Selected Chapters from AI applications

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About me

- Ph.D. in Natural Language Processing and Artificial Intelligence at Masaryk University
- 10 years at seznam.cz (last 8 years as Head Of Research)
- Founder and co-organizer of ML Prague
- Mentor at StartupYard
- ML Freelancer and consultant

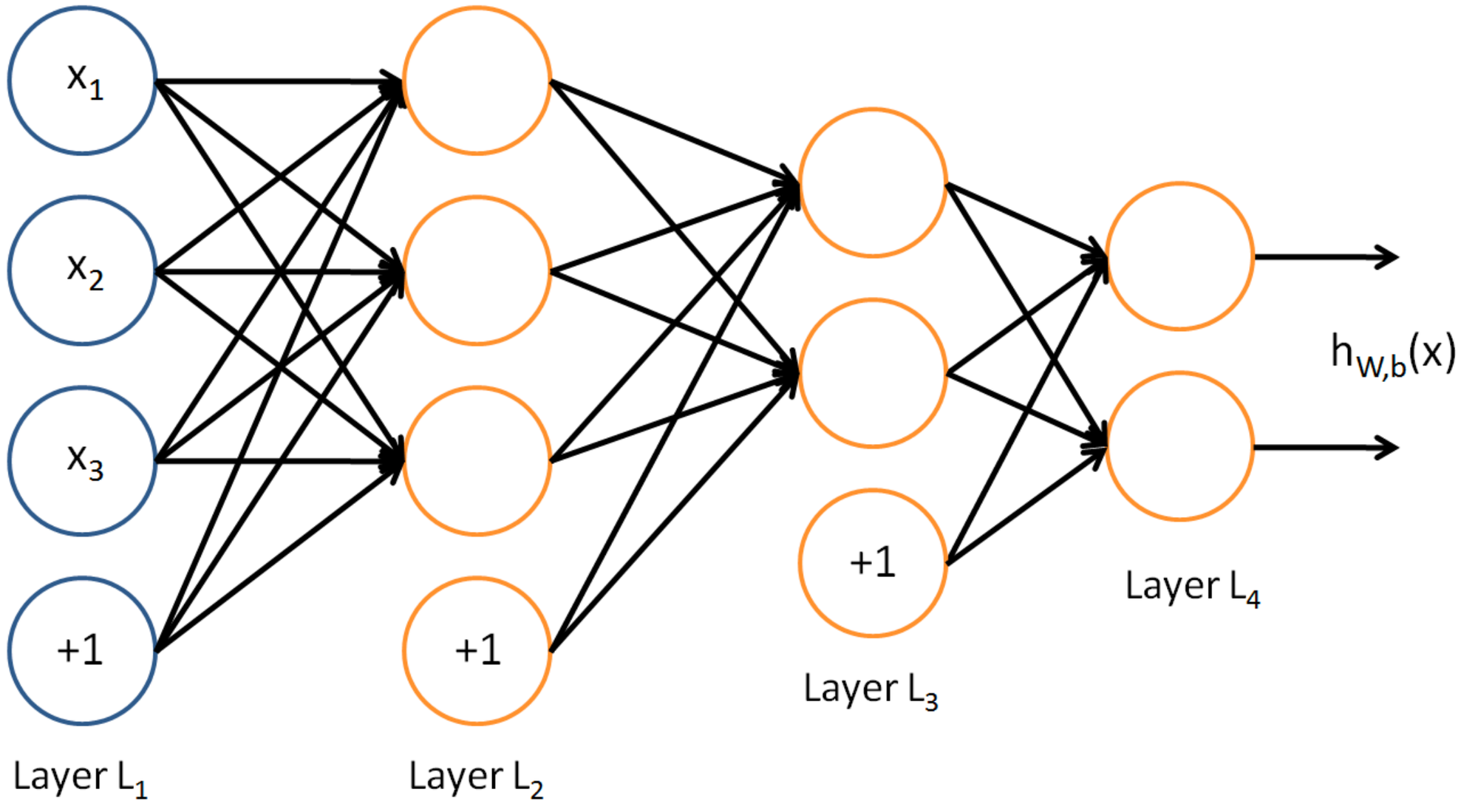
www.mlguru.com **www.mlprague.com** **www.mlcollege.com**

