IE801/KSE801
Machine Learning for
.....

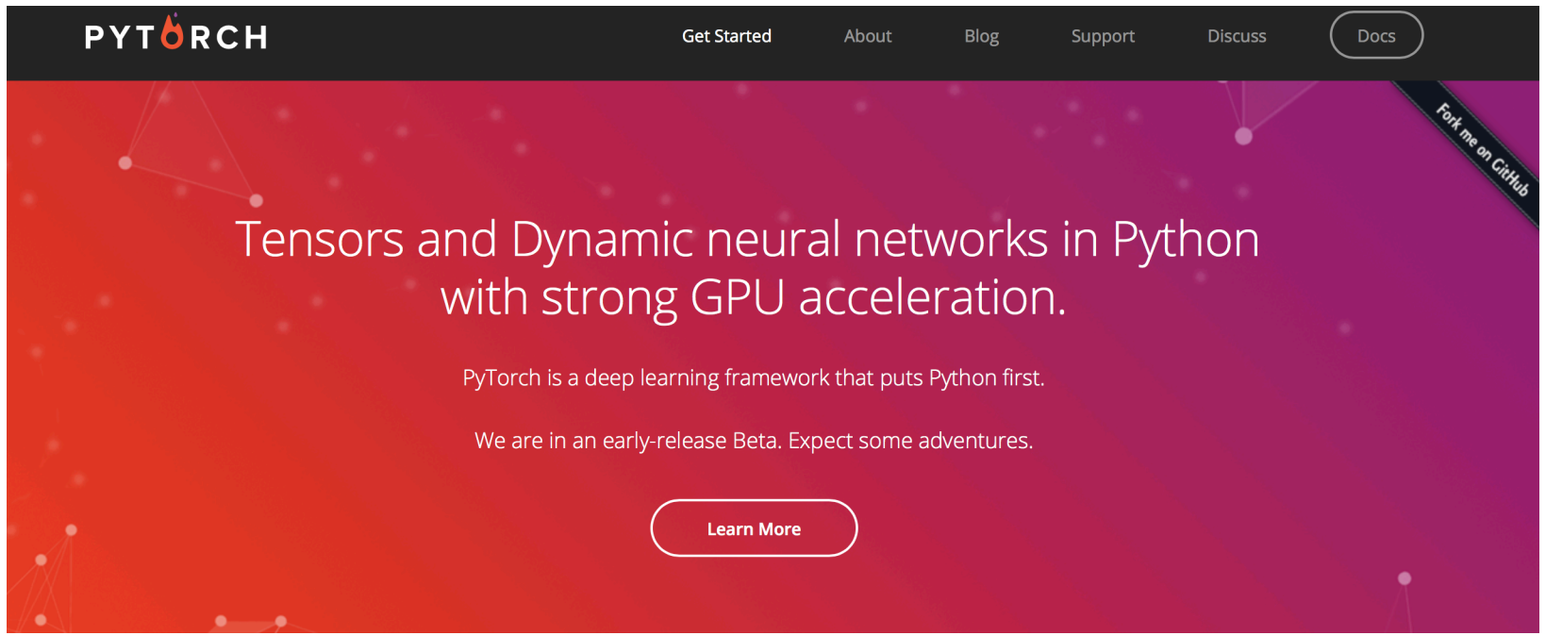
Seyoung Yun

Instructor

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

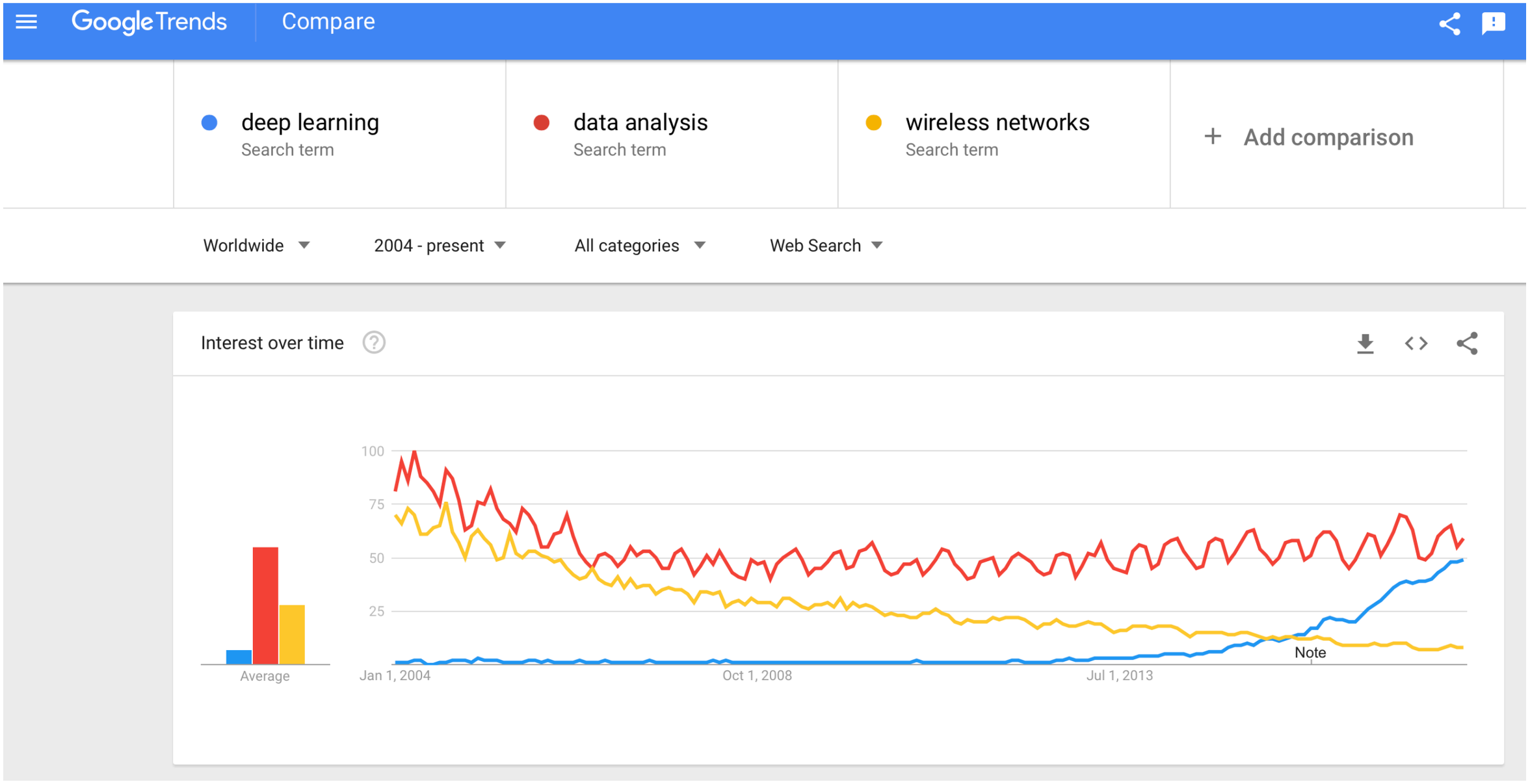
This course

- 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

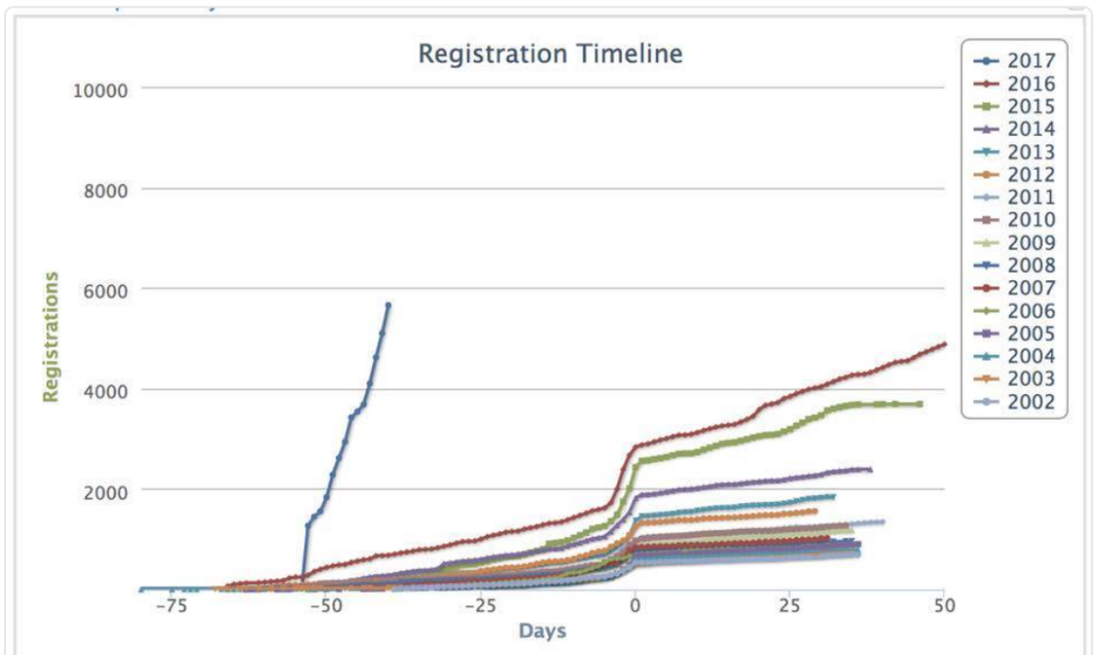


Deep Learning

Alex Lebrun
@lxbrun

Follow

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



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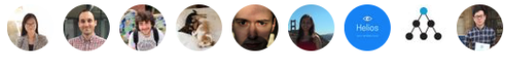

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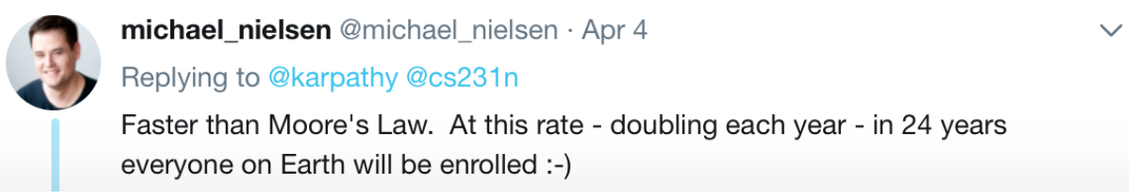
Deep Learning



