

Global revolution in machine learning

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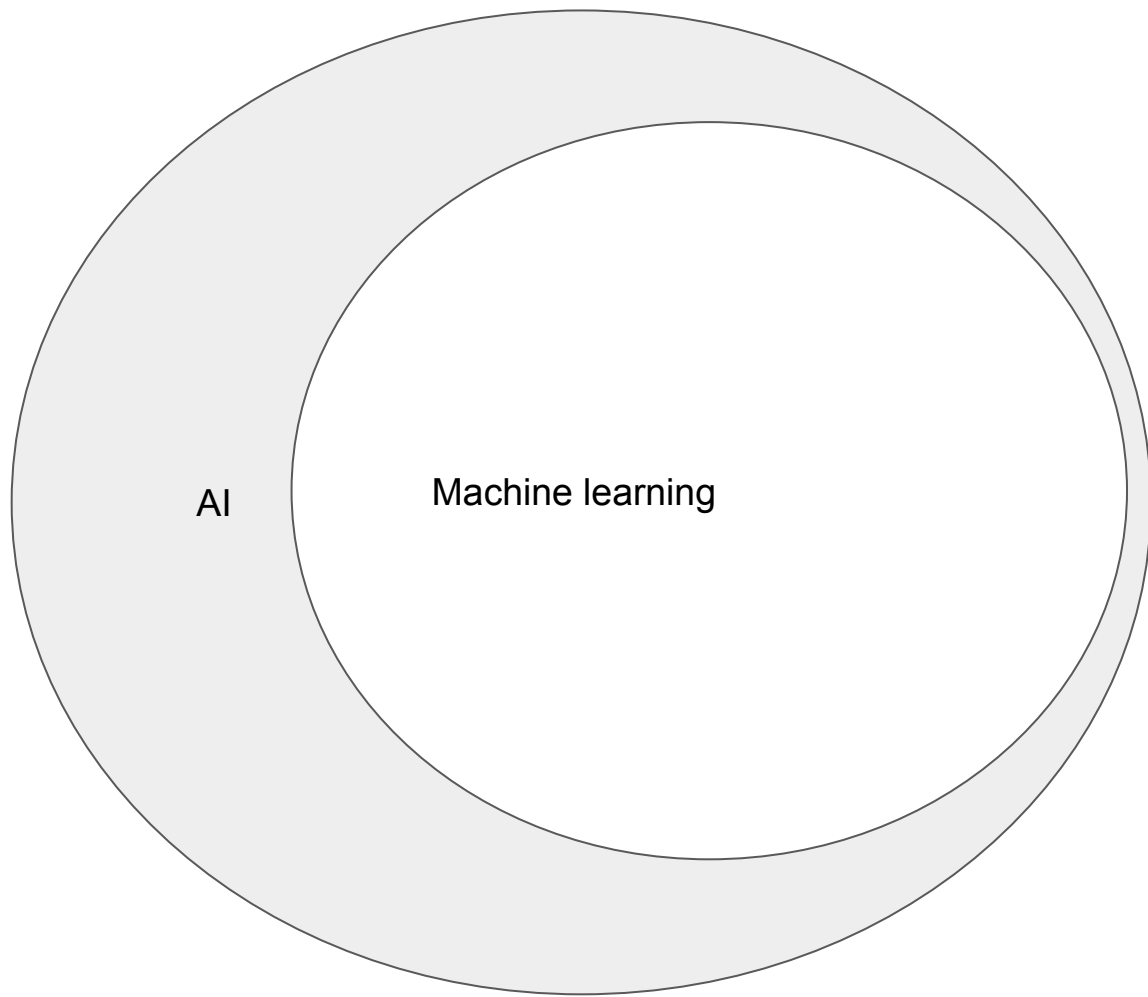
Have you ever interacted with AI/machine learning?



