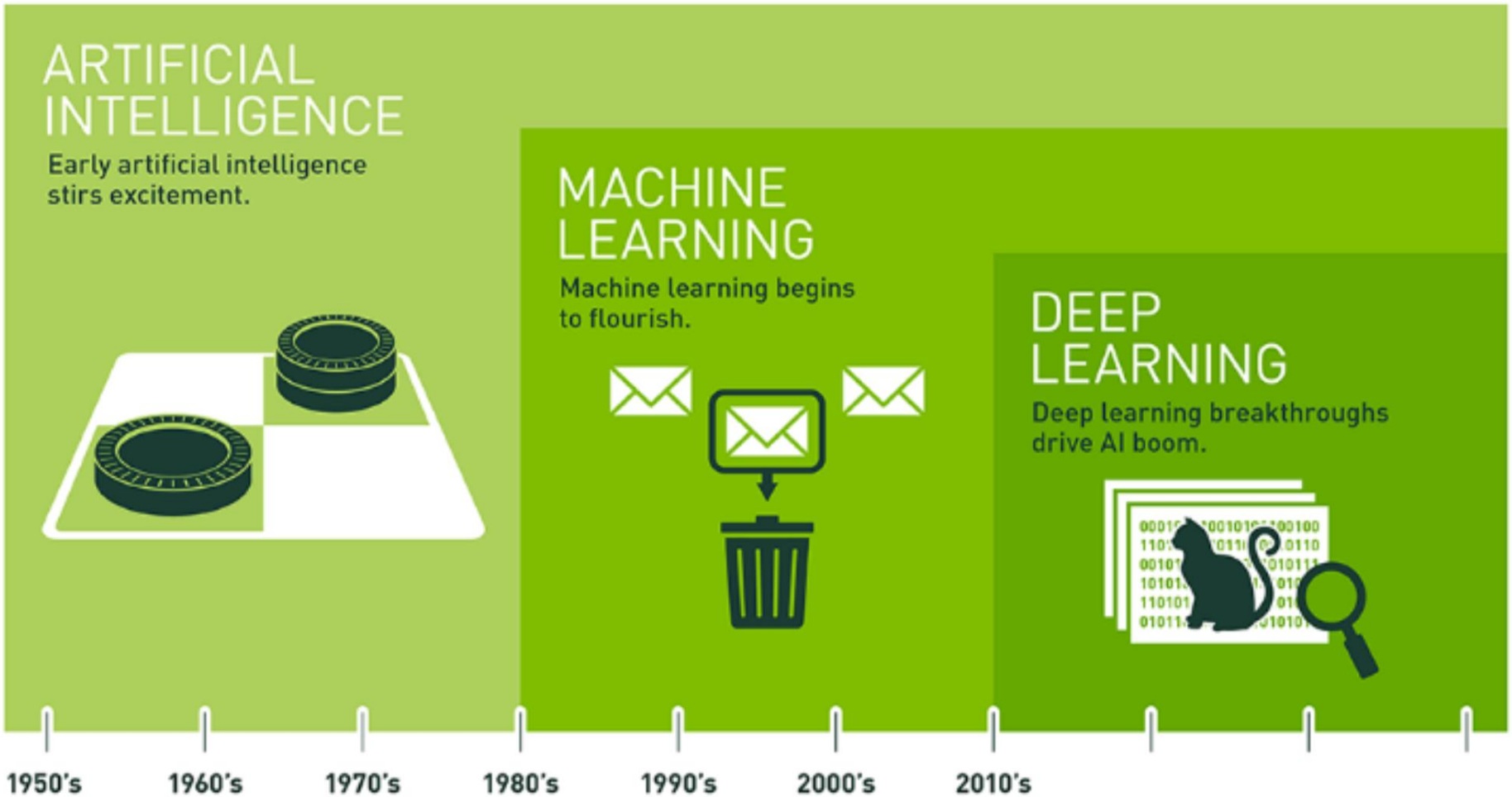
Machine Learning



Since an early flush of optimism in the 1950s, smaller subsets of artificial intelligence – first machine learning, then deep learning, a subset of machine learning – have created ever larger disruptions.

Big data và dữ liệu khổng lồ

3,024,476,315

Internet Users in the world

1,139,737,171

Total number of Websites

145,692,209,447

Emails sent today

2,776,526,173

Google searches today

2,547,826

Blog posts written today

486,695,263

Tweets sent today

5,516,365,773

Videos viewed today
on YouTube

92,250,973

Photos uploaded today
on Instagram

97,066,147

Tumblr posts today

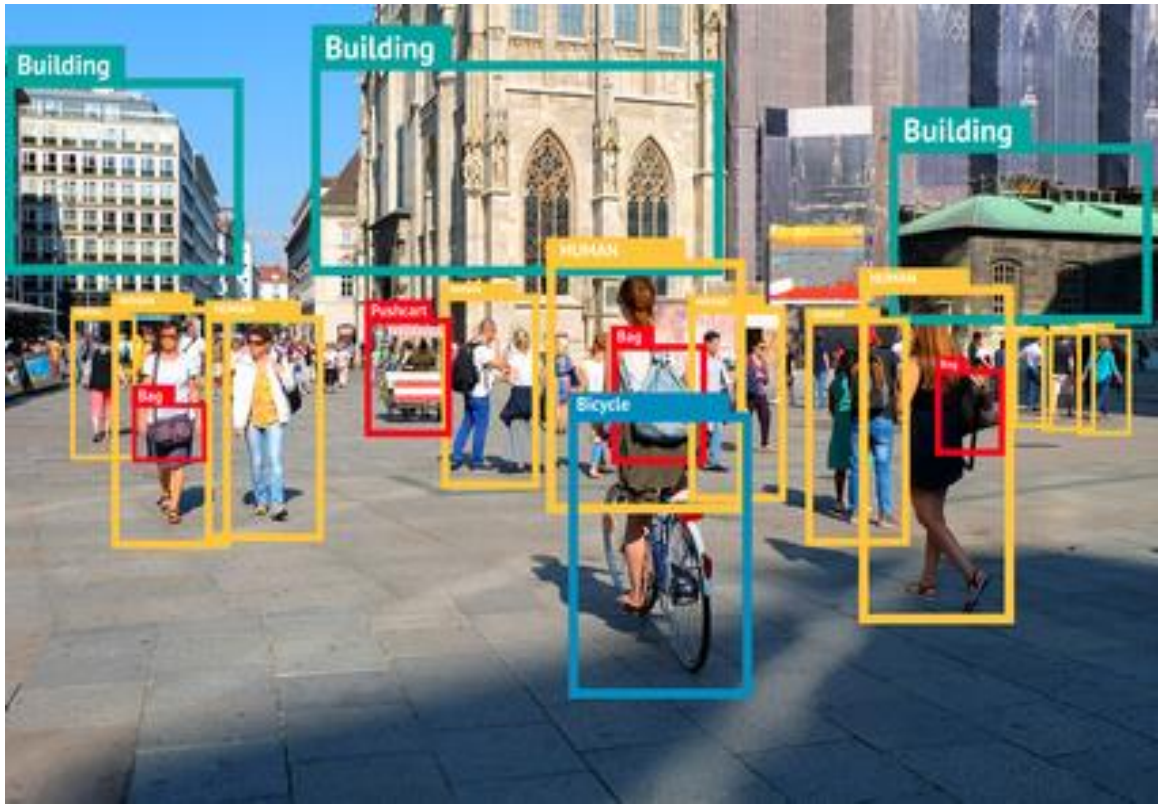
http://www.internetlivestats.com
Screenshot: 12/9/14

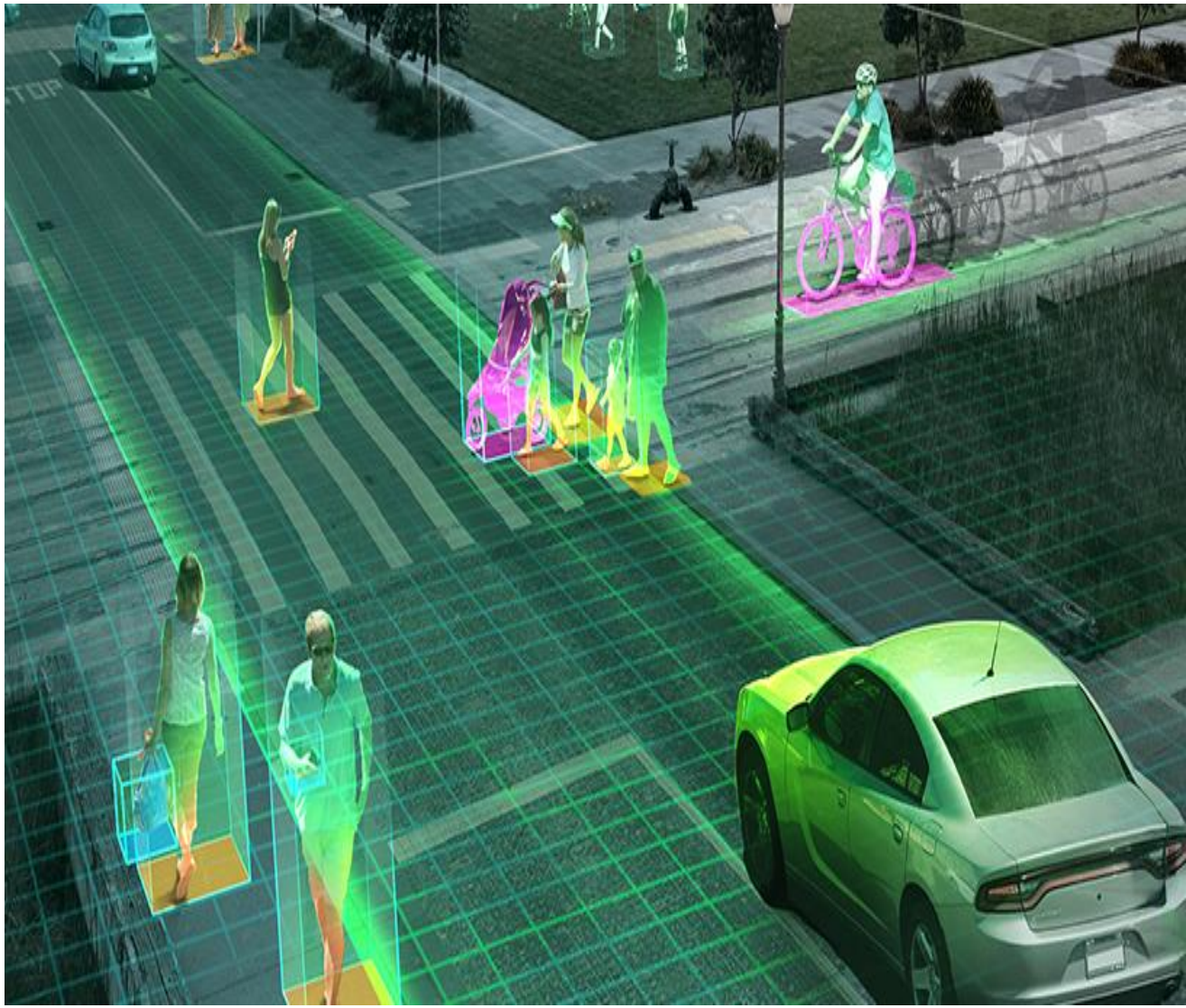
Một số bài toán dẫn nhập

- Thị giác máy tính (Computer Vision)
- Xử lý ngôn ngữ tự nhiên (Natural Language Processing)