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-inteligence/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


nature
THE INTERNATIONAL WEEKLY JOURNAL OF SCIENCE
At last — a computer program that can beat a champion Go player PAGE 484
ALL SYSTEMS GO

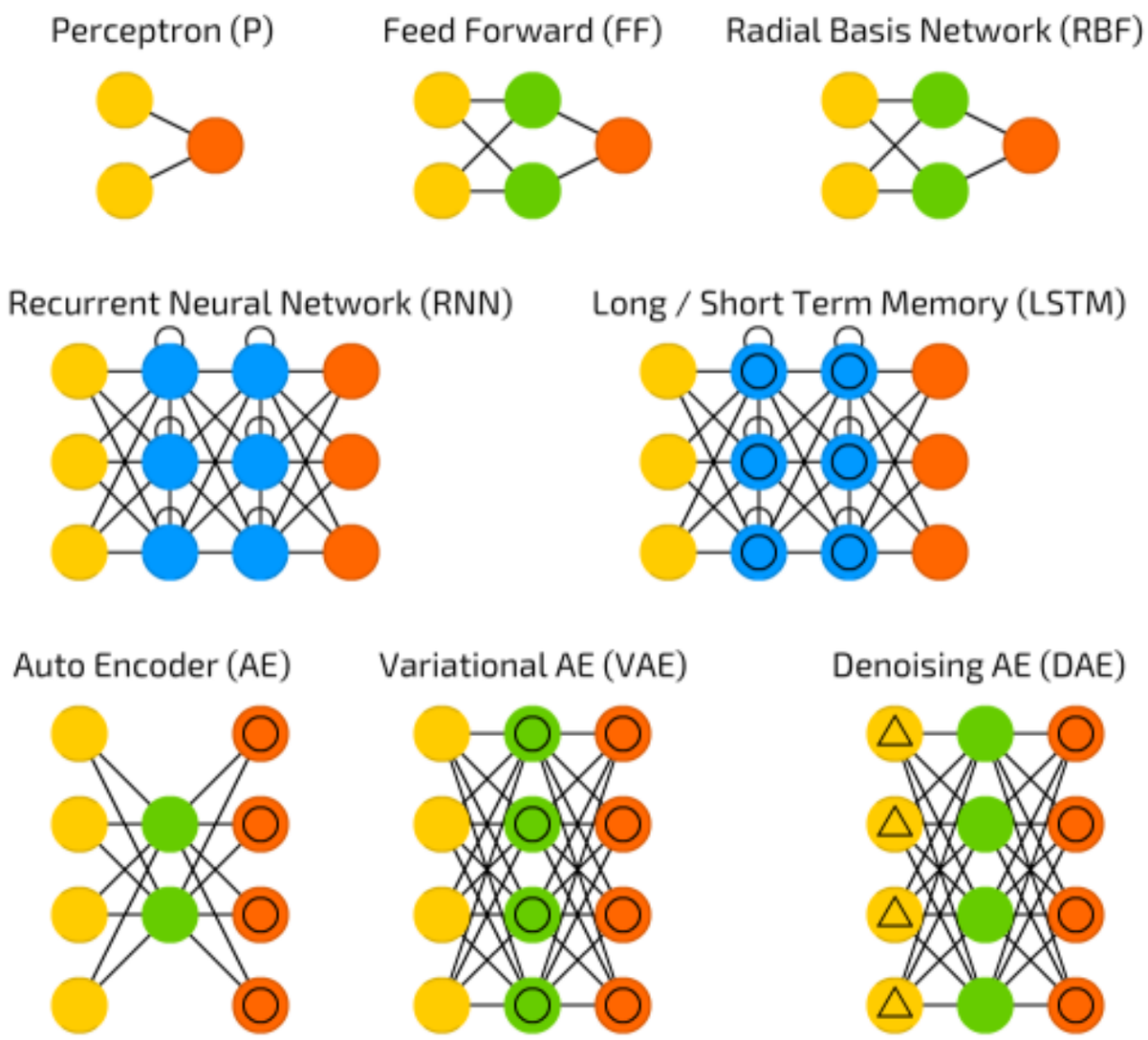

ALPHAGO

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

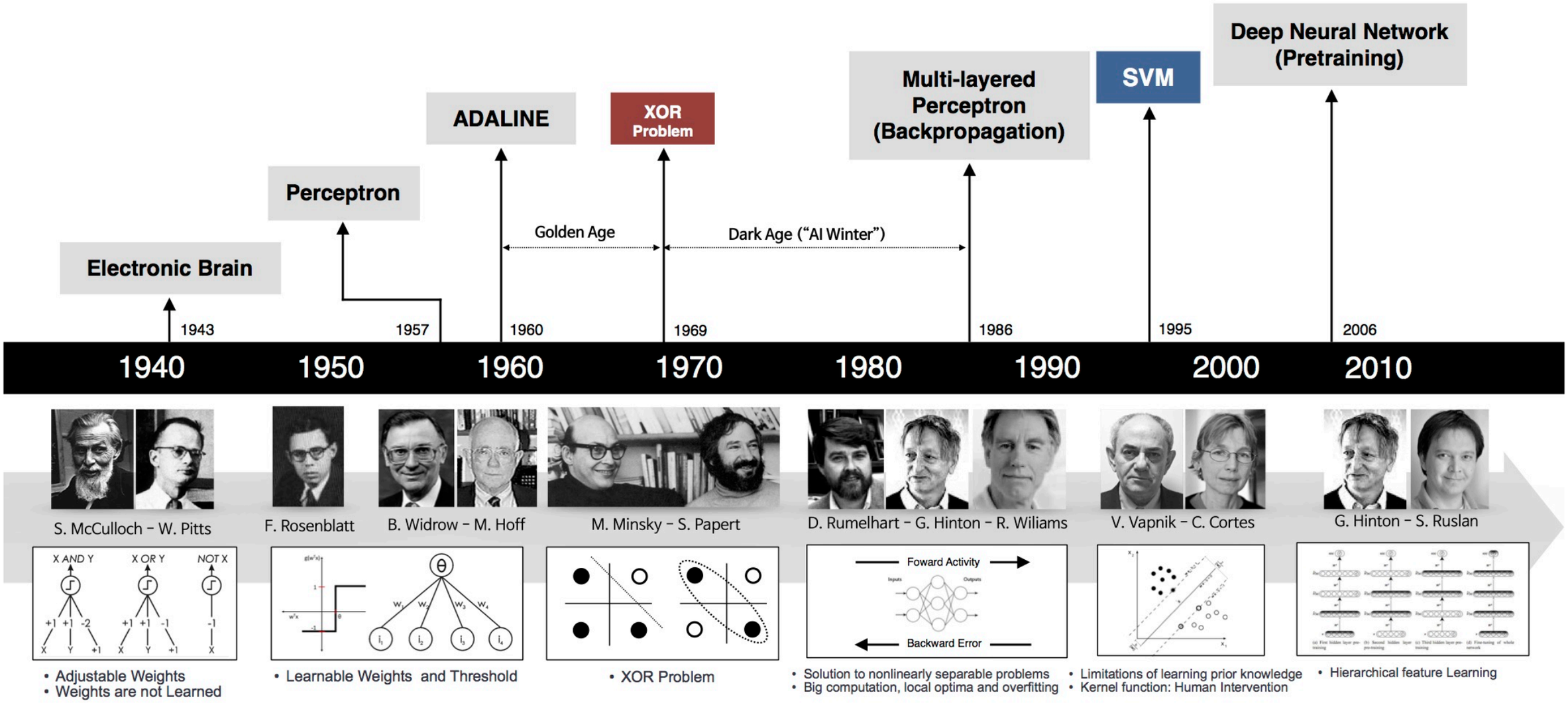
A mostly complete chart of

Neural Networks



https://leonardoaraujosantos.gitbooks.io/artificial-inteligence/content/neural_networks.html