Neural Network architectures design

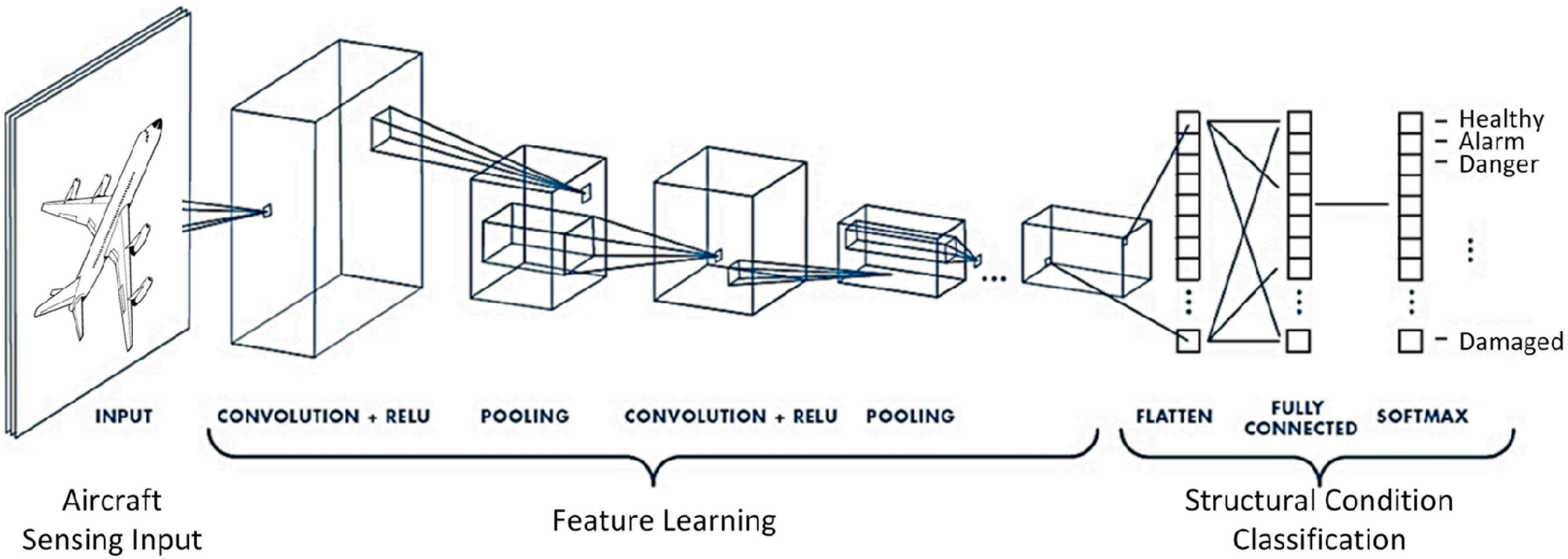
Neural Network design best practices

- ⭐ **Start from simple architectures**
- ⭐ **Get inspiration from architectures for similar problems**
- ⭐ **Change one parameter only and then validate**

