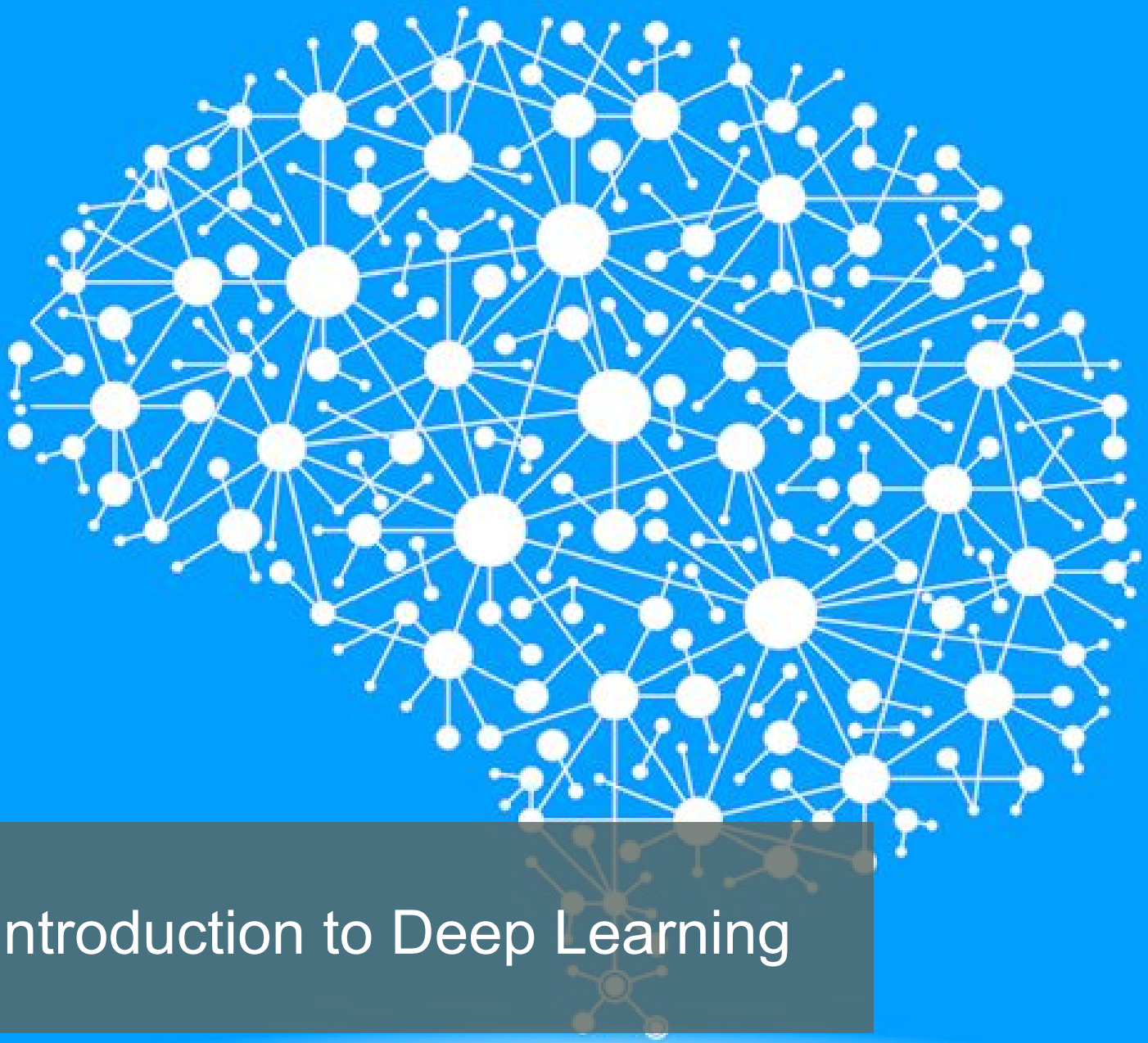


Introduction to Deep Learning

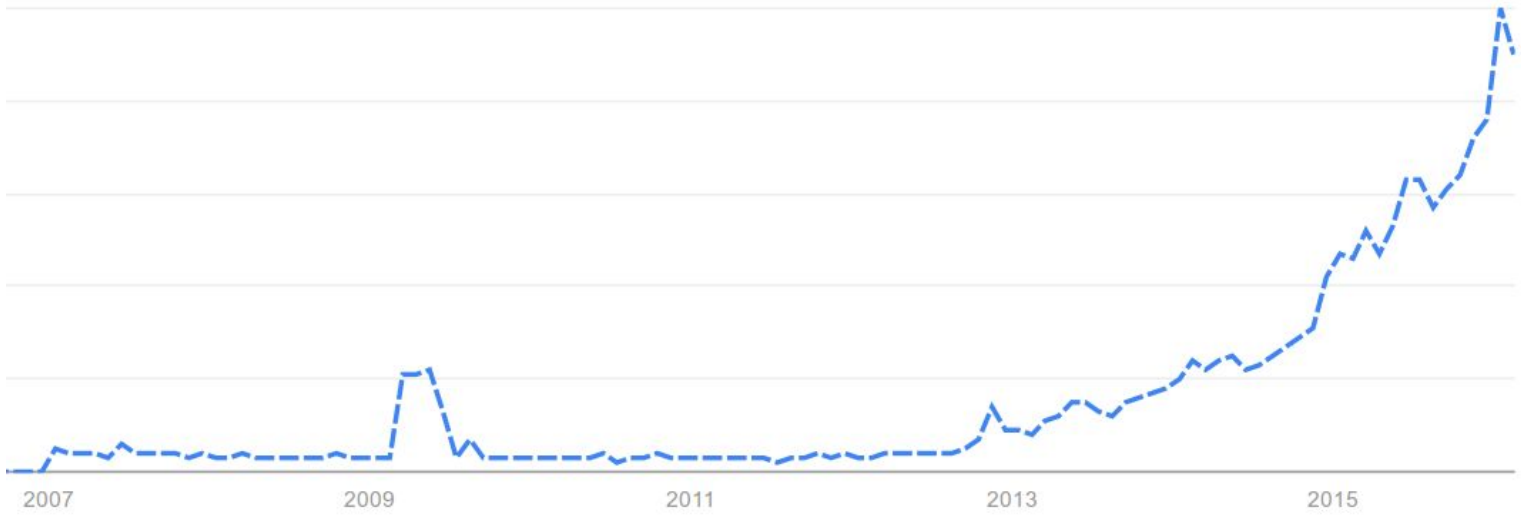
Agenda

1. Motivation
2. What is Machine Learning?
3. Demo 1
4. Modern Deep Learning
5. Demo 2
6. Interesting Use-cases
7. Where should I start?