Thị giác máy tính

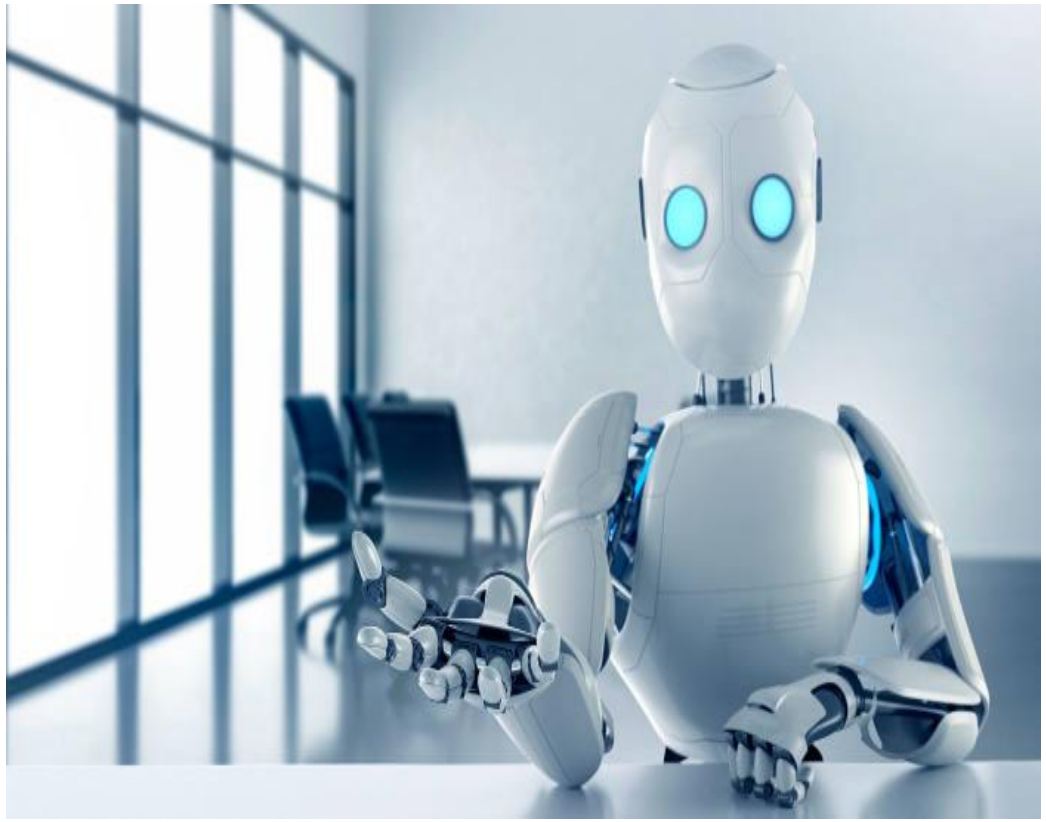
Bài toán nhận dạng:

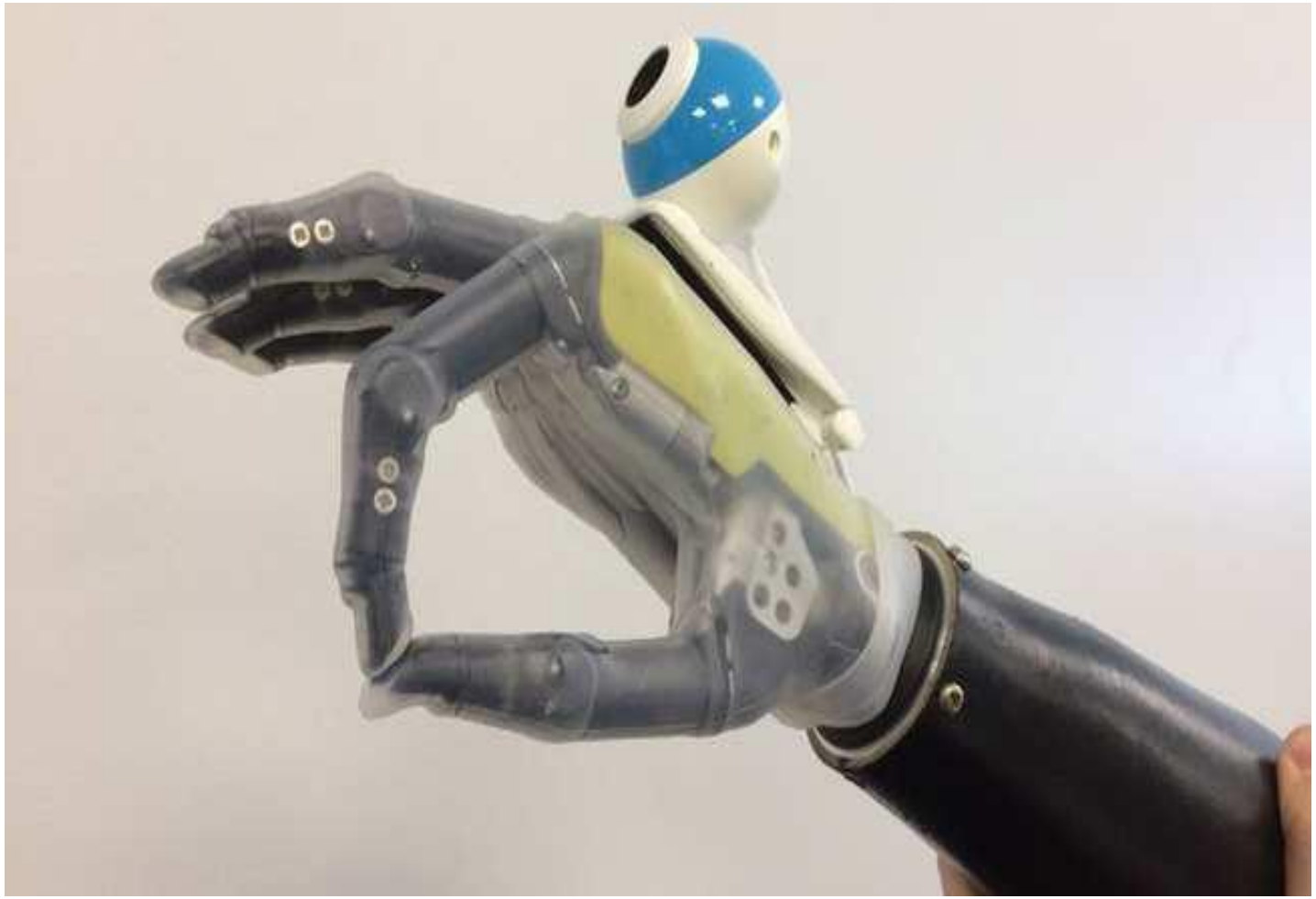




Thị giác máy tính

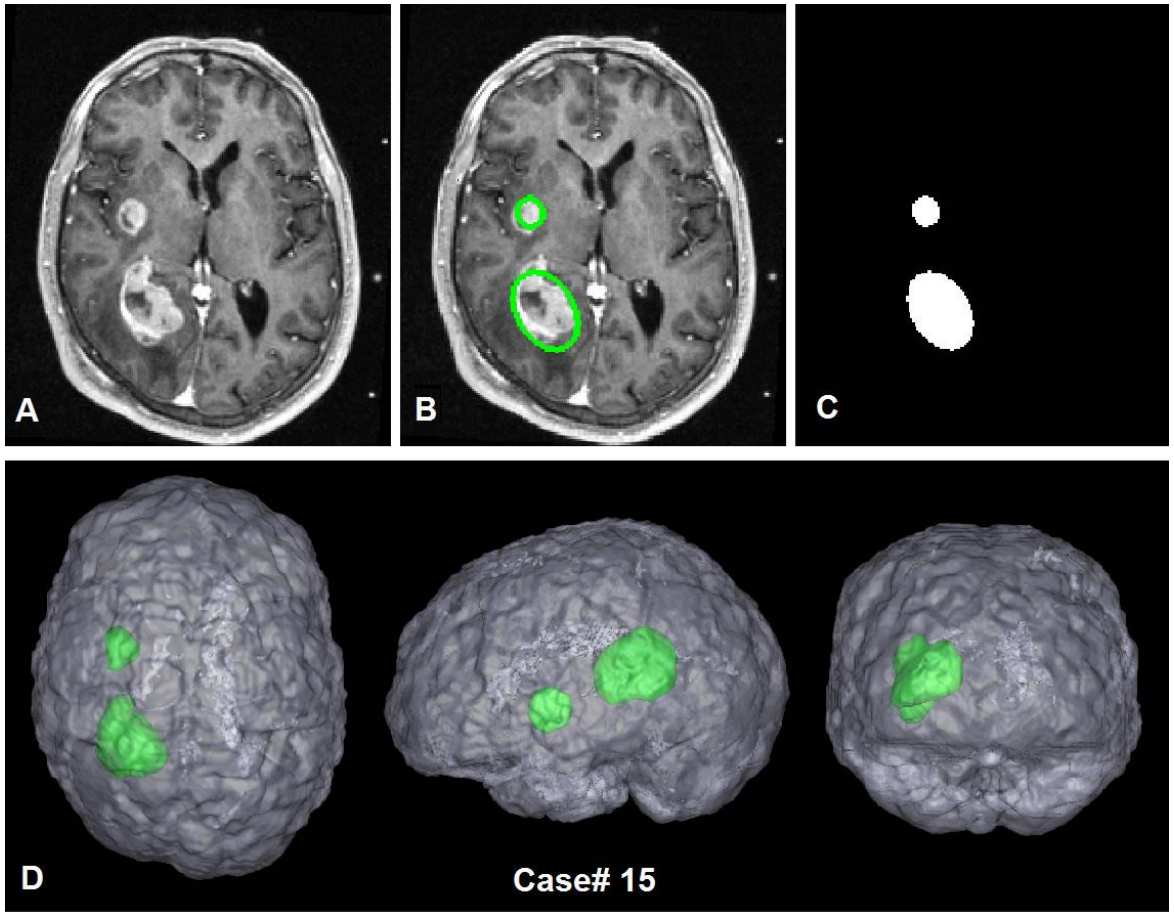
Robotics





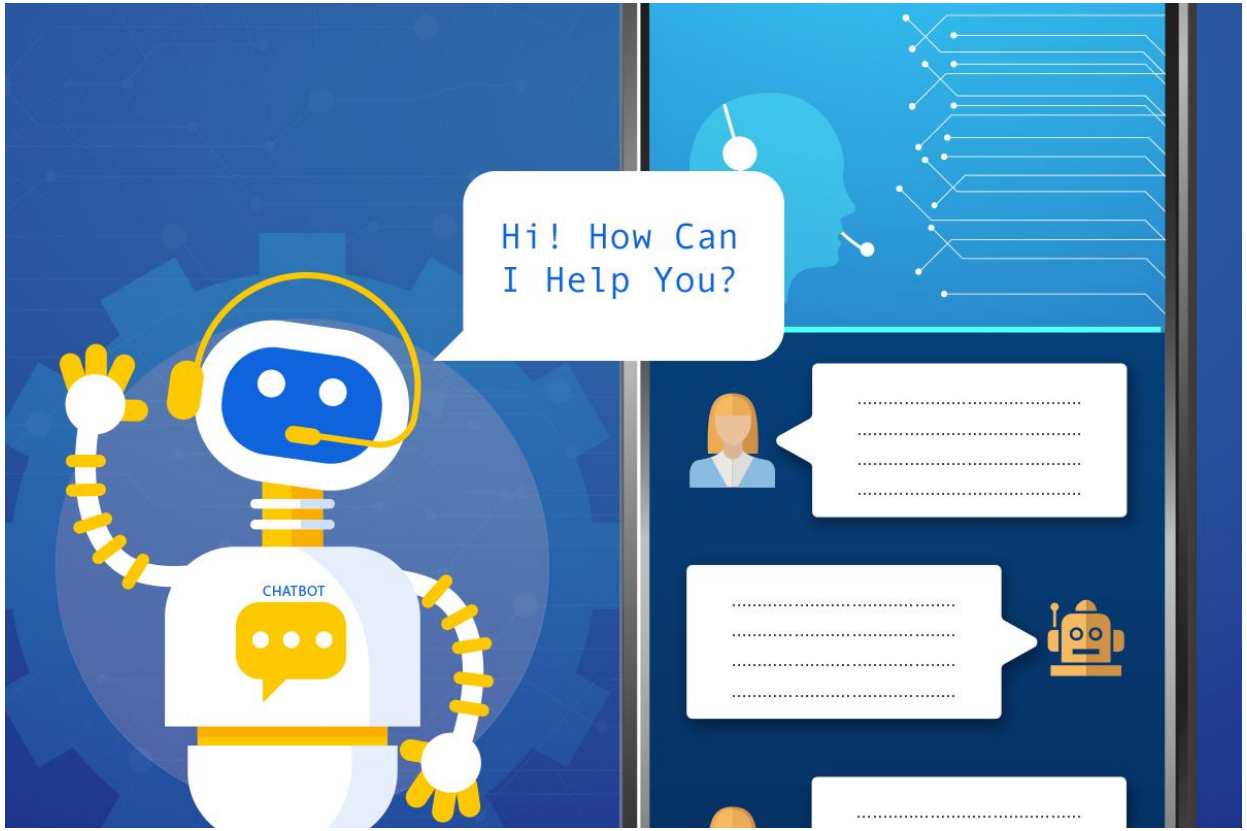
Thị giác máy tính

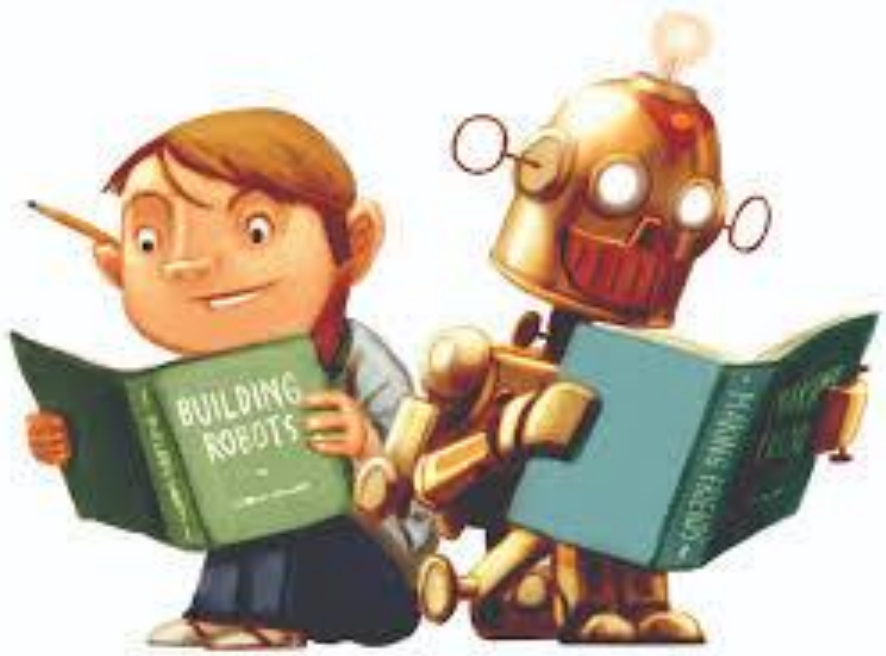
Bài toán trong y khoa:

