Învățare Automată în Arta Vizuală

Curs 1: Introducere

Logistică

Structură curs:

- 8 cursuri x 1-1.5h
- 8 laboratoare x 1.5-2h (4 pct.)
  - deadline laboratoare - 1 săptămână
- Proiect - 2 prezentări (6 pct.):
  - săptămâna 5 - prezentare temă proiect + SOTA + prezentare abordare aleasă
  - săptămâna 10 - prezentare finală + demo

Tehnologii: Python + TensorFlow (slim) + Google Colaboratory

Logistică

Cuprins curs

1. Introducere
2. Clasificarea imaginilor. Optimizare
3. Introducere în Rețele Neurale Convoluționale
4. Rețele Neurale Convoluționale I
5. Rețele Neurale Convoluționale II
6. Detecție. Segmentare
7. Învățare nesupervizată. Rețele Generative
8. Transferul stilului artistic

Echipă

Alex Ghiuță

Vlad Păunescu

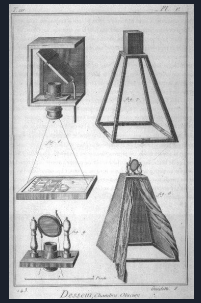
Radu Tudor

Gabriel Andrei

Andrei Jancă

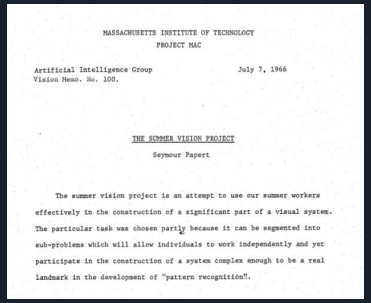

Fizică
Biologie
Inginerie
Vederea Artificială
Psihologie
Matematică
Informatică

Istoria Vederii (Artificiale)



Camera Obscura

Sec. 16



MASSACHUSETTS INSTITUTE OF TECHNOLOGY
PROJECT MAC

Artificial Intelligence Group
Vision Memo. No. 100.

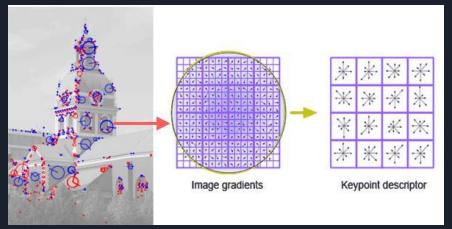
July 7, 1966

THE SUMMER VISION PROJECT

Seymour Papert

The summer vision project is an attempt to use our summer workers effectively in the construction of a significant part of a visual system. The particular task was chosen partly because it can be segmented into sub-problems which will allow individuals to work independently and yet participate in the construction of a system complex enough to be a real landmark in the development of "pattern recognition".

1966

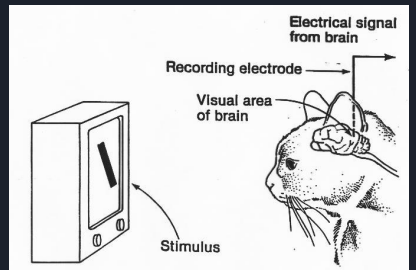


SIFT, David Lowe

1999

1959

Hubel & Wiesel



1997

Normalized cut, Shi & Malik

2001

Face Detection, Viola & Jones

Rețele Neurale - Mit sau Realitate?

I have worked all my life in Machine Learning, and I've never seen one algorithm knock over benchmarks like Deep Learning.
- Andrew Ng (Stanford, Baidu)

