

IE801/KSE801

Machine Learning for

.....

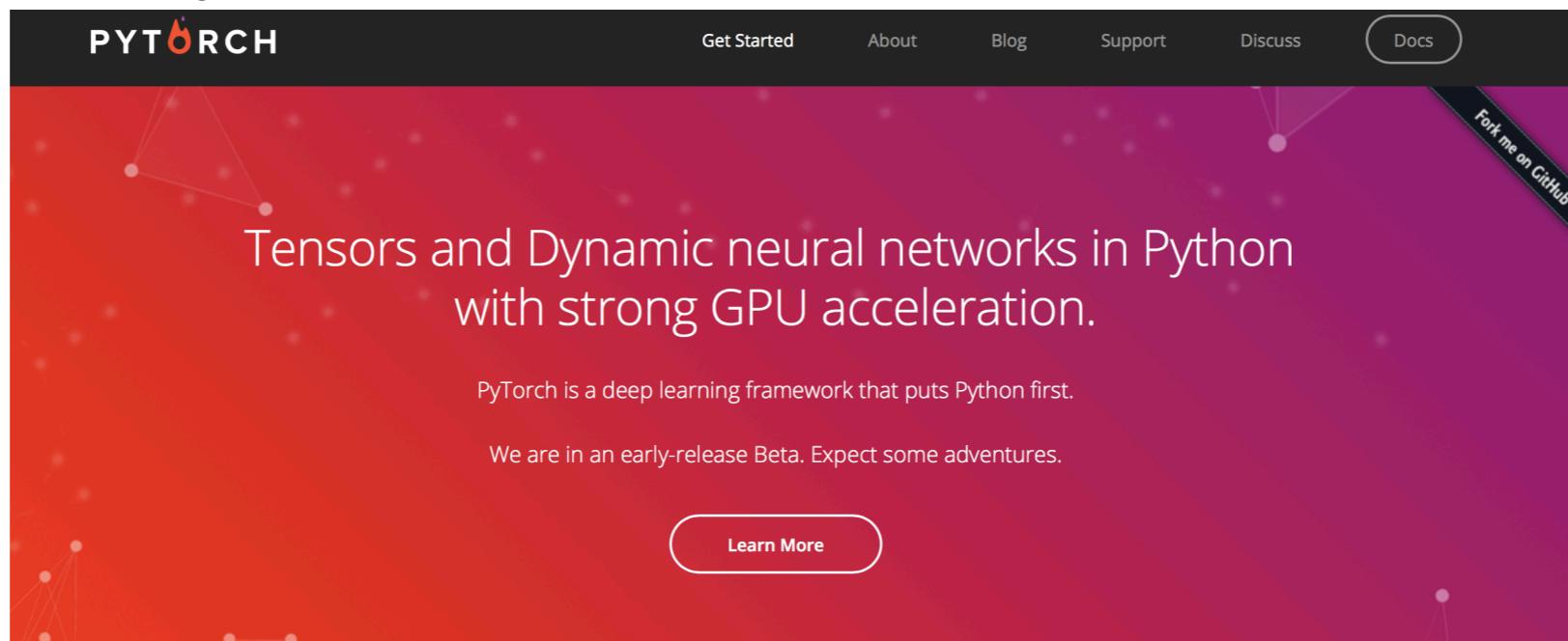
Seyoung Yun

Instructor

- Instructor : Seyoung Yun (윤세영)
- TA
 - 오재훈, 이기훈, 김태현, 김상묵
 - Please use KLMS!