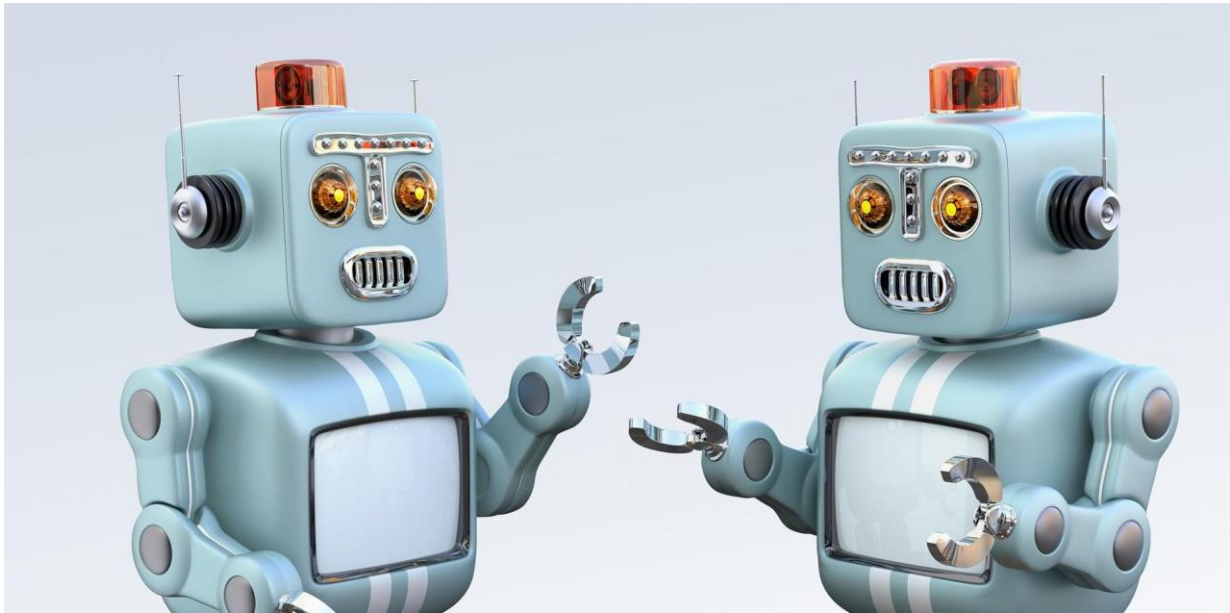


Xử lý ngôn ngữ tự nhiên

Bài toán xử lý văn bản, giọng nói







Xử lý ngôn ngữ tự nhiên

Bài toán xử lý văn bản, giọng nói

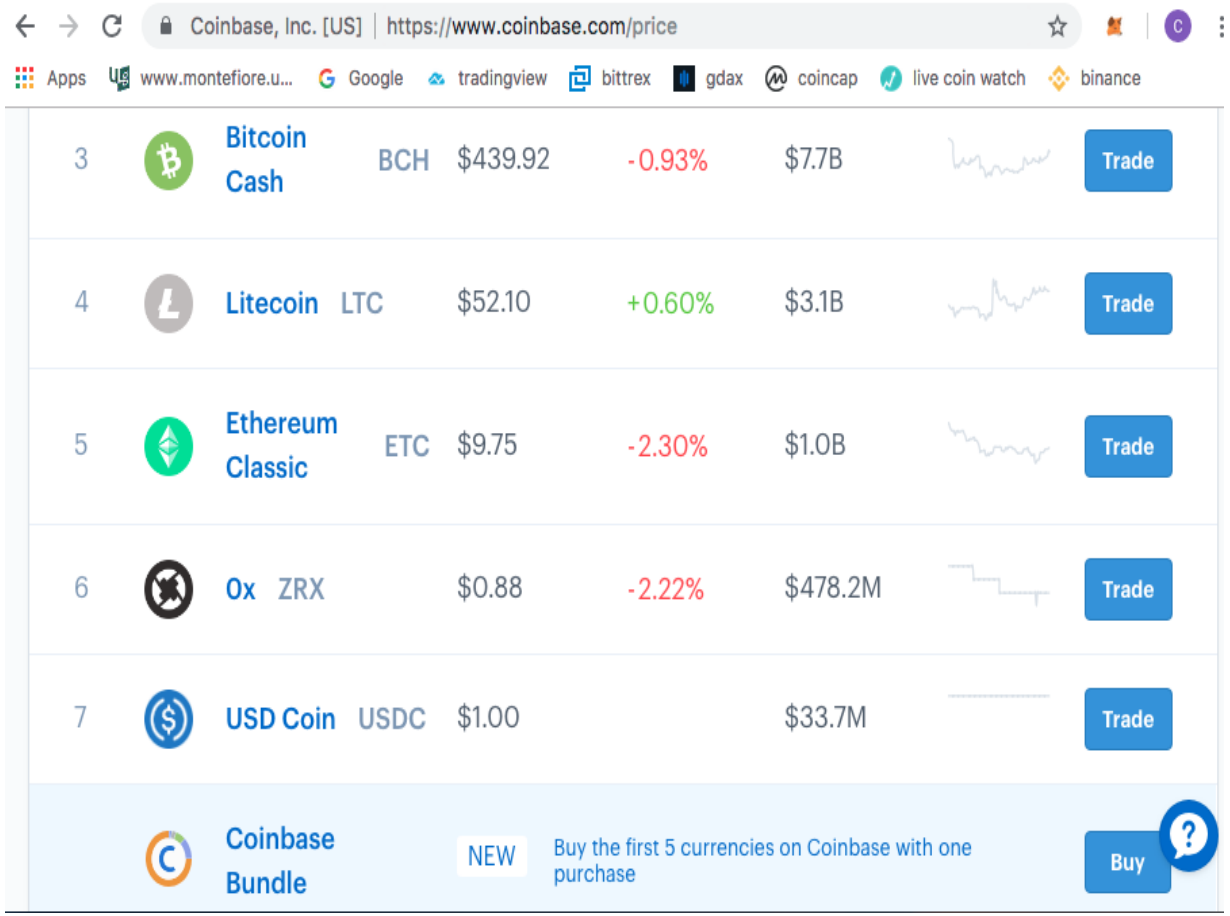
Google

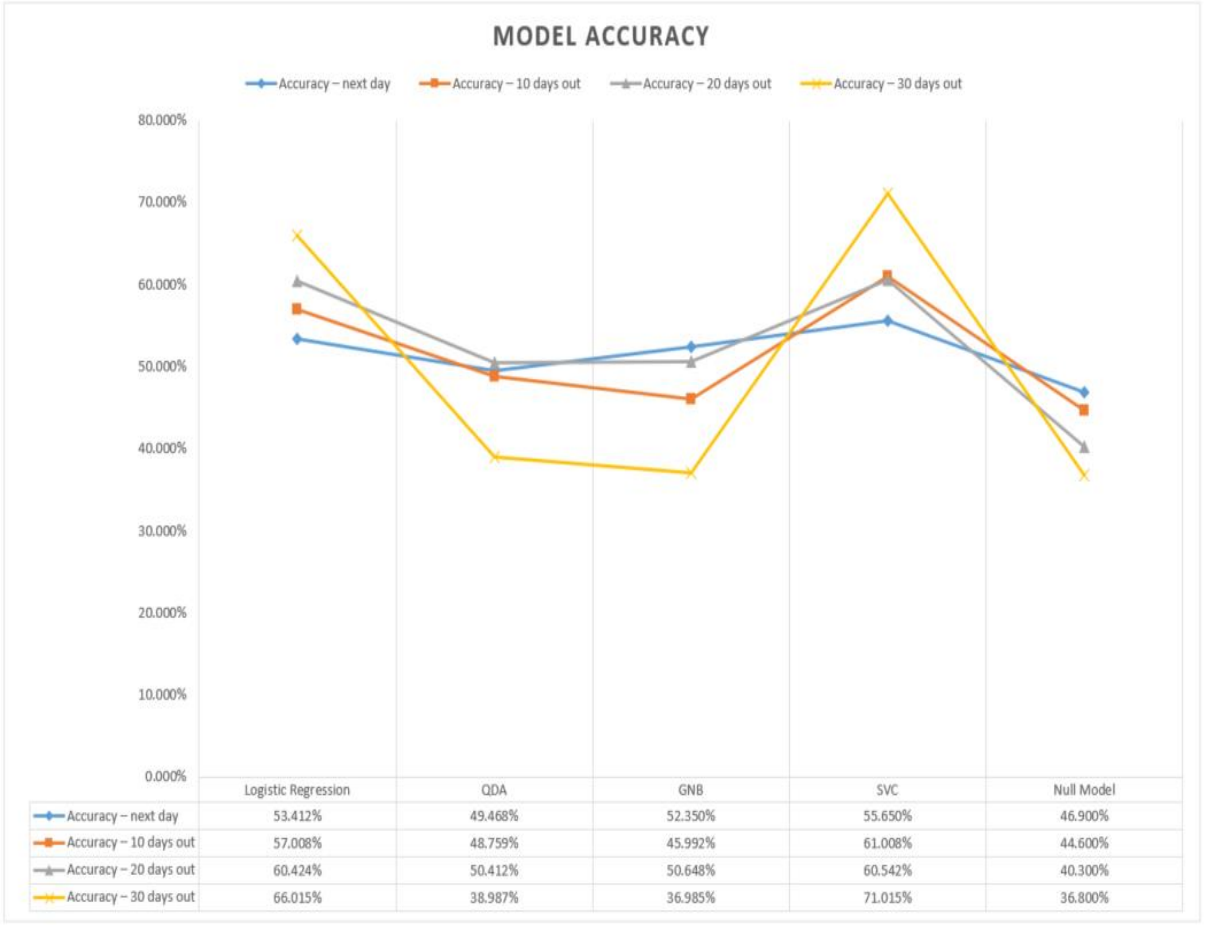
artificial int

artificial intelligence
artificial intelligence course
artificial intelligence meaning
artificial intelligence examples

Xử lý ngôn ngữ tự nhiên

Lĩnh vực tài chính





	Logistic Regression	QDA	GNB	SVC	Null Model
Accuracy – next day	53.412%	49.468%	52.350%	55.650%	46.900%
Accuracy – 10 days out	57.008%	48.759%	45.992%	61.008%	44.600%
Accuracy – 20 days out	60.424%	50.412%	50.648%	60.542%	40.300%
Accuracy – 30 days out	66.015%	38.987%	36.985%	71.015%	36.800%

Xử lý ngôn ngữ tự nhiên

Hệ thống dự đoán

Xử lý ngôn ngữ tự nhiên

Hệ thống dự đoán

amazon.com

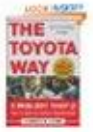
Help | Close window

Recommended for You

Inside Apple: How America's Most Admired--and Secretive--Company Really Works
Our Price: $9.99
Used & new from $9.99
See all buying options

Rate this item
I own it
Not interested

Because you purchased...



