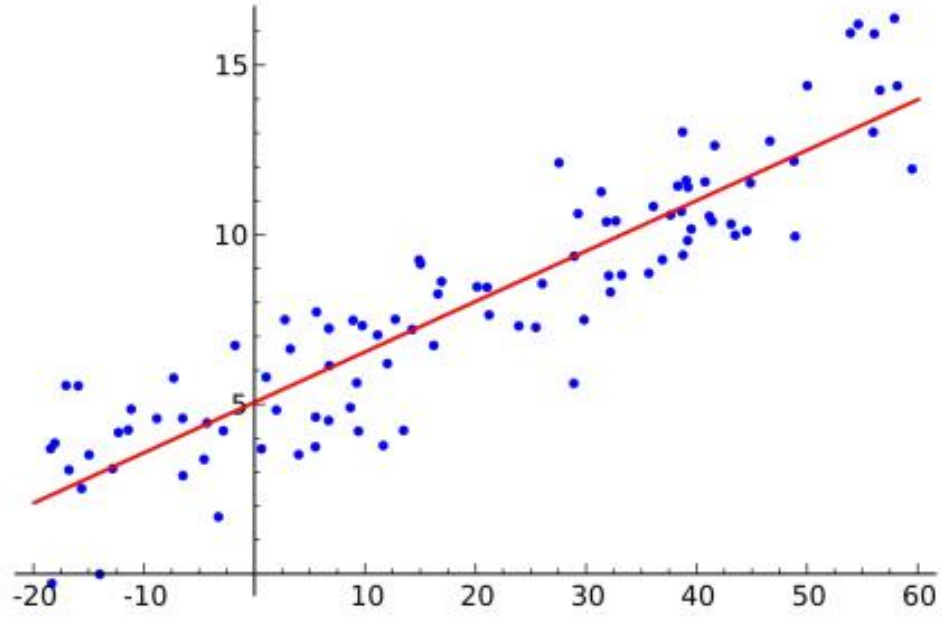
Types of Problems in Machine Learning

Types of Problems in Supervised Machine Learning -



Classification

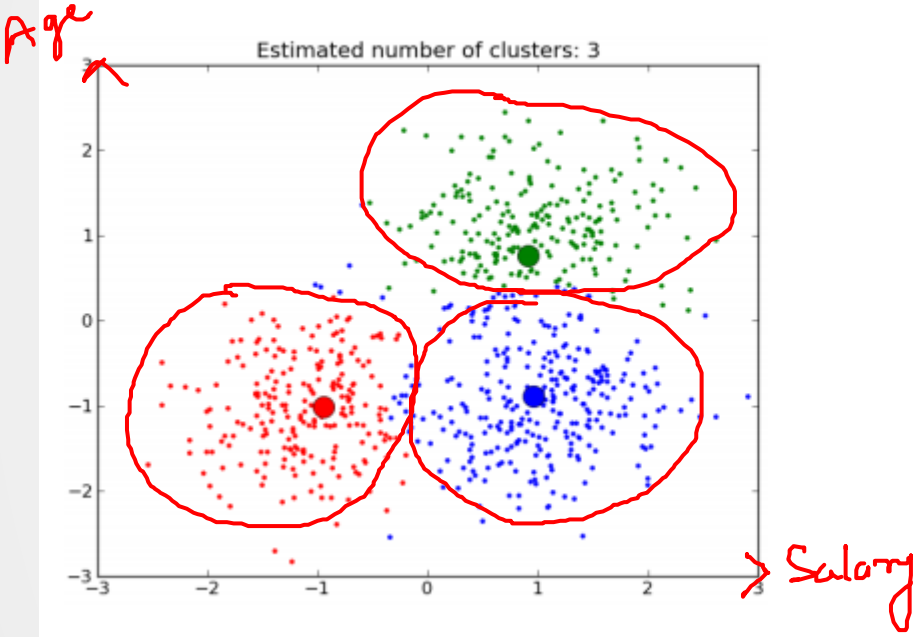
(discrete set of possible outcomes)