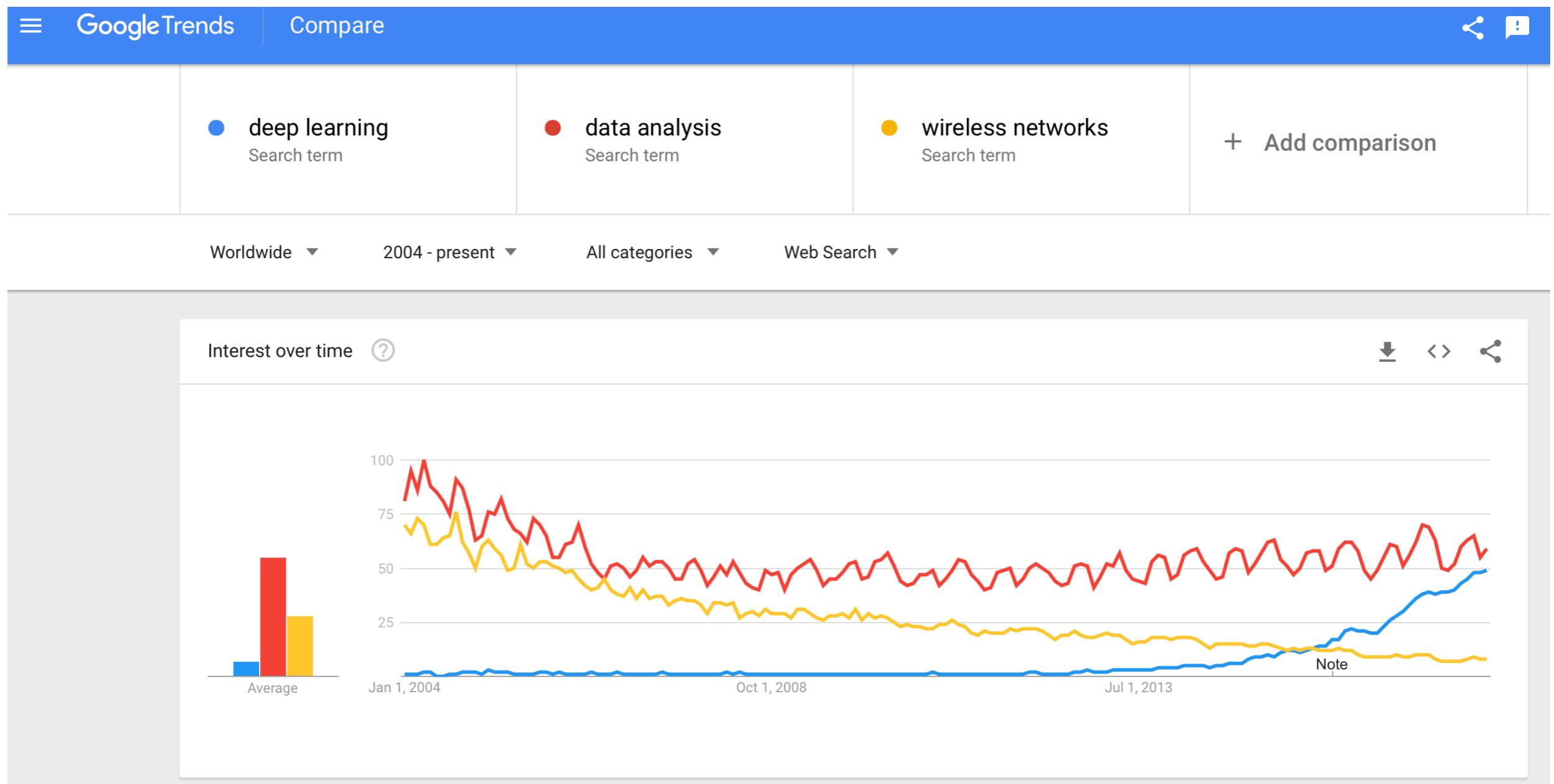
This course

- We will study deep learning algorithms.
 - FNN, CNN, VAE, RNN, LSTM, GAN,...
- You will use PyTorch



PyTorch vs TensorFlow (https://www.reddit.com/r/MachineLearning/comments/7ziagd/d_discussion_on_pytorch_vs_tensorflow/)

Deep Learning



Deep Learning



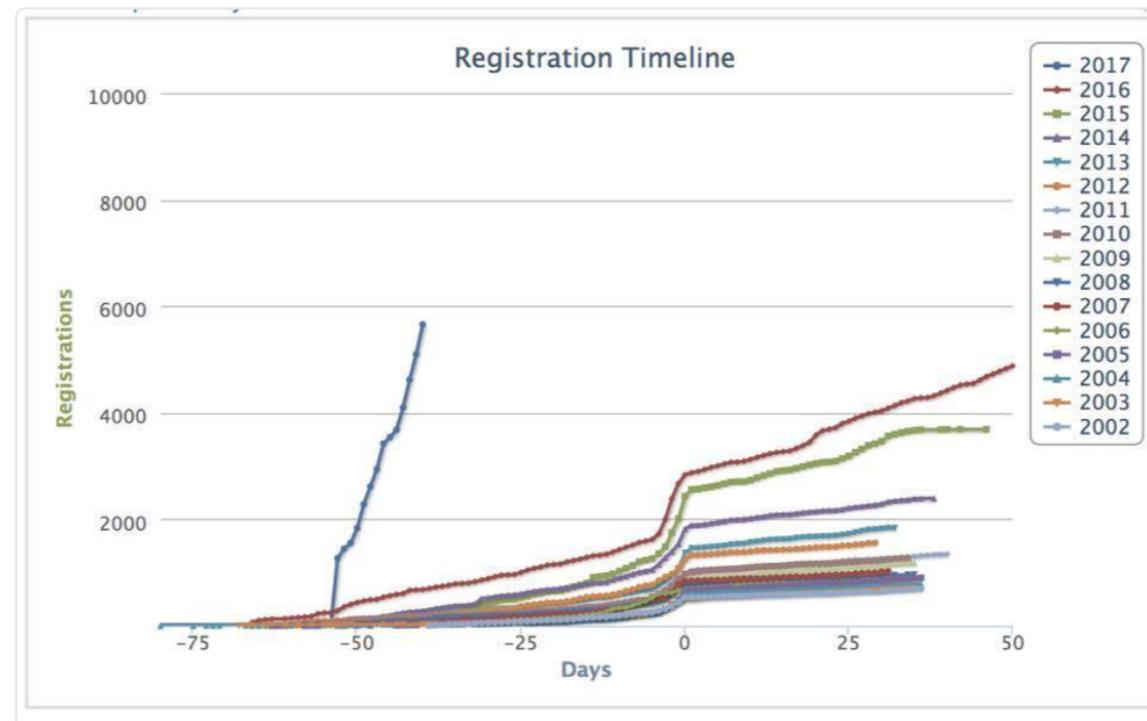
Alex Lebrun

@lxbrun

Follow



Deep learning hype in one picture
(NIPS conference registrations, 2002 through
2017) [#nips2017](#)



8:20 AM - 15 Sep 2017

758 Retweets 1,005 Likes



20

758

1.0K

Deep Learning



Andrej Karpathy ✅
@karpathy

Follow



Came to visit first class of [@cs231n](#) at Stanford. 2015: 150 students, 2016: 350, this year: 750. [#aiinterestsingularity](#)



12:11 PM - 4 Apr 2017

155 Retweets 623 Likes



19



155



623



michael_nielsen @michael_nielsen · Apr 4

Replying to [@karpathy @cs231n](#)

Faster than Moore's Law. At this rate - doubling each year - in 24 years everyone on Earth will be enrolled :-)

What will you learn?