The Toyota Way : 14 Management Principles from the World's Greatest Manufacturer (Kindle Edition)

This was a gift
Don't use for recommendations

Frequently Bought Together

Price For All Three: $120.44

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Show availability and shipping details

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  Ian H. Witten Paperback $42.09
- Data Mining: Concepts and Techniques, Third Edition (The Morgan Kaufmann Series in Data Management Sy
- Mining the Social Web: Analyzing Data from Facebook, Twitter, LinkedIn, and Other Social Media Sites by Ma

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Recommender System

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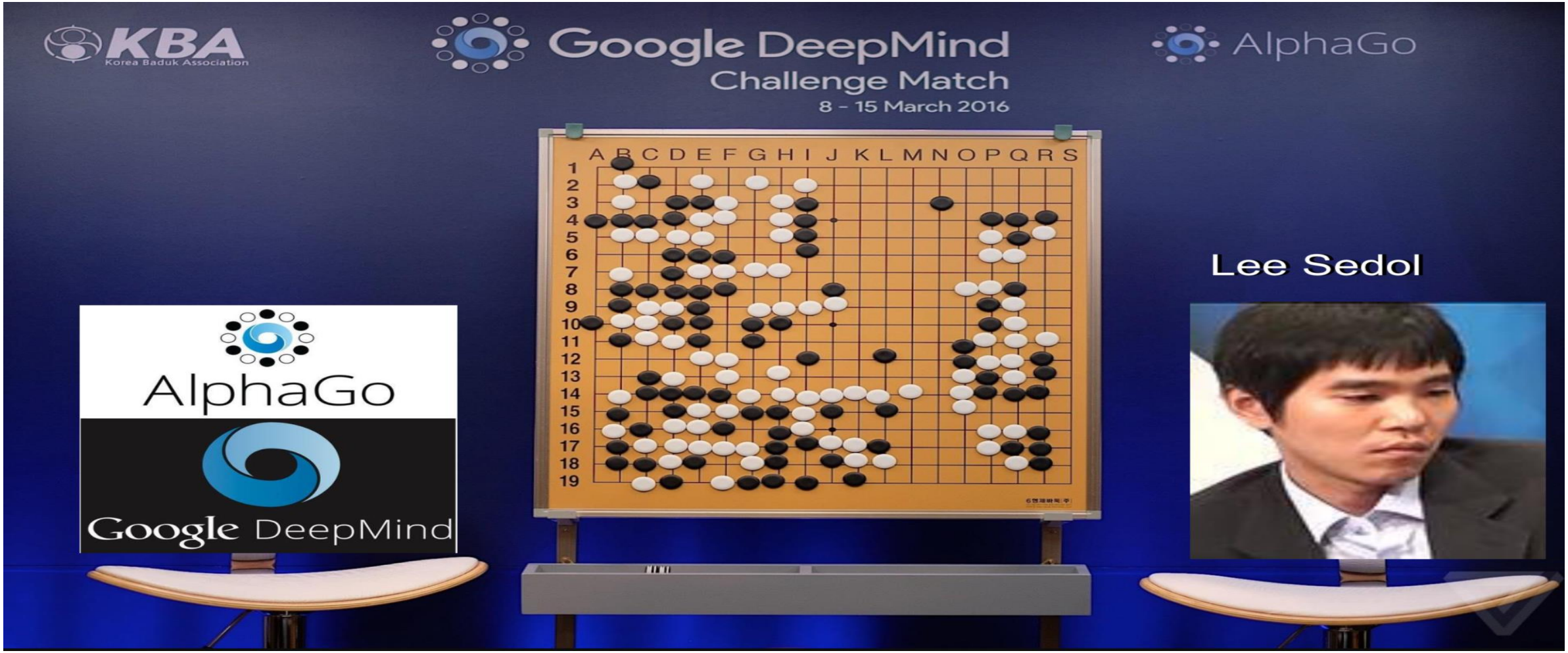
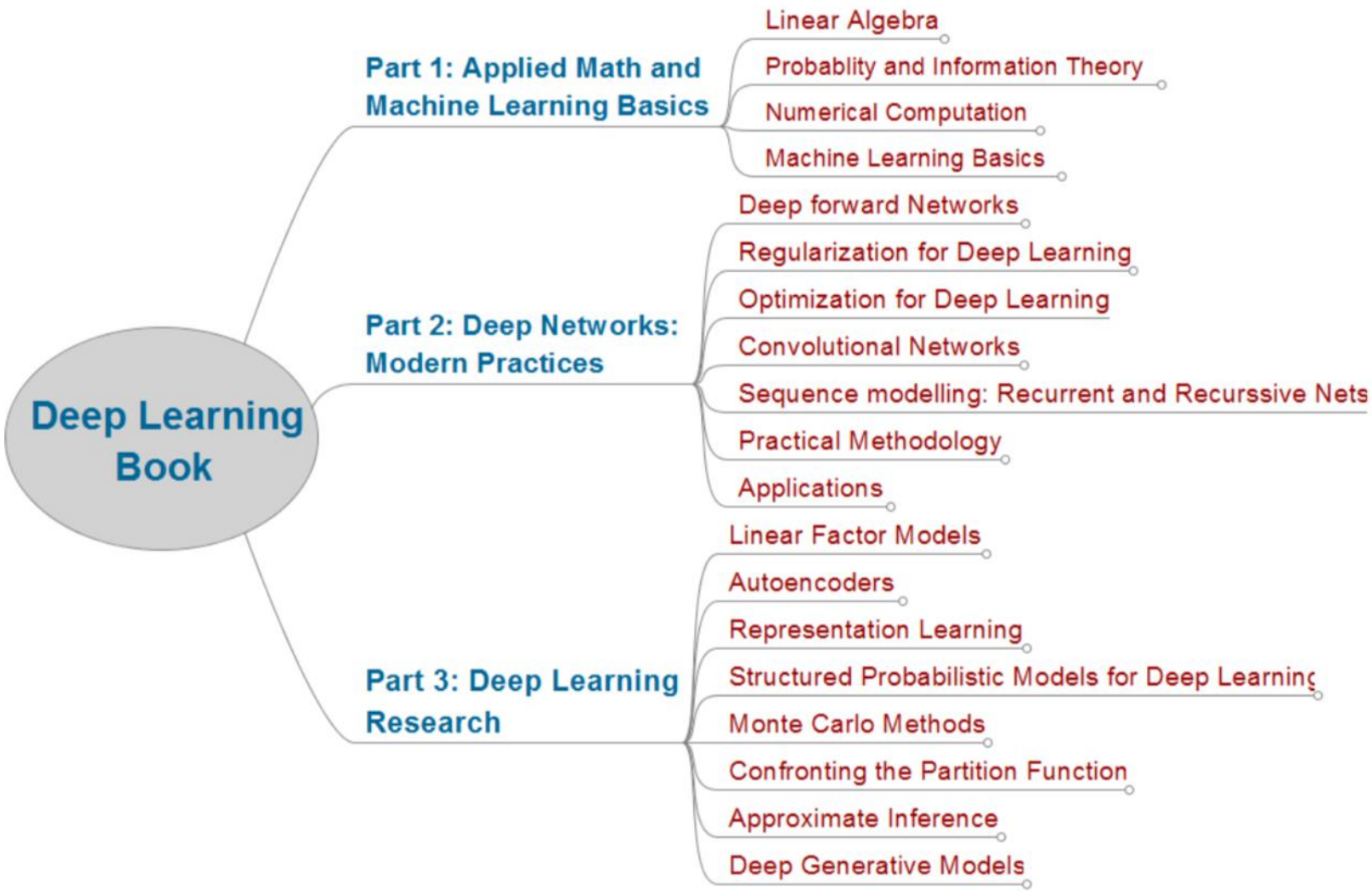
Học tăng cường



Bản chất vấn đề là gì???

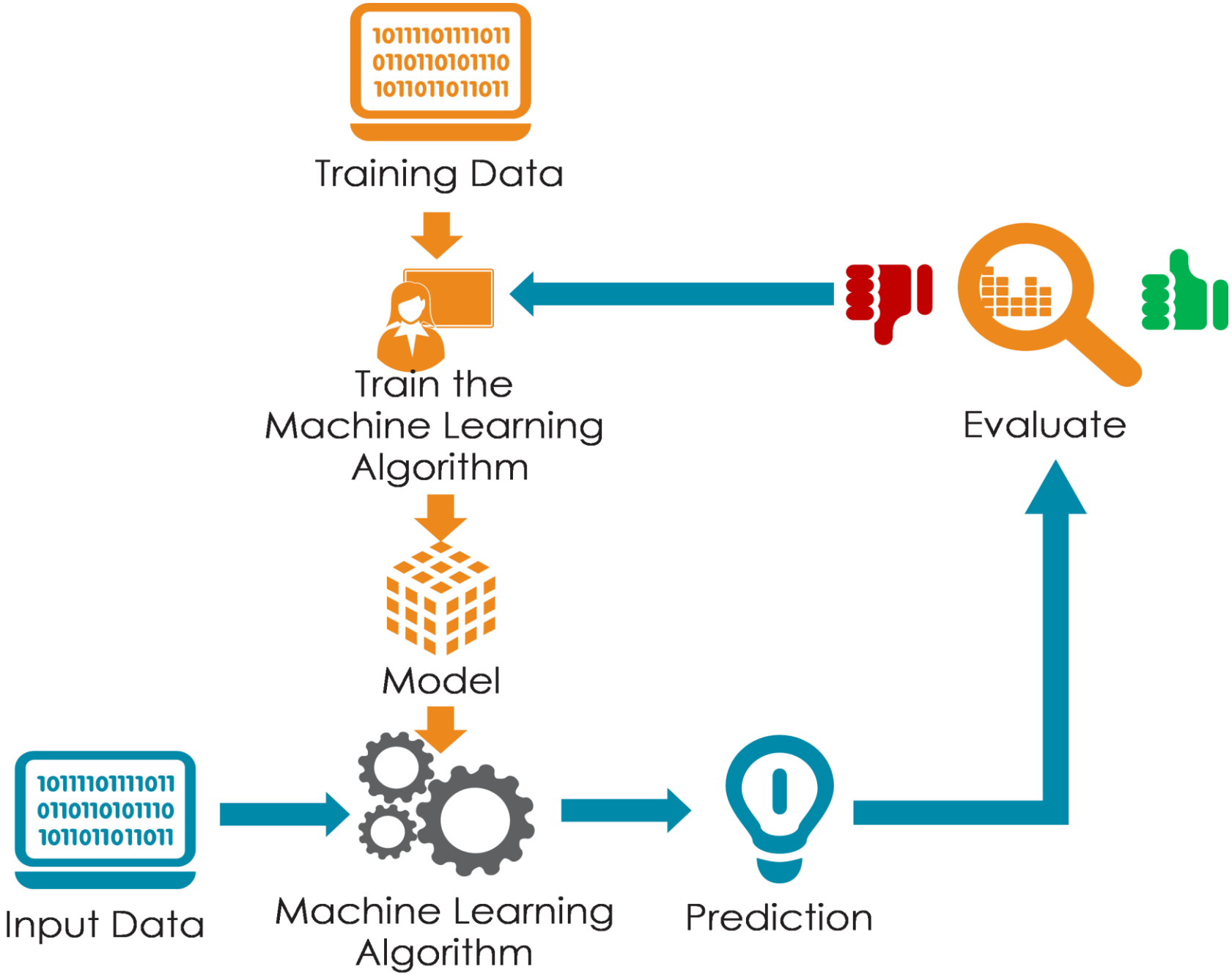
Từ heuristics đến ... **AUTOMATED LEARNING!**

Books


Deep Learning Book
Part 1: Applied Math and Machine Learning Basics
Linear Algebra
Probablity and Information Theory
Numerical Computation
Machine Learning Basics
Part 2: Deep Networks: Modern Practices
Deep forward Networks
Regularization for Deep Learning
Optimization for Deep Learning
Convolutional Networks
Sequence modelling: Recurrent and Recurssive Nets
Practical Methodology
Applications
Part 3: Deep Learning Research
Linear Factor Models
Autoencoders
Representation Learning
Structured Probabilistic Models for Deep Learning
Monte Carlo Methods
Confronting the Partition Function
Approximate Inference
Deep Generative Models

