

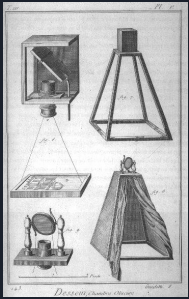


Învățare Automată în Arta Vizuală

Curs 1: Introducere



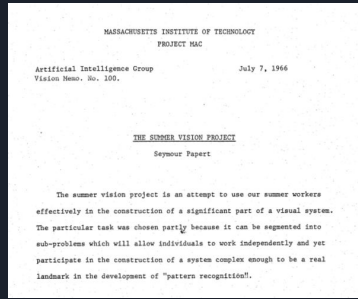
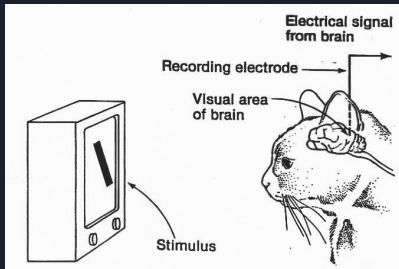
Istoria Vederii (Artificiale)



Sec. 16
Camera Obscura

1959

Hubel & Wiesel

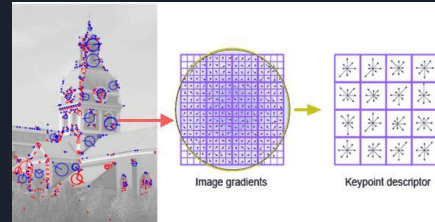


1966

Normalized cut, Shi & Malik



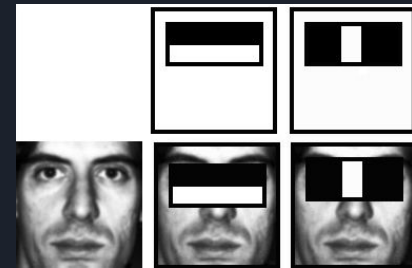
1997



SIFT, David Lowe

1999

Face Detection, Viola & Jones



2001

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.

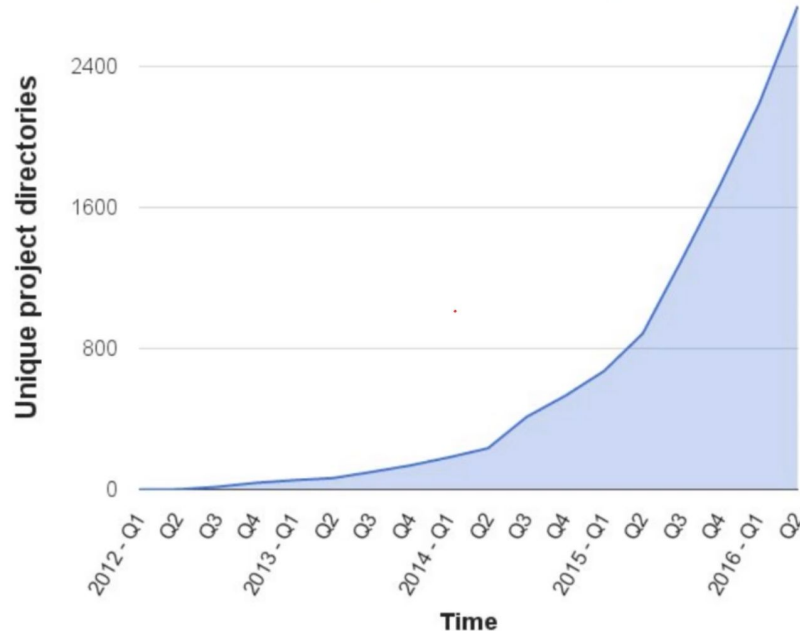
- Demis Hassabis (DeepMind)



Rețele Neurale - Mit sau Realitate?

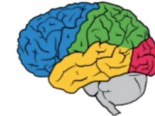
Growing Use of Deep Learning at Google

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 .