Artificial Intelligence

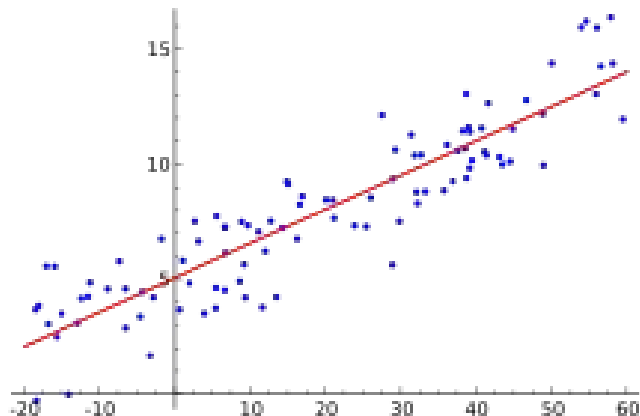
- Artificial Intelligence (AI) - mimic human behaviour
 - Alan Turing - Computing Machinery and Intelligence ([PDF](#))
 - Prolog

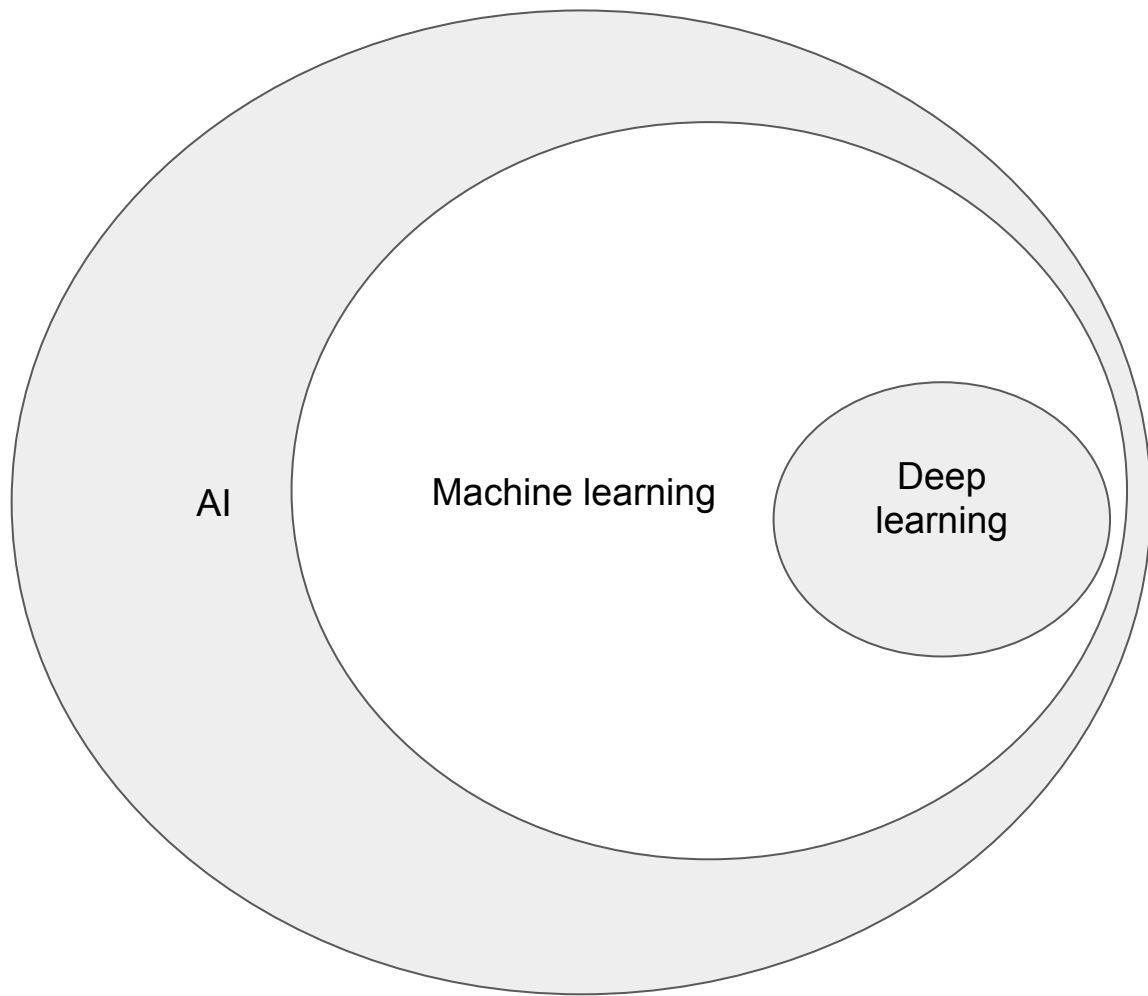
```
?- father(john, jake).  
true.
```



Machine learning

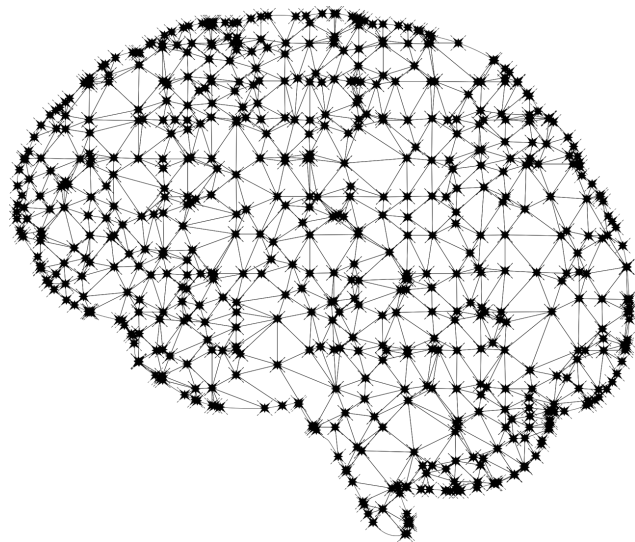
- Machine learning - mimic human behaviour using machines without being explicitly programmed
 - Predict me average price of a house in Brno - linear regression