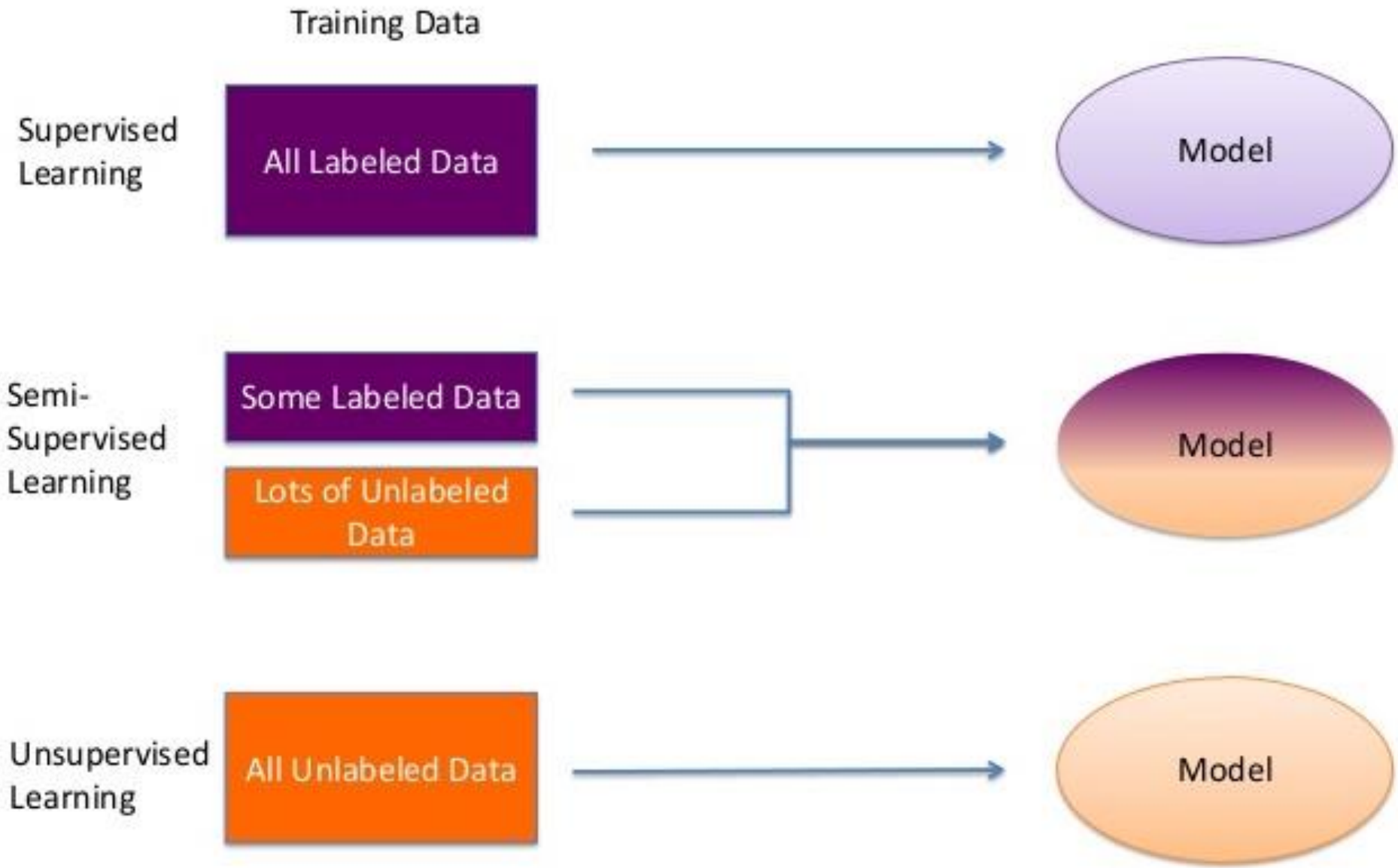
Steps

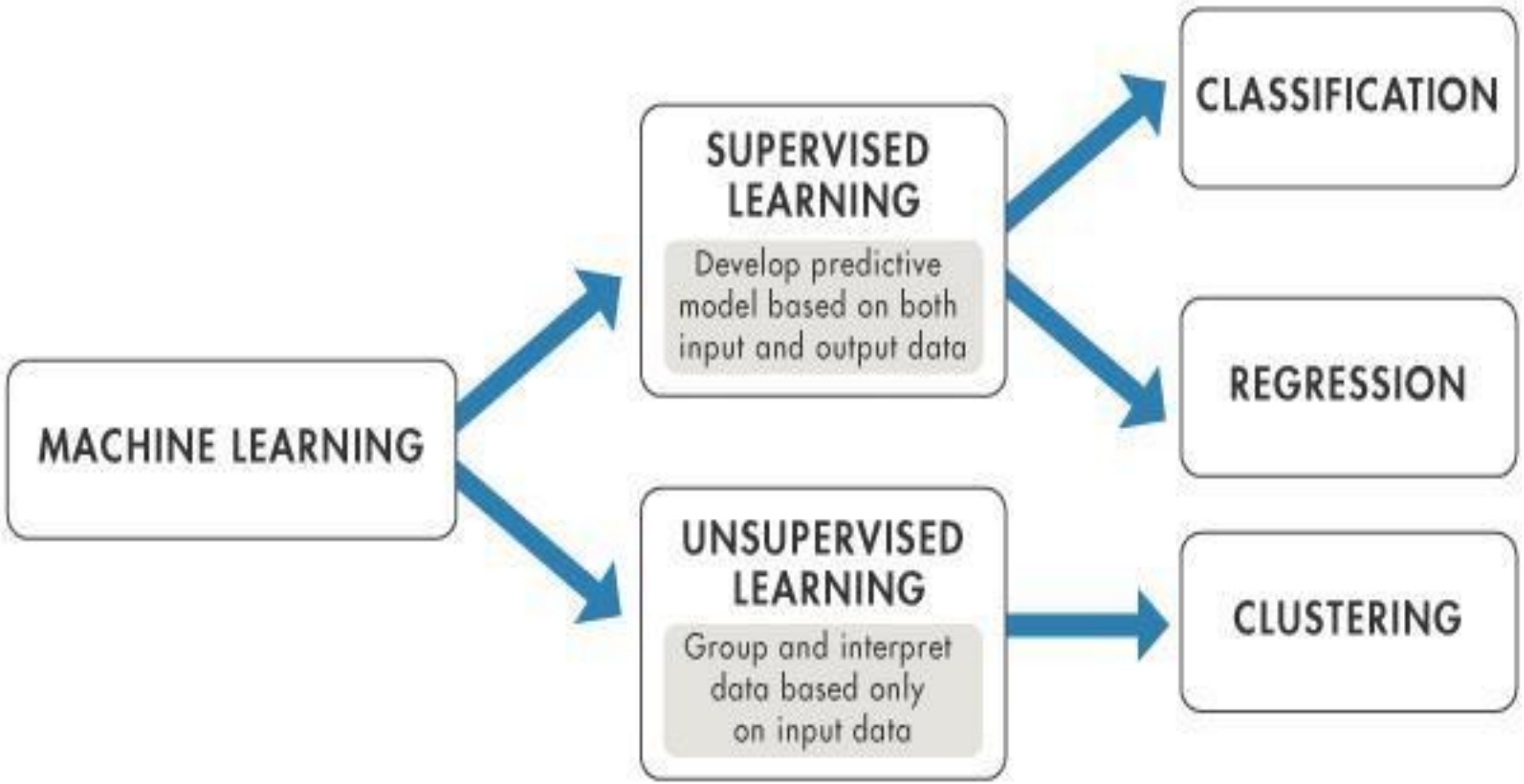
- Collect Data
- Data preprocessing
- Data mining
- Data modeling and prediction
- Data visualization


1011110111011
0110110101110
1011011011011
Training Data
Train the
Machine Learning
Algorithm
Evaluate
Model
1011110111011
0110110101110
1011011011011
Input Data
Machine Learning
Algorithm
Prediction

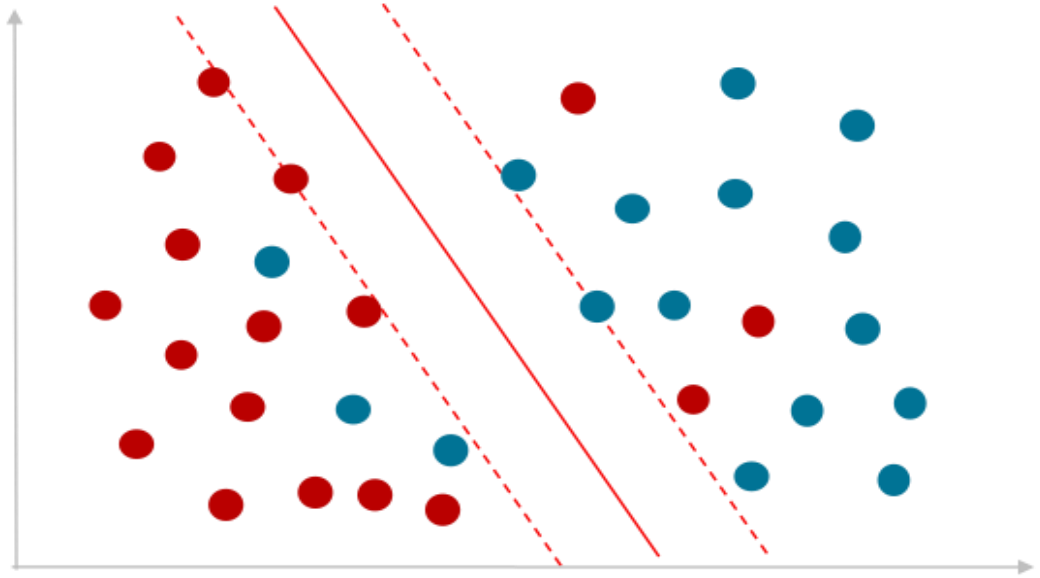
Phân loại máy học

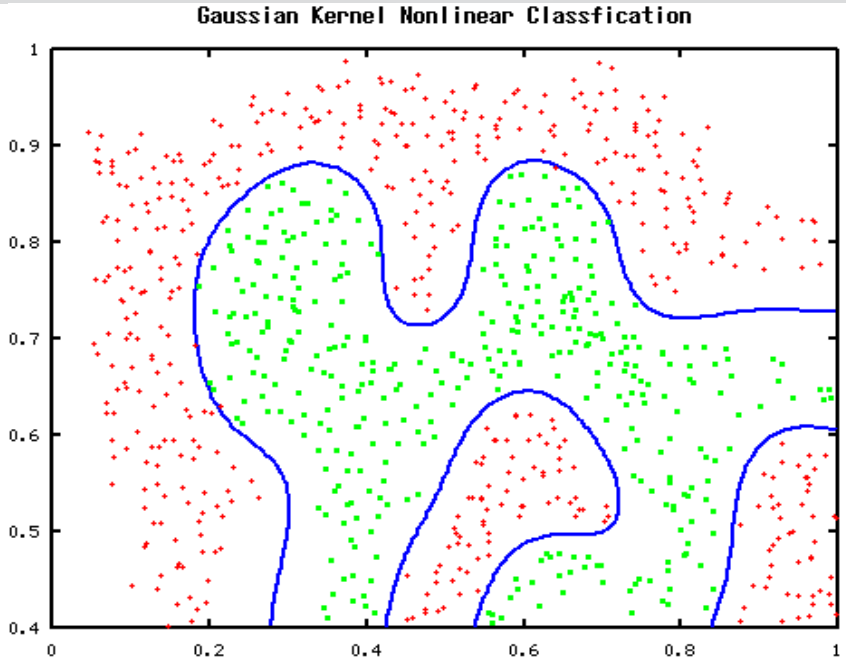
- Supervised Learning (Học có giám sát)
- Unsupervised Learning (Học không giám sát)
- Semi-Supervised Learning (Học bán giám sát)
- Reinforcement Learning (Học củng cố)

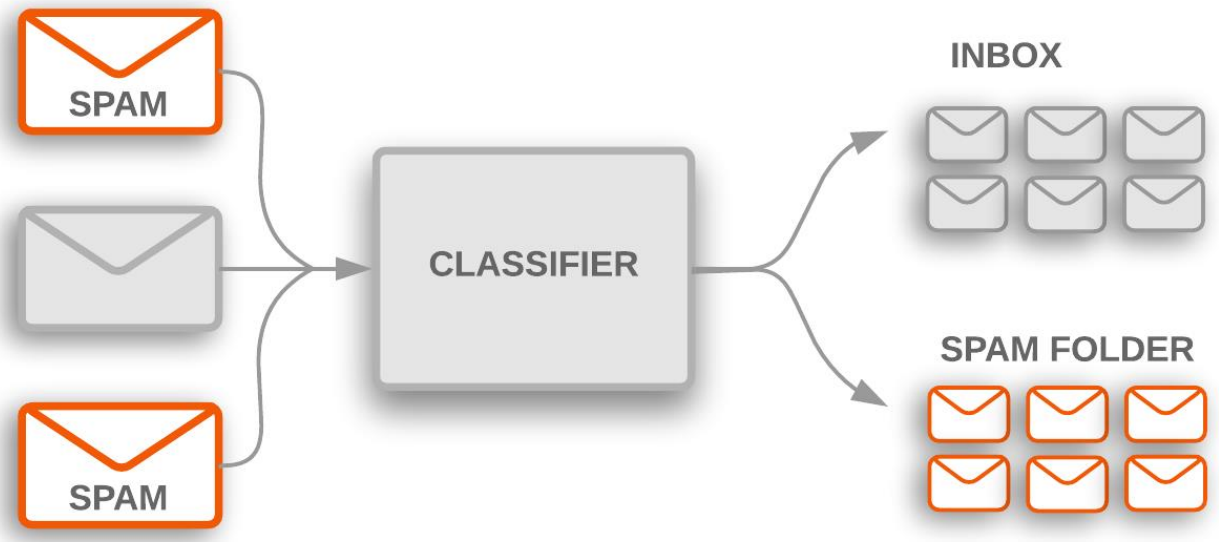

Training Data
Supervised Learning
All Labeled Data
Model
Semi-Supervised Learning
Some Labeled Data
Lots of Unlabeled Data
Model
Unsupervised Learning
All Unlabeled Data
Model


