
school of ai

Beril Sirmacek www.BerilSirmacek.com

- Artificial Intelligence
- Augmented Reality
- Computer Vision

- Remote Sensing
- Medical Applications

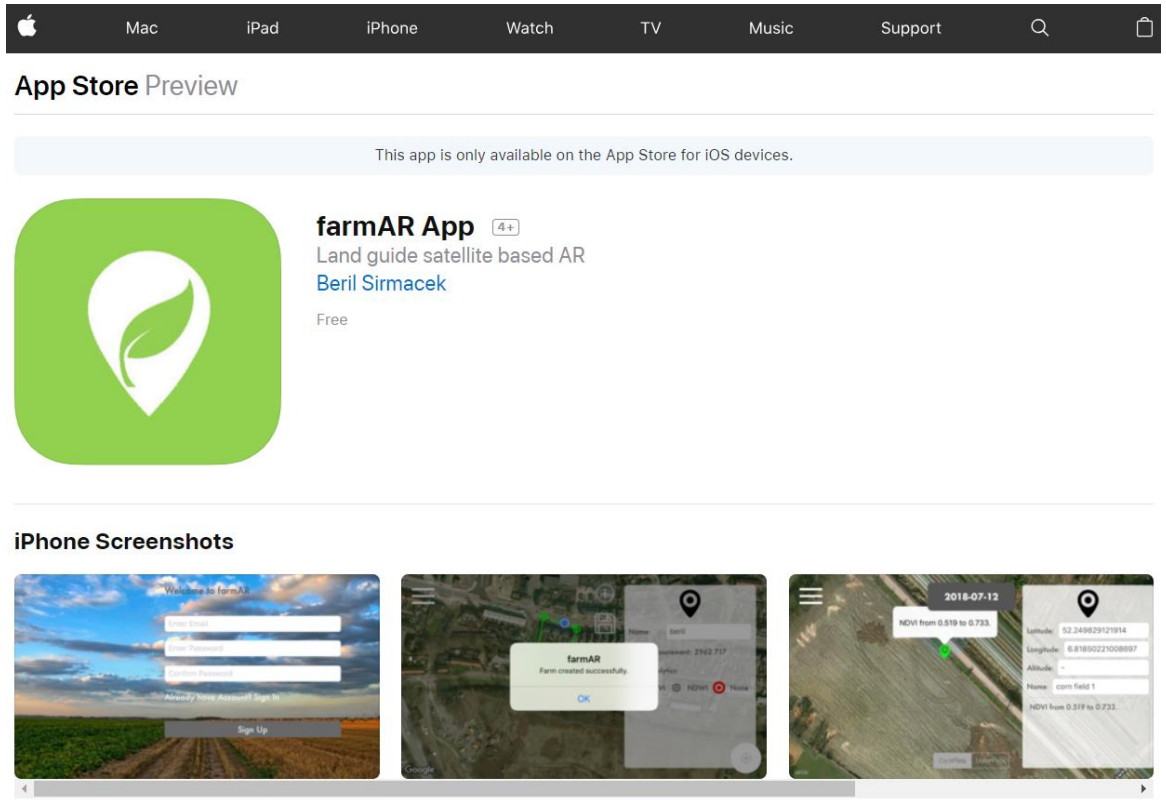
- create4D www.create4D.com
- farmAR app

Beril Sirmacek www.BerilSirmacek.com

- Artificial Intelligence
- Augmented Reality
- Computer Vision

- Remote Sensing
- Medical Applications

- create4D www.create4D.com
- farmAR



https://www.youtube.com/user/DrSirmacek/videos

School of AI Deans (Kareem Elsafty as the Dean for...

230 views • 3 weeks ago

School of AI Deans (Carson Bentley as the Dean for San...

86 views • 3 weeks ago

School of AI Deans (Simbarashe Timothy Motsi...

90 views • 3 weeks ago

School of AI Deans (Fazl Barez the dean of Edinburg...

77 views • 3 weeks ago

School of AI Deans (Sathish Krishnasamy Ravichandran...

144 views • 1 month ago

School of AI Deans (Vamsi Annabathula the dean of...

40 views • 1 month ago

School of AI Deans (Ngong Constantine Mbufung the...

94 views • 1 month ago

School of AI Deans (Joao Areias the dean of Itabira...

142 views • 1 month ago

School of AI Deans (Gregory Shavers the dean of Buffalo...

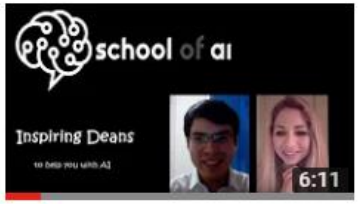
139 views • 1 month ago

School of AI Deans (Jubeen Shah the dean of Raleigh...

124 views • 1 month ago

School of AI Deans (Karan Kharecha the dean of Rajko...

144 views • 1 month ago

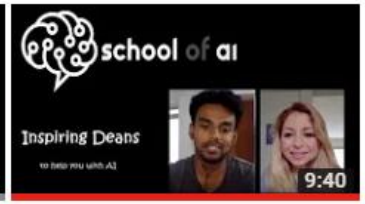


School of AI Deans (Ricardo Enrique Pretelt the dean of...

63 views • 1 month ago

School of AI Deans (Rafael Villca Poggian the dean of L...

51 views • 1 month ago



School of AI Deans (Pravin Vedurla dean of...

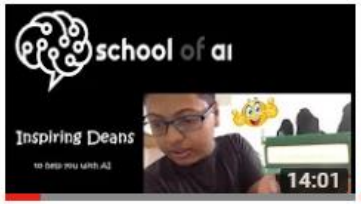
174 views • 1 month ago

School of AI Deans (Beril and Ernest the deans of...

78 views • 1 month ago

School of AI Deans (Nurbek the dean of Tampere School...

63 views • 1 month ago



School of AI Deans (Devansh Trivedi the dean of Rajkot...

88 views • 1 month ago

School of AI Deans (Kaushal Sharma the dean of Noida...

192 views • 1 month ago

Deep Learning and Tensorflow

Beril Sirmacek

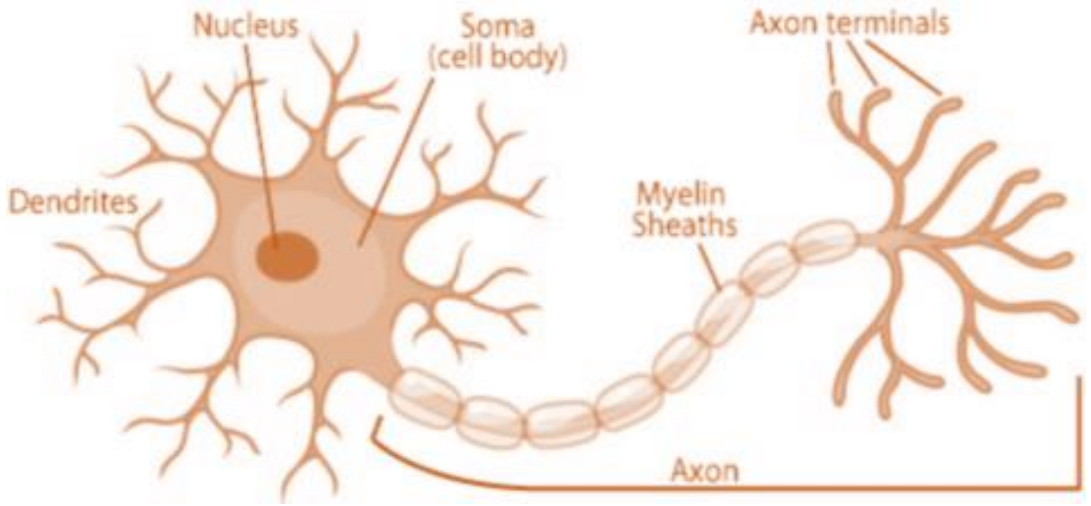
beril@create4D.com

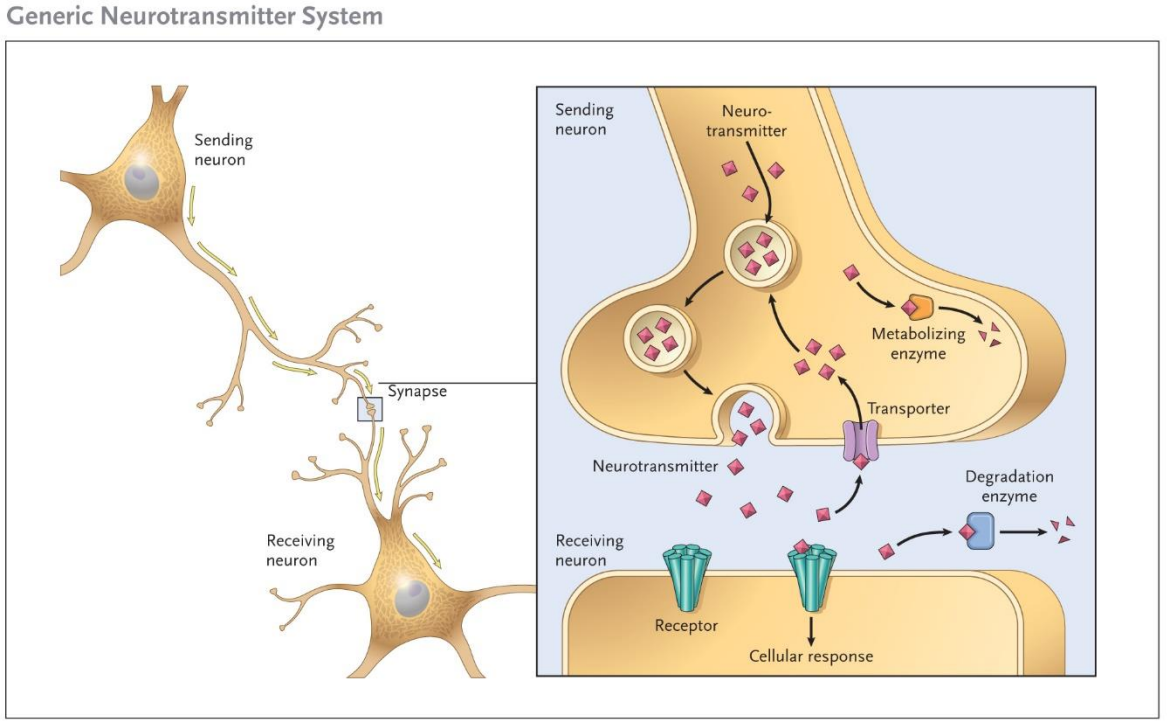
October 4th, 2018

Goals for today:

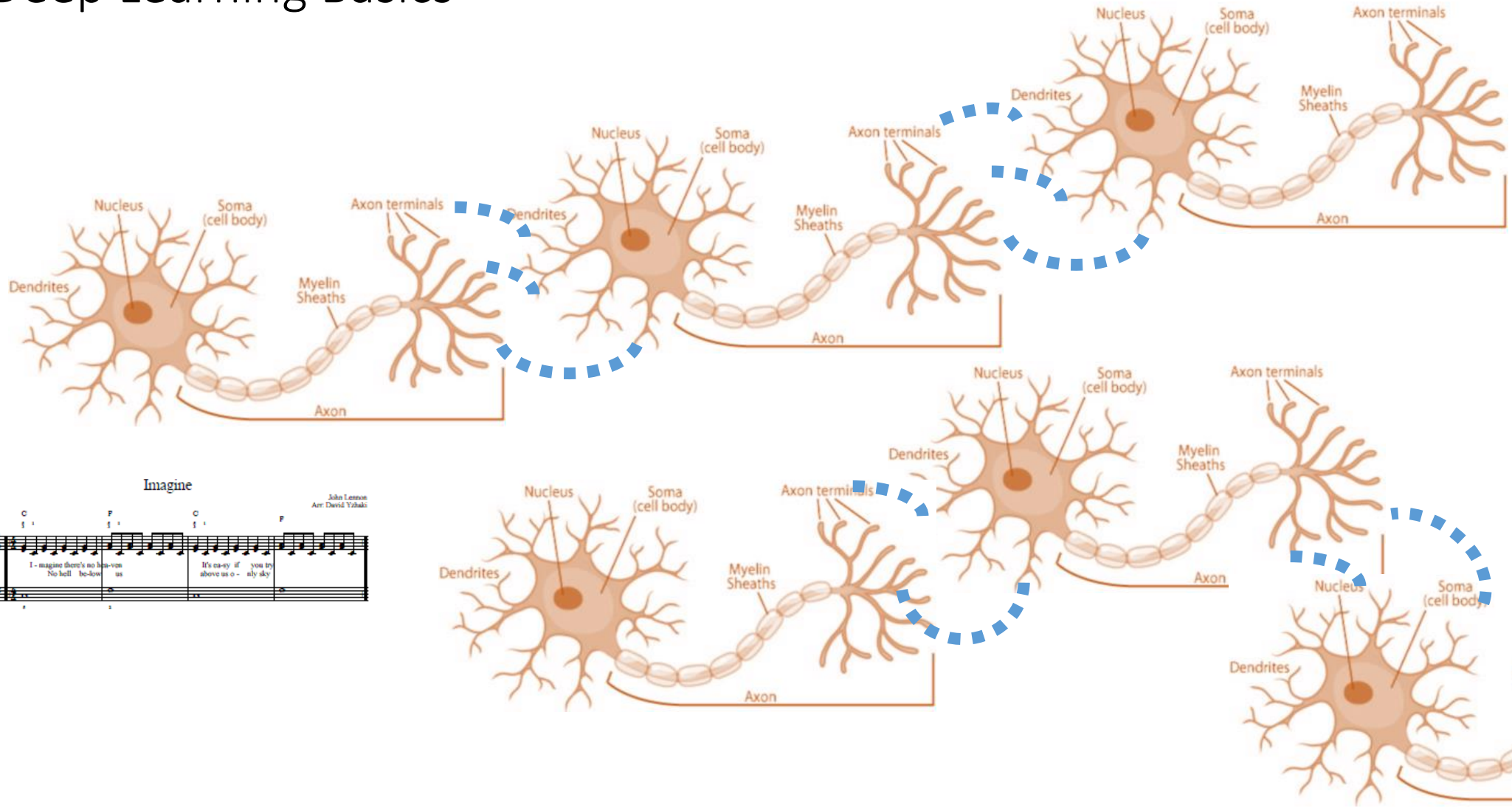
- Deep learning basics
- Deep learning implementation *(transfer learning & learning from scratch)*
- Useful resources
- Python examples to get started