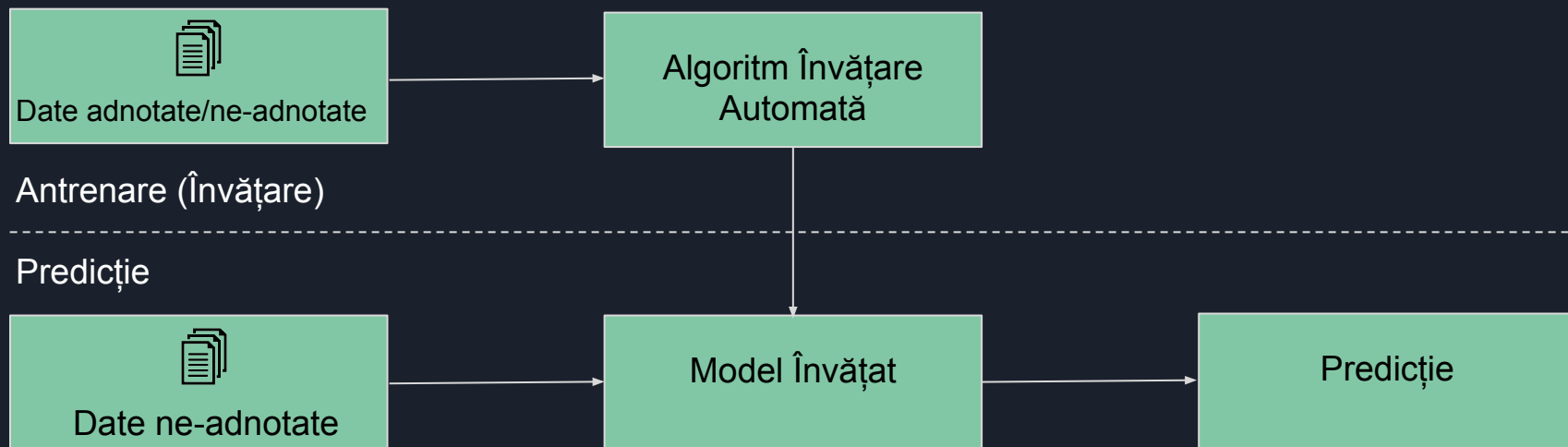
- Tom Mitchell

Învățarea Automată - Concepte de Bază

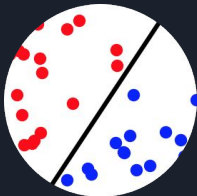


sursă foto:
[http://karpathy.github.io/
2012/10/22/state-of-co
mputer-vision/](http://karpathy.github.io/2012/10/22/state-of-computer-vision/)

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**

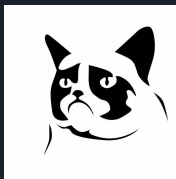
Exemplu: segmentarea imaginilor bazată pe culoare



Învățare prin Recompensă (Reinforcement Learning):

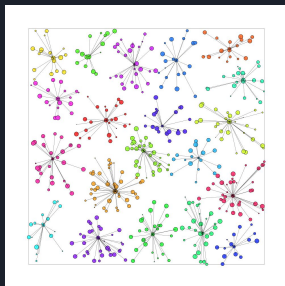
Exemplu: învață să joace Tetris

Învățarea Automată - Concepte de Bază

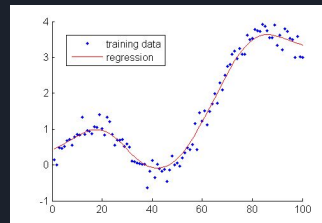


→
pisică 0.8
câine 0.1
...

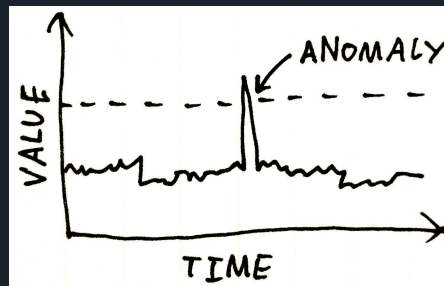
Clasificare
(Supervizată - predictivă)



Grupare (Clustering)
(Nesupervizată - descriptivă)

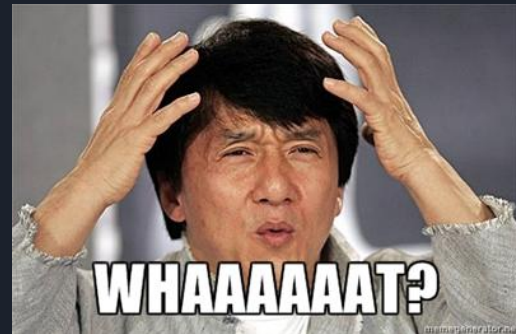


Regresie
(Supervizată - predictivă)