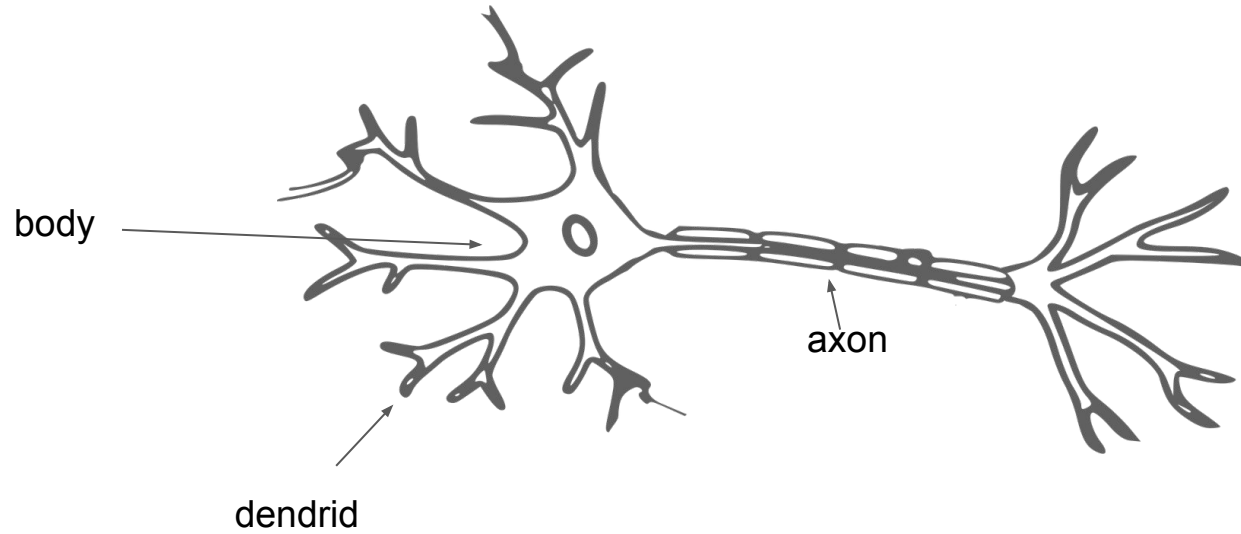


Deep learning

- Let's try to model a human brain
 - Multiple level of abstractions

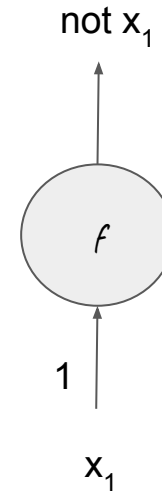
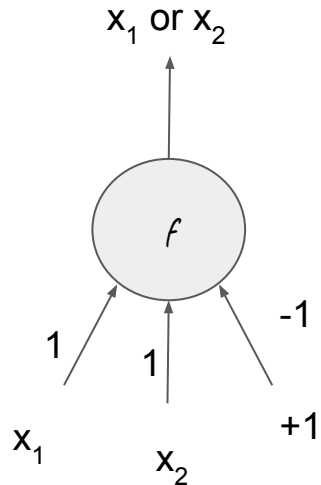
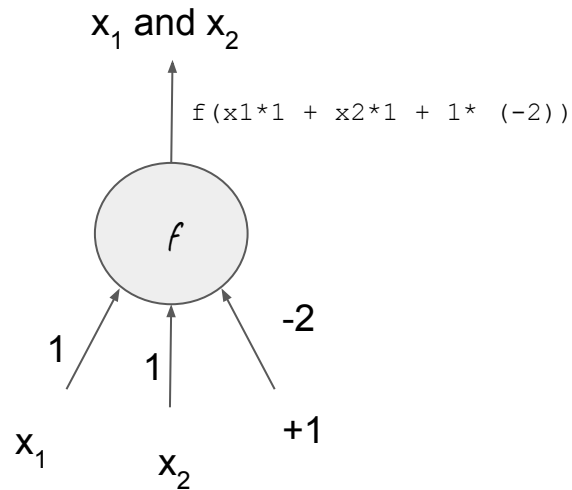


Neuron



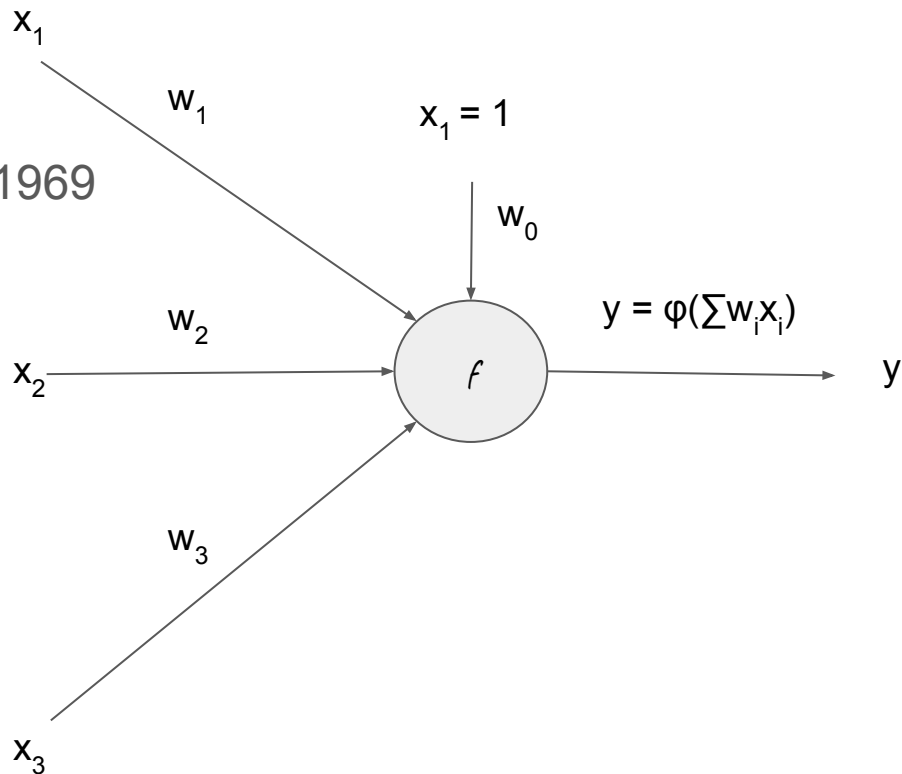
Artificial neuron

- S. McCulloch, W. Pitts - 1943
 - Thresholded logic unit
 - Artificial neuron
 - No learning



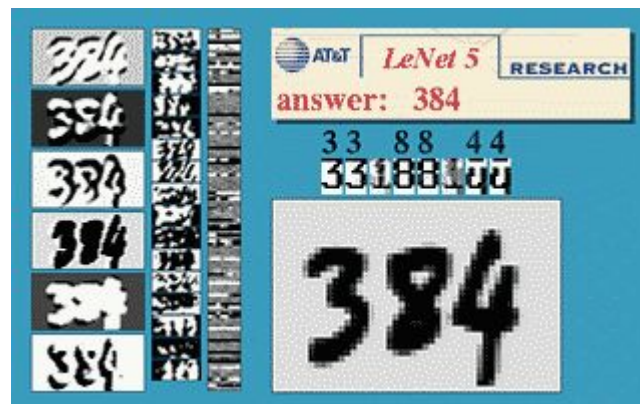
Artificial neuron

- F. Rosenblatt - 1957
 - Founder of neurocomputing
- Minsky, Papert - Perceptrons - 1969
 - Impossible to learn XOR function