Deep Learning Basics

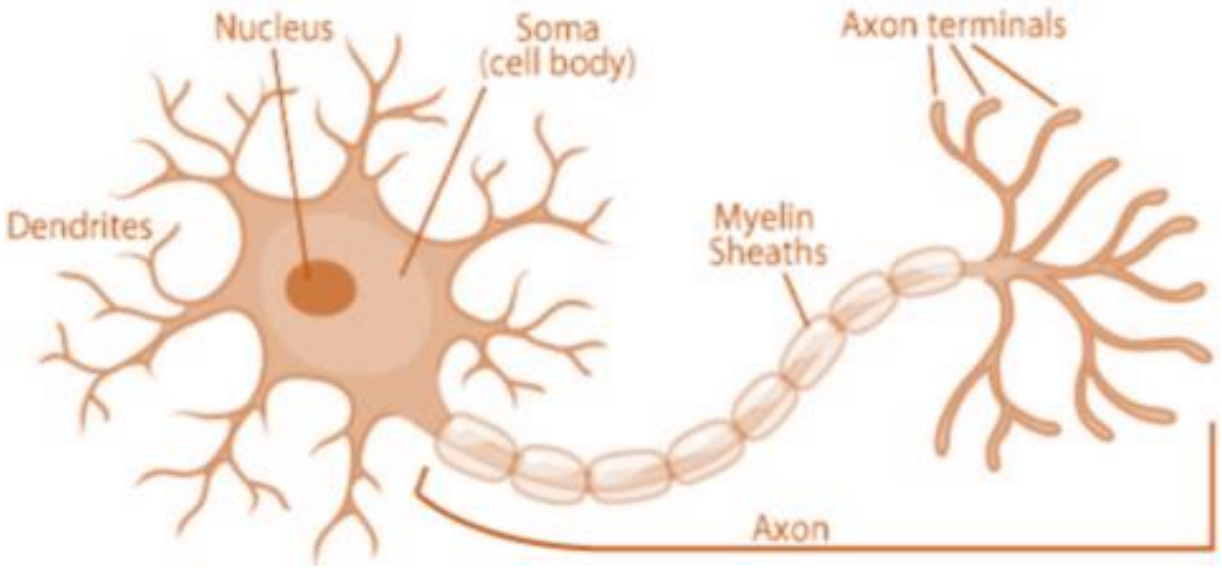


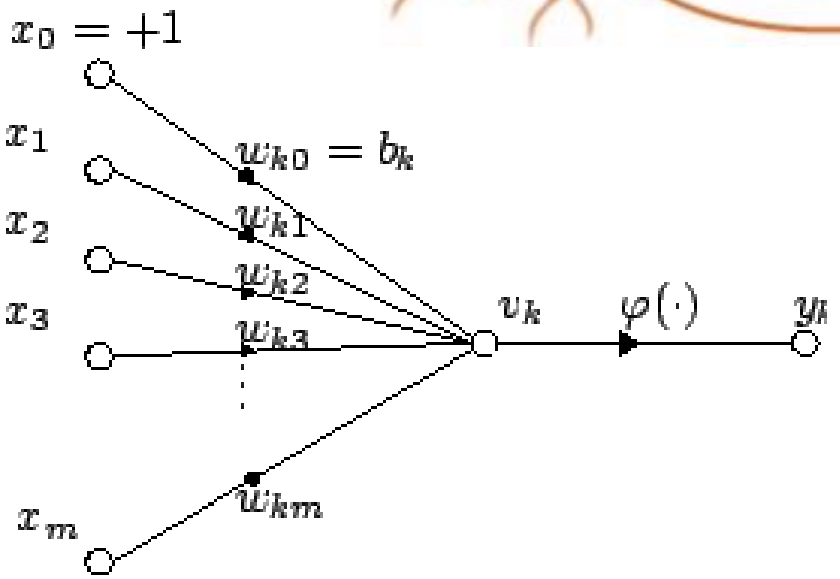


Deep Learning Basics



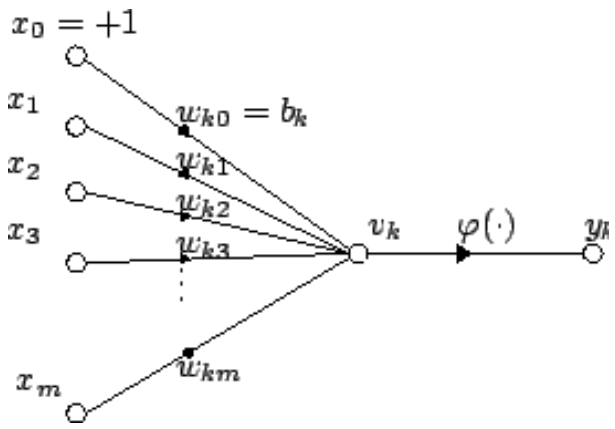
Deep Learning Basics



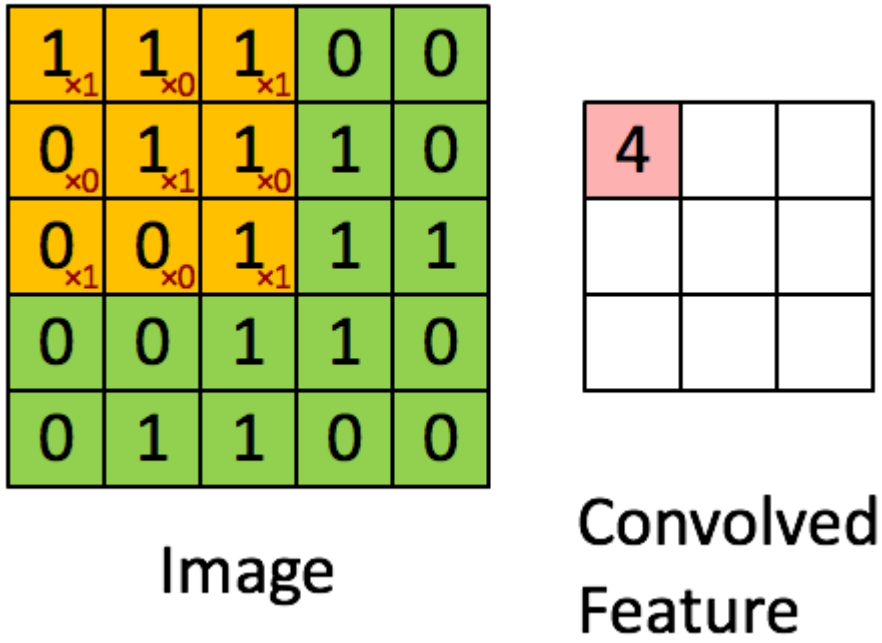


$$y_k = \varphi\left(\sum_{j=0}^{m} w_{kj} x_j\right)$$

Deep Learning Basics

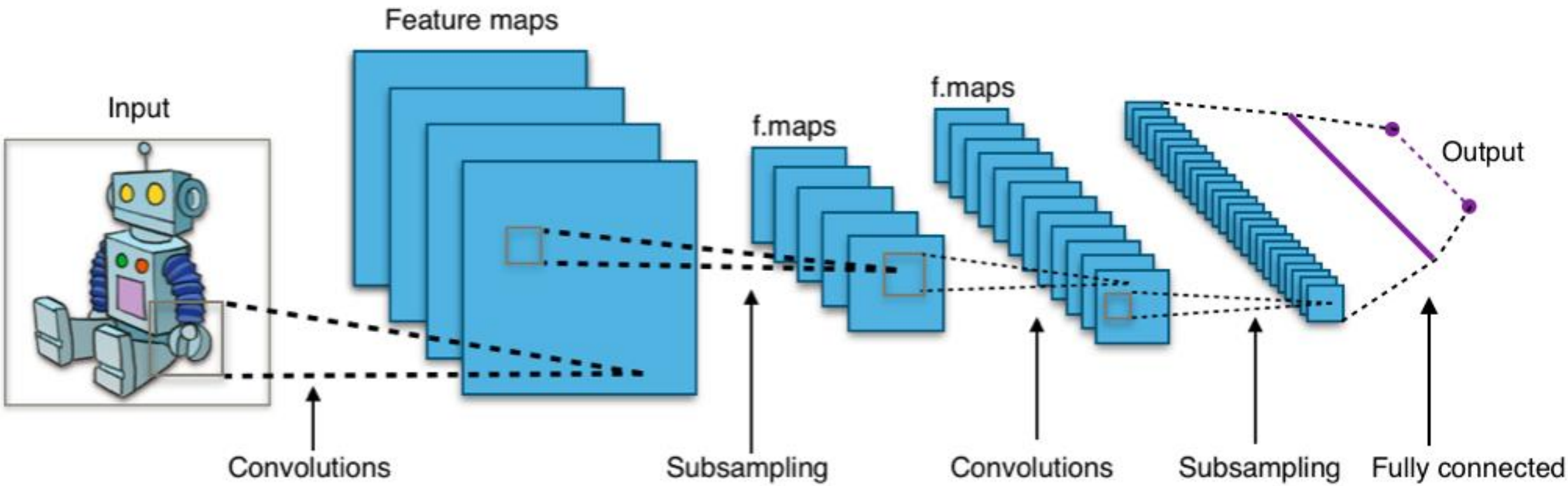


$$y_k = \varphi\left(\sum_{j=0}^{m} w_{kj} x_j\right)$$



This is what a ***neuron*** can do, if the input is an image.

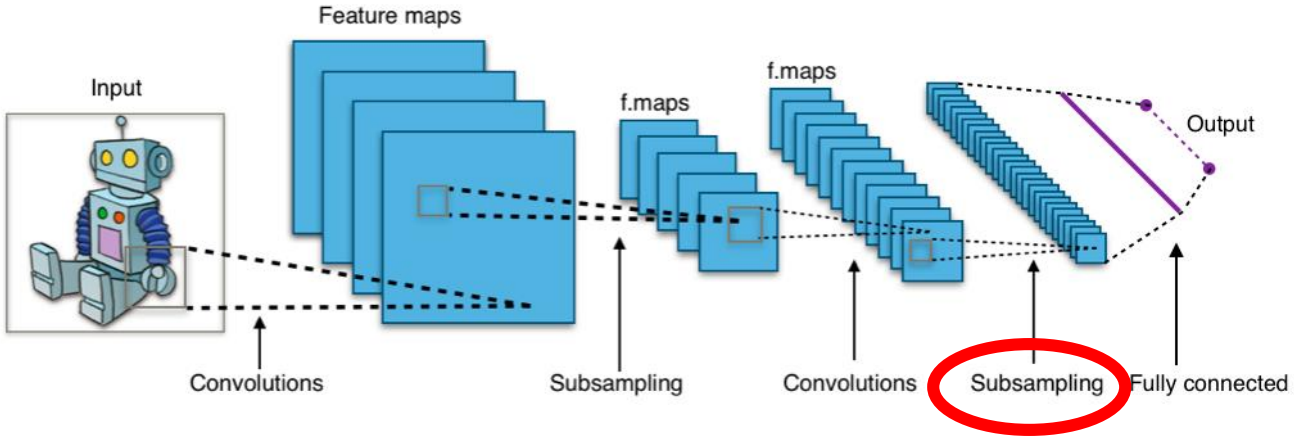
Deep Learning Basics

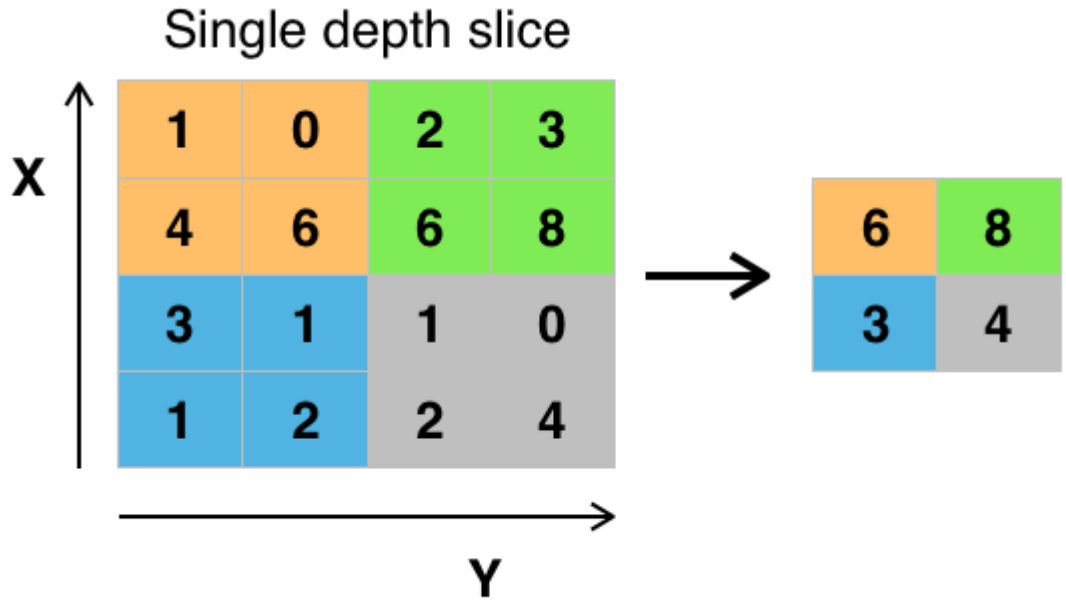


This is what cascade of ***neurons*** (CNN) can do.