Milestones

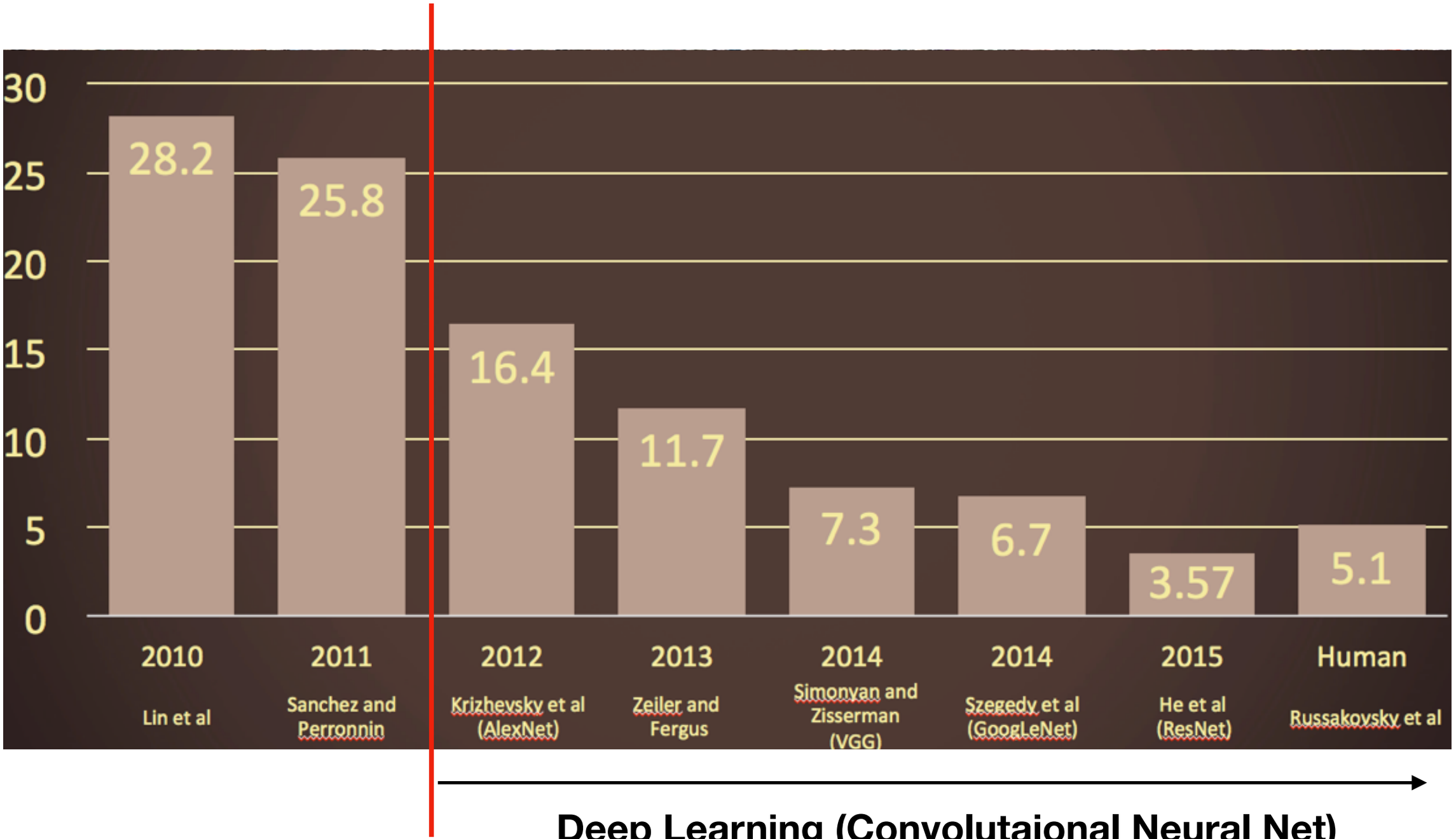


http://slides.com/beamandrew/deep-learning-101#/

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