Feed Forward Network

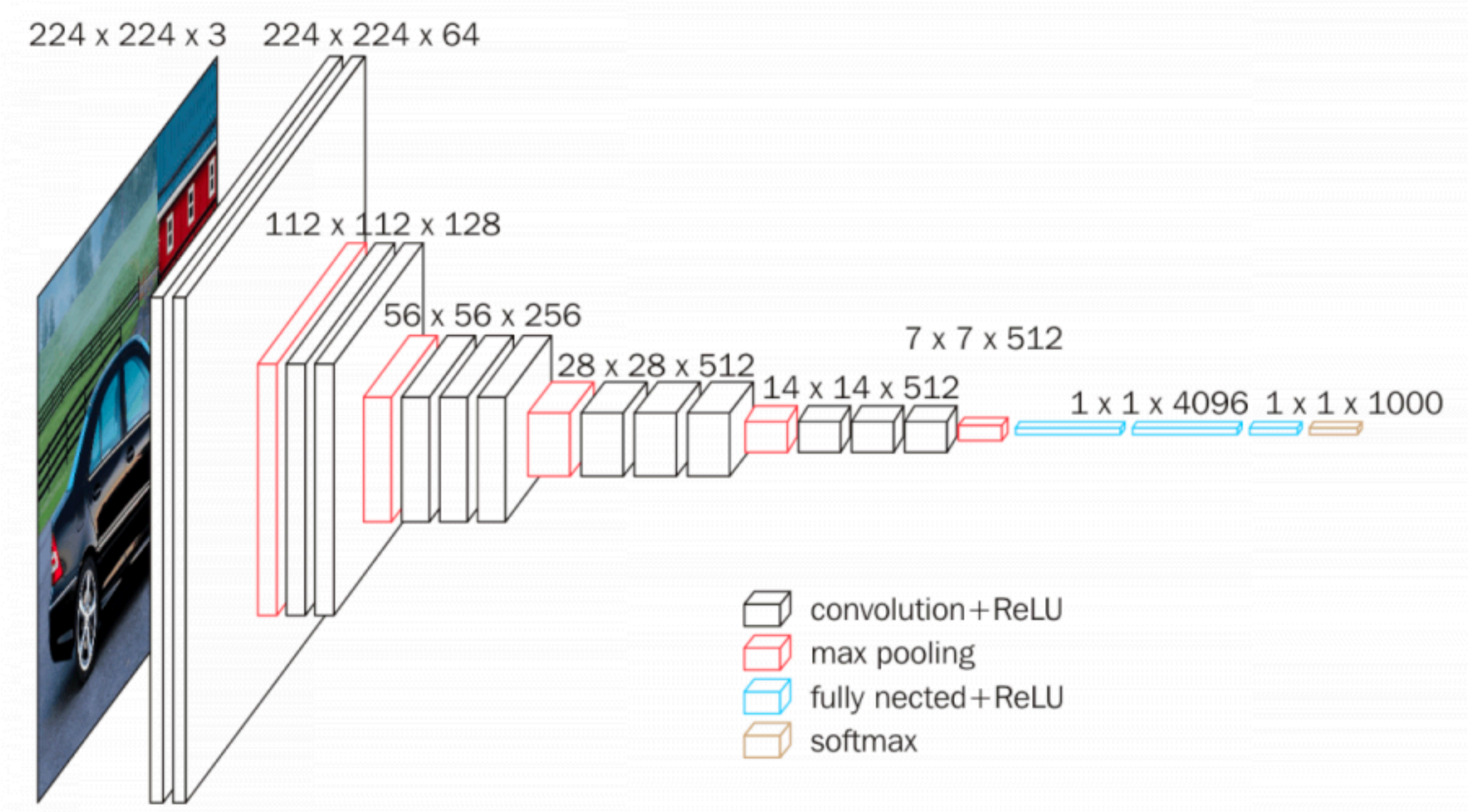


Convolutional Neural Network

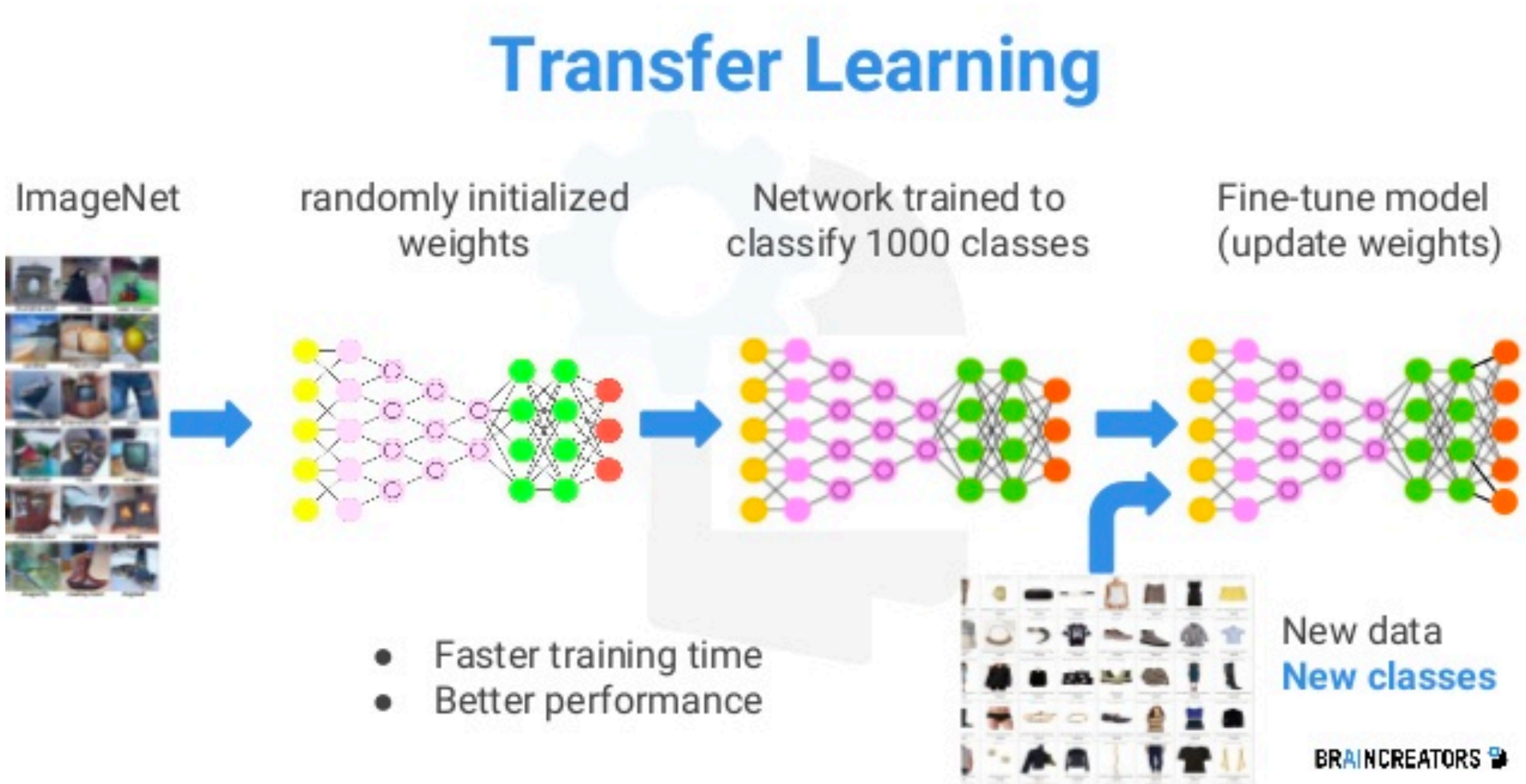


https://www.mdpi.com/sensors/sensors-19-04933/article_deploy/html/images/sensors-19-04933-g001.png

VGG 16


224 x 224 x 3
224 x 224 x 64
112 x 112 x 128
56 x 56 x 256
28 x 28 x 512
14 x 14 x 512
7 x 7 x 512
1 x 1 x 4096
1 x 1 x 1000
convolution+ReLU
max pooling
fully nected+ReLU
softmax