image: https://goo.gl/dVSMQo

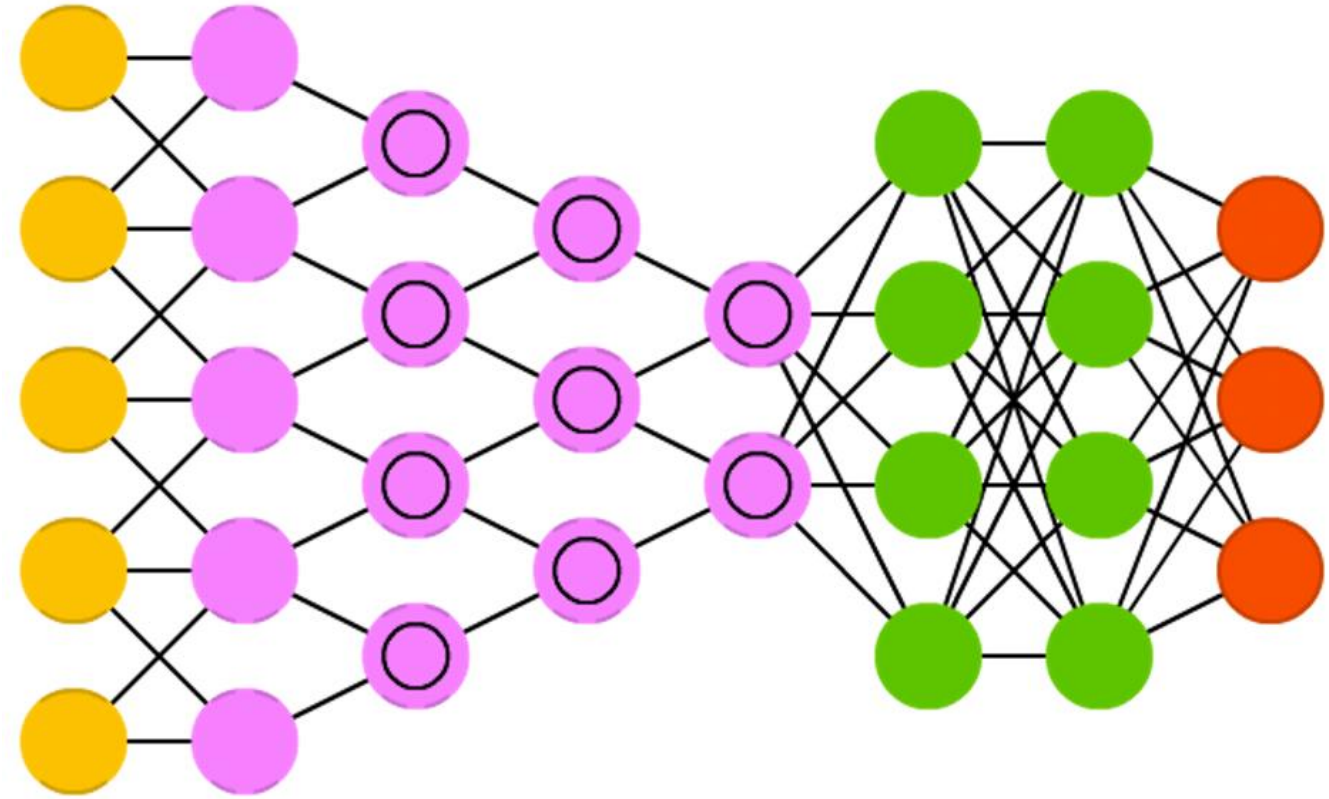
Deep Learning Basics





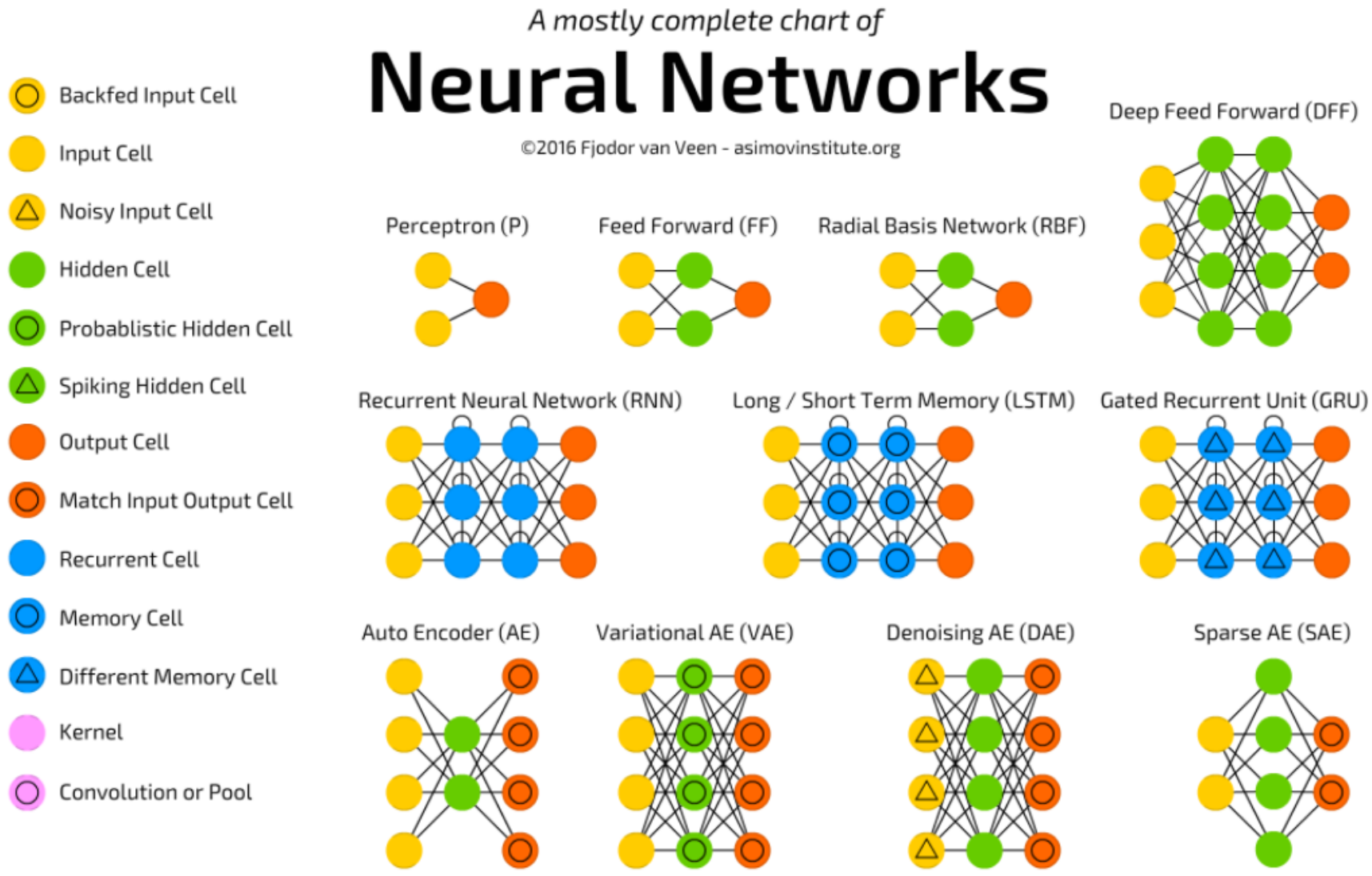
This is how a ***max pool layer*** looks like.