Motivation

Google Trends

Shows how often "deep learning" is entered relative to the total search-volume across various regions of the world, and in various languages



Deep Learning in News

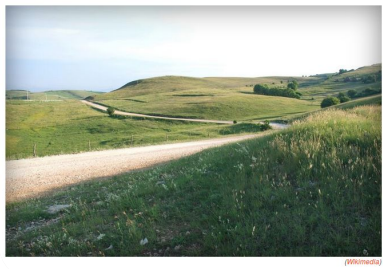
Can Google's AlphaGo really feel it in its algorithms?
John Naughton

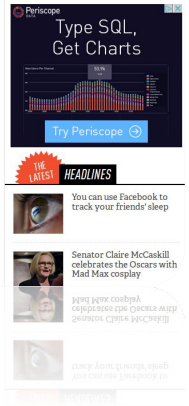
When the game-playing system AlphaGo defeated a master of the Chinese game go five games to nil, its creators could not explain why. Is this a sign of intuitive AI?

Google's latest AI doesn't need geotags to figure out a photo's location

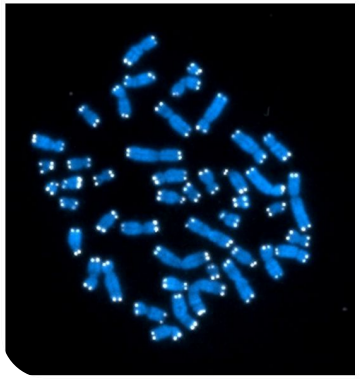
The new deep-learning program churns through millions of photos to determine the best match.

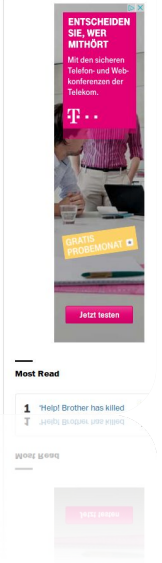
By Alex Brokaw on February 25, 2016 01:03 pm

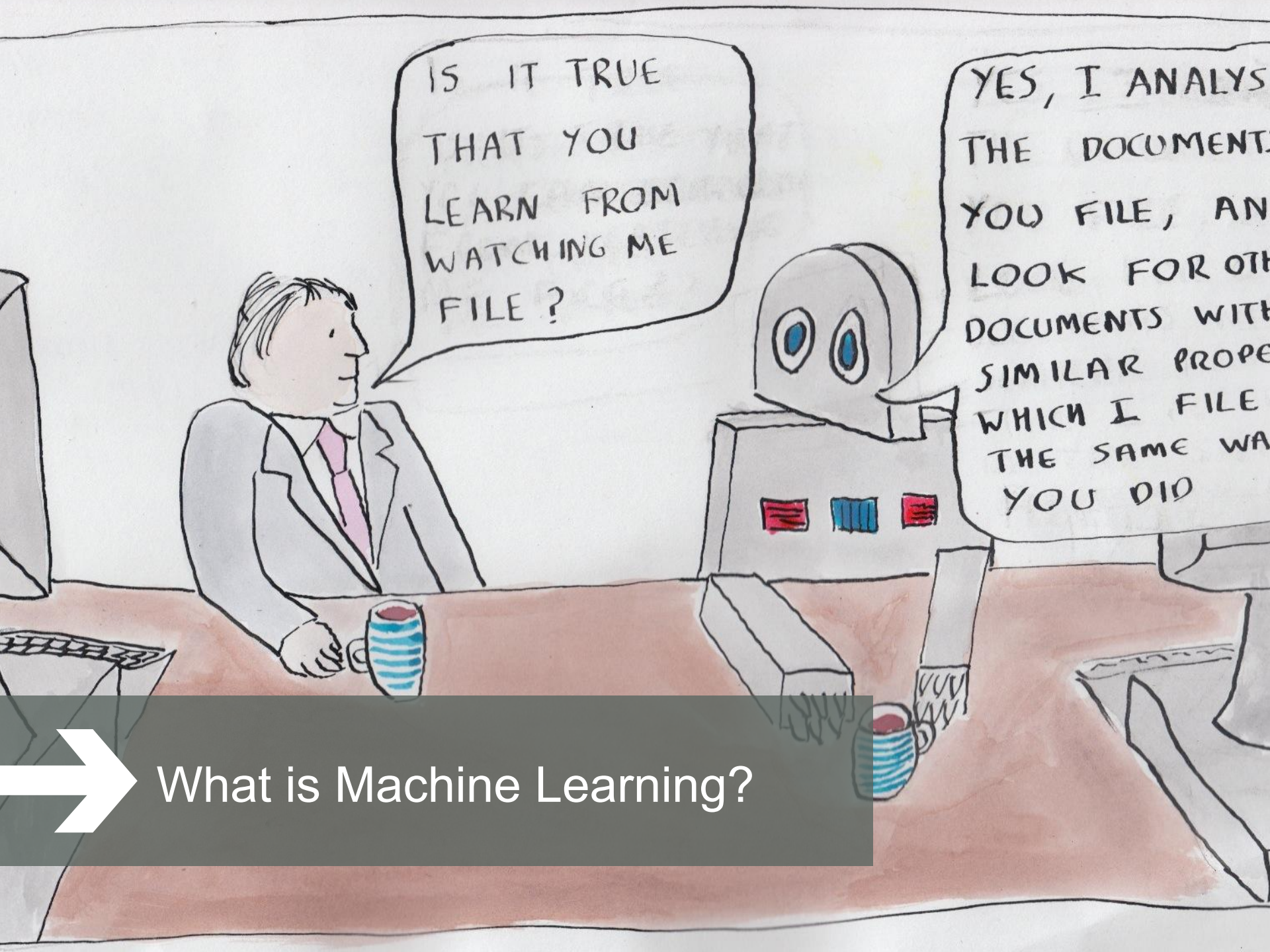




Meet Deep Genomics, a start-up bringing the power of deep learning to genomics



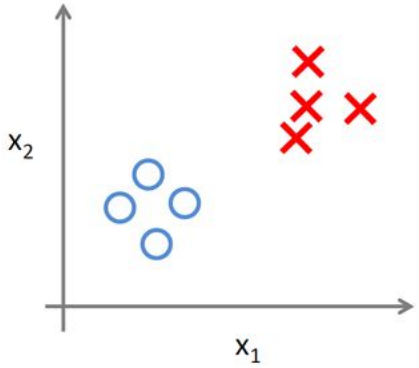




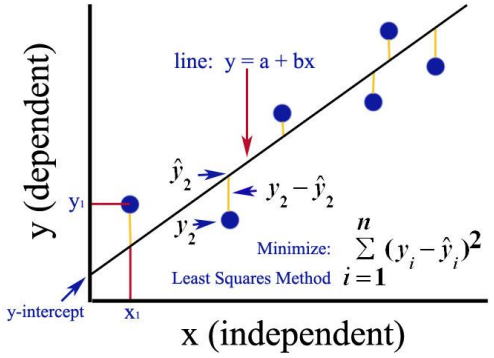
What is Machine Learning?