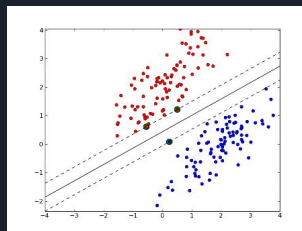
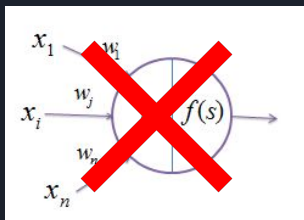
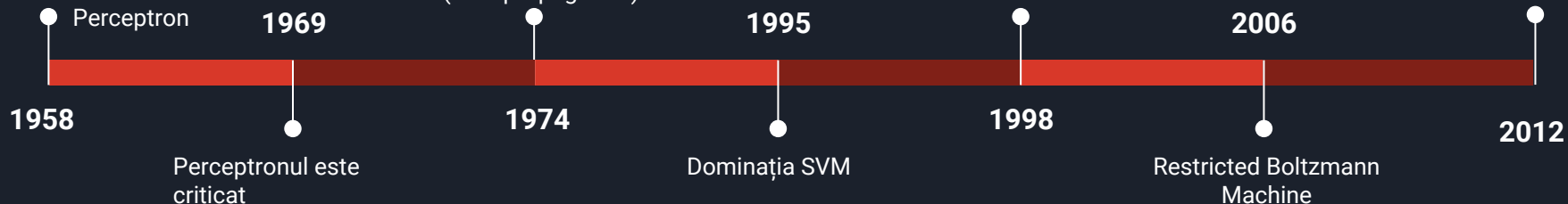
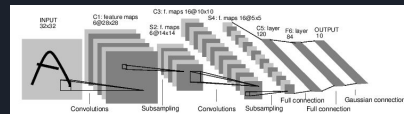


Detecția anomaliilor
(Nesupervizată - descriptivă)

De ce Rețele Neurale? De ce acum?

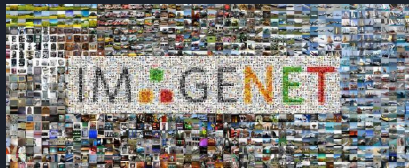


Istoria Rețelelor Neurale



De ce acum?