- We will not code from the scratch
- Contents(1/2)
 - Machine Learning Basics
 - Basic neural networks (multi-layered perceptron)
 - Convolutional Neural Networks (CNN)
 - Image classification

What will you learn?

- Contents (2/2)
 - Recurrent Neural Networks (RNN)
 - Speech recognition
 - AutoEncoder, Variational AutoEncoder
 - Dimensionality reduction, generative model
 - Generative Adversarial Networks (GAN)
 - Generative model

Grading

- Attendance 5%
- Programming Assignments 20% (5 assignments)
- Project 15%
- Midterm 30%
- Final 30%

DeepLearning 101

Reference materials.

- Images from Web.
- <http://slides.com/beamandrew/deep-learning-101#/>
- <https://devblogs.nvidia.com/deep-learning-nutshell-history-training/>
- https://leonardoaraujosantos.gitbooks.io/artificial-intelligence/content/neural_networks.html
- https://beamandrew.github.io/deeplearning/2017/02/23/deep_learning_101_part1.html
- http://www.di.ens.fr/~lelarge/dldiy/Slides_October16.pdf
- http://cs231n.stanford.edu/slides/2017/cs231n_2017_lecture1.pdf
- <https://stats385.github.io/assets/lectures/StanfordStats385-20170927-Lecture01-Donoho.pdf>

AlphaGo



What is “DeepLearning”?

- From WiKi
 - “Deep learning is part of a broader family of machine learning methods”
 - Use a cascade of multiple layers of **nonlinear** processing units
 - Most modern deep learning models are based on an artificial neural network

A mostly complete chart of

Neural Networks

©2016 Fjodor van Veen - asimovinstitute.org

- (○) Backfed Input Cell
- (○) Input Cell
- (△) Noisy Input Cell
- (●) Hidden Cell
- (○) Probabilistic Hidden Cell
- (△) Spiking Hidden Cell
- (●) Output Cell
- (○) Match Input Output Cell
- (●) Recurrent Cell
- (○) Memory Cell
- (△) Different Memory Cell
- (●) Kernel
- (○) Convolution or Pool

Perceptron (P)



Feed Forward (FF)



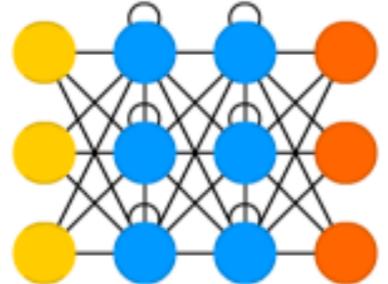
Radial Basis Network (RBF)



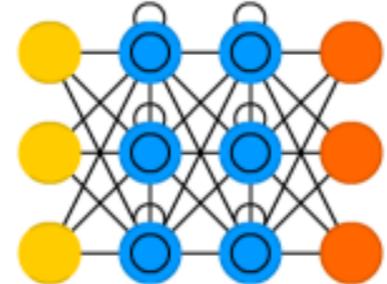
Deep Feed Forward (DFF)



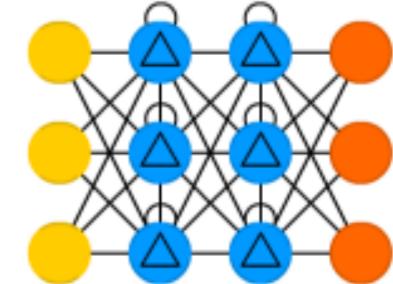
Recurrent Neural Network (RNN)



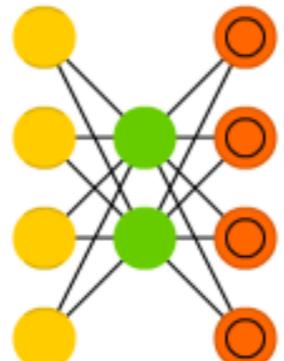
Long / Short Term Memory (LSTM)



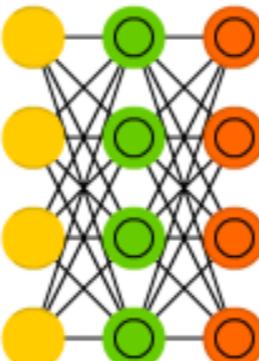
Gated Recurrent Unit (GRU)



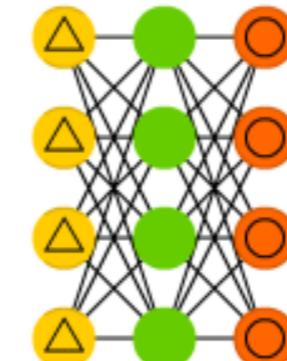
Auto Encoder (AE)