Tasks in Machine Learning

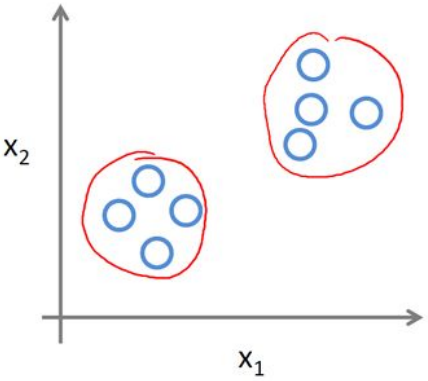
Classification



Regression



Clustering



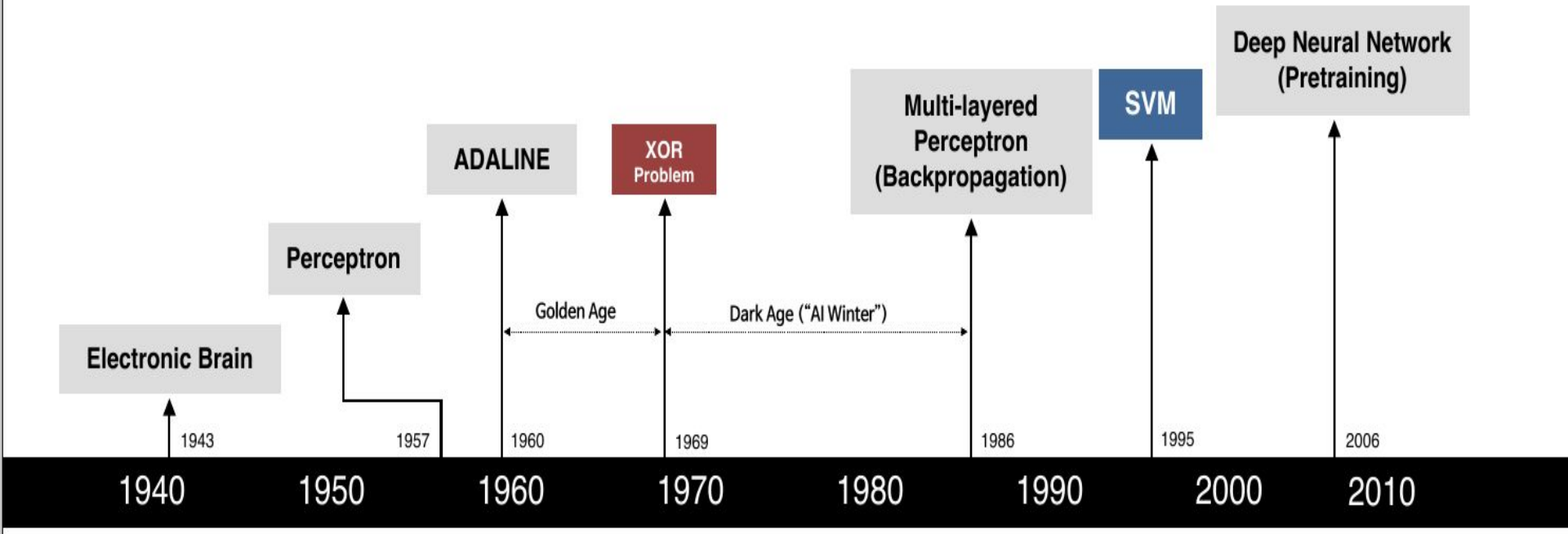
Association Rule Learning

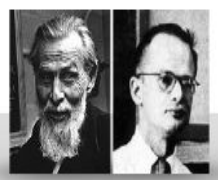
TID	Items
1	Bread, Milk
2	Bread, Diaper, Beer, Eggs
3	Milk, Diaper, Beer, Coke
4	Bread, Milk, Diaper, Beer
5	Bread, Milk, Diaper, Coke

	Beer	Bread	Milk	Diaper	Eggs	Coke
T_1	0	1	1	0	0	0
T_2	1	1	0	1	1	0
T_3	1	0	1	1	0	1
T_4	1	1	1	1	0	0
T_5	0	1	1	1	0	1

Brief History of Neural Network

DEVIEW
2015





S. McCulloch - W. Pitts

F. Rosenblatt

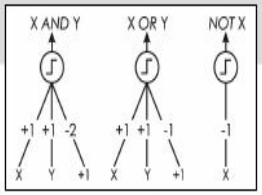
B. Widrow - M. Hoff

M. Minsky - S. Papert

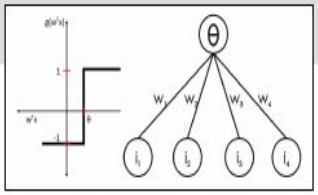
D. Rumelhart - G. Hinton - R. Wiliams

V. Vapnik - C. Cortes

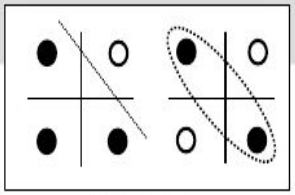
G. Hinton - S. Ruslan



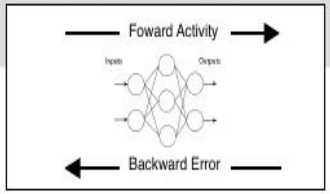
- Adjustable Weights
- Weights are not Learned



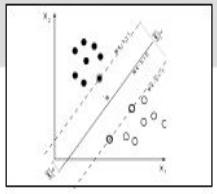
- Learnable Weights and Threshold



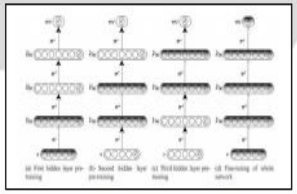
- XOR Problem



- Solution to nonlinearly separable problems
- Big computation, local optima and overfitting



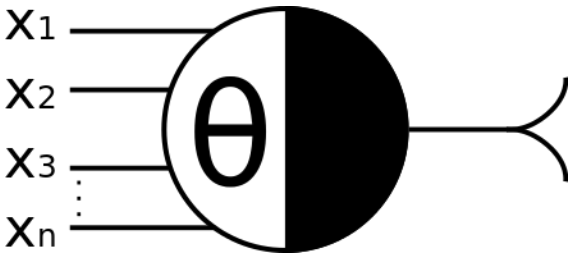
- Limitations of learning prior knowledge
- Kernel function: Human Intervention