**Seturi Mari
de Date
(Digitalizare)**



**Putere de
Calcul
(Legea lui Moore,
GPU)**

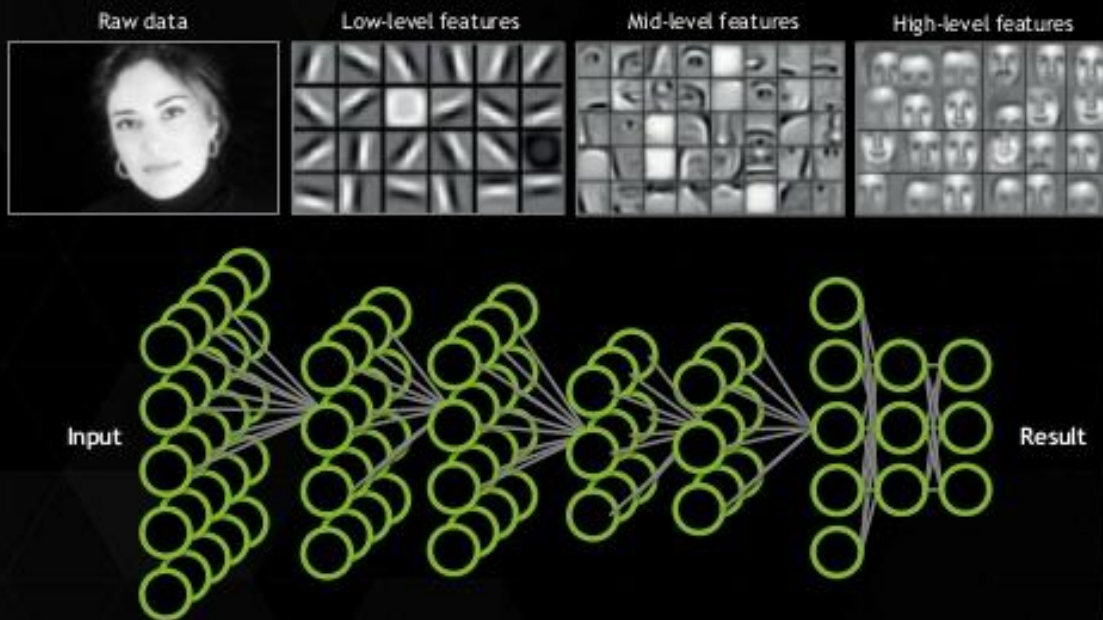


**Contribuitori
Importanți
(Progresul
Algoritmilor)**



Rețele Neurale - Concepte de Bază

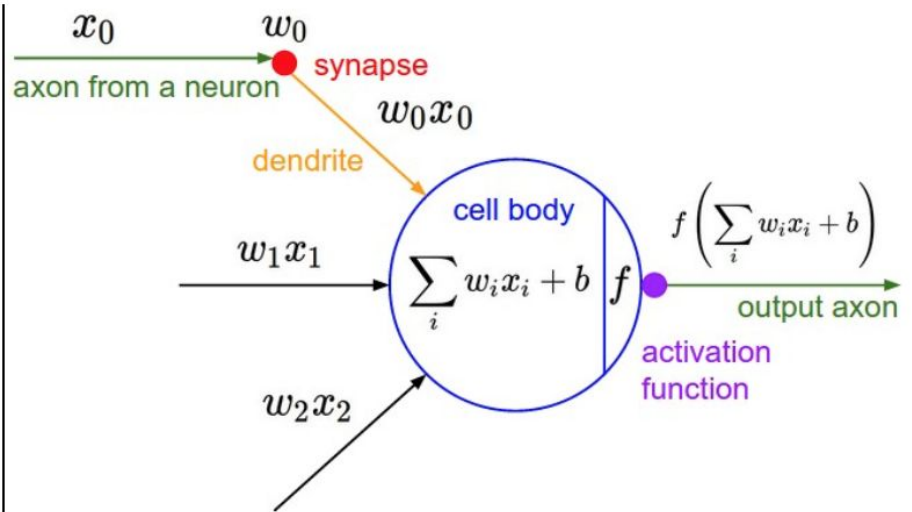
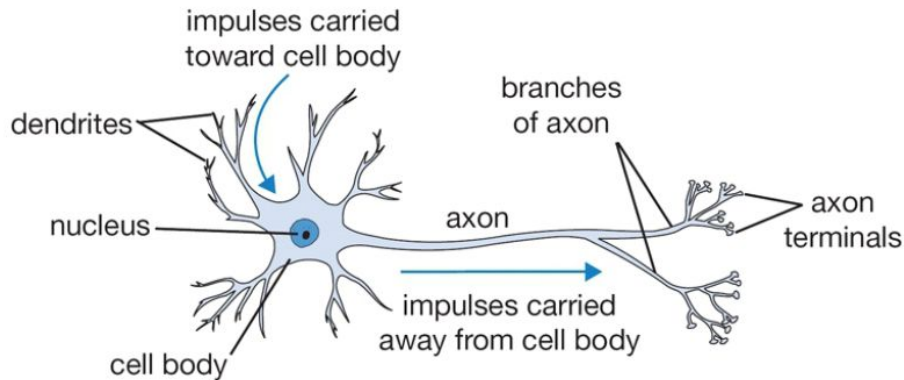
DEEP NEURAL NETWORK (DNN)



Application components:

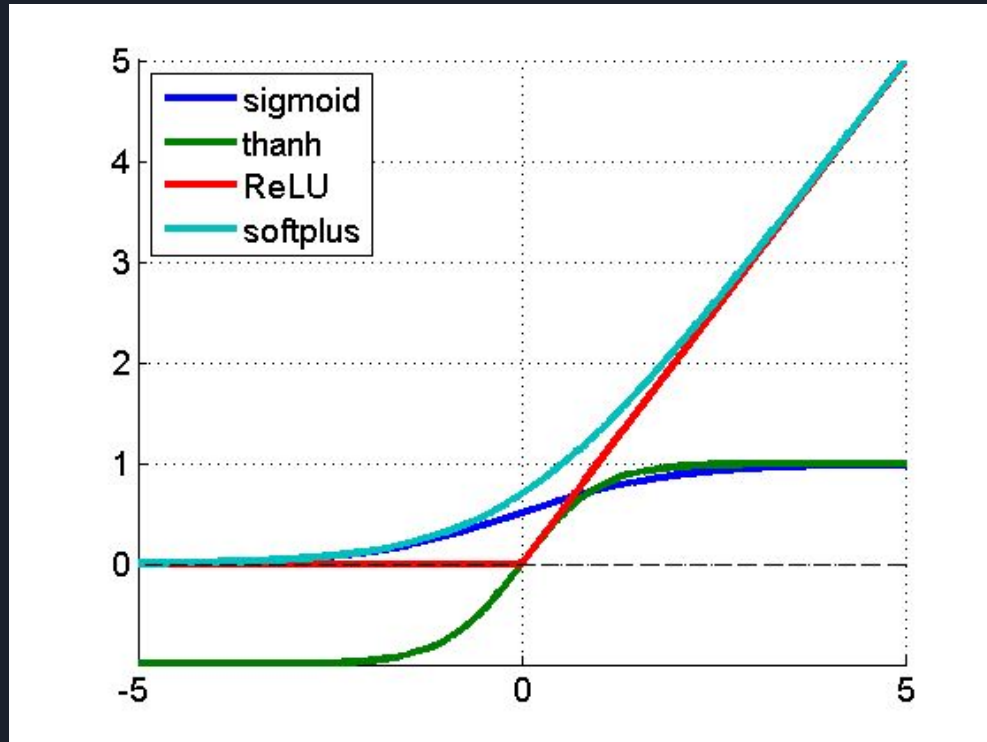
- Task objective**
 - e.g. Identify face
- Training data**
 - 10-100M images
- Network architecture**
 - ~ 10 layers
 - 1B parameters
- Learning algorithm**
 - ~ 30 Exaflops
 - ~ 30 GPU days

Rețele Neurale - Concepte de Bază



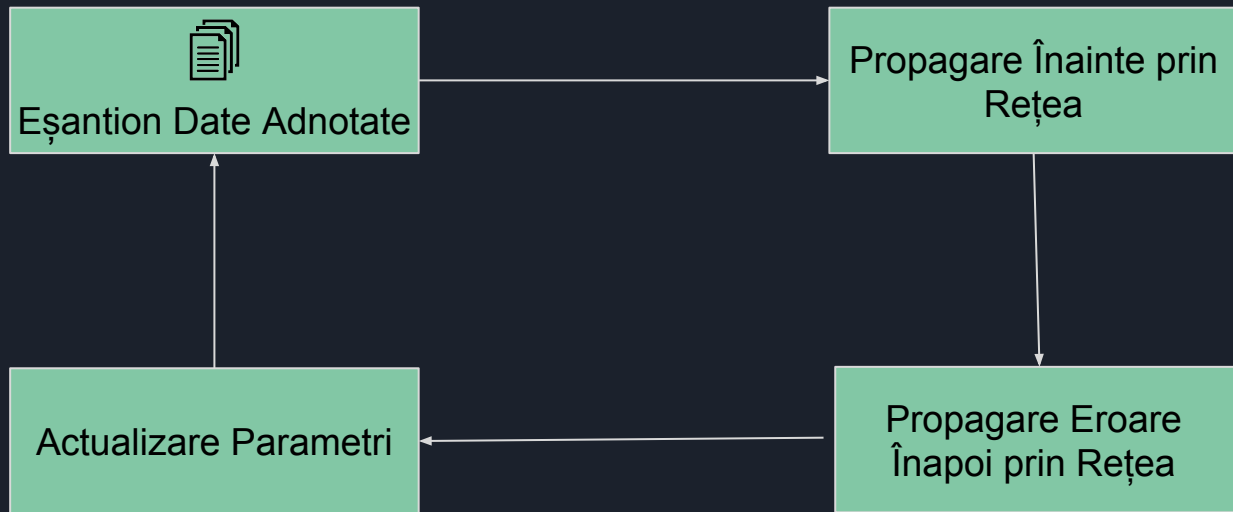
A cartoon drawing of a biological neuron (left) and its mathematical model (right).