MACHINE LEARNING
SUPERVISED LEARNING
Develop predictive model based on both input and output data
UNSUPERVISED LEARNING
Group and interpret data based only on input data
CLASSIFICATION
REGRESSION
CLUSTERING

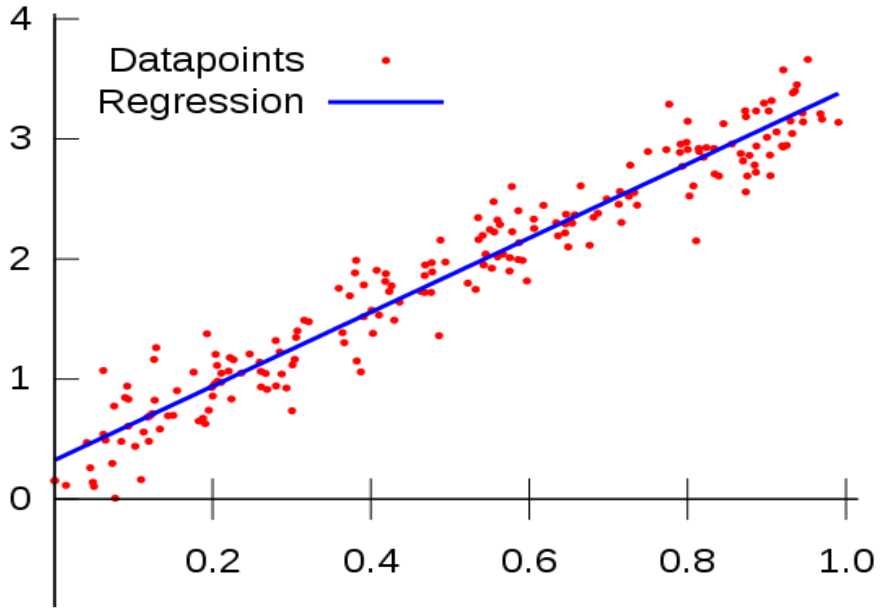
Classification in machine learning

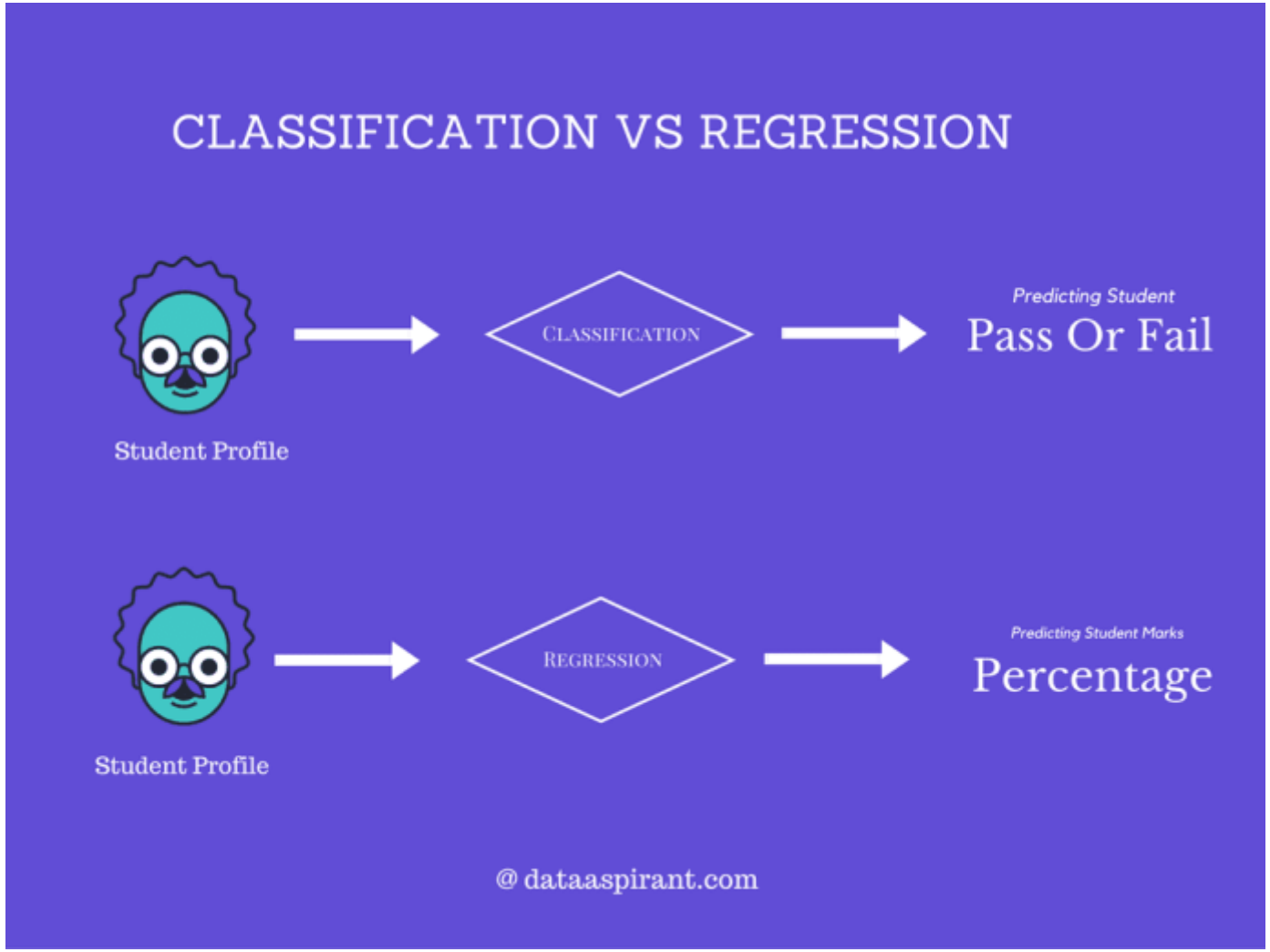




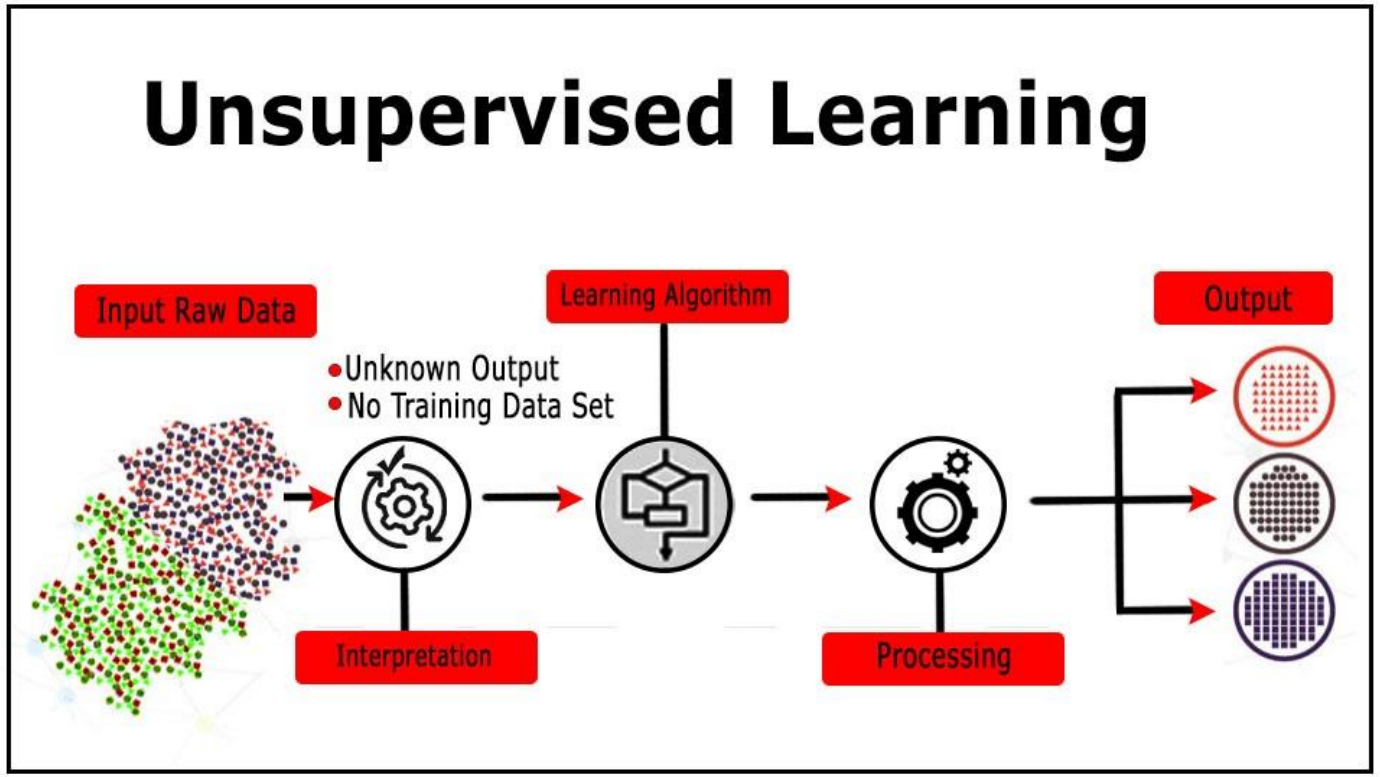


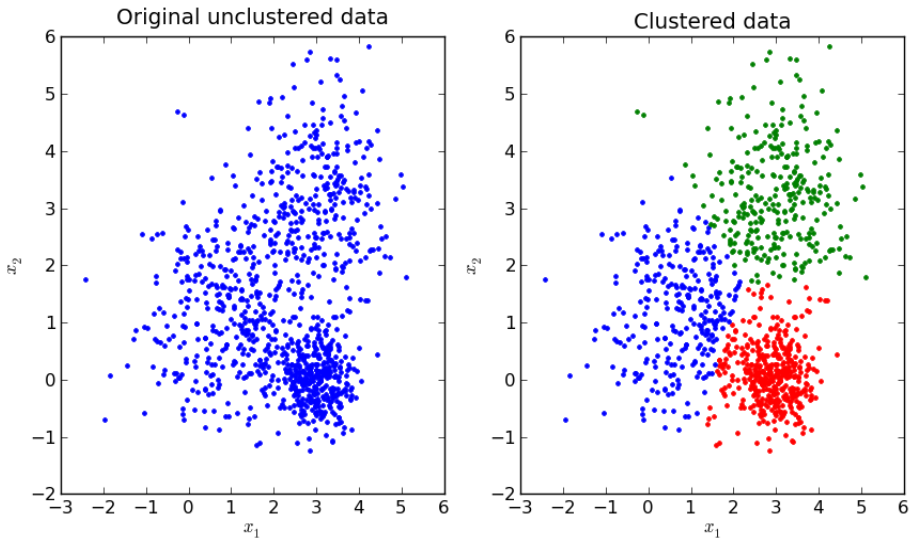
Regression in machine learning

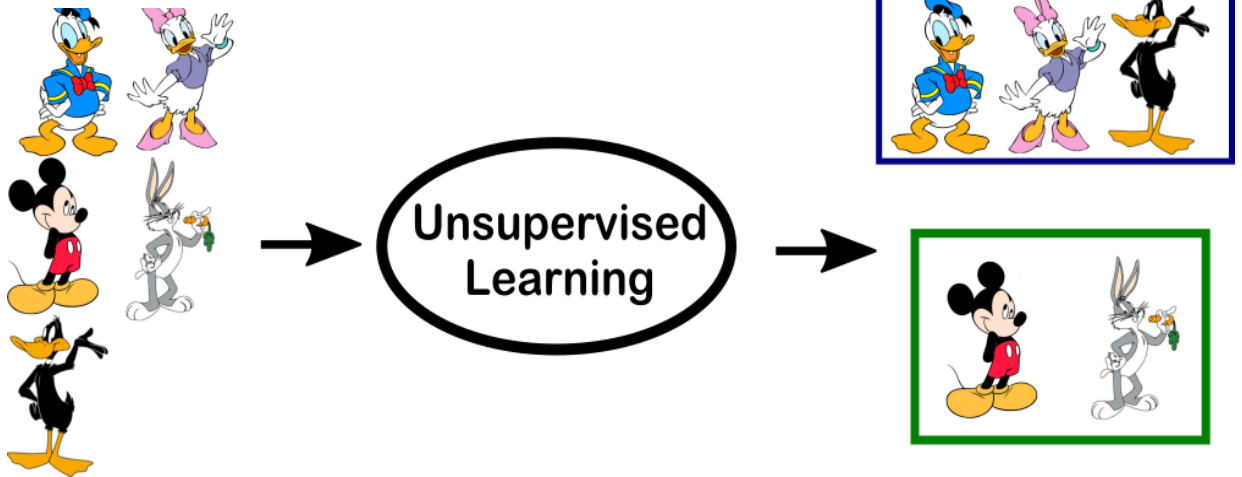




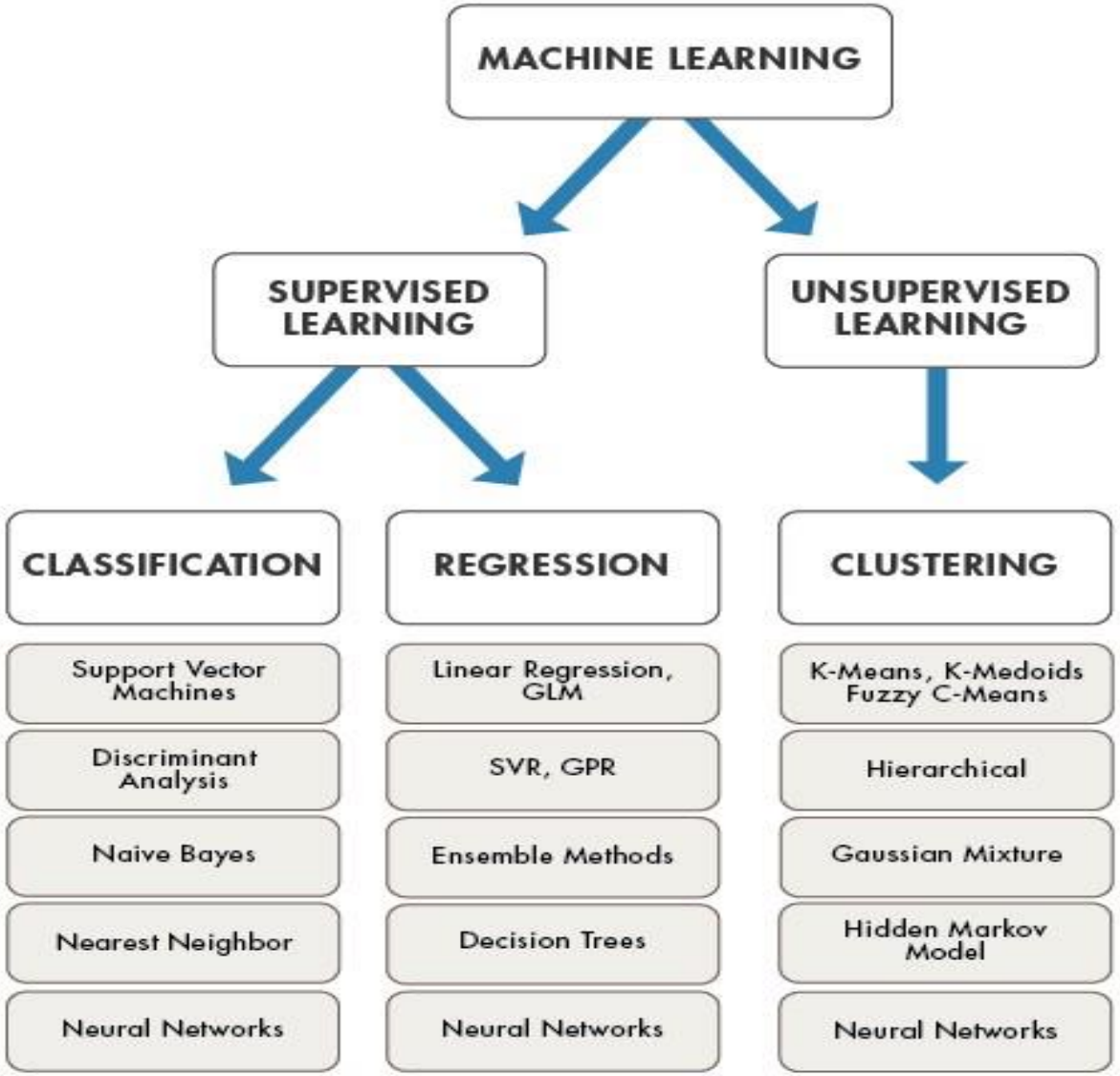
Unsupervised learning





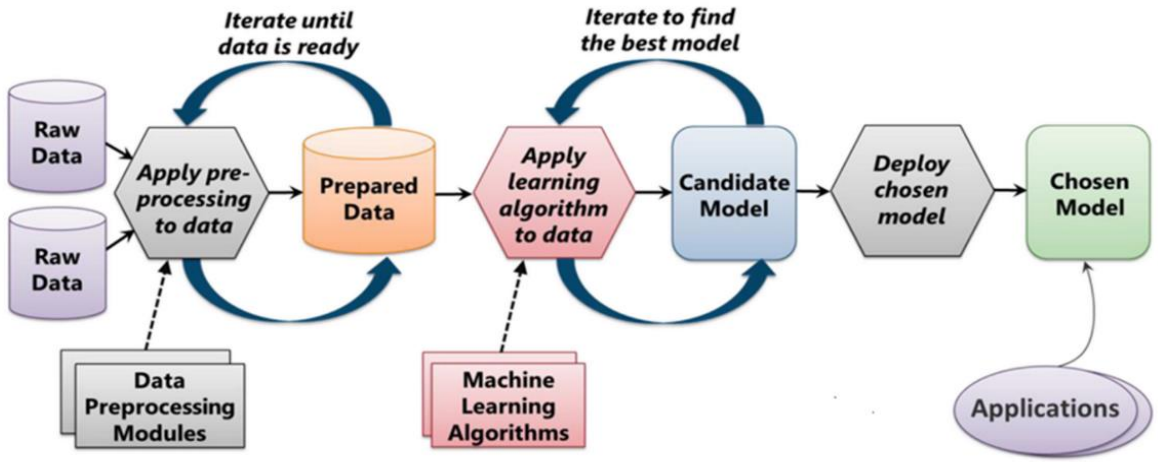


Machine Learning Algorithms

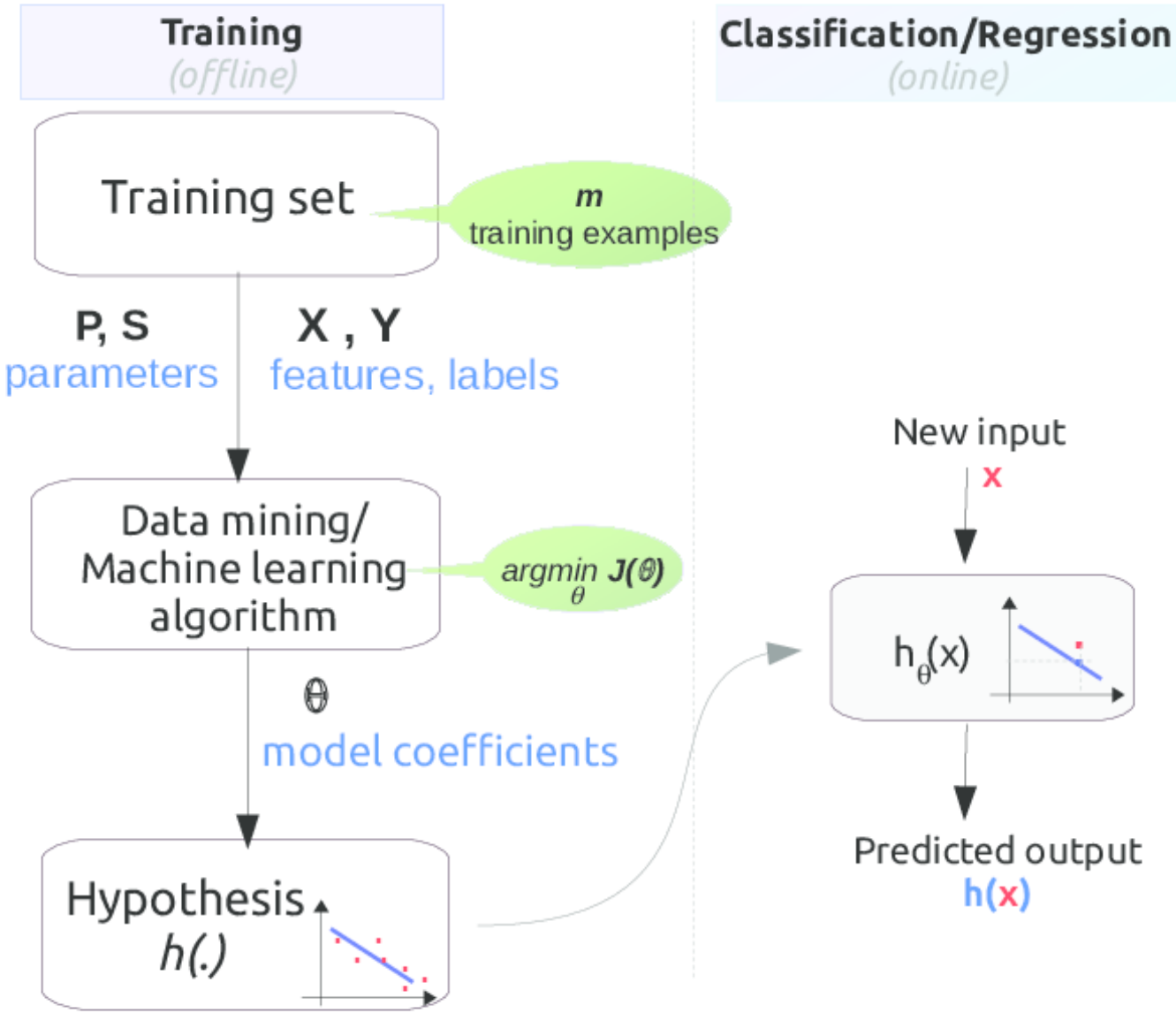


Machine Learning Algorithms

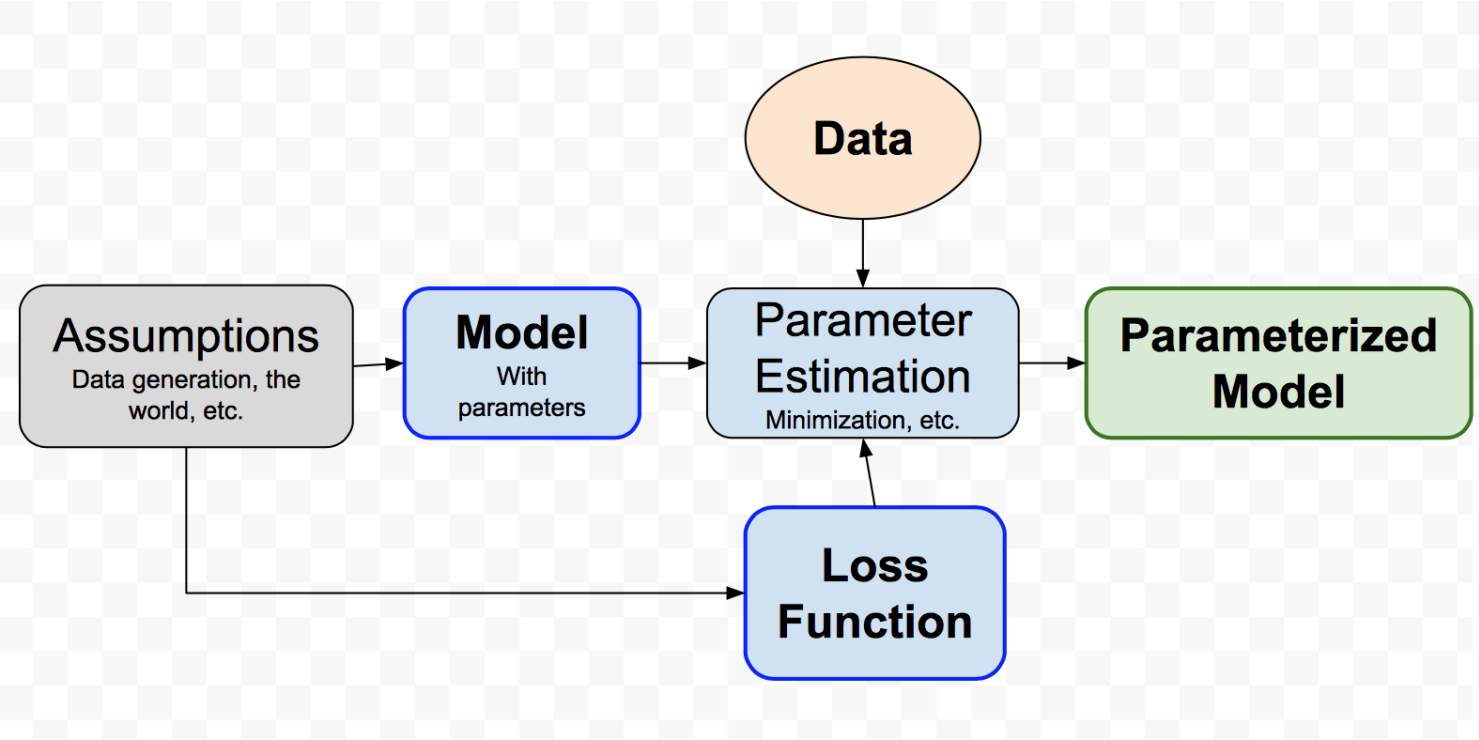
The Machine Learning Process

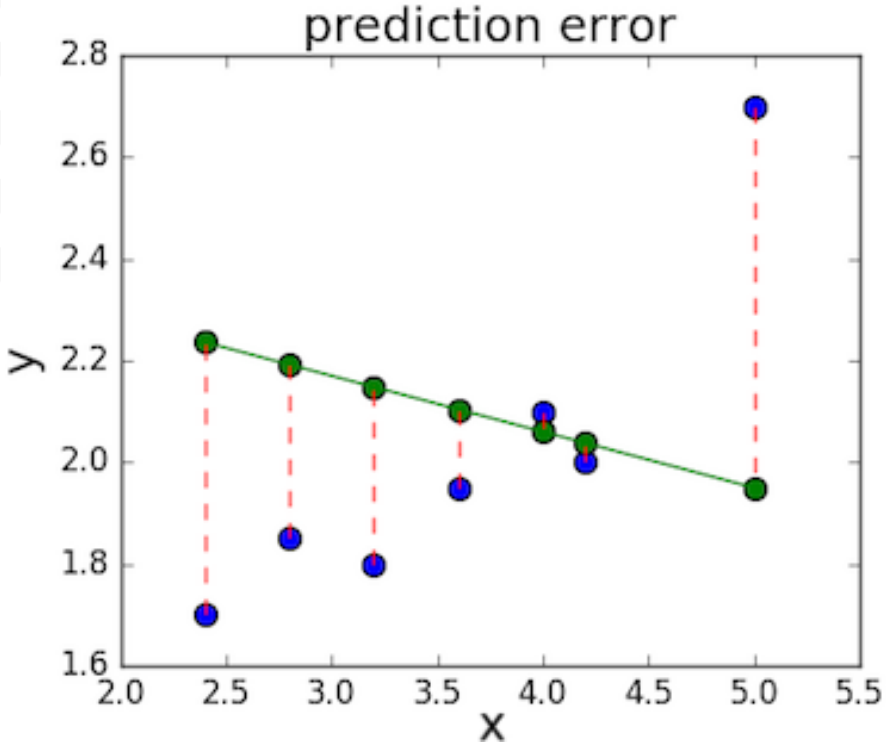