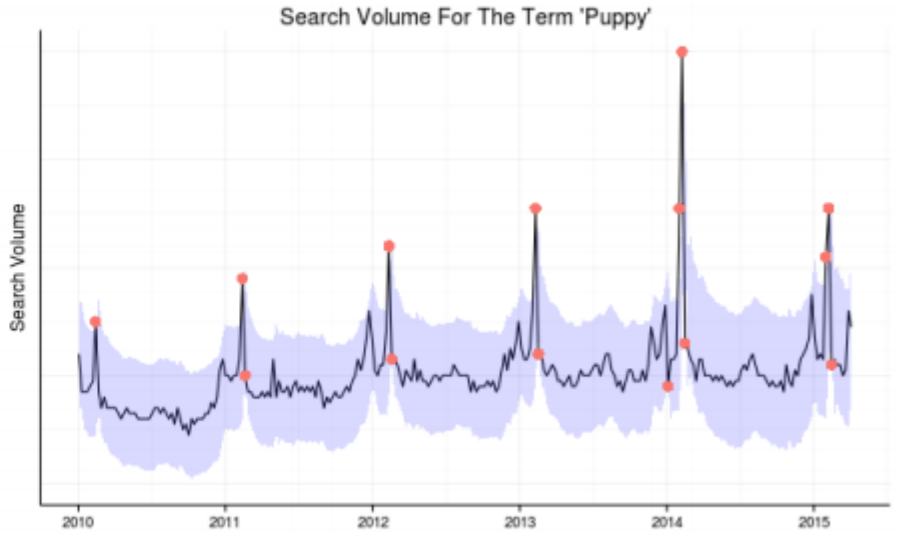


Regression

(possible outcome can by any numerical value with in a particular continuous range)