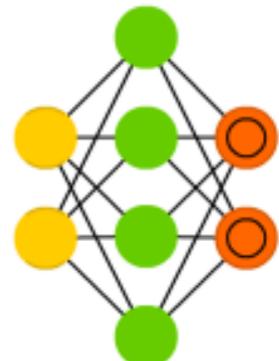
Variational AE (VAE)



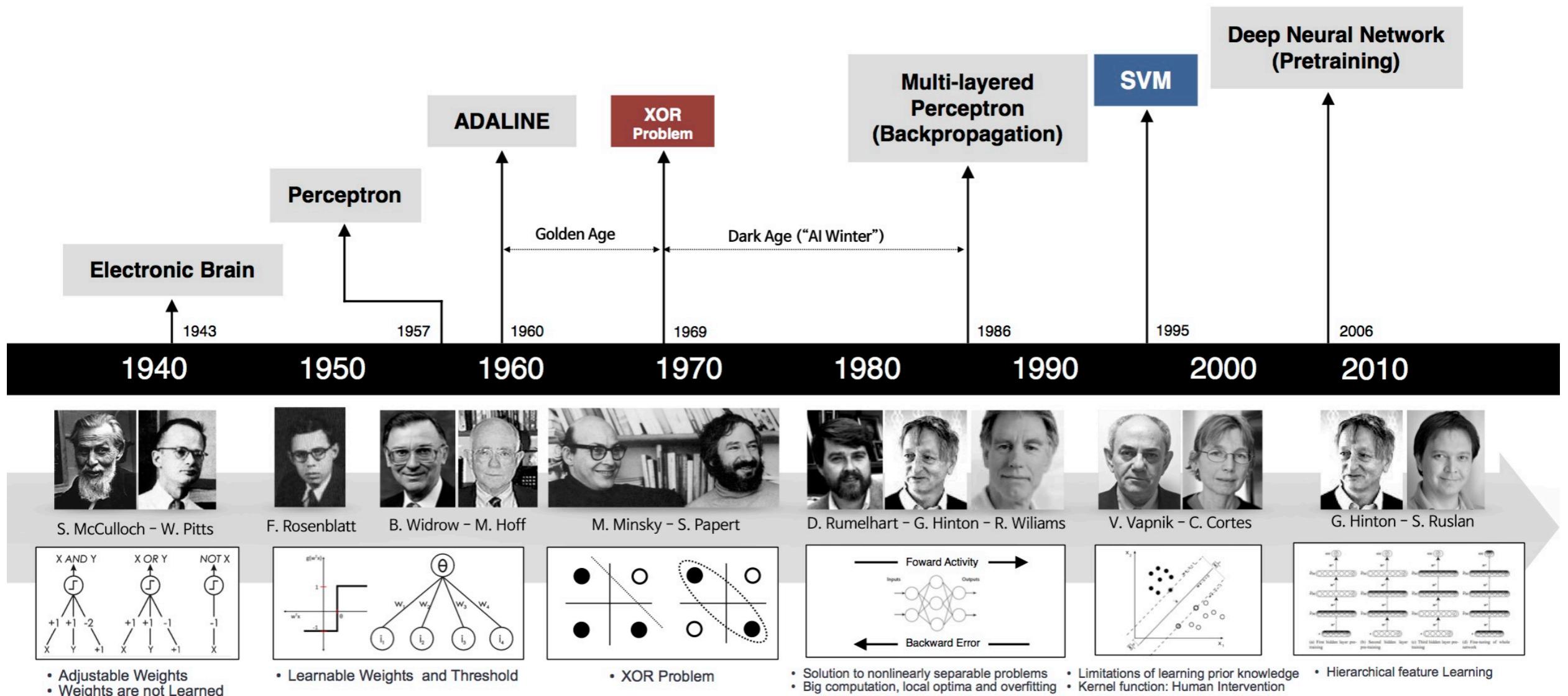
Denoising AE (DAE)



Sparse AE (SAE)