Deep Learning Basics



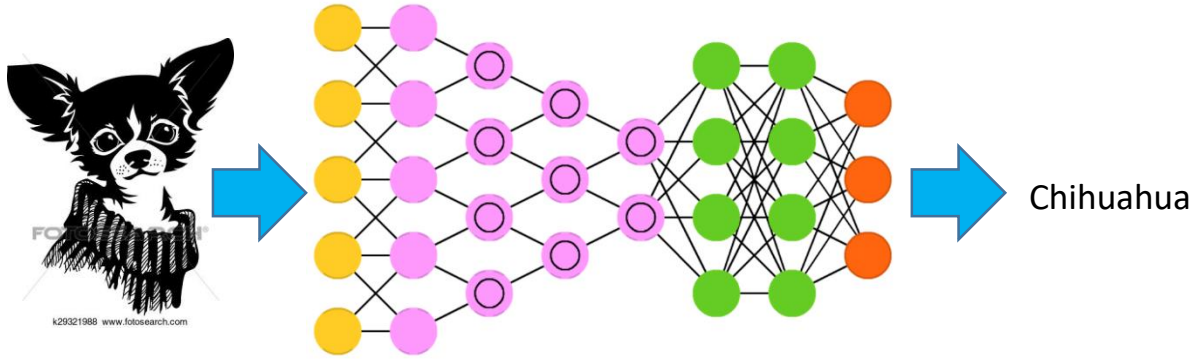
CNN architecture

Deep Learning Basics

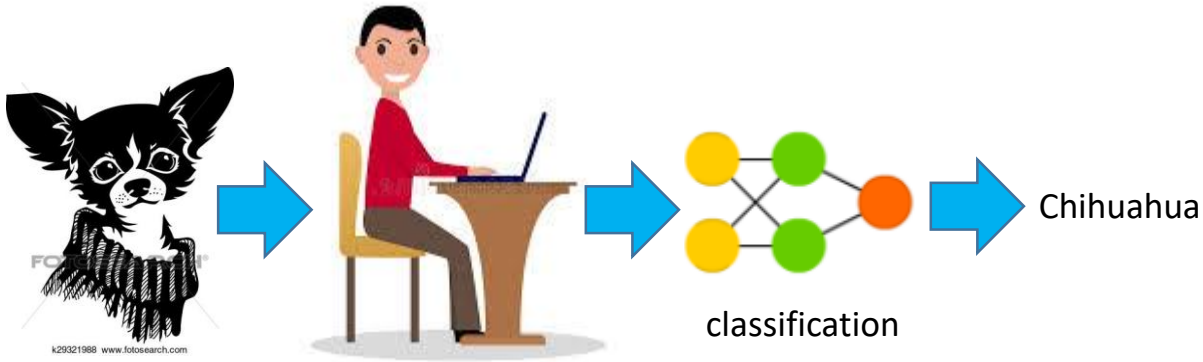


http://www.asimovinstitute.org/neural-network-zoo/

Deep Learning Basics



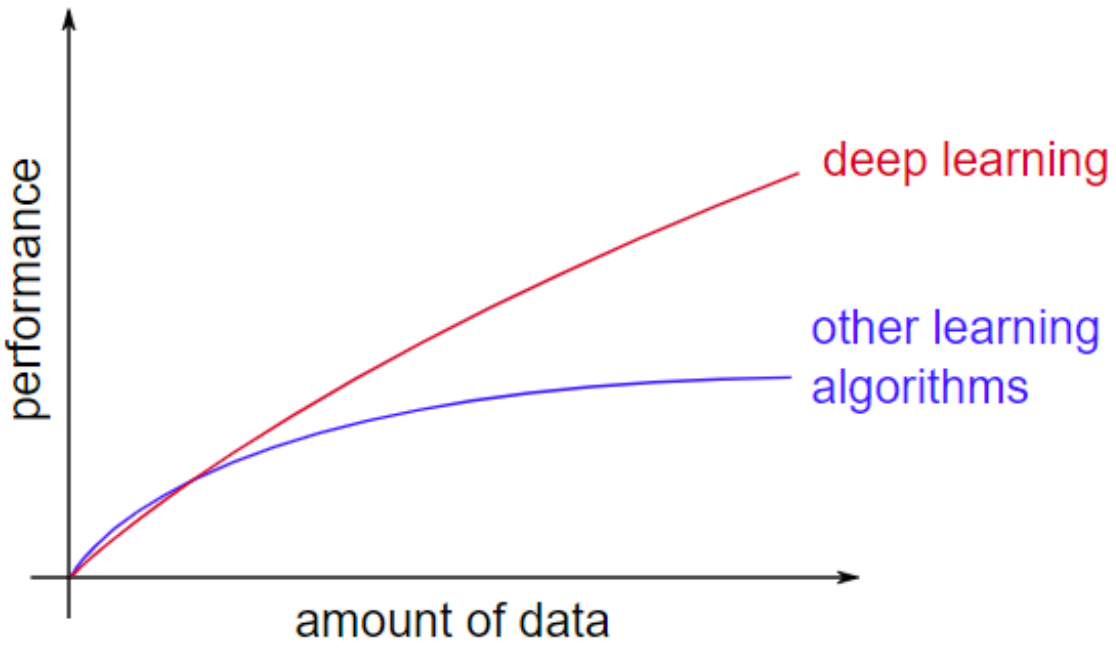
CNN architecture

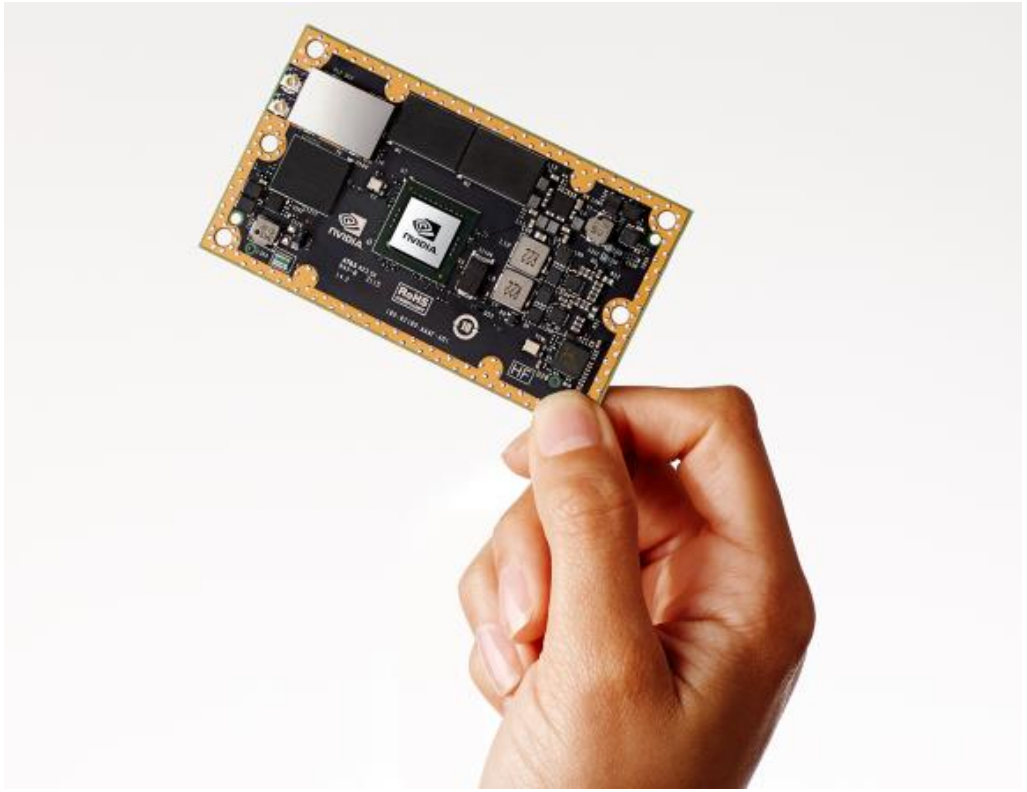


Feature extraction

Difference between ***deep learning*** (left) and the classical machine ***learning algorithms*** (right)

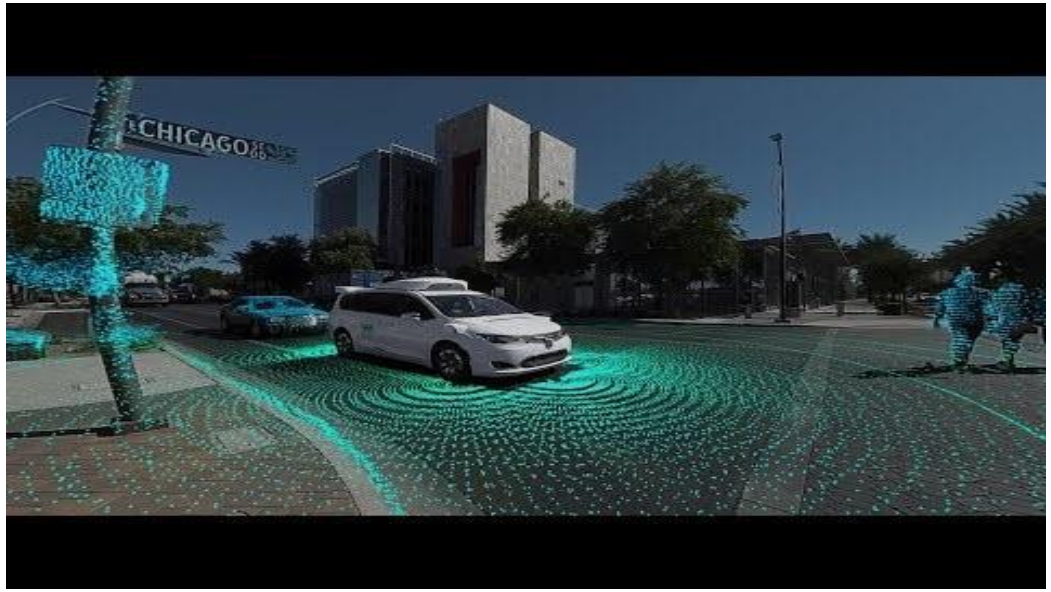
Deep Learning Basics





Deep Learning Basics

Lyrics created by neural networks
(trained by existing rap songs' content and rhyming words)



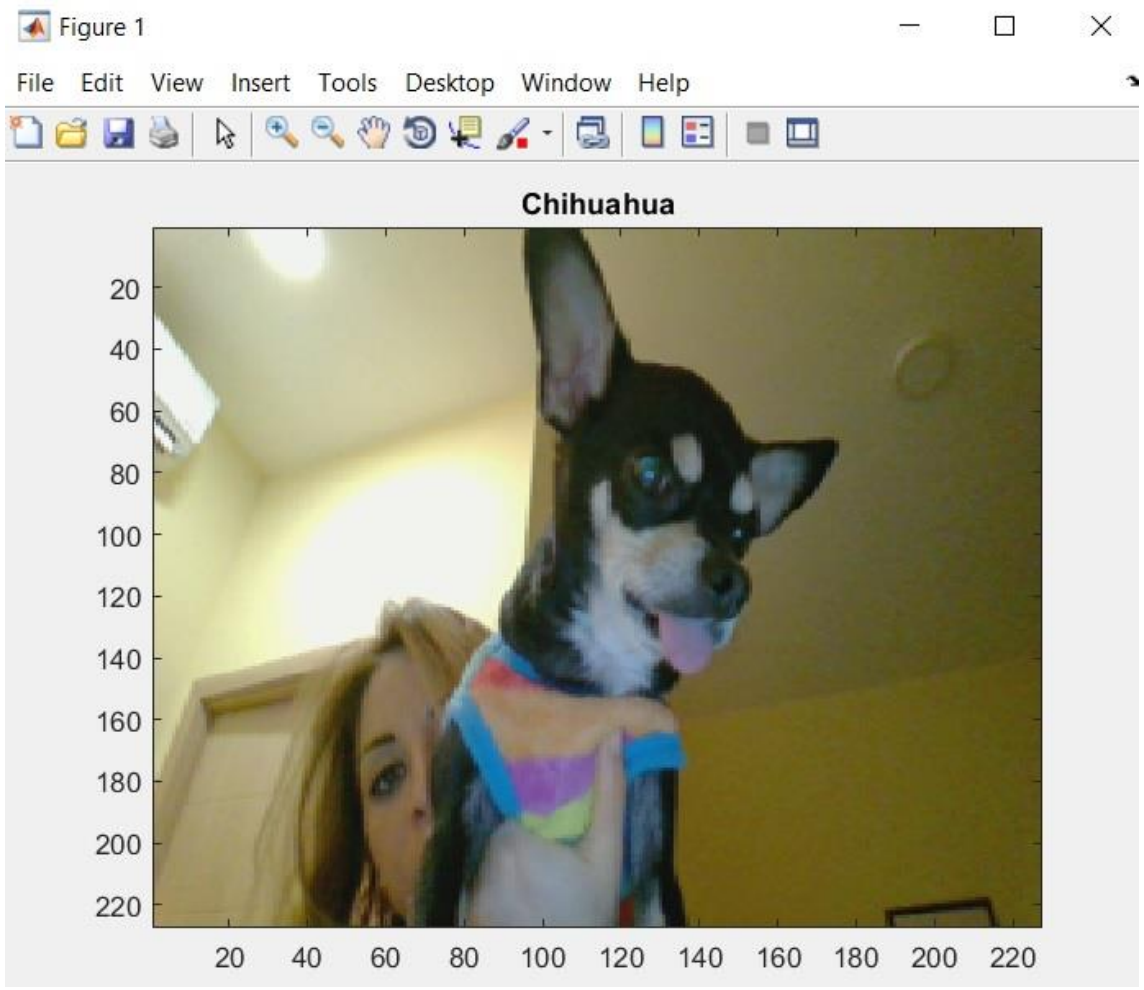
Self driving cars assisted by neural networks
(trained to classify surrounding objects in 3D space in real-time)

Deep Learning Basics

amazon

5.99 Euro

Deep Implementation



Using AlexNet in Matlab

(C:\Users\sirmacekb\Documents\School_of_AI\MeetUps\codes)

Deep Implementation

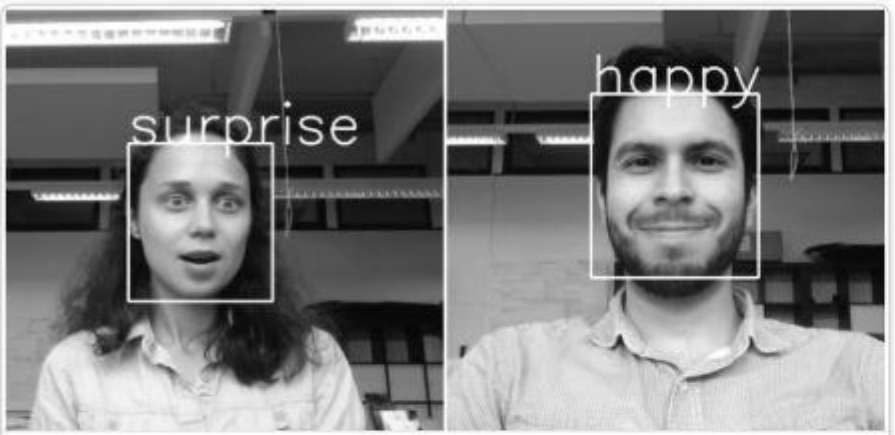
Why transfer learning?