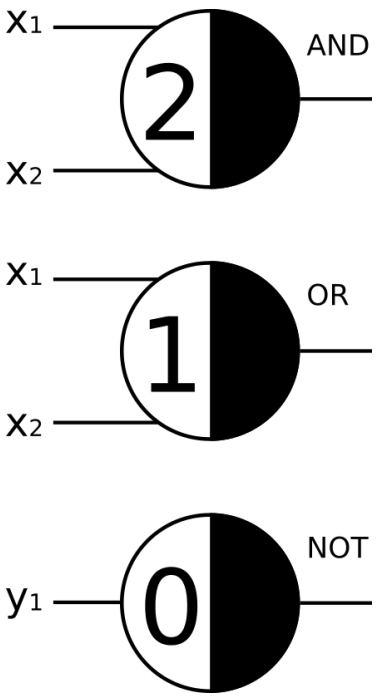


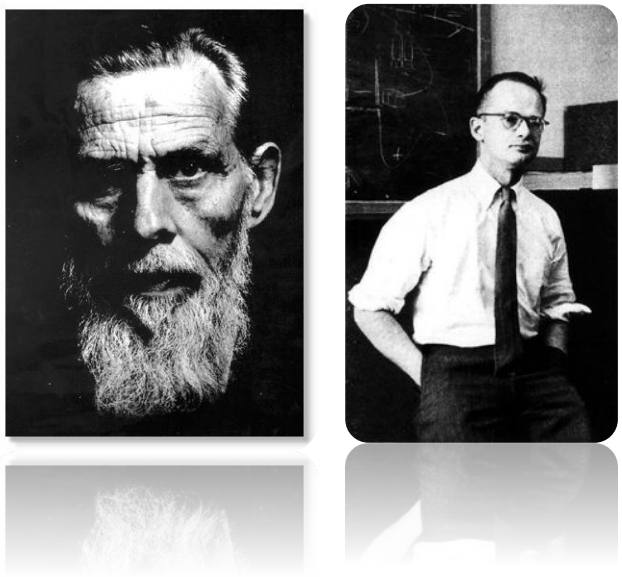
- Hierarchical feature Learning

History of Deep Learning (1943)

McCulloch-Pitts Model of Neuron

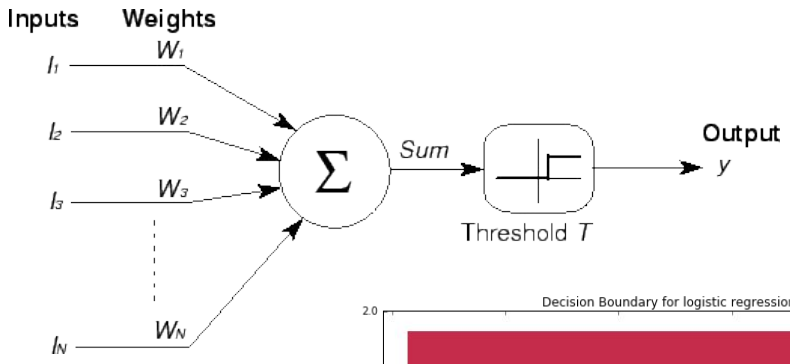


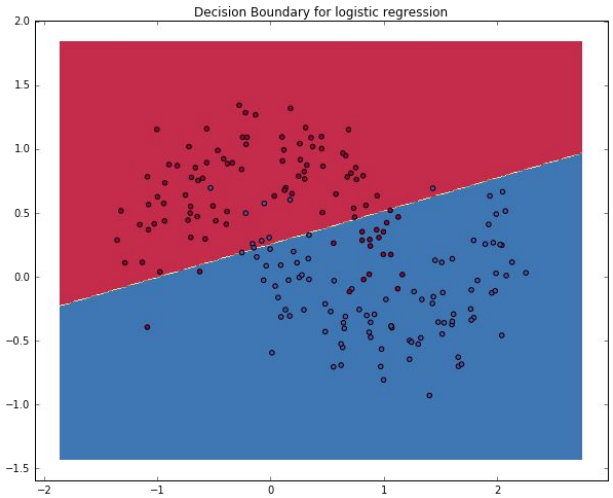


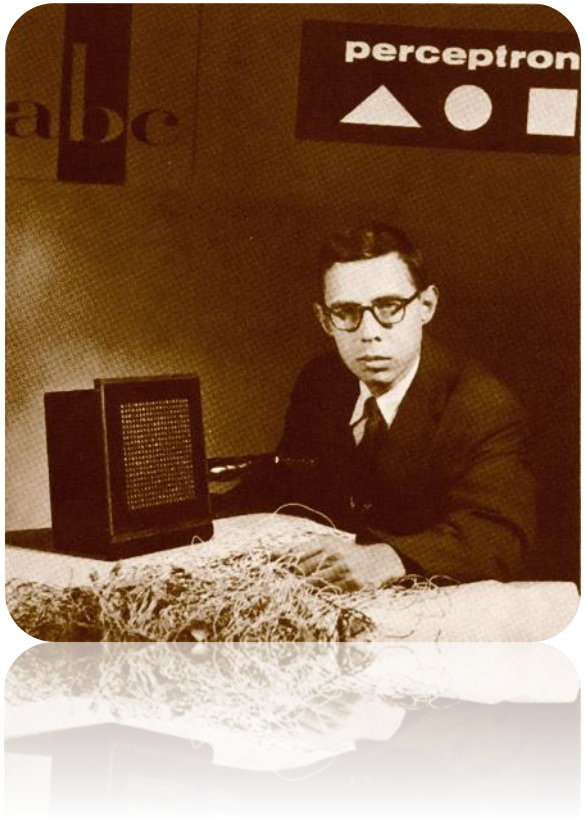


History of Deep Learning (1957)

Frank Rosenblatt: Perceptron Model
(including learning algorithm)

