Objectives of the course

* basic concepts of AI.
* different methods for function approximation.
* select the right learning scheme.
* difference between shallow and deep learning.
* verify the learning capability.
* how to run and evaluate experiments.
* how to write a scientific paper

Lecture topics

1). Encoding/embedding: Data compression
PCA
t-SNE
Fisher vector
K-Fold cross validation

2). Classification / Clustering: K-means
FCM
SVM
Self organizing maps

3) Learning : Perceptron
Backpropagation
CNN
Auto Encoders

4) Reinforcement Learning

5) Uncertain vs Vague : Probability
Fuzzy Logic
Decision Tree
Random Forest

Why interest in AI ?

- Recent progress in algorithms
- Availability of data
- Computational power

History of AI

1901 - PCA (K Pearson)
1933 - PCA development (H. Hotelling)
1958 - Perceptron (F. Rosenblatt)
1965 - Fuzzy sets (L. Zadeh)
1969 - Limitations of Perceptron (Minsky)

1982 - Self organizing Maps (T. Kohenen)

Perceptron - Smallest artificial neural network that can learn linear problems.

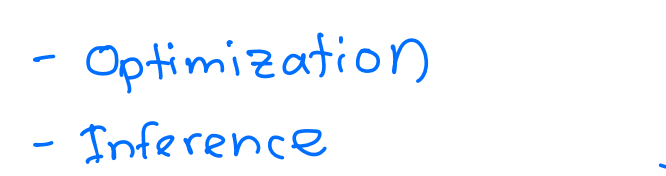
1986 - Backpropegation (Rumelhart / Hinton)
1986 - ID3 algorithm (J. D Quinlan)
1993 - C45 algorithm (" " ")
1995 - SVM (Cortes / Vapnik)
1995/2001 - Random Forest (T.K Ho / L. Breiman)
1995 - CNN (LeCun / Bengio)
2006 - Fast learning for deep belief Nets (Hinton el al)
2007 - Greedy layerwise training for deep nets (Bengio el al)
2012 - Alexnet

Main Tasks for AI

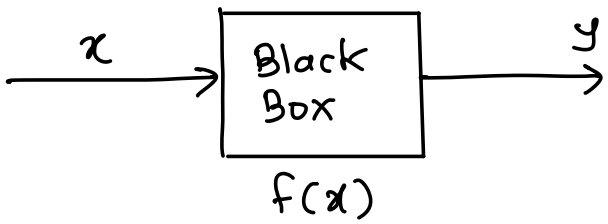
- Classification
- Estimation / prediction
- Search