- When there is not sufficient data to train a neural network from scratch
- When there is not enough time (days / weeks) to train a neural network from scratch
- When there are good layers which could be used (a dog breed classifier can benefit from layers which are trained to classify dogs)
- Allows people to share/exchange layers (trained network models)

  Caffe has a model zoo where people share the network weights

  https://github.com/BVLC/caffe/wiki/Model-Zoo

Deep Implementation



Emotion Classification

by harshsikka

♥ 232 ⬇ 294

Detect emotions with 66% accuracy

CV | Feature Extraction | CNN

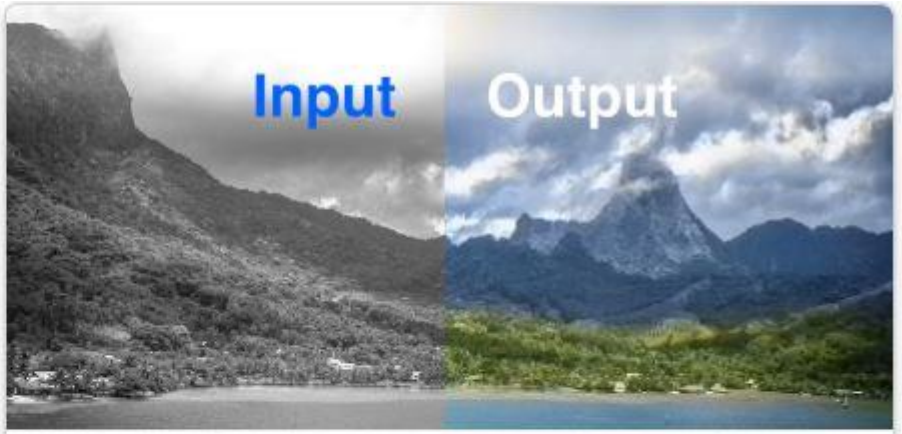


Image Colorization ♥ 225 ⬇ 320

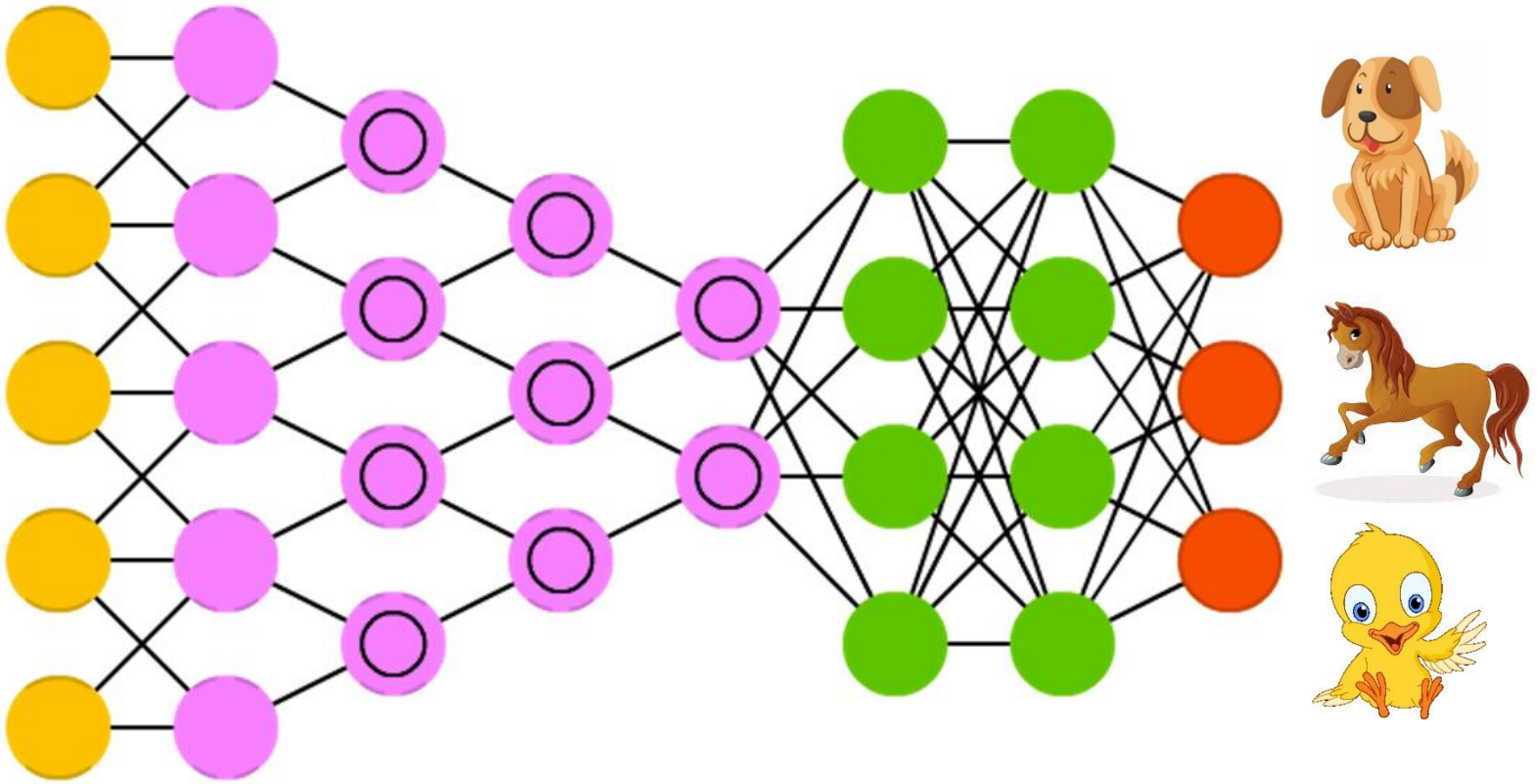
by mikeshi

Turns black and white images to full color images!

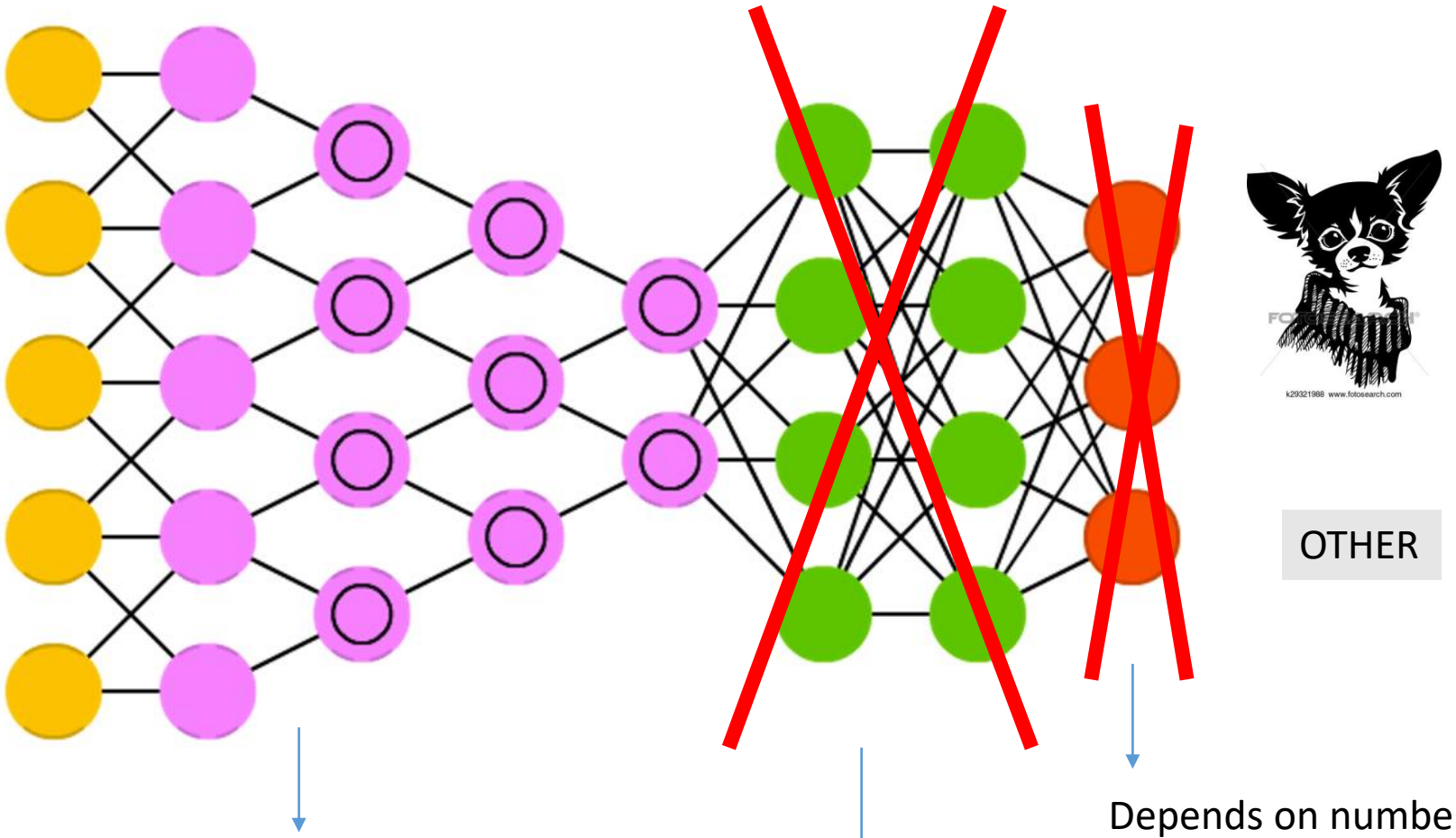
CV | Generative Model | NN

https://modeldepot.io/

Deep Implementation



Deep Implementation



Add/remove feature extraction layers if needed

Replace with new layers and retrain

Depends on number of classes in the output

Deep Implementations

alexnet	Pretrained AlexNet convolutional neural network
vgg16	Pretrained VGG-16 convolutional neural network
vgg19	Pretrained VGG-19 convolutional neural network
googlenet	Pretrained GoogLeNet convolutional neural network
inceptionv3	Pretrained Inception-v3 convolutional neural network
resnet50	Pretrained ResNet-50 convolutional neural network
resnet101	Pretrained ResNet-101 convolutional neural network
inceptionresnetv2	Pretrained Inception-ResNet-v2 convolutional neural network
squeezenet	Pretrained SqueezeNet convolutional neural network
importCaffeLayers	Import convolutional neural network layers from Caffe
importCaffeNetwork	Import pretrained convolutional neural network models from Caffe
importKerasLayers	Import series network or directed acyclic graph layers from Keras network
importKerasNetwork	Import a pretrained Keras network and weights
findPlaceholderLayers	Find placeholder layers in Layer array or LayerGraph imported using importKerasLayers
replaceLayer	Replace layer in layer graph
PlaceholderLayer	Layer to replace an unsupported Keras layer

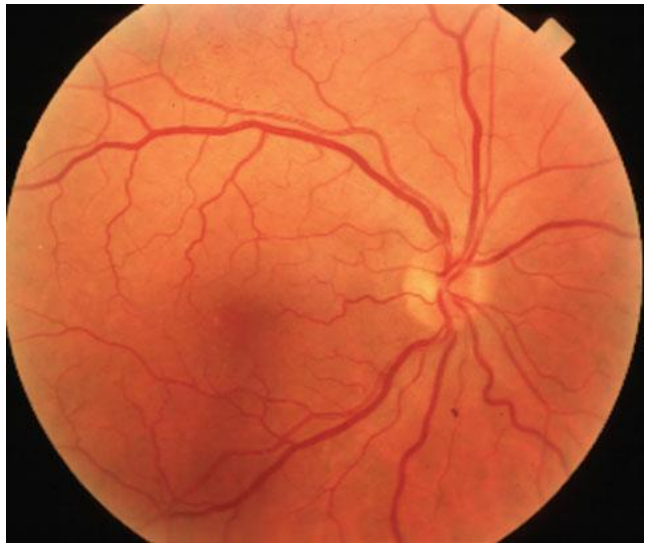
Useful pre-trained networks and layers accessible with Matlab functions

Deep Implementation

How transferable are features in deep neural networks?