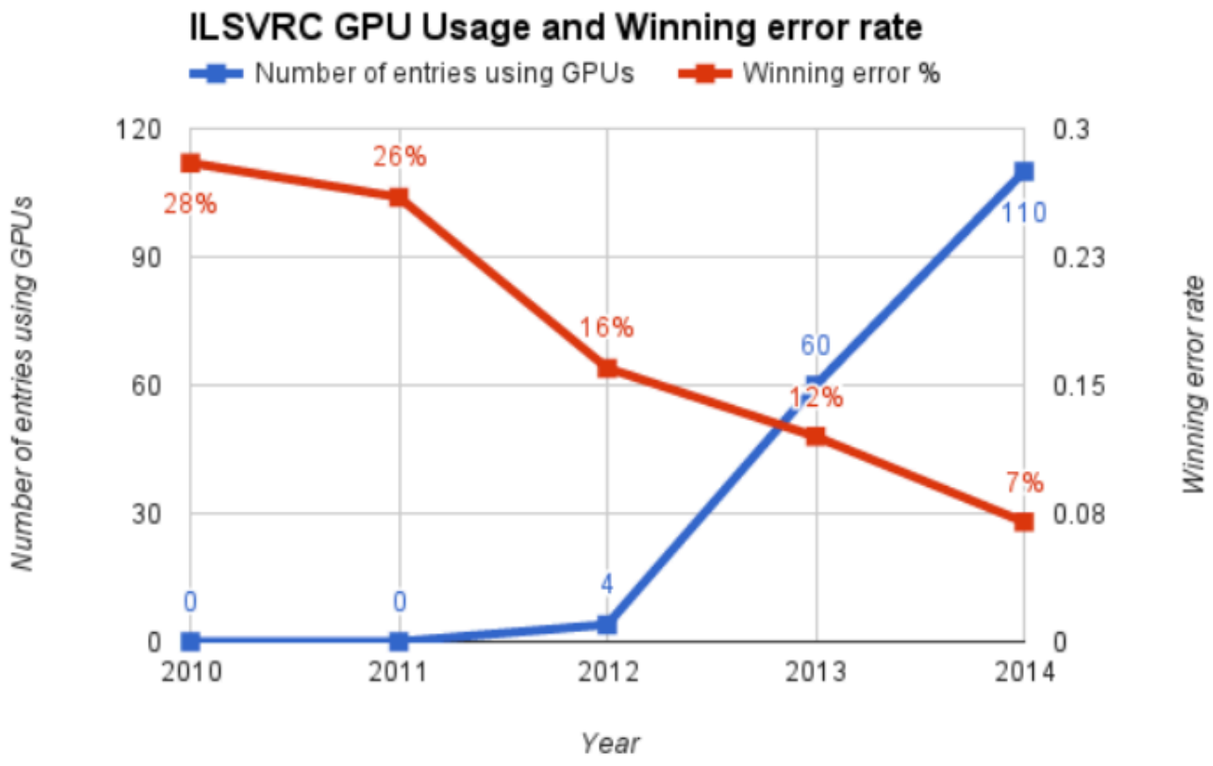


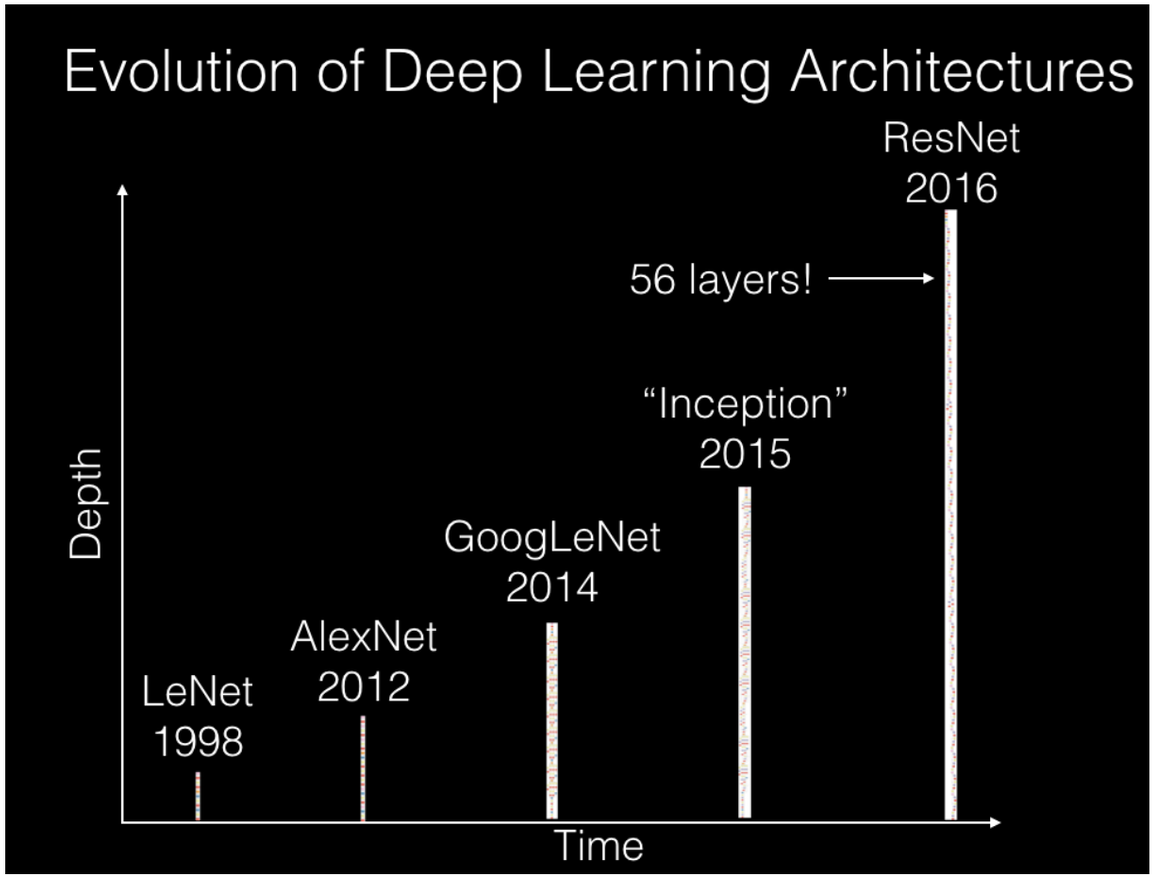
Russakovsky et al. arXiv, 2014

What happened in 2012?