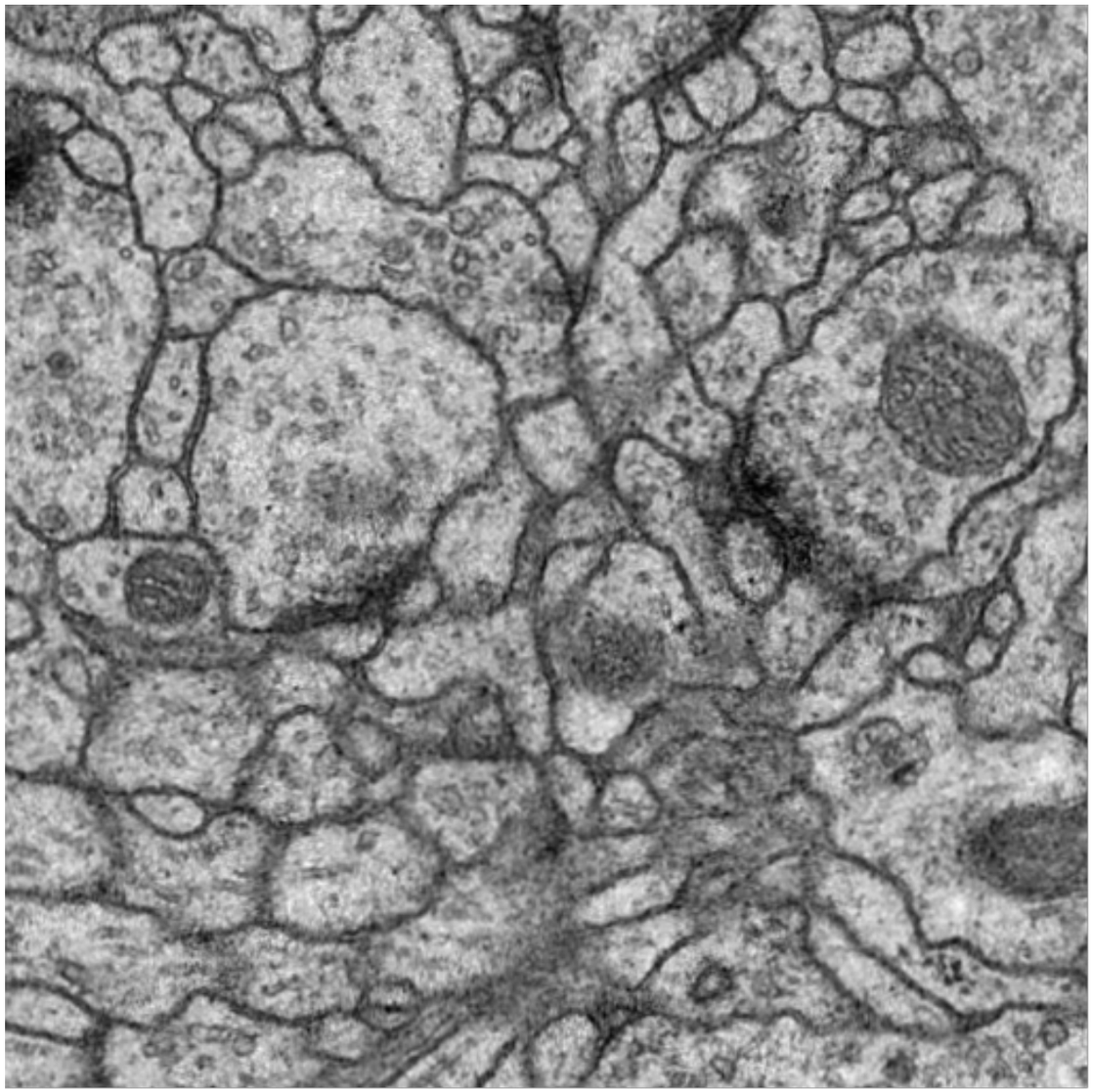
Finetuning

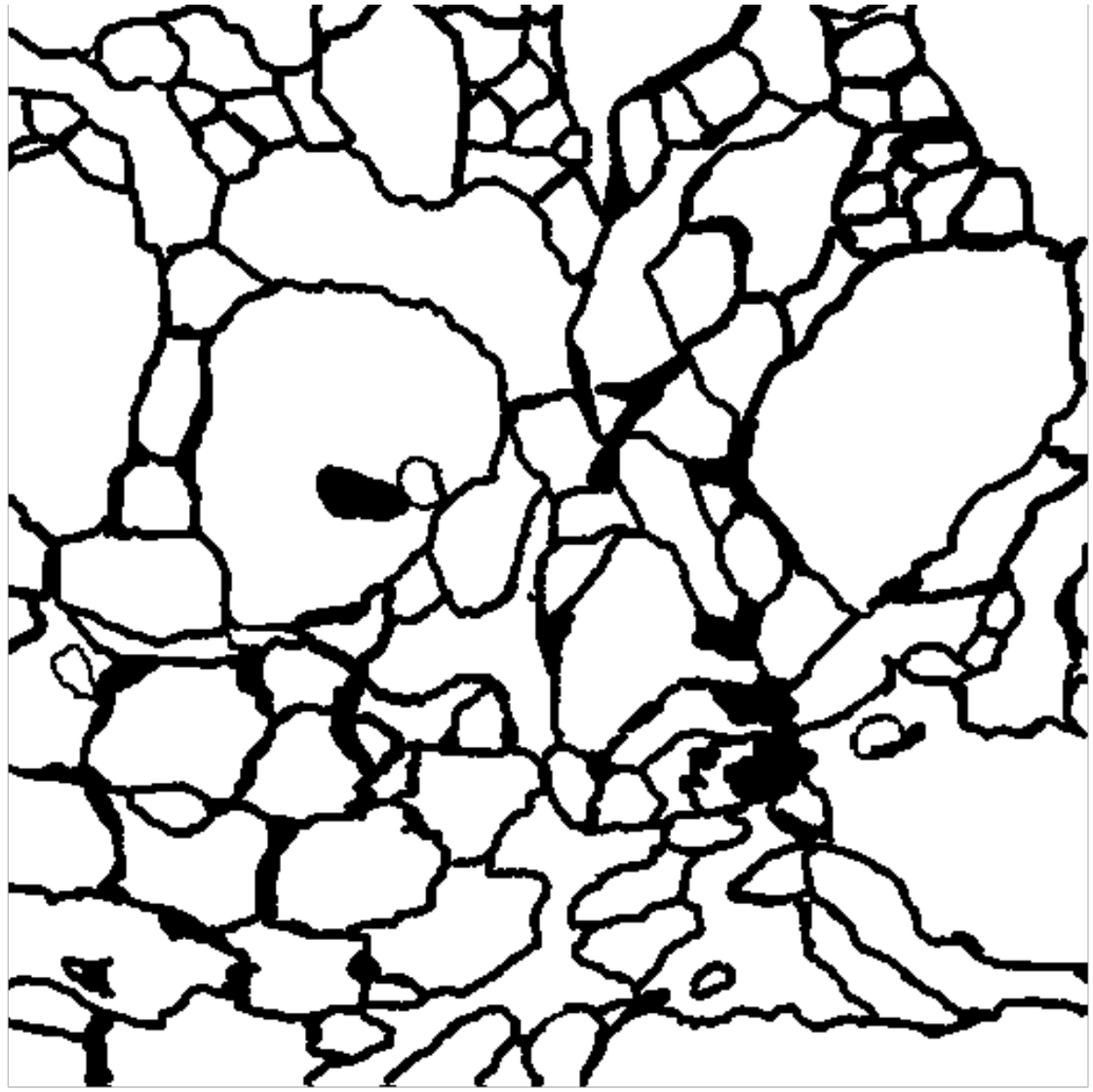

Transfer Learning
ImageNet
randomly initialized weights
Network trained to classify 1000 classes
Fine-tune model (update weights)
Faster training time
Better performance
New data
New classes
BRAINCREATORS