Jason Yosinski,[1] Jeff Clune,[2] Yoshua Bengio,[3] and Hod Lipson[4]

Deep Implementations



Retina image
(Vessel network)

Satellite image
(Road network)

Useful pre-trained networks and layers accessible with Matlab functions

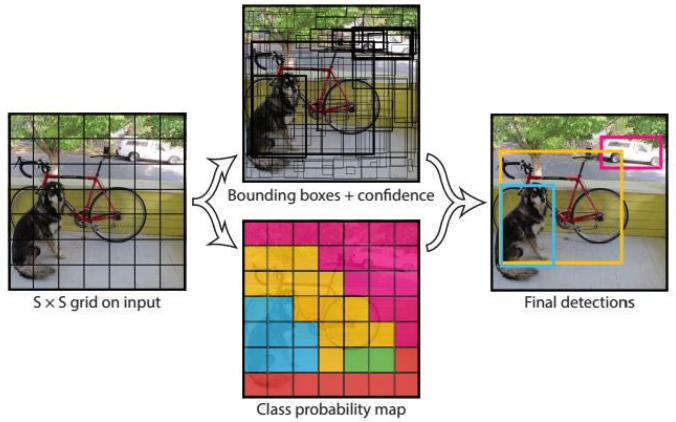
Deep Implementations

IEEE TRANSACTIONS ON MEDICAL IMAGING, VOL. 35, NO. 5, MAY 2016 1299

Convolutional Neural Networks for Medical Image Analysis: Full Training or Fine Tuning?

Nima Tajbakhsh, *Member, IEEE*, Jae Y. Shin, Suryakanth R. Gurudu, R. Todd Hurst, Christopher B. Kendall, Michael B. Gotway, and Jianming Liang*, *Senior Member, IEEE*

Useful resources



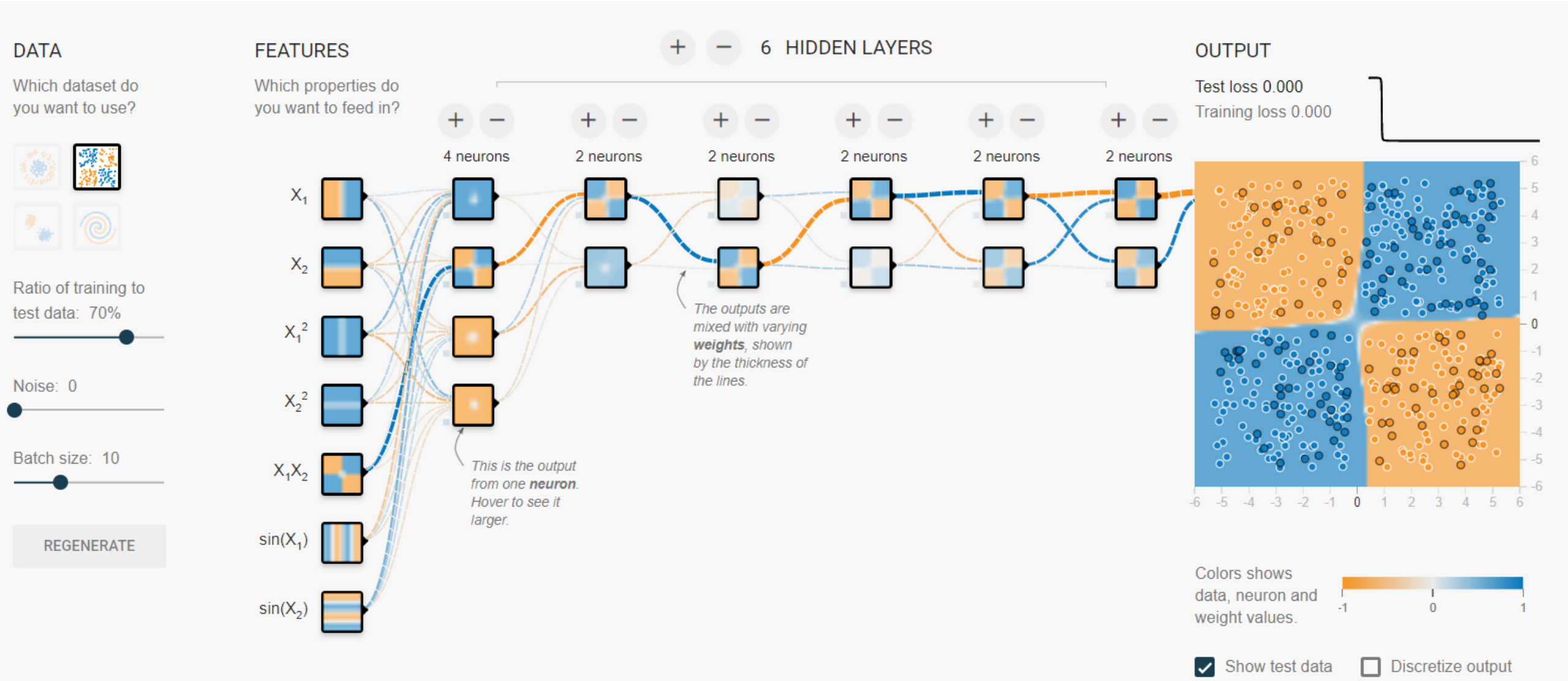
https://pjreddie.com/darknet/yolo/

Deep learning frameworks offer building blocks for designing, training and validating deep neural networks, through a high level programming interface.

Widely used deep learning frameworks such as Caffe2, Cognitive toolkit, MXNet, PyTorch, TensorFlow and others rely on GPU-accelerated libraries such as cuDNN and NCCL to deliver high-performance multi-GPU accelerated training.

TensorFlow

Useful resources



https://playground.tensorflow.org

Useful resources

https://js.tensorflow.org/

Useful resources

Privacy friendly (because client-side app)

Core API
Low-level functions
Similar to TensorFlow python library

Layers API
High-level functions
Makes it easier to build models, just like Keras.

Useful resources

https://ml5js.org/

https://ml5js.org/docs/video-classification-example

Get started!

1. Install Python 3.x https://www.python.org/downloads/
2. Install Anaconda https://www.anaconda.com/download/
3. Install Jupyter https://jupyter.readthedocs.io/en/latest/install.html
4. Install Tensorflow https://www.tensorflow.org/install/

Get started!

> conda install jupyter

> conda install numpy

> conda install pandas

> conda install scikit-learn

> conda install matplotlib

> conda install tensorflow

> jupyter notebook

Get started!

```
print('Hello World!')
```

Get started!

https://github.com/bsirmacek/linear_regression_demo

Thanks Siraj!

Get started!

```
import tensorflow as tf

hello = tf.constant(“Hello World”)
sess = tf.Session()
print(sess.run(hello))
```

Get started!

```
# Import  tensorflow
import tensorflow as tf

# Initialize two constants
x1 = tf.constant([1,2,3,4])
x2 = tf.constant([5,6,7,8])

# Multiply
result = tf.multiply(x1, x2)

# Print the result
print(result)
```

This will not show any result!

Get started!

```
# Import  tensorflow
import tensorflow as tf

# Initialize two constants
x1 = tf.constant([1,2,3,4])
x2 = tf.constant([5,6,7,8])

# Multiply
result = tf.multiply(x1, x2)

# Initialize the session
sess = tf.Session()

# Print the result
print(sess.run(result))

# Close the session
sess.close()
```

Get started!

```
# Import  tensorflow
import tensorflow as tf

# Initialize two constants
x1 = tf.constant([1,2,3,4])
x2 = tf.constant([5,6,7,8])

# Multiply
result = tf.multiply(x1, x2)

# Initialize the session
sess = tf.Session()

# Print the result
print(sess.run(result))

# Close the session
sess.close()
```

https://github.com/bsirmacek/TensorFlow-Examples

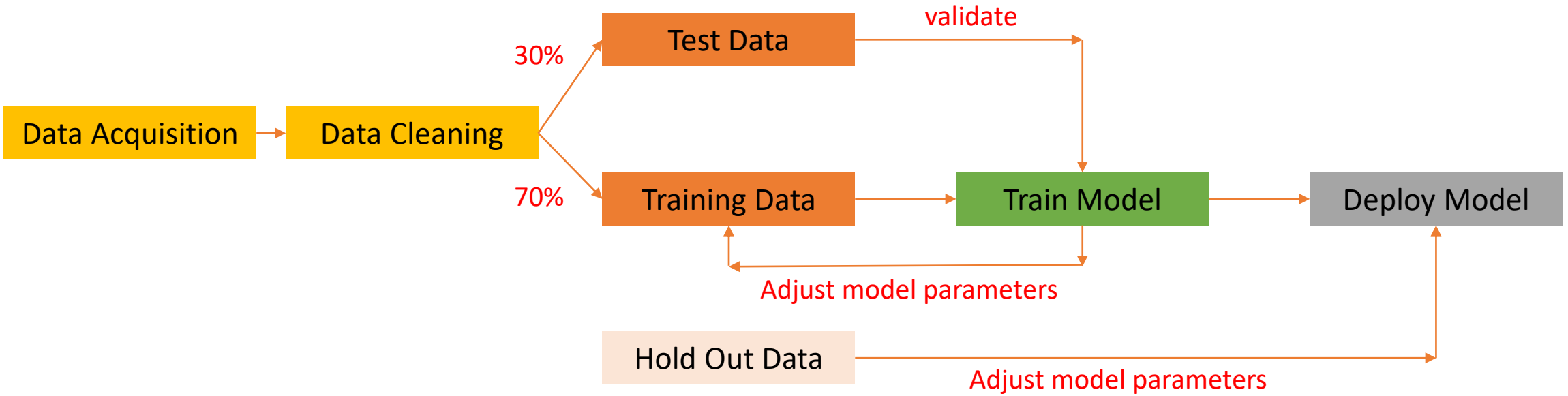
Get started!