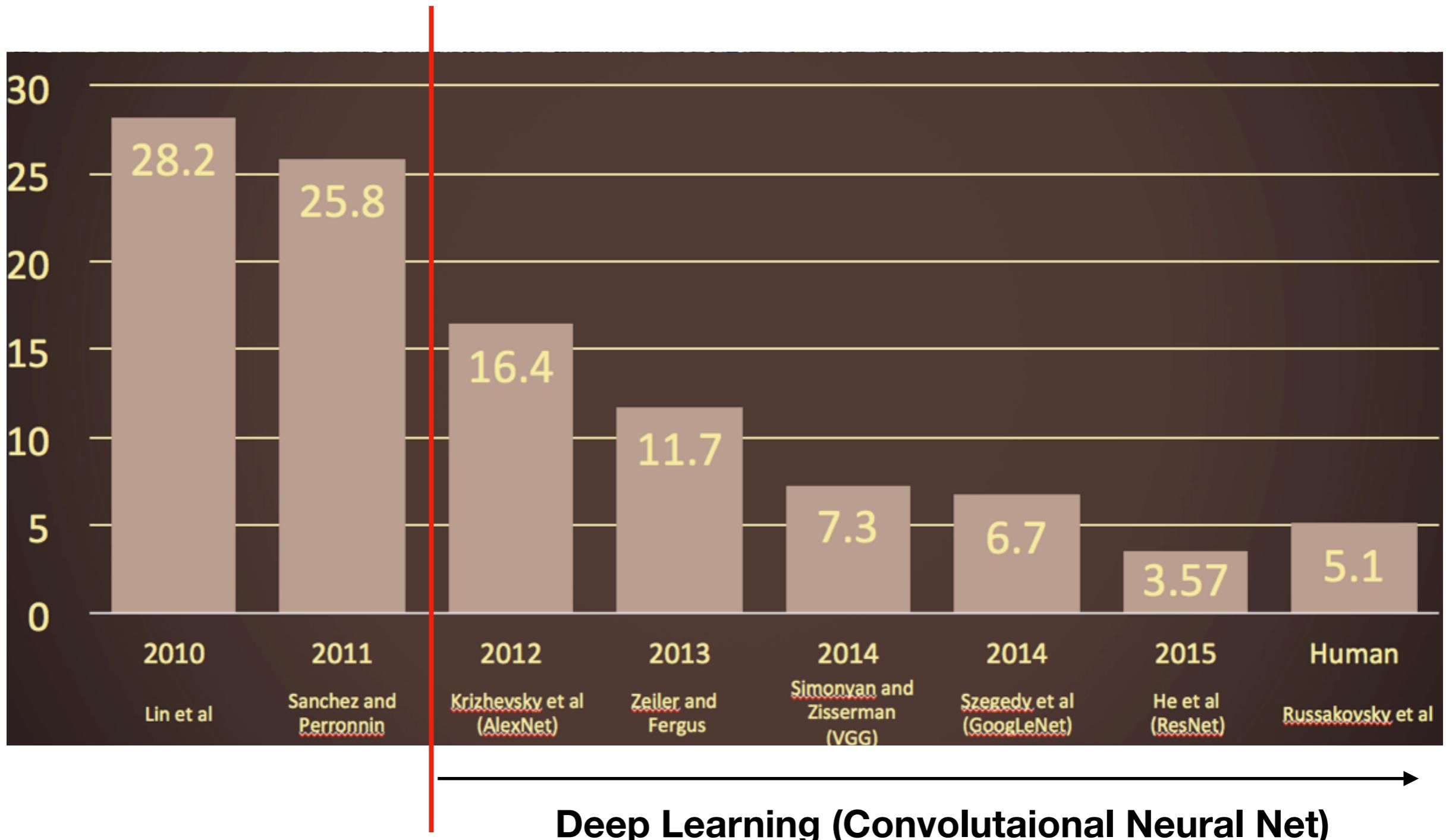
Milestones



ImageNet Challenge

- ImageNet data set
 - A huge data set for image classification tasks
 - www.image-net.org
 - 22K categories and 14M images
 - Animals, Plants, Structures, ...
- ImageNet Challenge
 - 1000 object classes and 1,431,167 images