Transfer learning example

Transfer_learning.ipynb

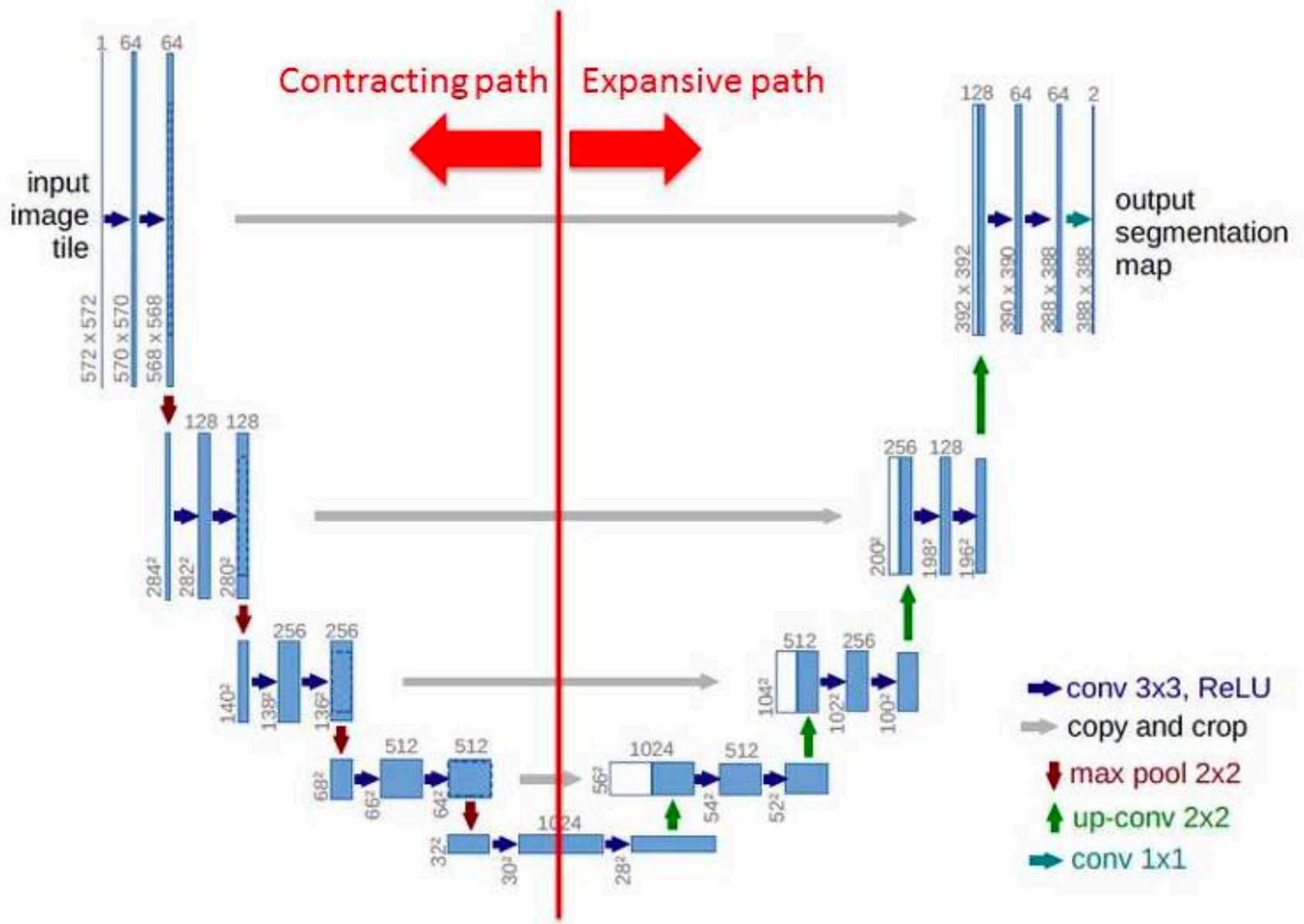
Image segmentation