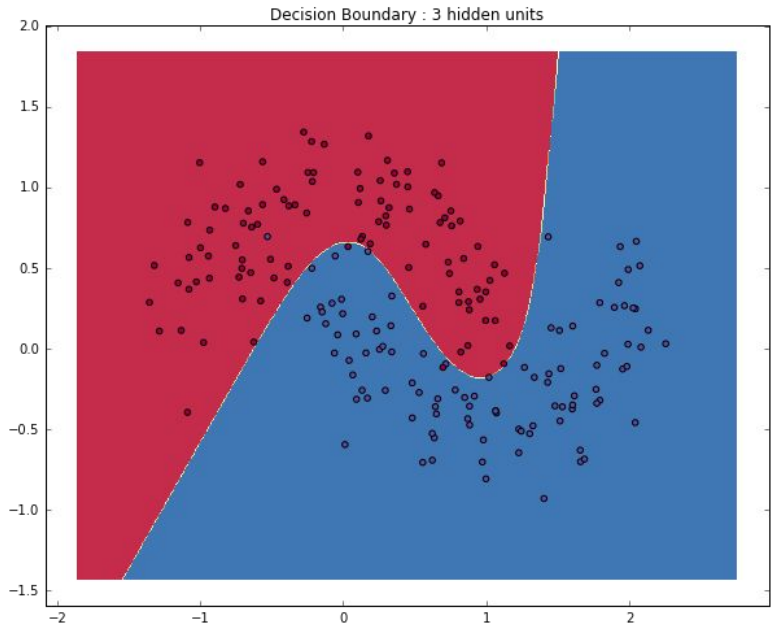


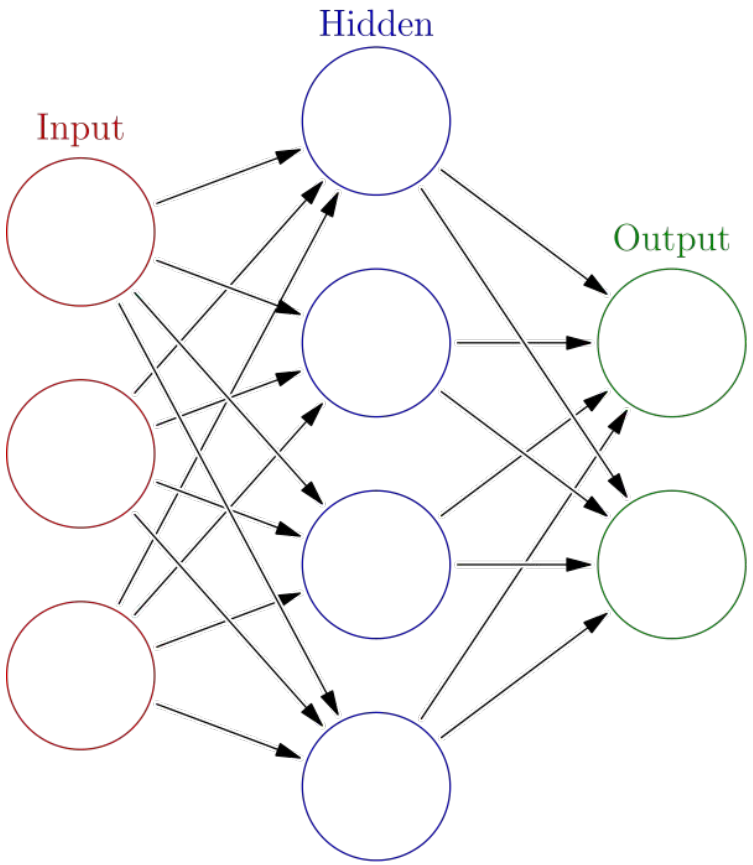




History of Deep Learning

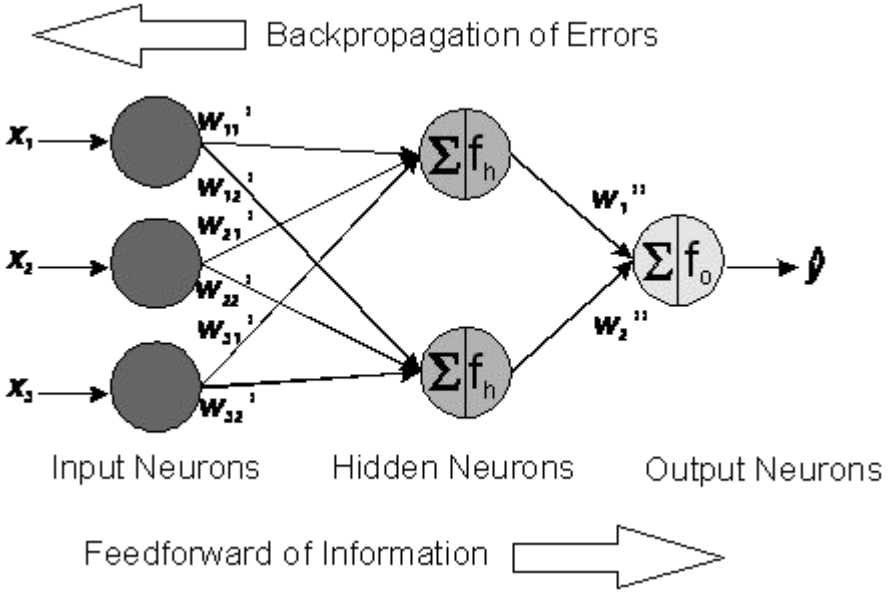
Multi Layer Perceptron
(can approximate any continuous function)





History of Deep Learning (1986)