Rețele Neurale - Concepte de Bază

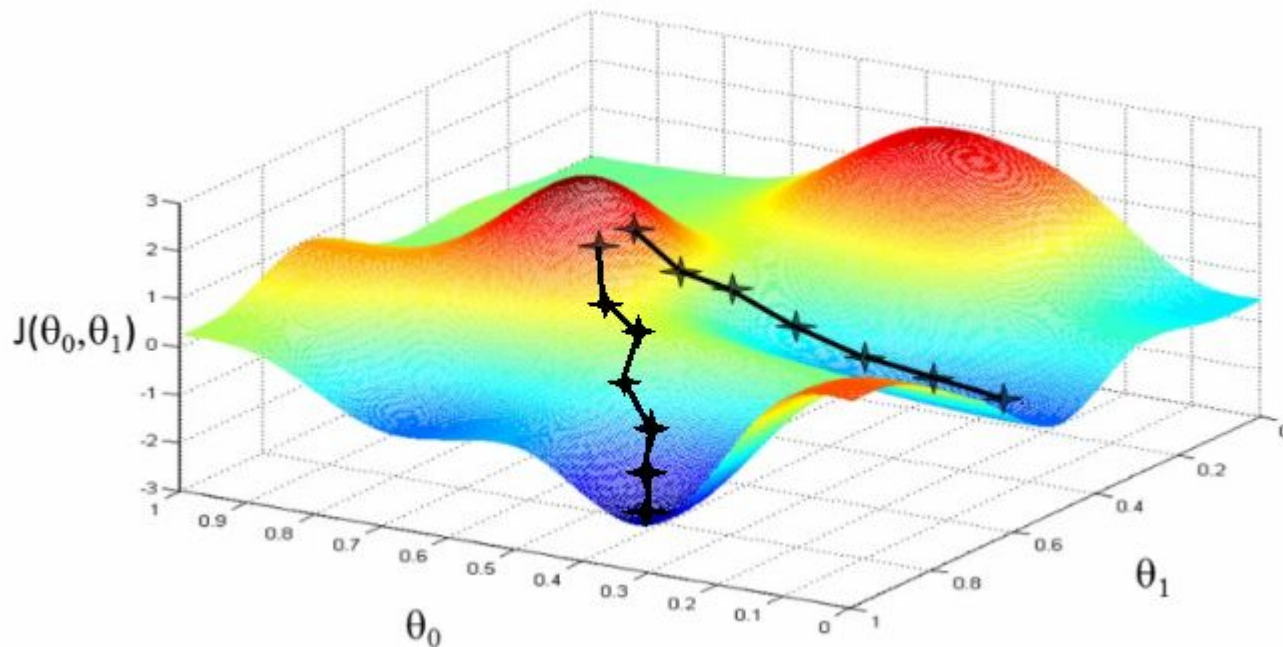


sursă foto:
<https://imiloainf.wordpress.com/2013/11/06/rectifier-nonlinearities/>

Rețele Neurale - Concepte de Bază



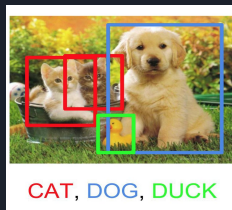
Rețele Neurale - Concepte de Bază



Prezentare Generală a Cursului



CAT

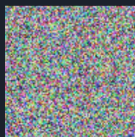


CAT, DOG, DUCK

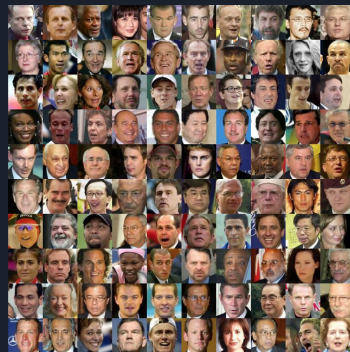


CAT, DOG, DUCK

Noise $\sim N(0, 1)$



Generative
Model





Logistică

- Proiect (60%)
 - 2 prezentari si github
 - documentatie (stil articol științific)
- Activitate laborator (40%)



Echipa



Ioana Chelu



Alex Ghiuță



Andi Petreanu



Vlad Păunescu



Andrei Jancă