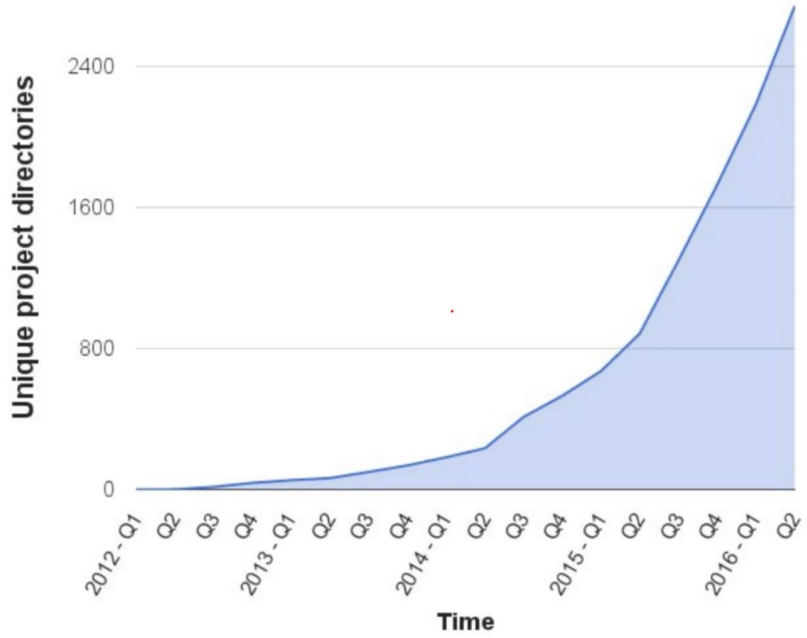
Deep Learning is an algorithm which has no theoretical limitations of what it can learn; the more data you give and the more computational time you provide, the better it is.
- Geoffrey Hinton (University of Toronto, Google)

For a very long time it will be a complementary tool that human scientists and human experts can use to help them with the things that humans are not naturally good.
- Demis Hassabis (DeepMind)

Rețele Neurale - Mit sau Realitate?

Growing Use of Deep Learning at Google

of directories containing model description files



Across many products/areas:

Android
Apps
drug discovery
Gmail
Image understanding
Maps
Natural language understanding
Photos
Robotics research
Speech
Translation
YouTube
… many others ...

Învățarea Automată - Concepte de Bază

Machine Learning is a field of computer science (part of Artificial Intelligence) that gives computers the ability to learn without being explicitly programmed.

- Arthur Samuel

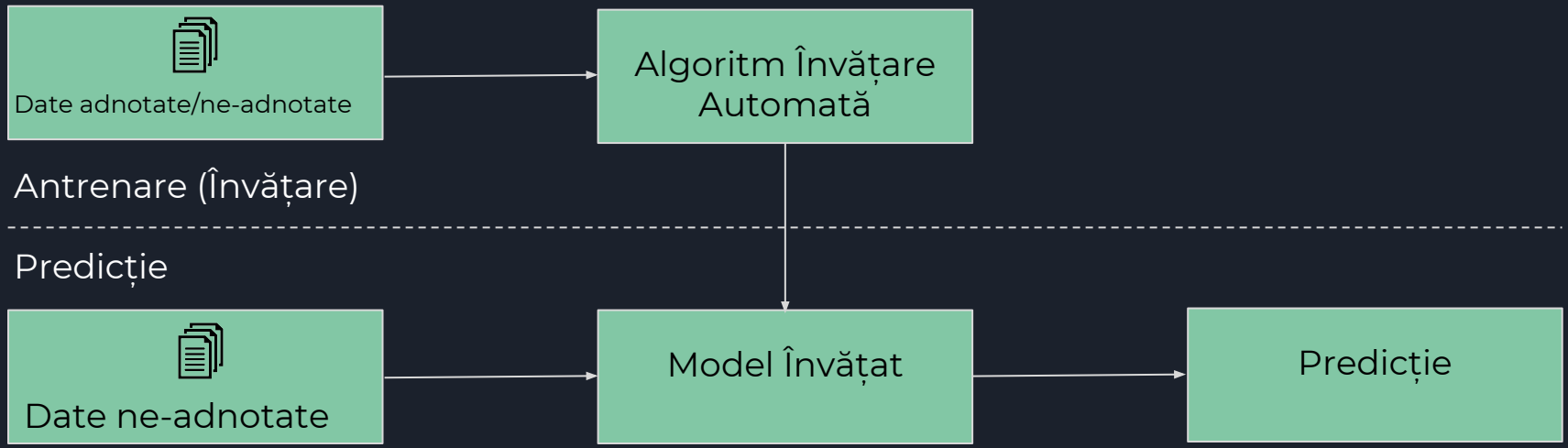
A computer program is said to learn from experience E with respect to some task T and some performance measure P, if its performance on T, as measured by P, improves with experience E.