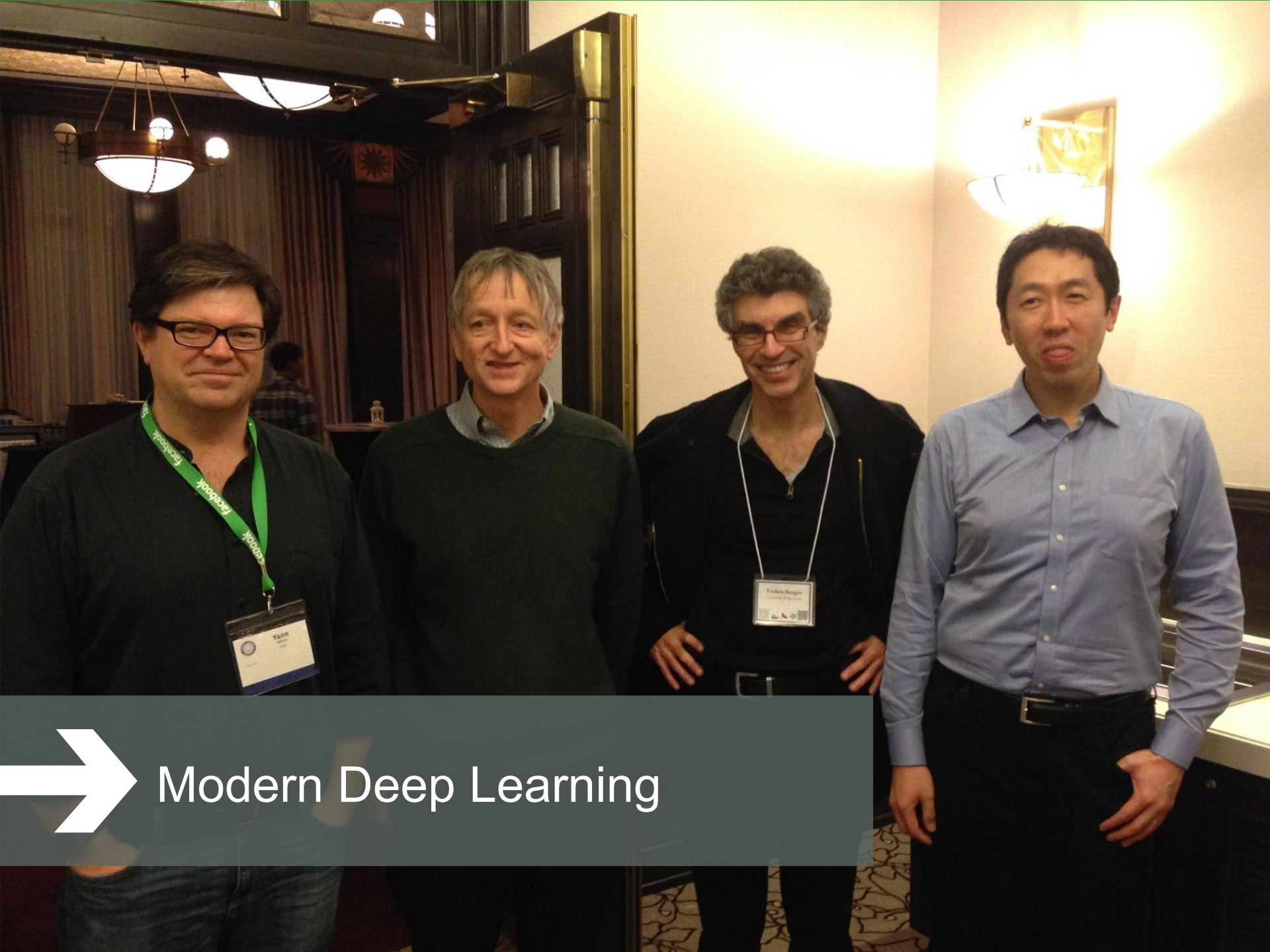
Backpropagation



pressrelations
schneller mehr wissen

Demo Time!

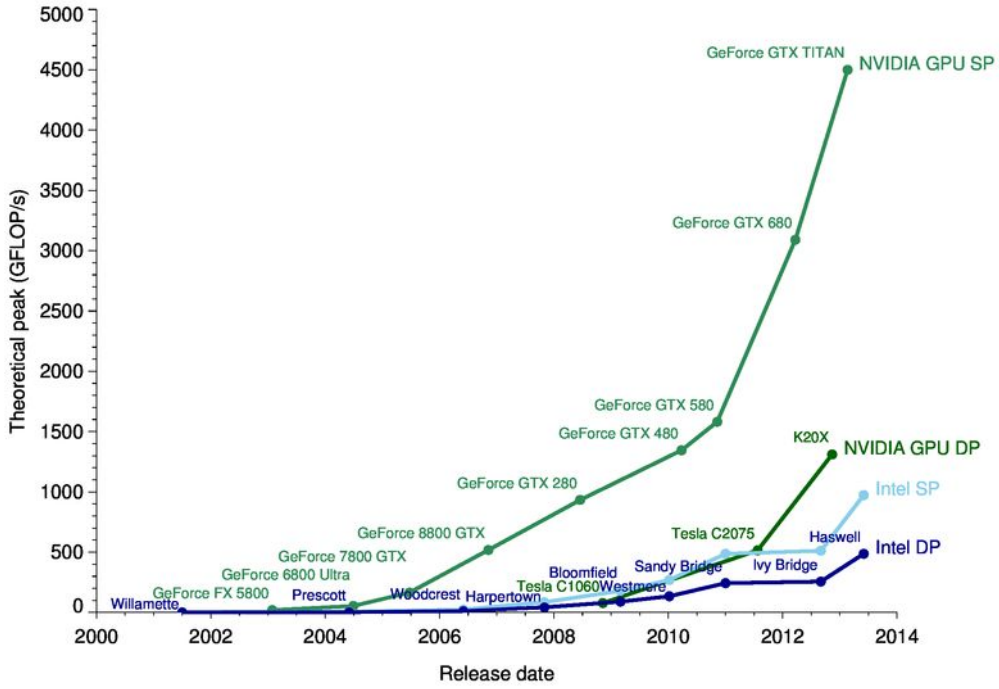
Lets train a neural network!