From "Introduction to Microsoft Azure" by David Chappell

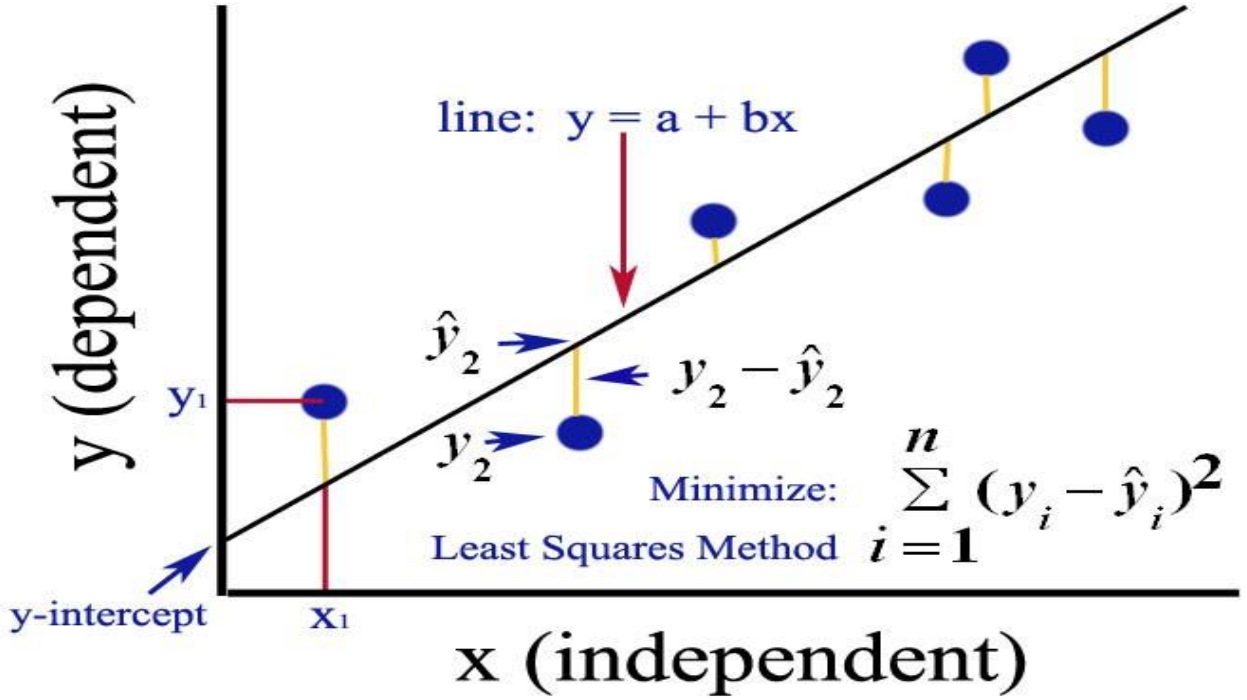

Training
(offline)
Classification/Regression
(online)
Training set
m
training examples
P, S
parameters
X , Y
features, labels
Data mining/
Machine learning
algorithm
argmin J(θ)
θ
θ
model coefficients
Hypothesis
h(.)
New input
x
hθ(x)
Predicted output
h(x)

Loss function



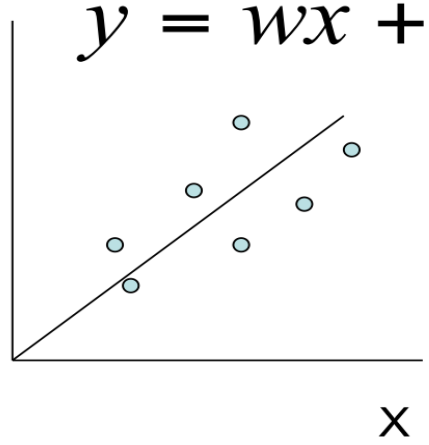


Loss function



$$\mathrm{MSE} = \frac{1}{n}\sum_{i=1}^{n}(Y_i - \hat{Y}_i)^2.$$

$$y = wx + \varepsilon$$



- Our goal is to estimate *w* from a training data of $<x_i, y_i>$ pairs
- Optimization goal: minimize squared error (least squares):

$$\arg\min_w \sum_i (y_i - wx_i)^2$$

Linear Regression - Types of Loss Functions

Least Squares Estimation

» loss function is sum of squared residuals = sum of squared prediction errors