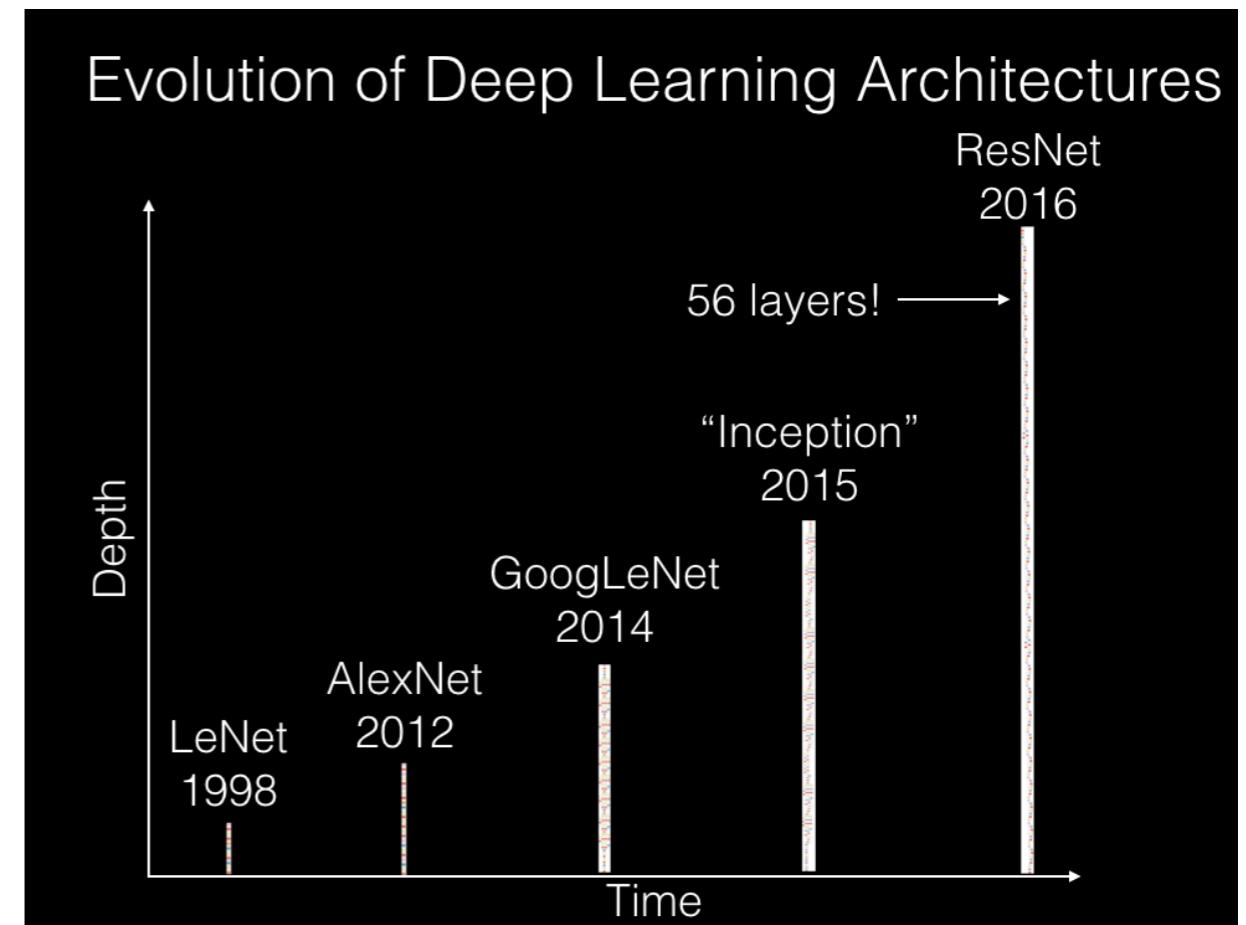
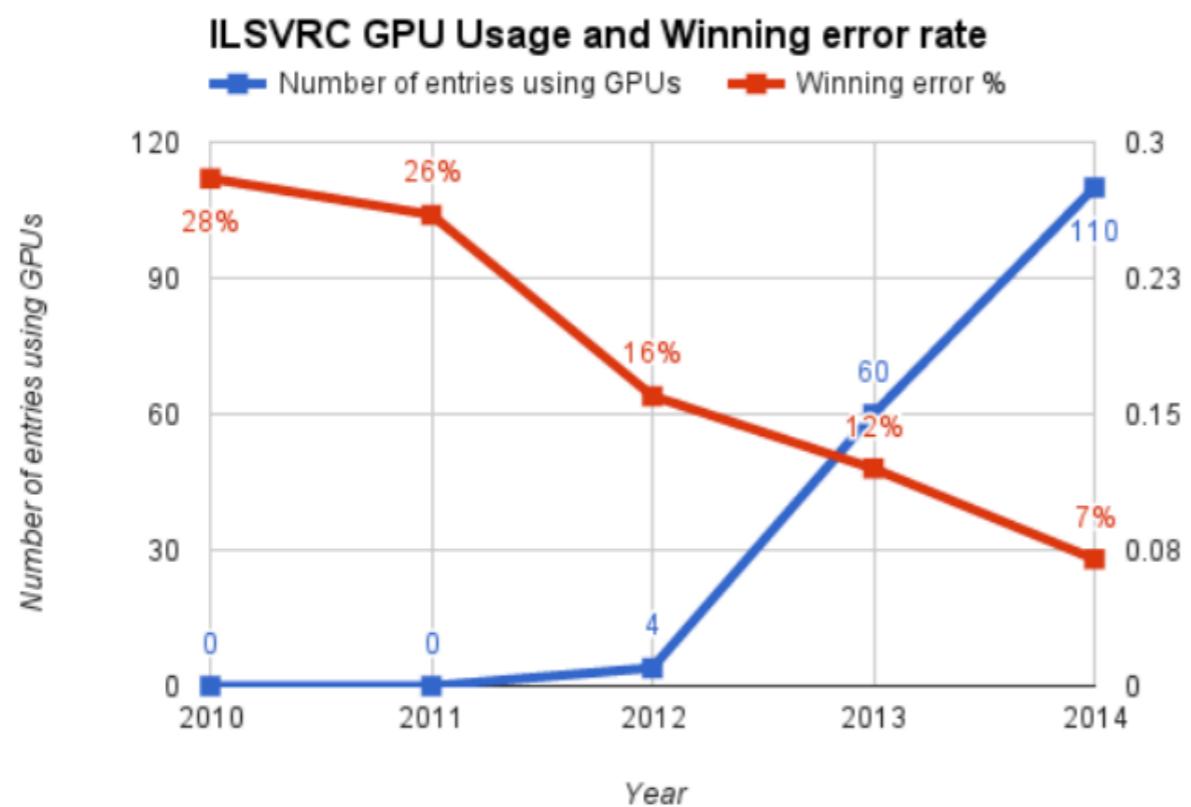
Challenge Winners



What happened in 2012?