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

And then,

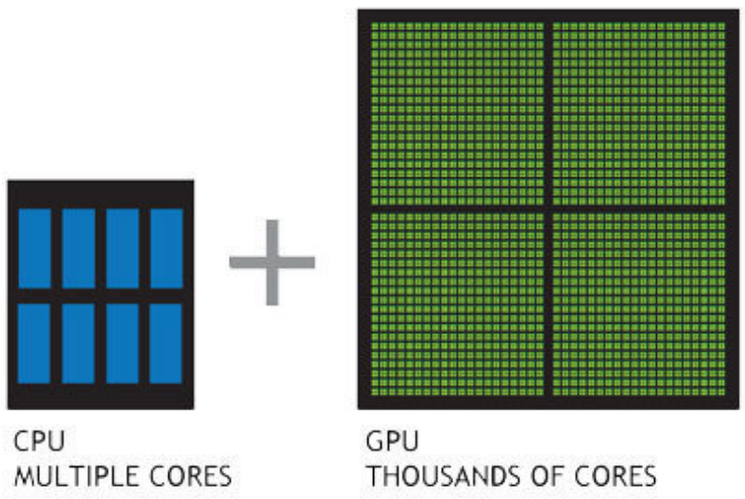


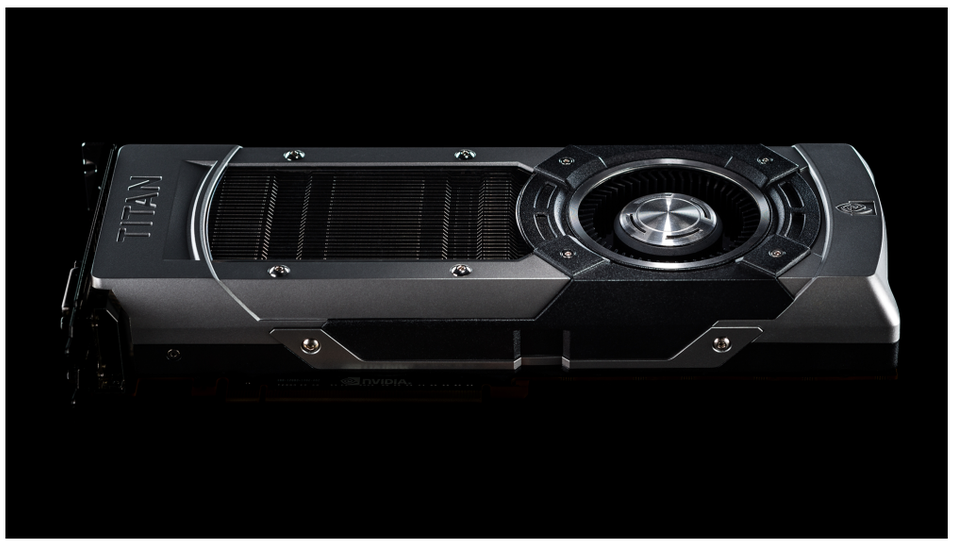


- Going deeper with more GPU!

Why GPU??

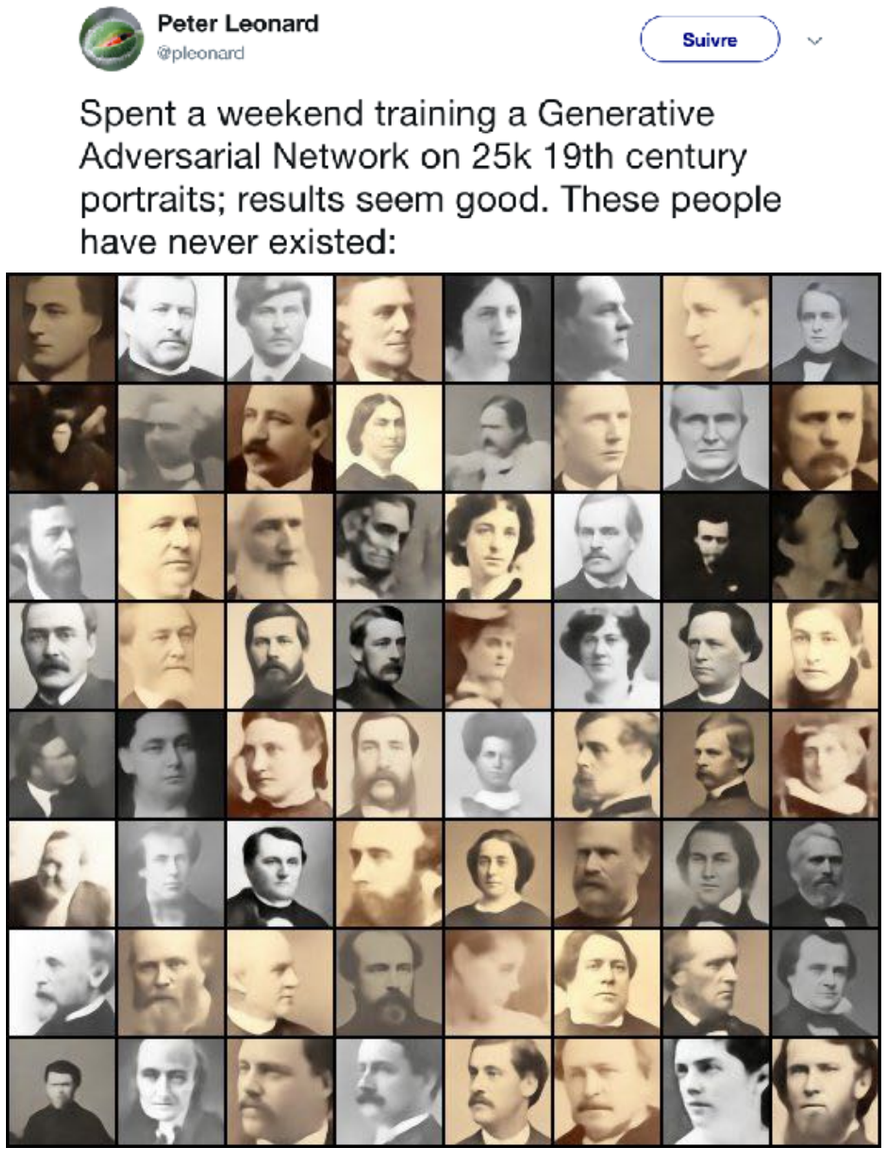
- GPU has thousands of cores!
  - good for massive parallel computing
  - good for computing matrix multiplications, additions,..
  - good for training of huge neural nets on extremely large data sets