Neural networks

- Rumelhart, Hinton, Williams - 1986
 - Backpropagation algorithm
- Yann Lecun - handwritten digits
- Now different types of NN
 - Large research





Iterations
000,599

Learning rate
0.1

Activation
ReLU

Regularization
L2

Regularization rate
0.001

Problem type
Classification

DATA

Which dataset do you want to use?



Ratio of training to test data: 50%

Noise: 0

Batch size: 10

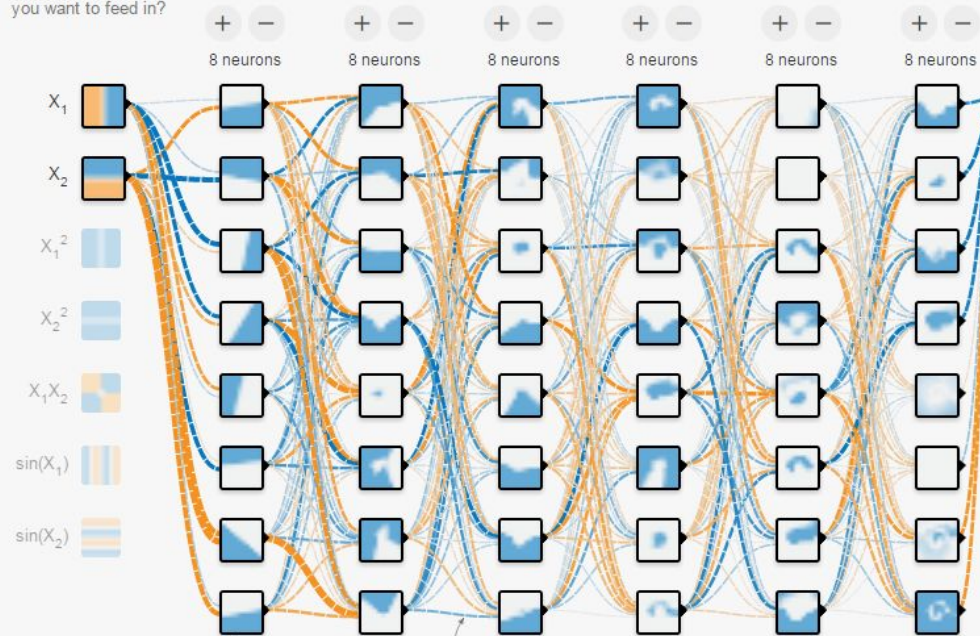
REGENERATE

INPUT

Which properties do you want to feed in?

X_1
 X_2
 X_1^2
 X_2^2
 $X_1 X_2$
 $\sin(X_1)$
 $\sin(X_2)$

+ - 6 HIDDEN LAYERS

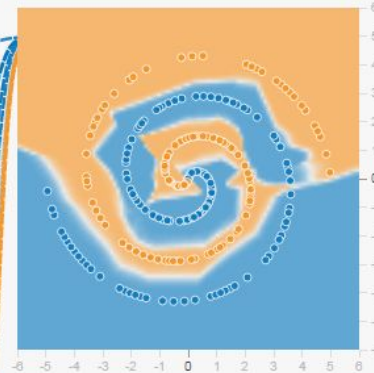


This is the output from one neuron. Hover to see it larger.

The outputs are mixed with varying weights, shown by the thickness of the lines.