(1) Supervised Learning (data is labelled,
continues labels=regression problem, categorical labels=classification problem)

(2) Unsupervised Learning (data is not labeled, there are only features, no right/wrong answer)

(3) Reinforcement Learning (Agent=decision maker, Environment=Agent interacts, Actions=What agent can do)

Get started!

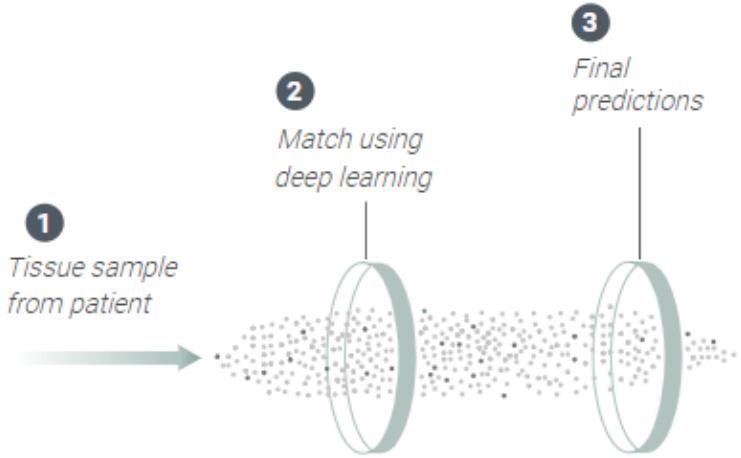

Data Acquisition
Data Cleaning
30%
70%
Test Data
Training Data
validate
Train Model
Deploy Model
Adjust model parameters
Hold Out Data
Adjust model parameters

Examples

Health

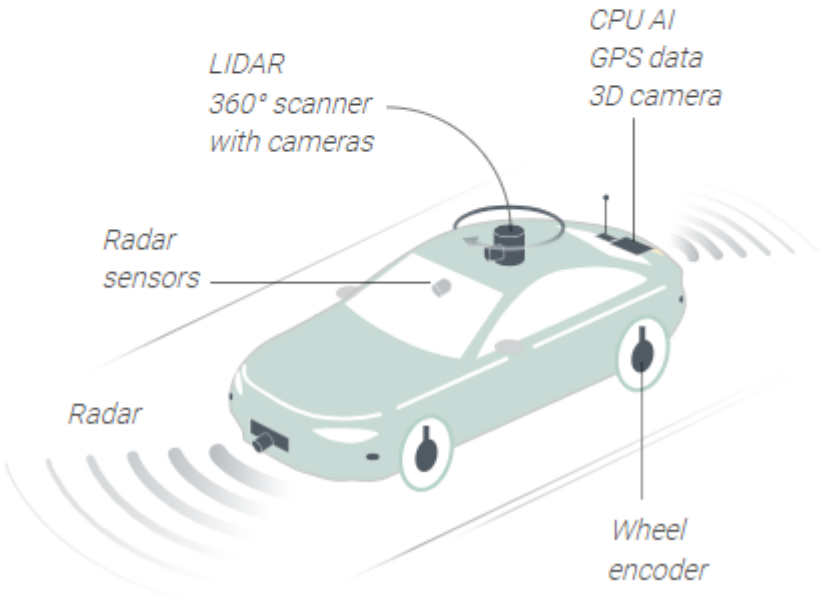
Dermatology is among the first health disciplines to embrace AI. Using computer vision and AI analysis, software can identify 90 per cent of the 700 diseases most common among outpatients.

AI processes in dermatology



Driverless vehicles

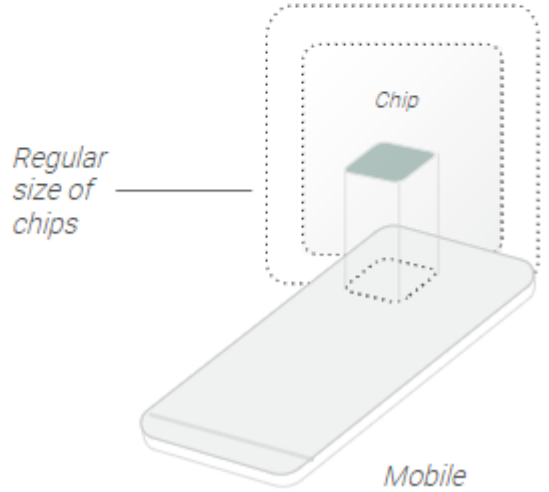
Although China has the world's largest car market – both for conventional and electric vehicles – it still lags behind the US in developing driverless vehicles for the road. The Chinese government has set the goal of having a manufacturing industry in place for sensors and embedded chips with a value exceeding US$1.4 billion by 2020.



Computer chips

China makes more than 90 per cent of the world's smartphones, 65 per cent of all personal computers and 67 per cent of smart televisions, according to Bernstein Research. But the country imports most of the chips for these devices, valued at US$260 billion last year.

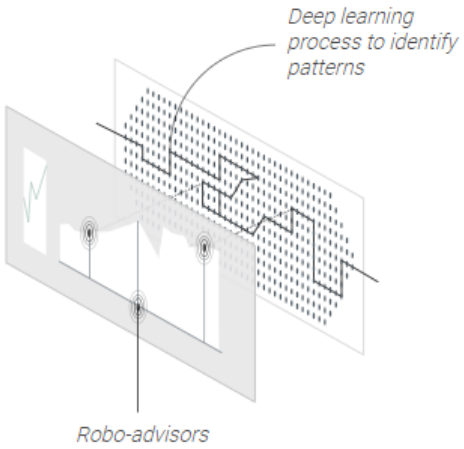
Production of AI–optimised chips for mobile devices to learn on their own



Examples

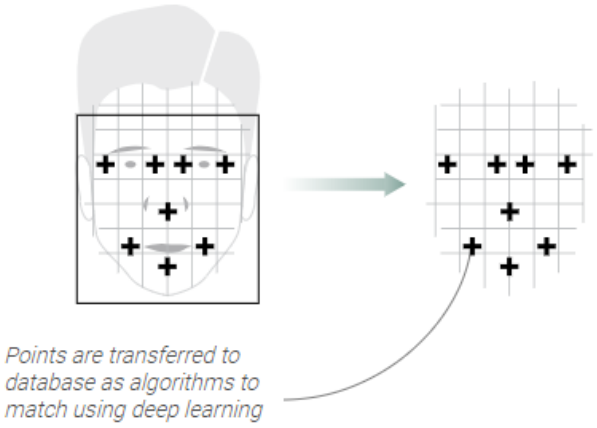
Financial

China's national banks are testing AI applications for wealth management and fraud prevention. China's robo-advisory market – platforms that provide automated, algorithm-driven financial planning – is expected to be the world's largest by 2020. Globally, the segment is expected to expand to US$6.5 trillion by 2025, from US$100 billion in 2016, according to McKinsey.



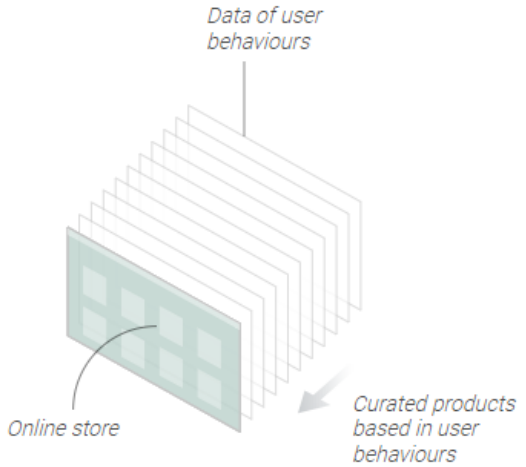
Facial recognition

China is developing a facial recognition system with a database of 1.3 billion ID photos that can be matched in seconds, with an accuracy rate of 90 per cent. This programme may eventually power China's Social Credit System: a metric to gauge the "trustworthiness" of citizens. Recently, SenseTime became the most valuable AI start-up in the world. The company drives China's ambition to dominate global AI.



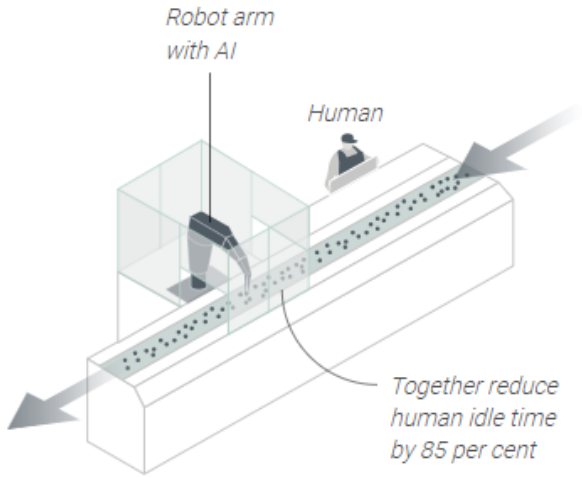
Retail

In 2017, 42 per cent of global e-commerce transactions took place in China, more than France, Germany, Japan, Britain, and the US combined. Big retailers have embraced online stores, which can recommend products and predict when users will need certain products based on their online history and behaviour. Alibaba drove US$25.3 billion of sales over 24 hours on Singles' Day in 2017, due largely to AI, machine learning, and cloud computing. Alibaba is the owner of the South China Morning Post.



Robots

The Chinese robot market is forecast to grow at an average annual rate of 23.4 per cent in the four years to 2019, much faster than global shipment growth of 13 per cent, according to the International Federation of Robotics. China's robot makers aim to supply 50 per cent of the domestic market by 2020, rising to 70 per cent by 2025.



Thank you!

Beril Sirmacek
www.BerilSirmacek.com
www.create4D.com
Twitter @berilsirmacek

Follow me on;