} Approximation

- Optimization
- Inference



Approximation



$y = f(x)$

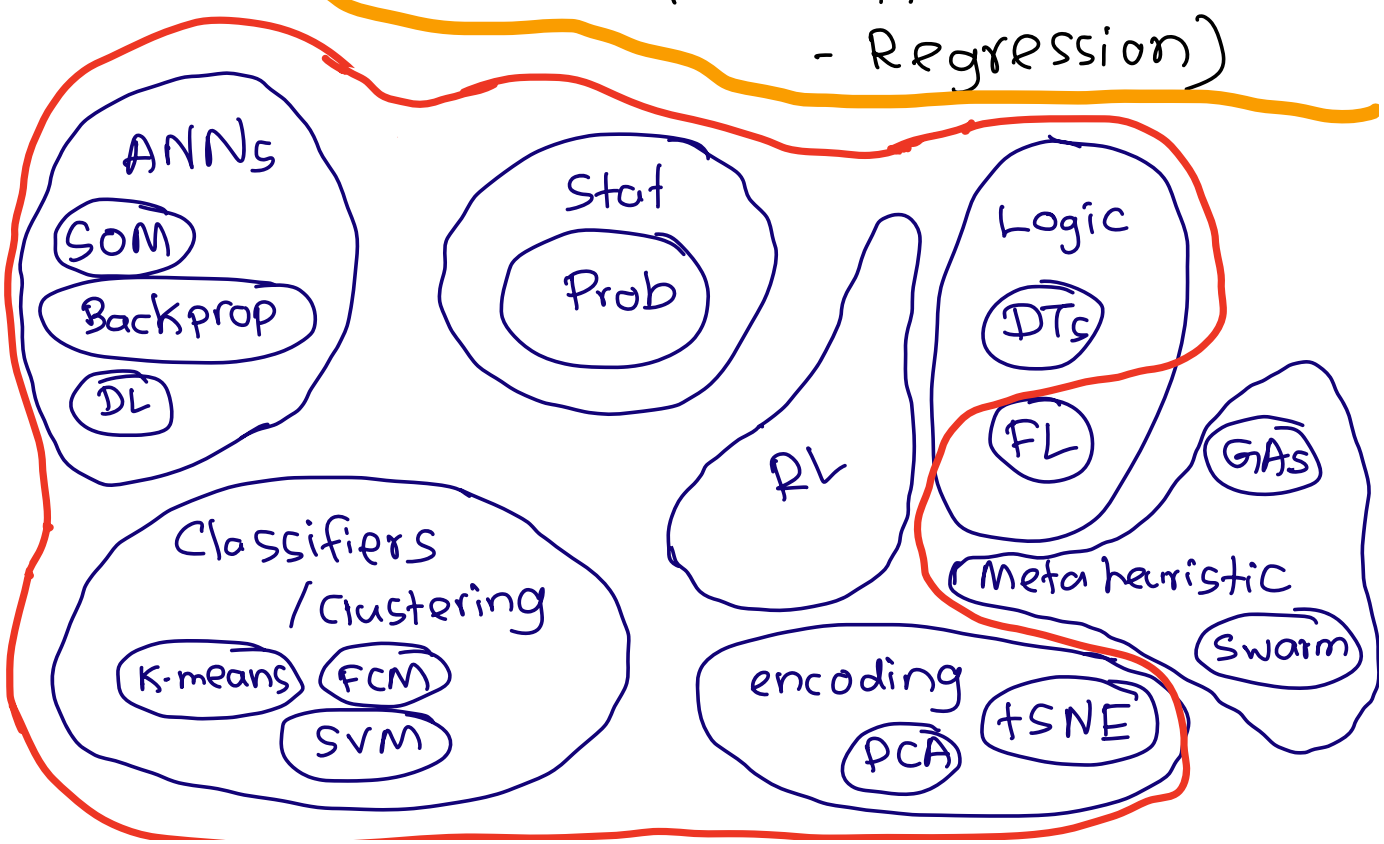
$f : x \longrightarrow y$

(f) is unknown

↓

AI tries to infer f

(simplest approach - Regression)



Machine Learning

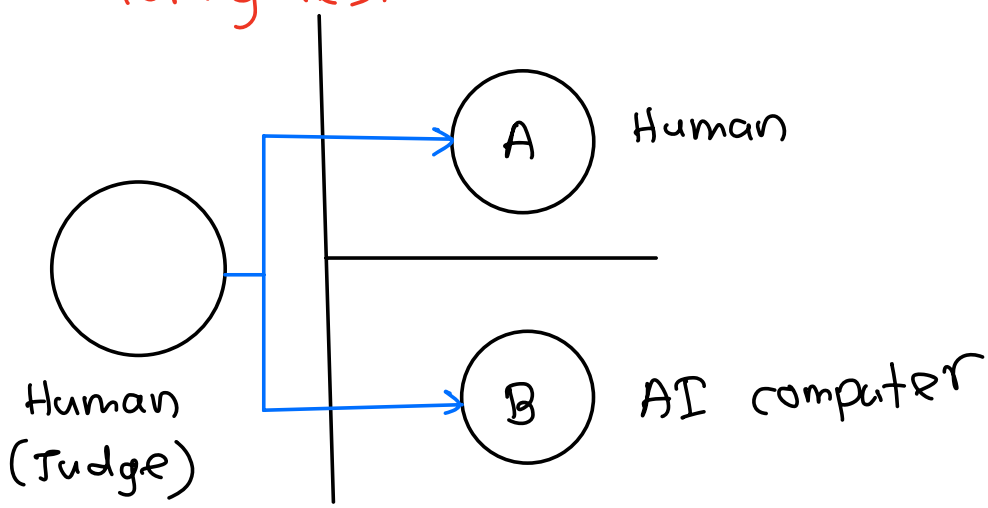
AI = MI

What is intelligence ?

	Humans	Machines
thought	reason (logical thinking)	rational decision
action	act	rational act

Can we measure intelligence ?

Turing Test



Judge ask questions and A, B provide answers, send unlabled answers to Judge.

$MIQ \sim t_{guss}$ how stupid is B