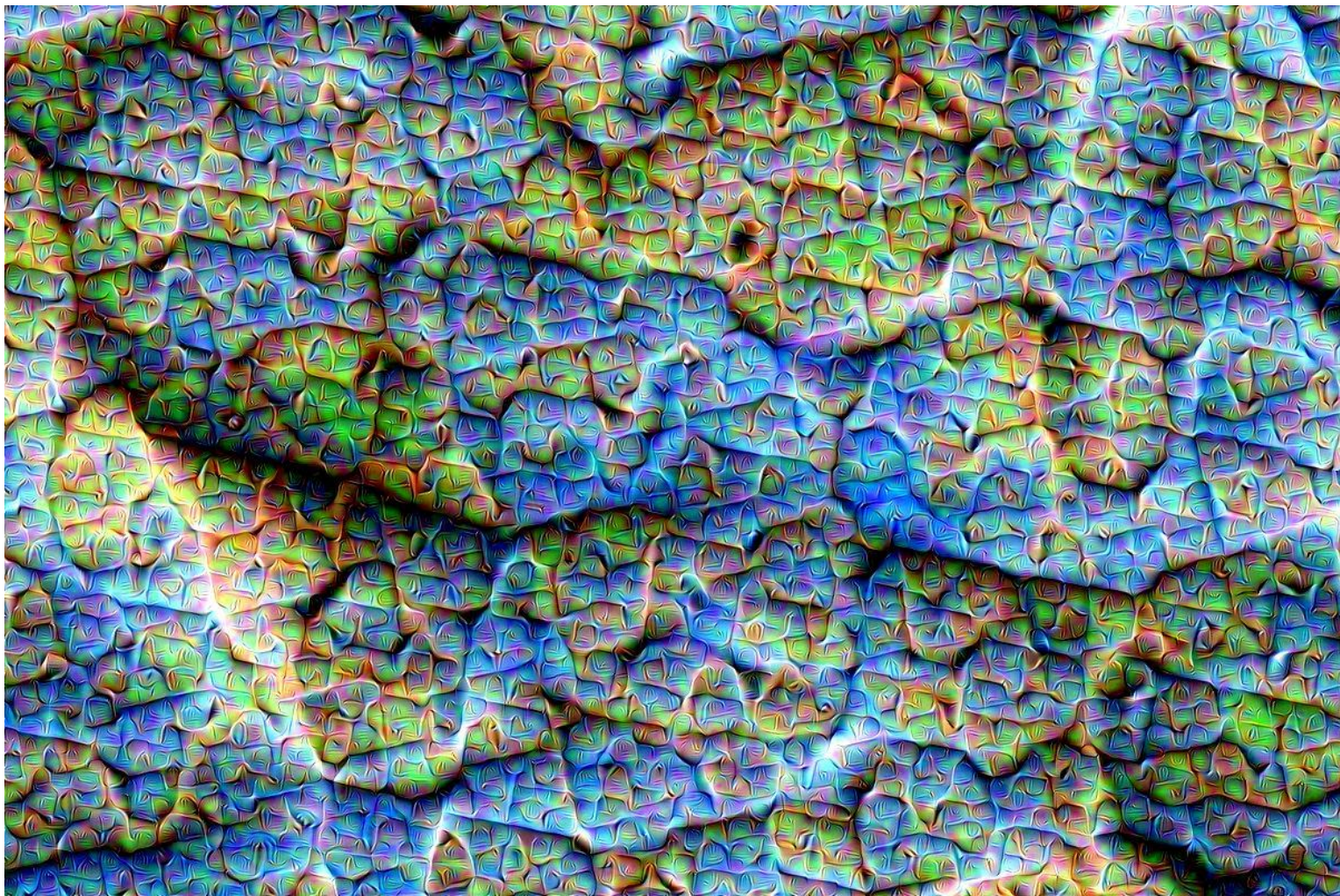
OUTPUT

Test loss 0.005
Training loss 0.012



Colors shows data, neuron and weight values.