Modern Deep Learning

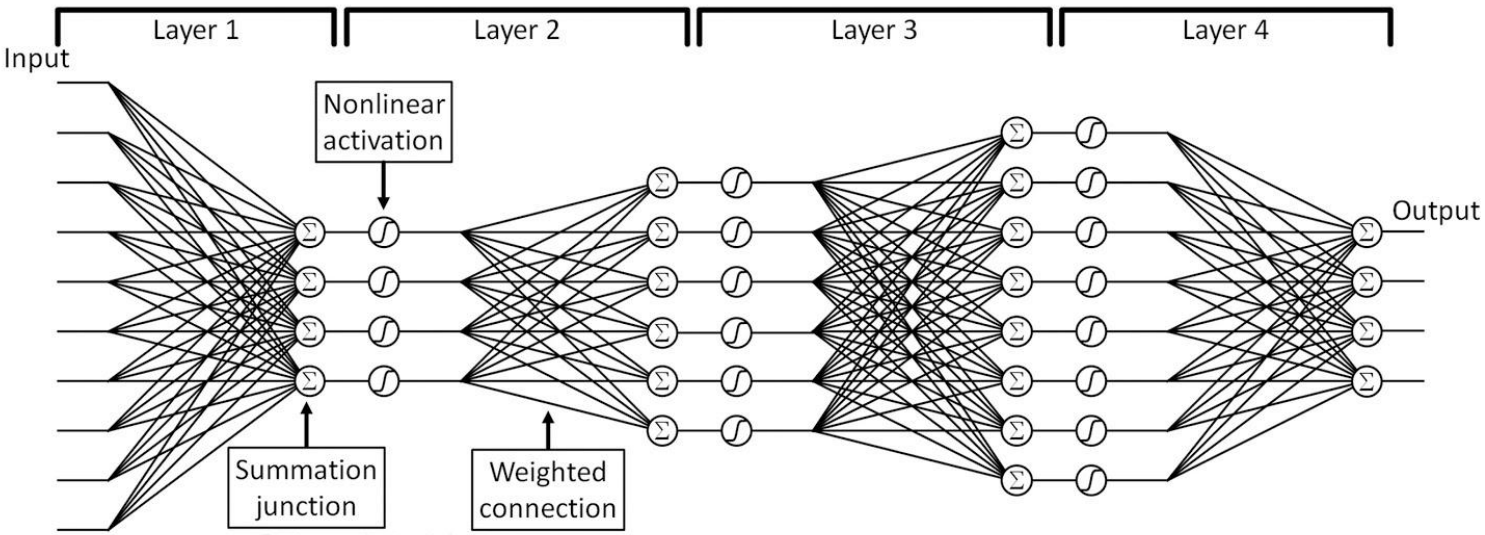
Increased Interest in Deep Learning

- ➔ Increased amount of data
- ➔ Increased computing power



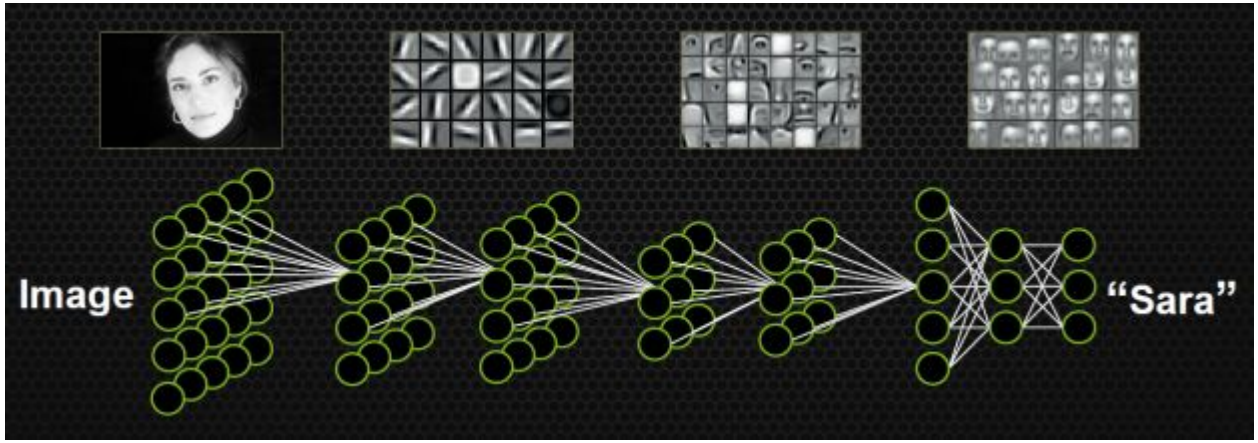
What does “deep” in DL mean?

➔ Multiple layers of non-linear information processing that are hierarchical in nature



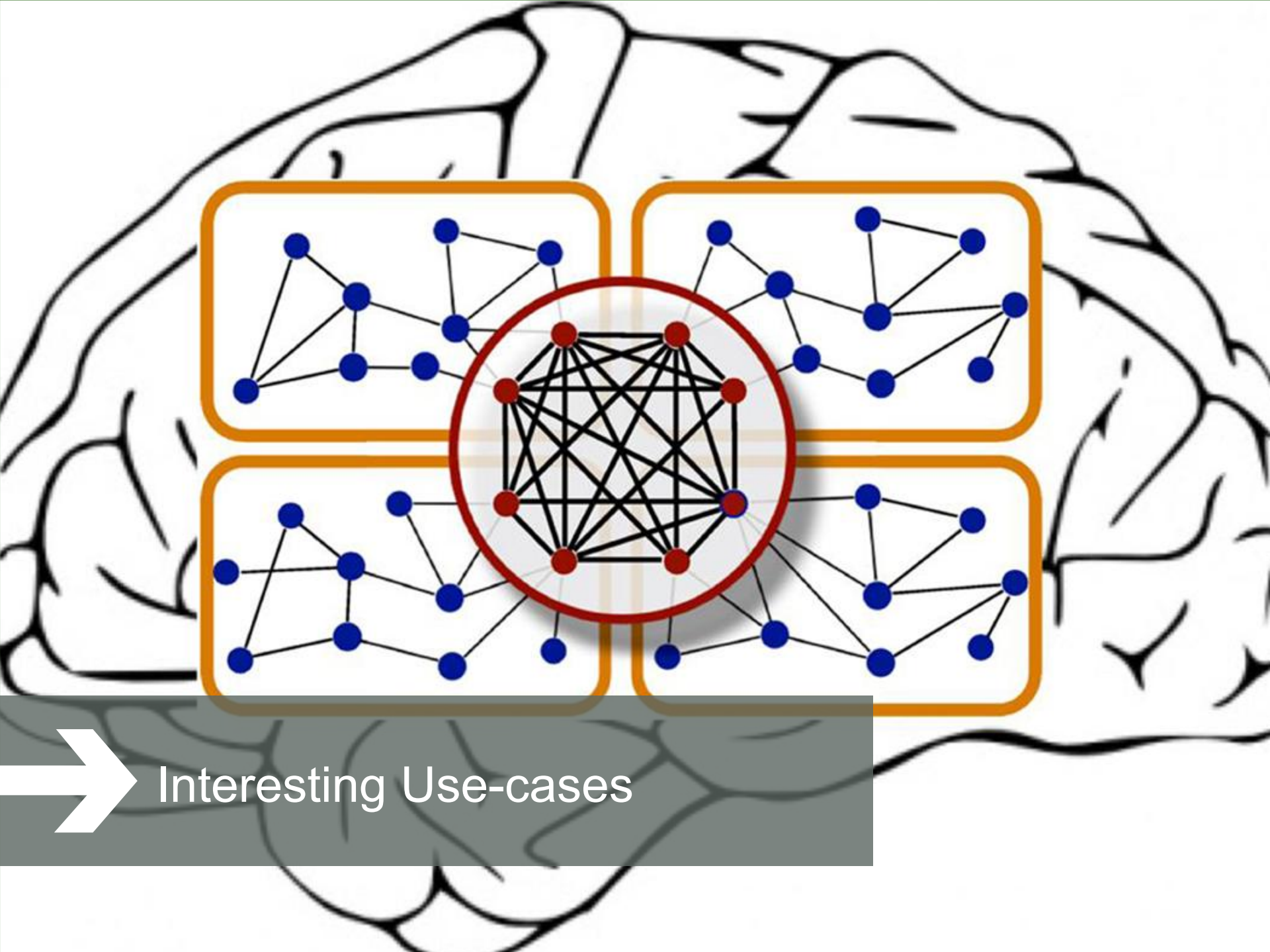
Representation Learning

- Representation learning: Transformation of raw data input to a representation that can be effectively exploited
- Output of each layer can be viewed as a representation of the original data
- Each level uses the representation produced by previous level as input



Deep Learning Demo

WORD2VEC

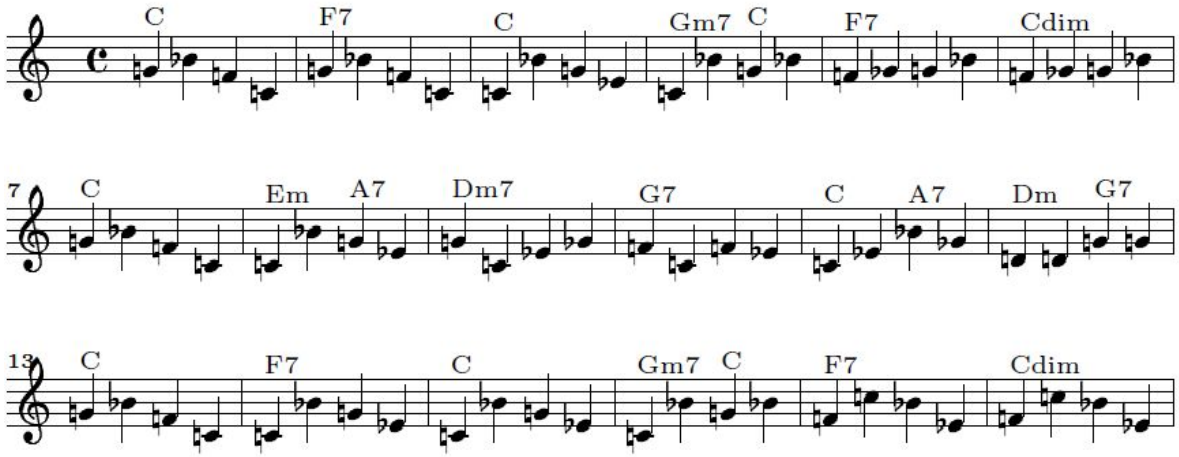


Interesting Use-cases

Composing Music

Recurrent Neural Networks (LSTM)