Types of Problems in Unsupervised Machine Learning -





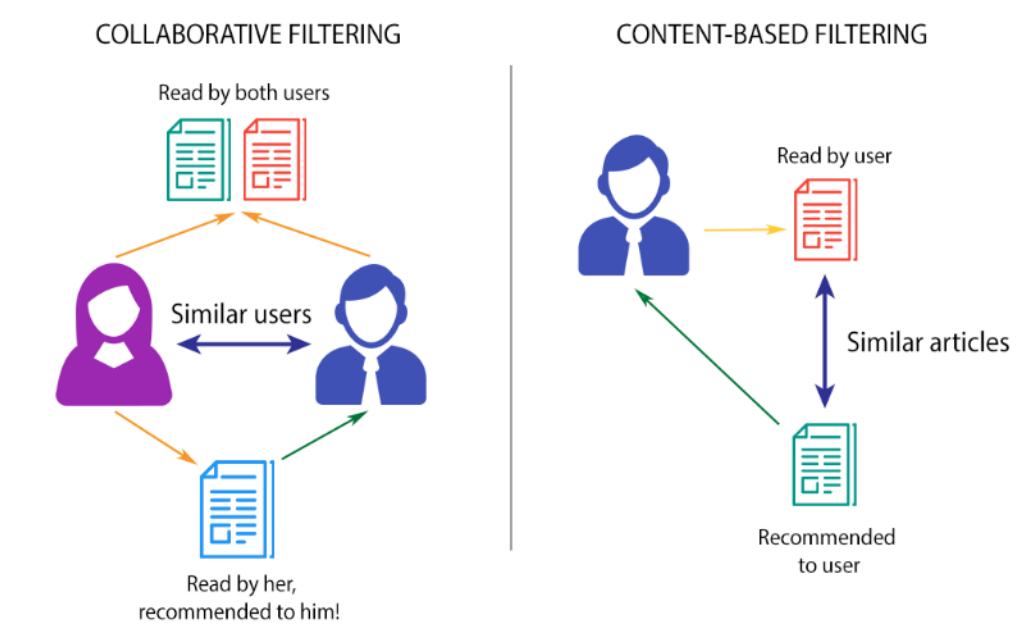
Clustering

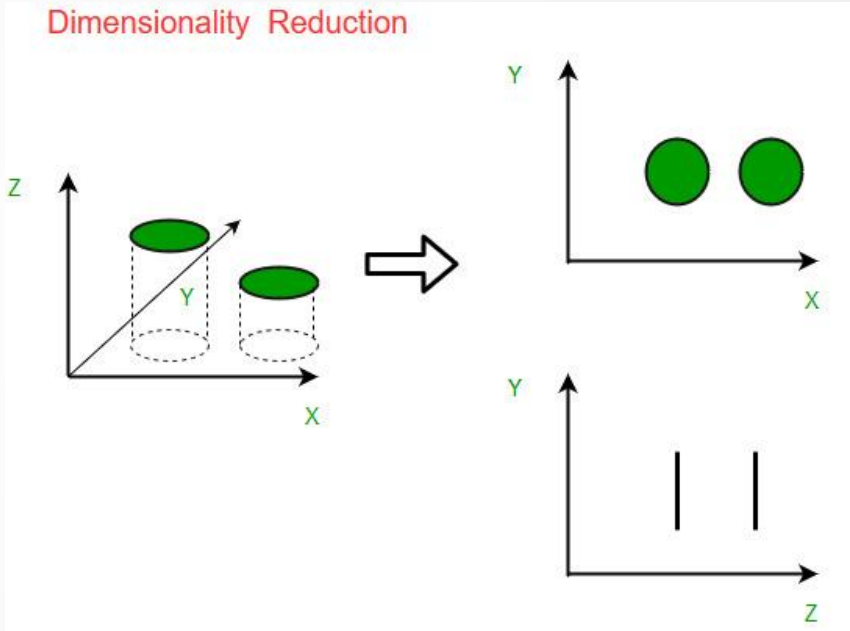
(categorization of samples based on similarity in features)

Anomaly Detection

(detecting an anomaly in a general pattern)