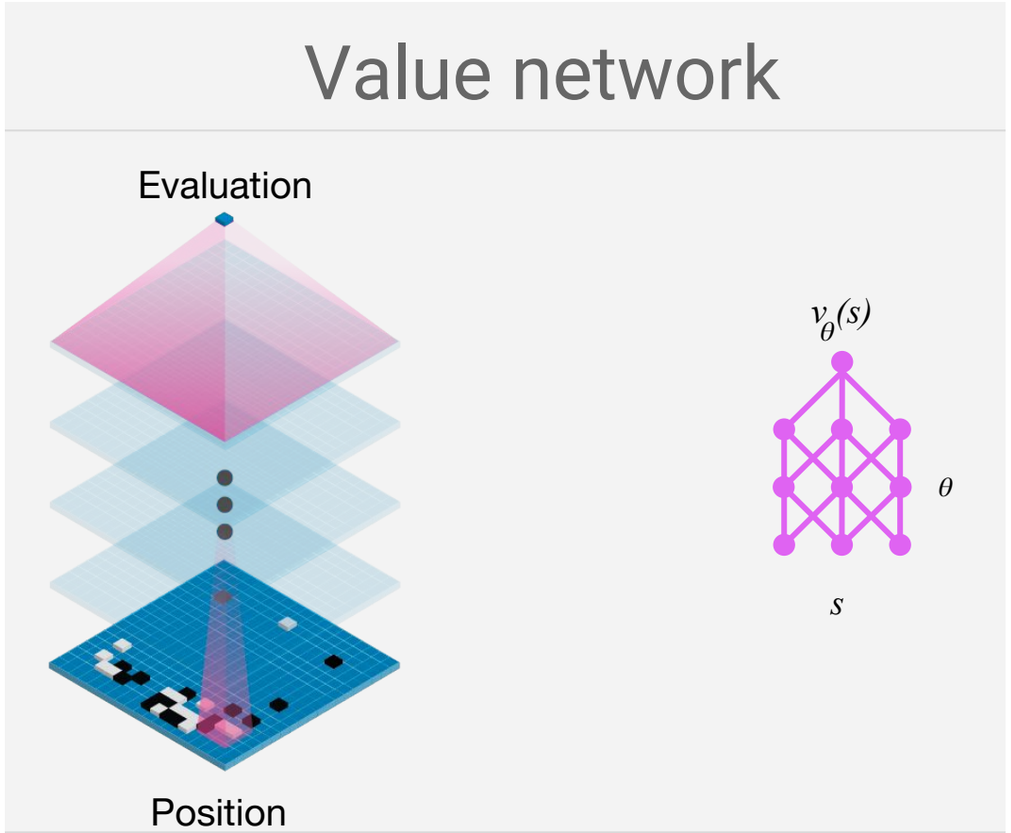


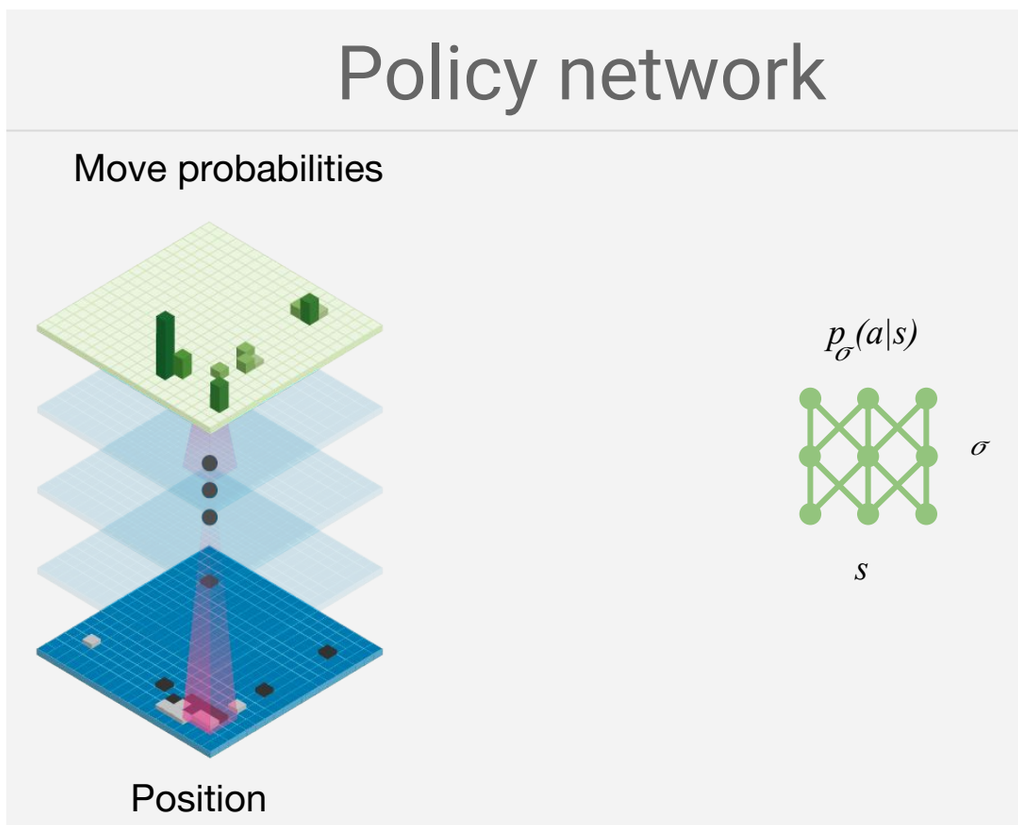
And also

- 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

- DL learns racism/sexism

Thank you!

-Q&A-