- Tom Mitchell

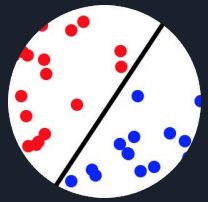
Învățarea Automată - Concepte de Bază

sursă foto: http://karpathy.github.io/2012/10/22/state-of-computer-vision/

Învățarea Automată - Concepte de Bază



Învățarea Automată - Concepte de Bază

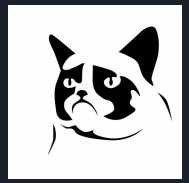


Învățare supervizată (Supervised Learning): Învățare dintr-un set de date adnotate
Exemplu: detector de spam din email-uri deja adnotate

Învățare nesupervizată (Unsupervised Learning): Descoperirea tiparelor în date neadnotate
Exemplu: segmentarea imaginilor bazată pe culoare

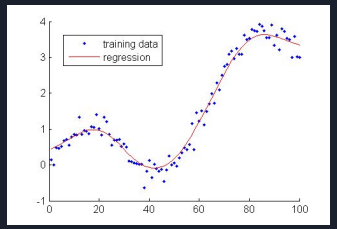
Învățare prin Recompensă (Reinforcement Learning):
Exemplu: învață să joace Tetris

Învățarea Automată - Concepte de Bază

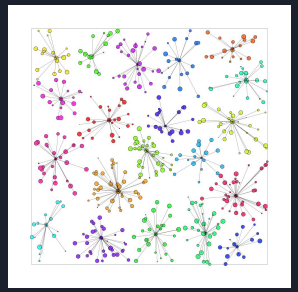


pisică 0.8
câine 0.1
...

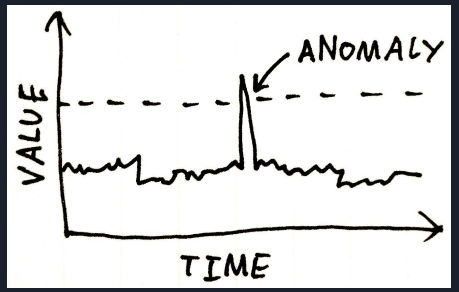
Clasificare
(Supervizată - predictivă)



Regresie
(Supervizată - predictivă)

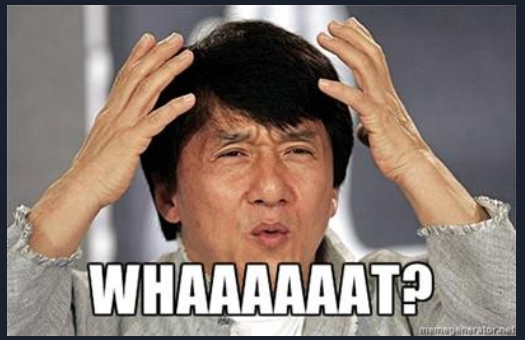


Grupare (Clustering)
(Nesupervizată - descriptivă)



Detecția anomaliilor
(Nesupervizată - descriptivă)

De ce Rețele Neurale? De ce acum?



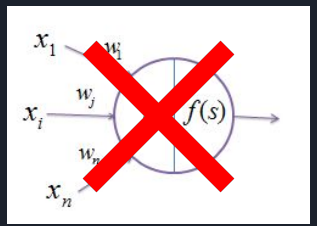
Istoria Rețelelor Neurale

Perceptron

1958

1969

Perceptronul este criticat

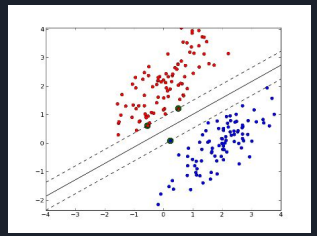


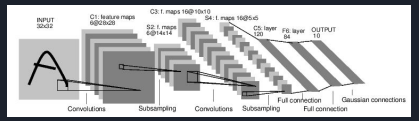
Algoritmul de Propagare Înapoi (Backpropagation)

1974

1995

Dominația SVM





CNN pentru Recunoașterea Scrisului de mână

1998

2006

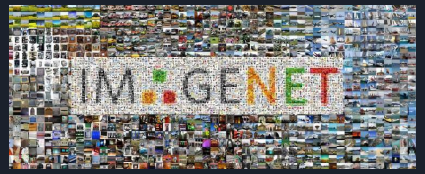
Restricted Boltzmann Machine

AlexNet câștigă ImageNet

2012

De ce acum?

Seturi Mari de Date
(Digitalizare)



COCO
Common Objects in Context

Putere de Calcul
(Legea lui Moore, GPU)

NVIDIA

Contribuitori Importanți
(Progresul Algoritmilor)