Types of Problems in Unsupervised Machine Learning -

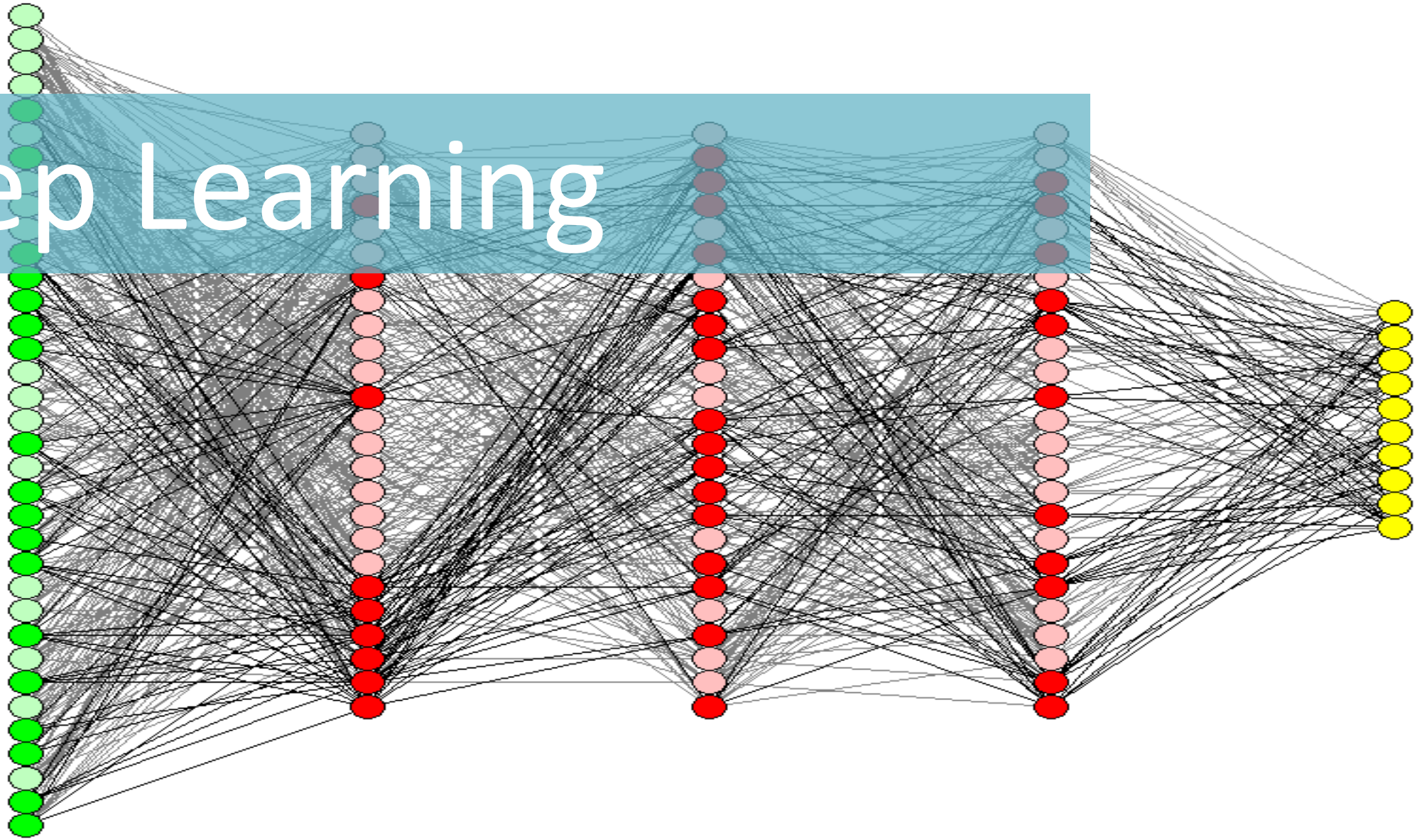




Recommendation Systems
(profiling of users and items and recommending relevant items to user)

Dimensionality Reduction
(Reducing dimensionality/size of data)

Deep Learning



Deep Learning

Deep Learning is part of the machine learning field of learning representations of data. Exceptional effective at learning patterns.

Deep Learning in one slide

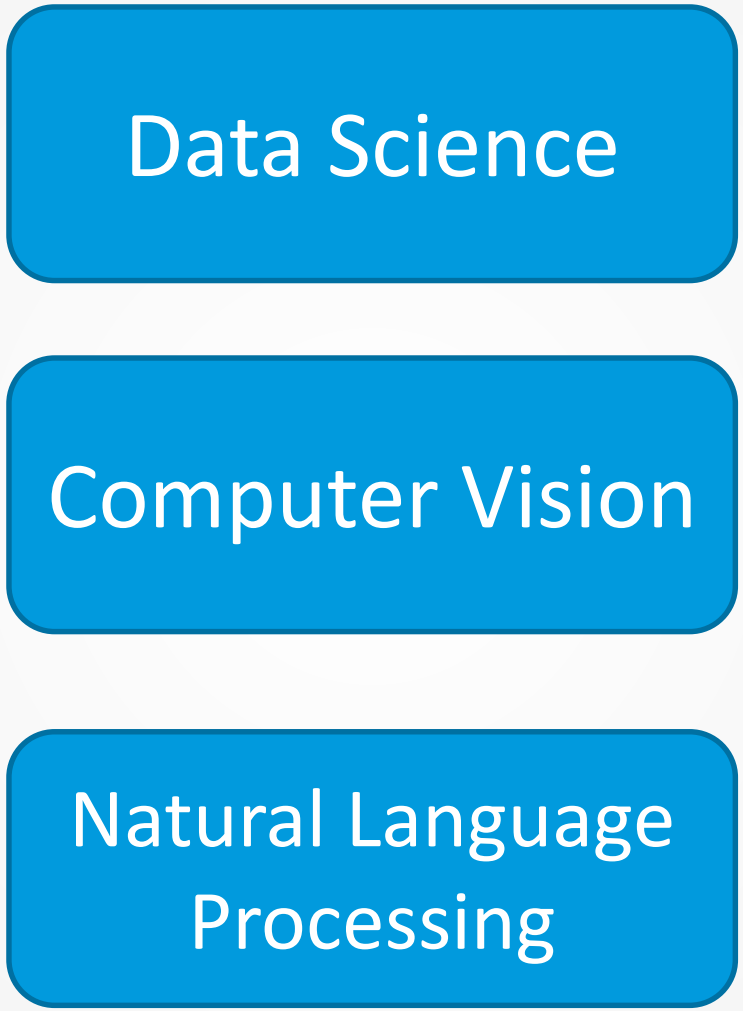
- **What is it:**
  Extract useful patterns from data.
- **How:**
  Neural network + optimization
- **How (Practical):**
  Python + TensorFlow & friends
- **Hard Part:**
  Good Questions + Good Data
- **Why now:**
  Data, hardware, community, tools, investment
- **Where do we stand?**
  Most big questions of intelligence have not been answered nor properly formulated