- The key parts
 - Big labeled data
 - Computing power.. especially GPU
 - Methodological innovations (Dropout and ReLU)

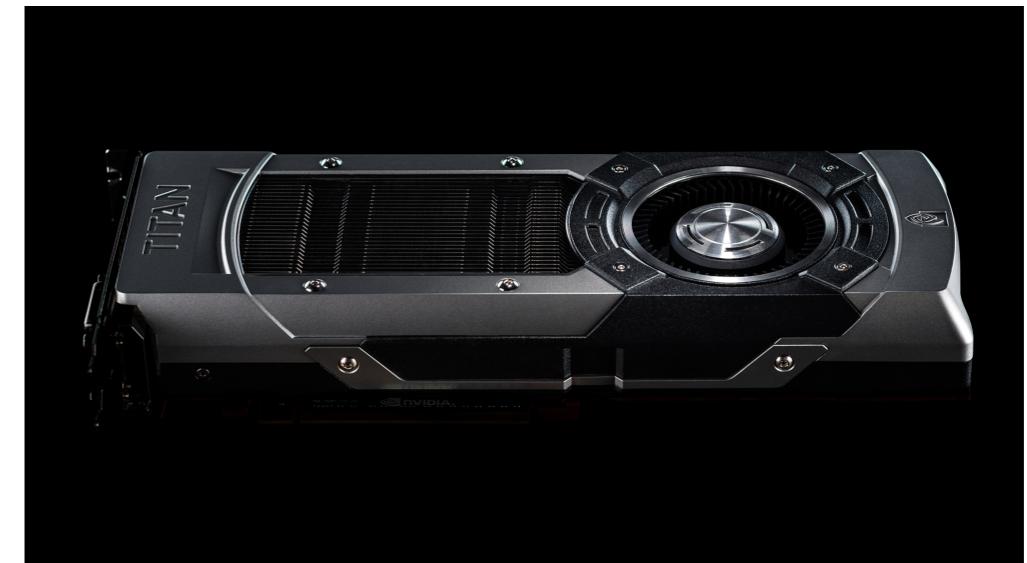
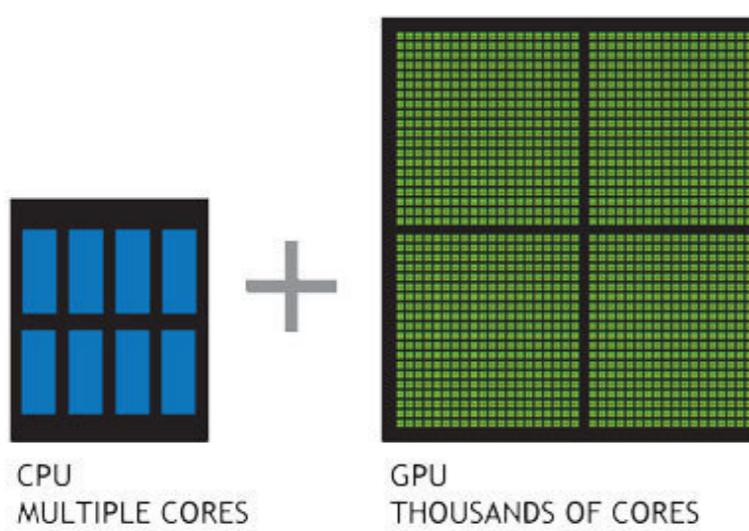
And then,



- Going deeper with more GPU!

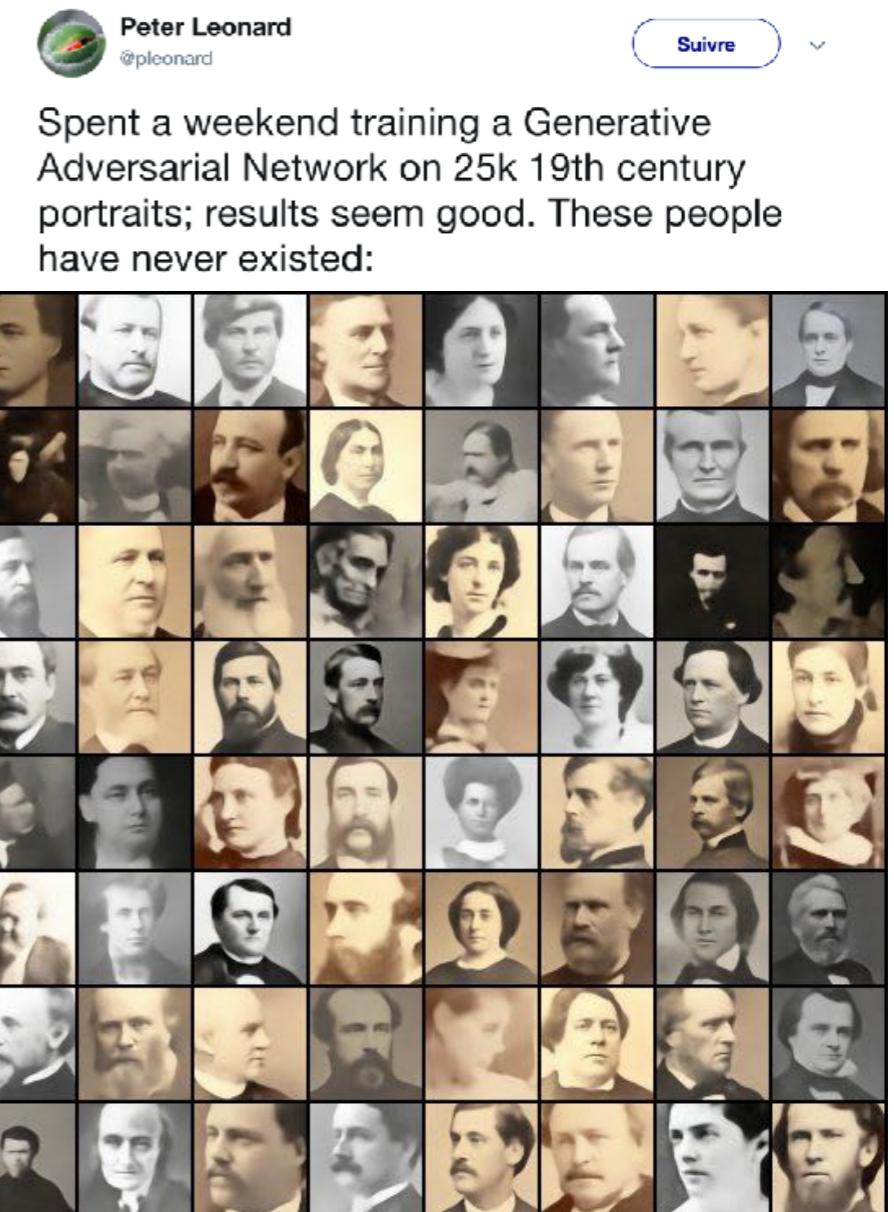
Why GPU??