- ➔ Learns to compose blues music
- ➔ Network induces both local and global structure of the music
- ➔ Composition of novel and pleasing melodies

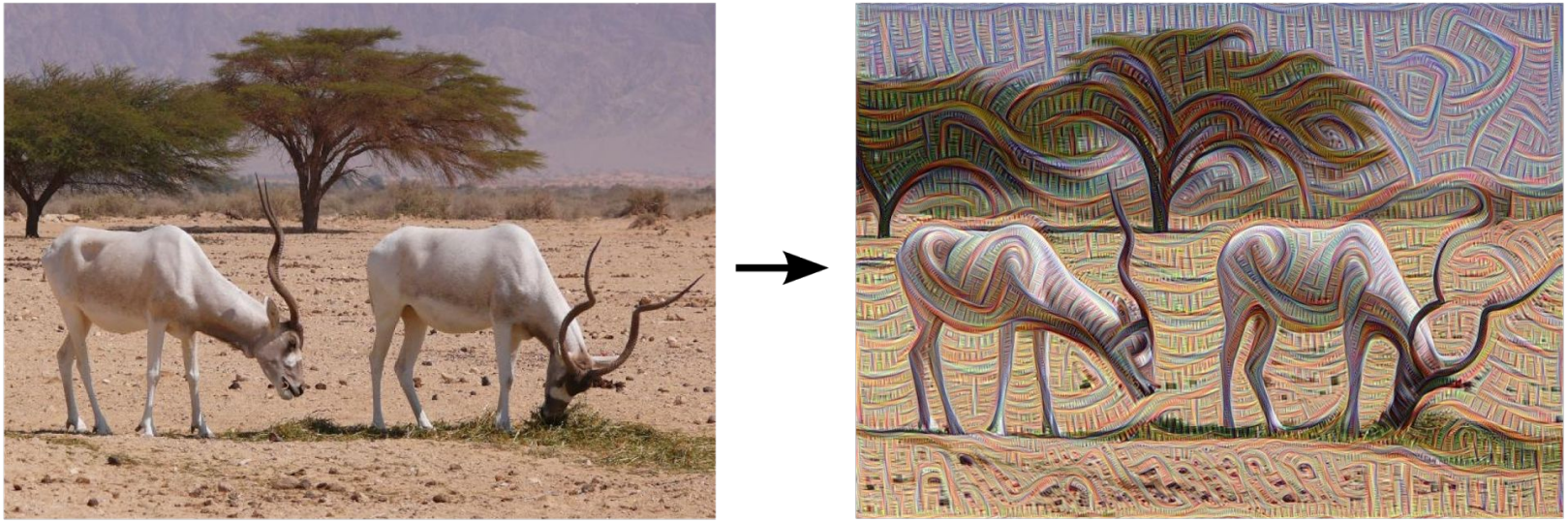


A First Look at Music Compositionusing LSTM Recurrent Neural Networks [Douglas Eck, Jürgen Schmidhuber]

Deep Dream

Deep Dream

- ➔ Originally for ImageNet Large Scale Visual Recognition Challenge
- ➔ Idea: Once a network can identify certain objects, it could then also recreate those objects on its own



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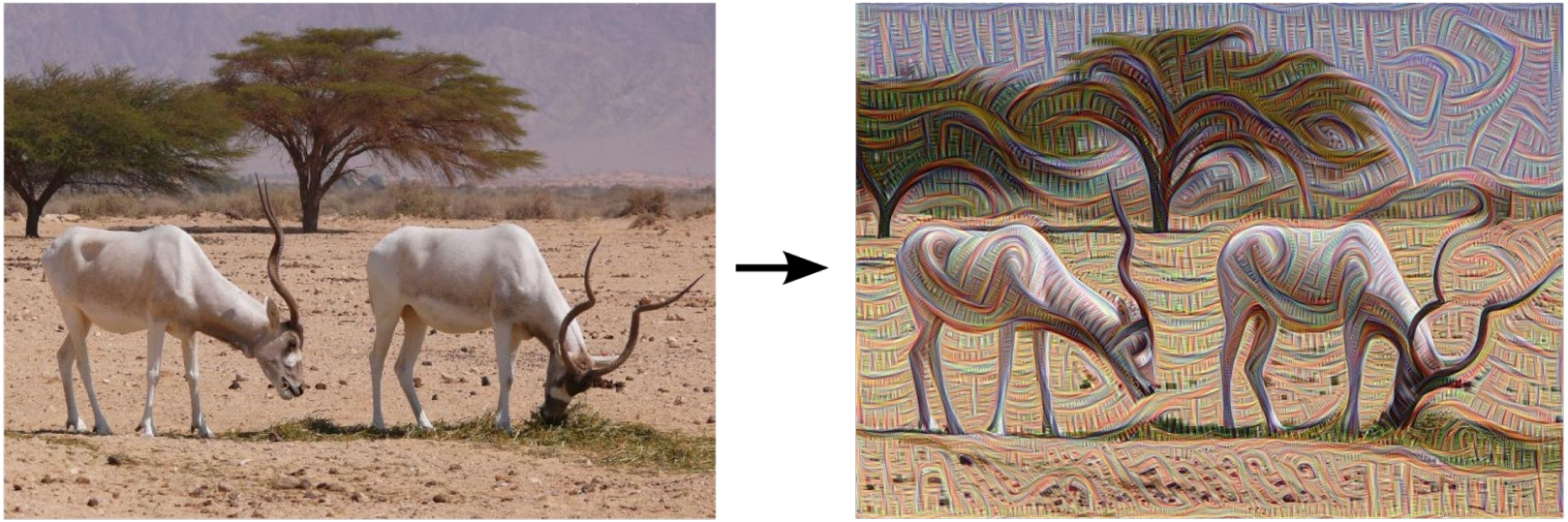


Where should I start?

Deep Learning Resources

Online Courses

- Deep Learning (Yann LeCun - NYU)
- Deep Learning (Vincent Vanhoucke - Google)
- Neural Networks for Machine Learning (Geoffrey Hinton - Toronto)
- Machine Learning (Andrew Ng)

Blogs

- Colah's Blog
- WildML

Books

- Deep Learning (Yoshua Bengio, ...) MIT Press

Thank You for Your DEEP Attention