- **Exciting progress:**
- Face recognition
- Image classification
- Speech recognition
- Text to speech generation
- Handwriting transcription
- Machine translation
- Medical diagnosis
- Cars: drivable area, lane keeping
- Digital assistants
- Ads, search, social recommendations
- Game playing with deep RL

What we can’t do with Deep Learning?

- Mirrors
- Sparse information
- 3D Structure
- Physics
- What’s on peoples’ minds?
- What happens next?
- Humor

Artificial Intelligence



Artificial Intelligence

Data Science

Computer Vision

Natural Language Processing

- Predicting Stock prices, housing prices or any other item prices based on historical data
- Predicting whether customer will buy a product or not, customer will churn or not
- Classifying the customers in different known groups
- Risk predictions for financial transactions.
- Fraud Detection from transactional data
- Segmentation of customers, stocks and server logs
- Predicting patient readmission into hospital
- Detecting anomalies in access management, data control
- Building product recommendation systems

Artificial Intelligence

Data Science

Computer Vision

Natural Language Processing

- Face Recognition, Emotion Recognition
- Optical Character Recognition
- Document verification, authentication
- Object Detection and Classification from images
- Identifying forgery in the images
- Vehicle number plate, type recognition
- Self Driving Cars – lane detection, traffic sign classification, Behavioural Cloning
- Motion Detection from videos
- Image restoration, colouring and pattern transfer
- Action Prediction