Maximum Likelihood

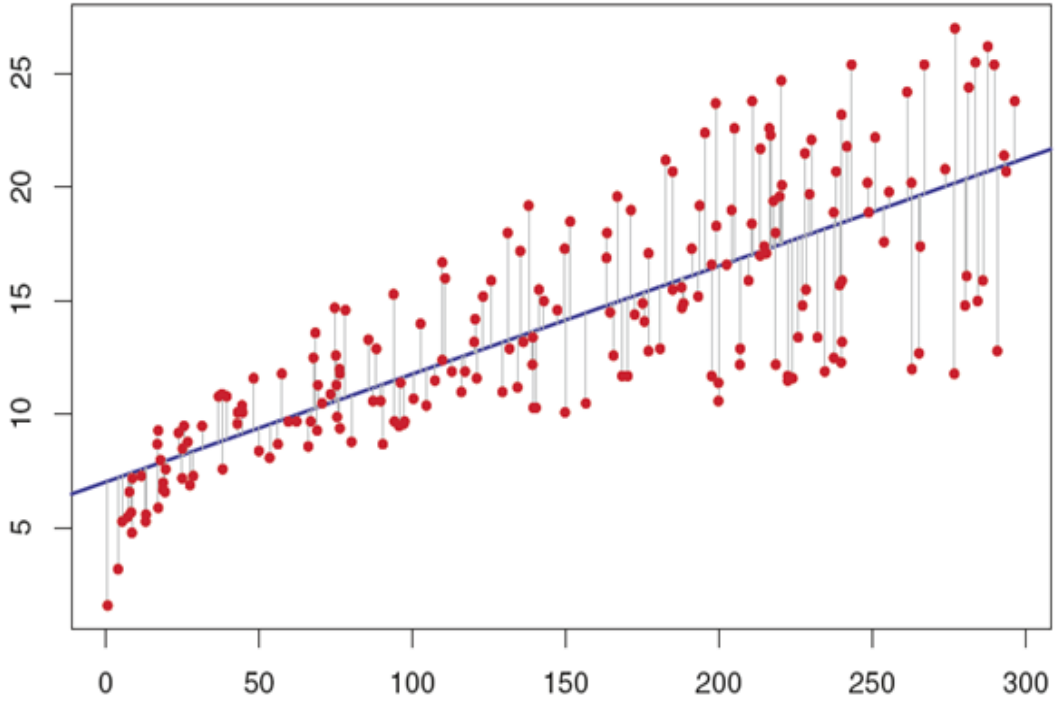
» loss function is likelihood function, which in the linear regression case is equivalent to the sum of squared prediction errors

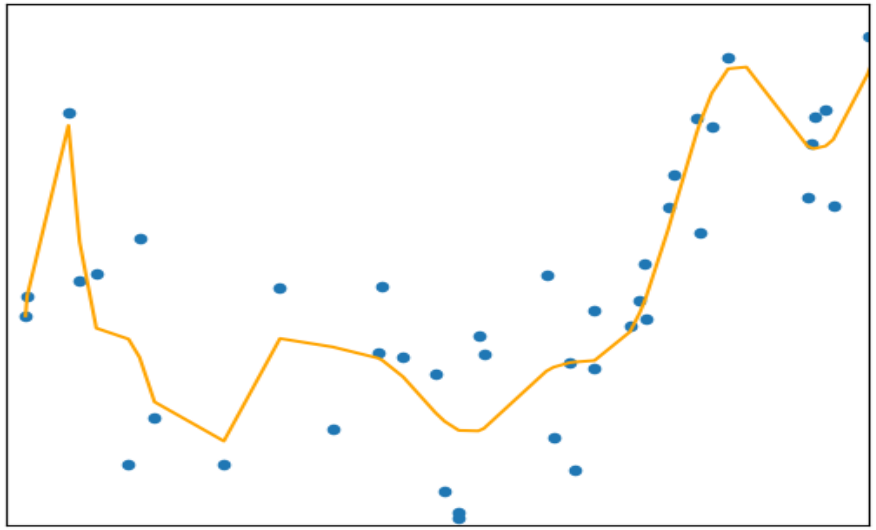
Prediction Error = observation - predicted value

$$y_i - \hat{y}_i = y_i - \{\beta_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + \cdots + \beta_p x_{pi}\}$$

Type of loss function

Mean squared error	$\mathrm{MSE} = \frac{1}{n}\sum_{t=1}^{n} e_t^2$
Root mean squared error	$\mathrm{RMSE} = \sqrt{\frac{1}{n}\sum_{t=1}^{n} e_t^2}$
Mean absolute error	$\mathrm{MAE} = \frac{1}{n}\sum_{t=1}^{n} \lvert e_t \rvert$
Mean absolute percentage error	$\mathrm{MAPE} = \frac{100\%}{n}\sum_{t=1}^{n} \left\lvert \frac{e_t}{y_t} \right\rvert$





Overfitting and underfitting