- GPU has thousands of cores!
 - good for massive parallel computing
 - good for computing matrix multiplications, additions,..
 - good for training of huge neural nets on extremely large data sets

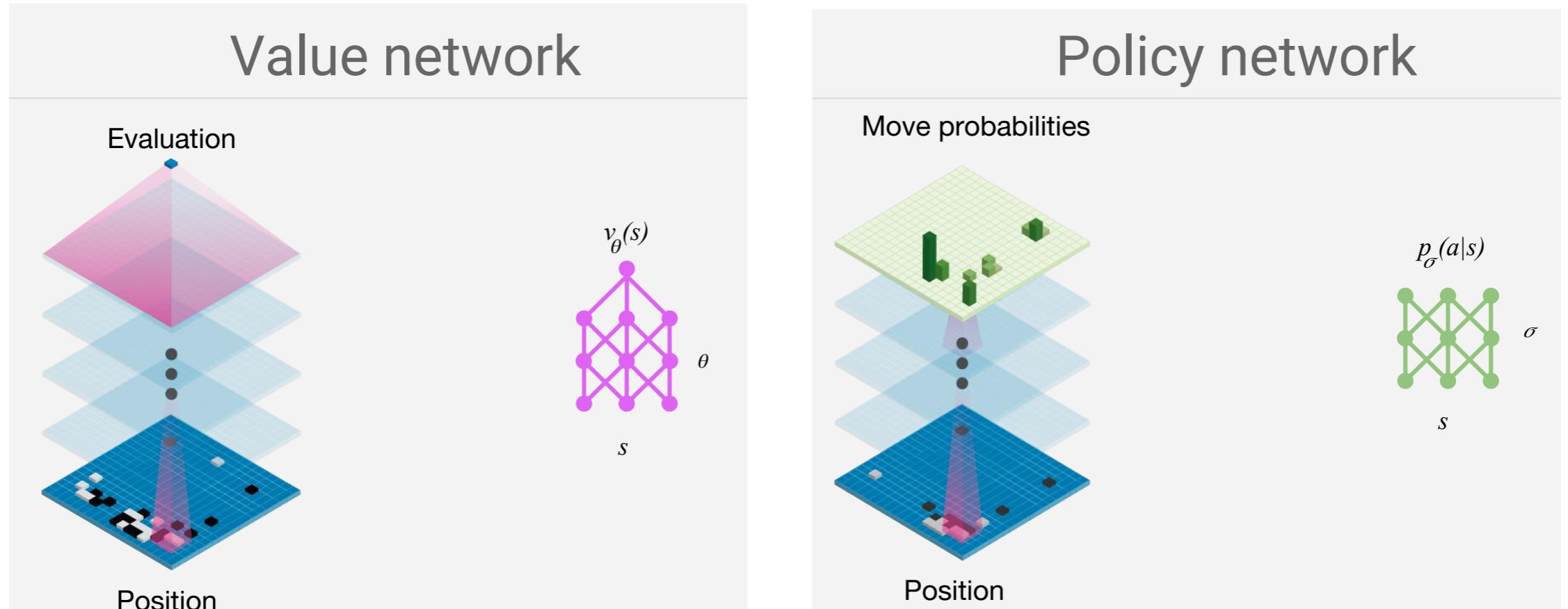


And also

- Natural Language Process (NLP), Translator
 - RNN, LSTM, ..
- Style transfer, image completion,
 - GAN, VAE



DL in AlphaGo



- DL makes AI win humans.
- Both value network and policy network are CNN
 - Value net: classify win or not
 - Policy net: the next best move is classified into 361 positions

Be careful



INDY/TECH
**AI ROBOTS LEARNING RACISM, SEXISM
AND OTHER PREJUDICES FROM
HUMANS, STUDY FINDS**

FaceApp apologizes for building a racist AI

Posted Apr 25, 2017 by Natasha Lomas (@riptari)



- DL learns racism/sexism

Thank you!
-Q&A-