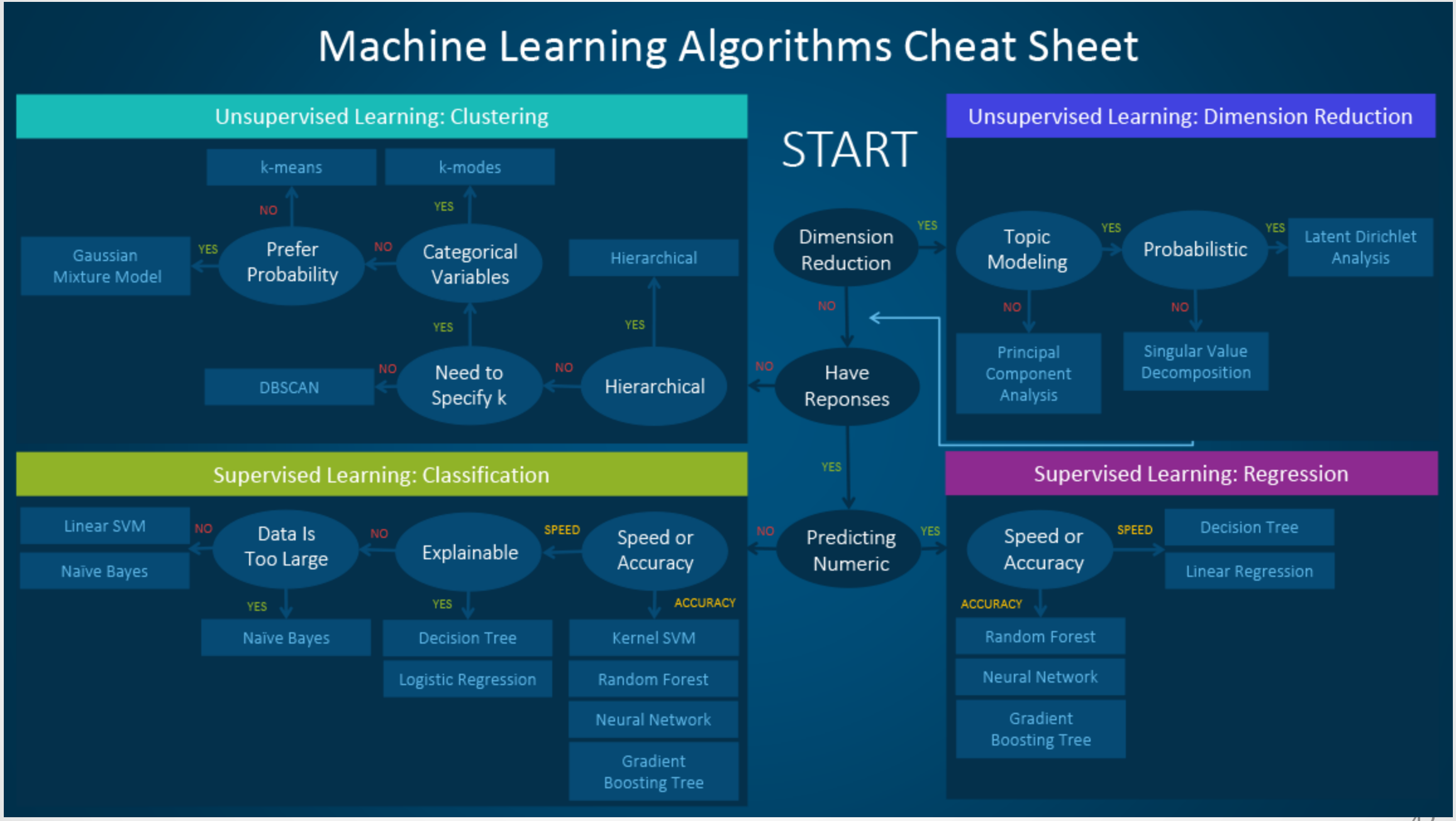
Artificial Intelligence

Data Science

Computer Vision

Natural Language Processing

- Text/document classification
- Social Media Text mining and Analysis
- Speech to Text and Text to Speech conversion
- Caption generation
- Machine Translation
- Sentiment analysis from text
- Chatbots
- Speaker recognition
- Personal Assistant, Sentence Correction
- Text Generation, Similarity Matching, Topic Modelling


Machine Learning Algorithms Cheat Sheet
START
Unsupervised Learning: Clustering
k-means
k-modes
NO
YES
Gaussian Mixture Model
YES
Prefer Probability
NO
Categorical Variables
Hierarchical
YES
YES
DBSCAN
NO
Need to Specify k
NO
Hierarchical
Unsupervised Learning: Dimension Reduction
Dimension Reduction
YES
Topic Modeling
YES
Probabilistic
YES
Latent Dirichlet Analysis
NO
NO
NO
Principal Component Analysis
Singular Value Decomposition
NO
Have Reponses
YES
Supervised Learning: Classification
Linear SVM
NO
Data Is Too Large
NO
Explainable
SPEED
Speed or Accuracy
Naïve Bayes
YES
YES
ACCURACY
Naïve Bayes
Decision Tree
Kernel SVM
Logistic Regression
Random Forest
Neural Network
Gradient Boosting Tree
NO
Predicting Numeric
YES
Supervised Learning: Regression
Speed or Accuracy
SPEED
Decision Tree
Linear Regression
ACCURACY
Random Forest
Neural Network
Gradient Boosting Tree

Happy Learning!

Stay Tuned for next exciting sessions on diving deeper into

Supervised Learning