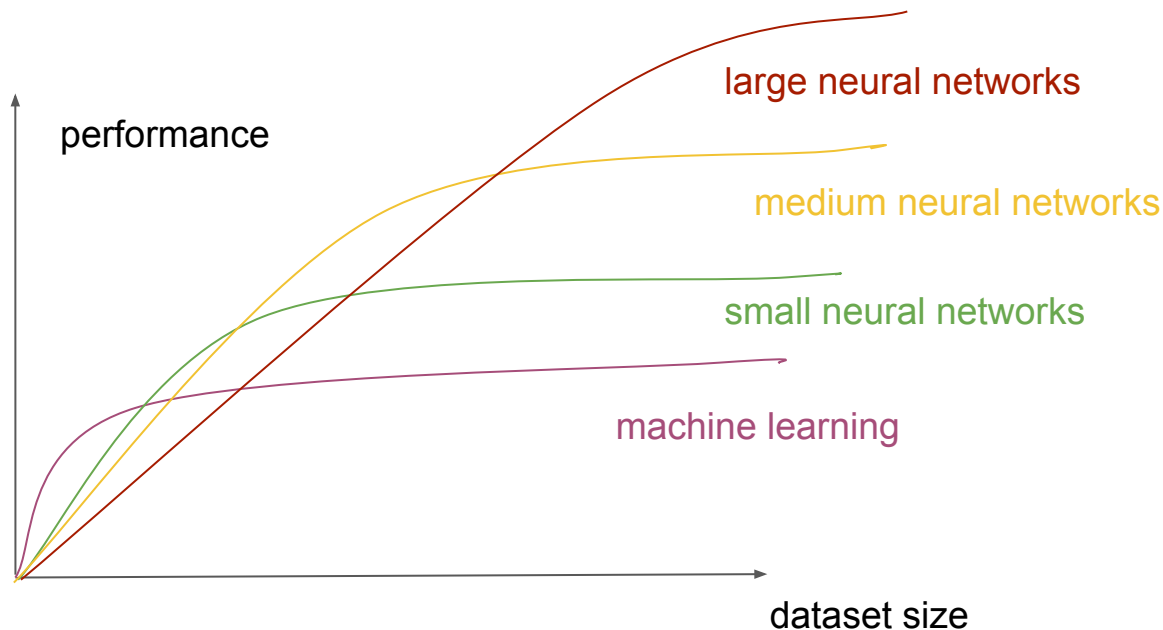
☐ Show test data ☐ Discretize output





Machine learning hype?

- GPU/TPU
- data aggregation



I want to do machine learning!

What is (currently) doable?

- Anything what people can do
- Anything that is doable under 1s for a human human expert

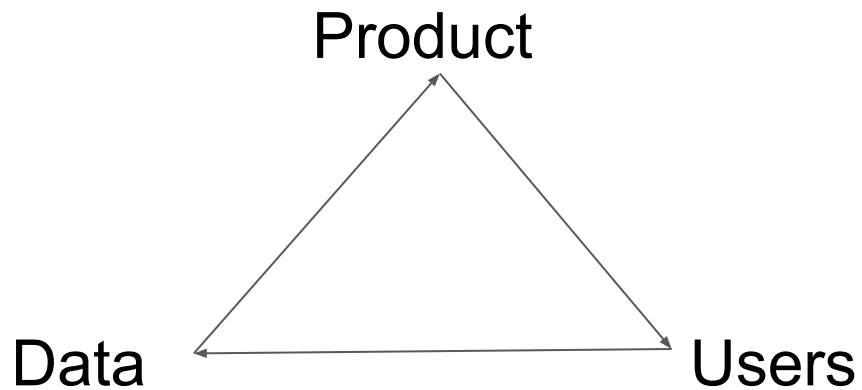
Data, data, data,... and data!

- Data are valuable
 - Thousands or million labeled images
 - 15 - 100 thousand hours of labeled audio samples
 - Synthesizing data possible
- 80/20 rule
 - Data preparation - 80% of work
 - Actual model design - 20% of work
- Good vs. bad models?



Machine learning

- Design a model
- Train
- Predict



What others did?

Pneumonia detection - CheXNet

- 121 layer convolutional neural network
- 112,000+ X-Ray images
- Outperforms a team of experts
- [More info](#)



Input

Chest X-Ray Image

CheXNet

121-layer CNN

Output

Pneumonia Positive (85%)



Some world class achievements in 2017

- [AI beats docs in cancer spotting](#)
- [Facebook is using AI to spot users with suicidal thoughts and send them help](#)
- [New Kepler Exoplanet Discovery Fueled by AI](#)
- [AlphaGo](#)
- [AlphaGo Zero](#)
- [WaveNet: A Generative Model for Raw Audio](#)
- [DeepMind's AlphaZero crushes chess](#)
- ...

What's next?

- [Andrew Ng: Artificial Intelligence is the New Electricity](#)
- Coursera - Machine learning courses
- [Kaggle](#)
- ...

Thank you!