U-Net

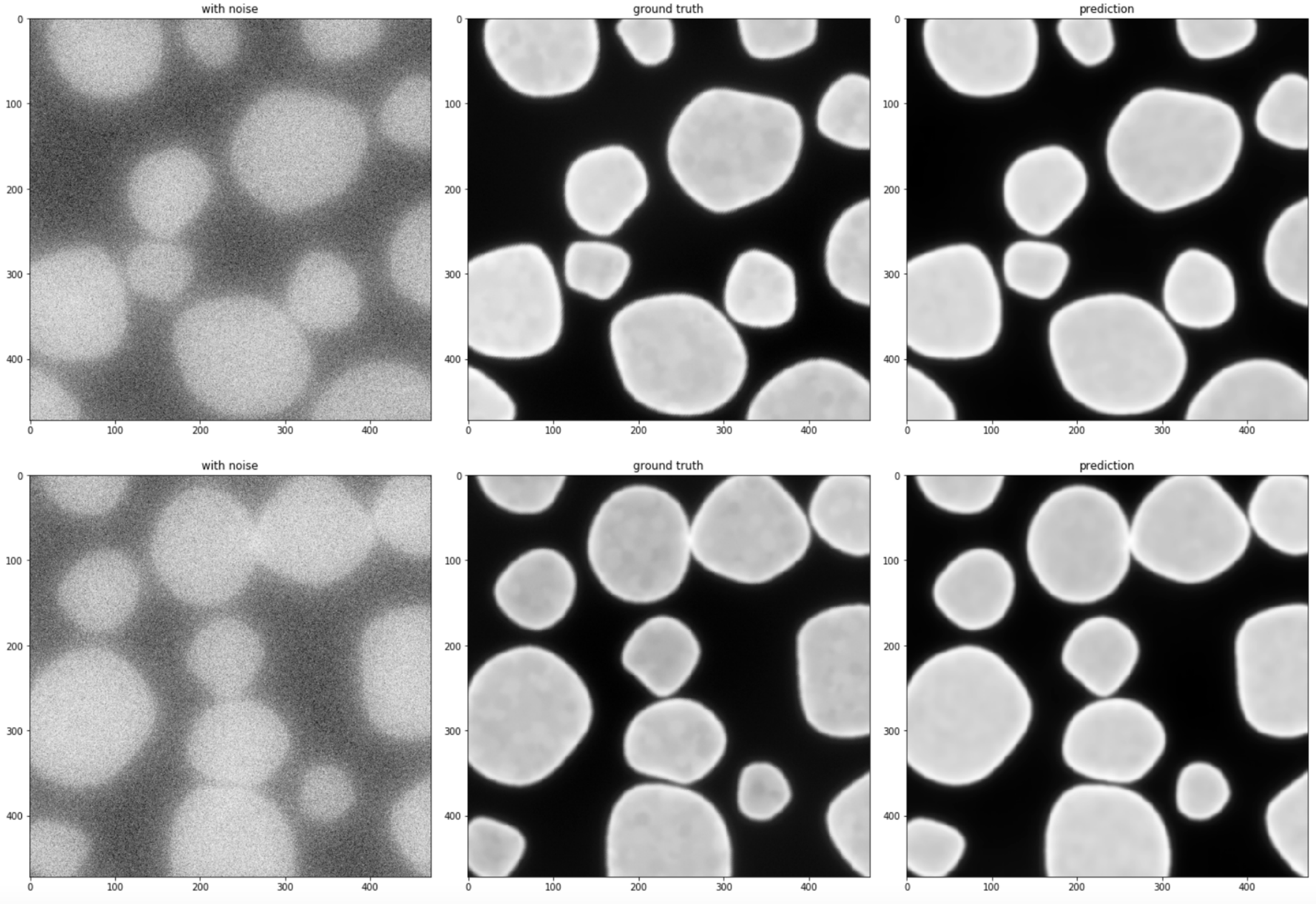
Network Architecture



U-Net segmentation example

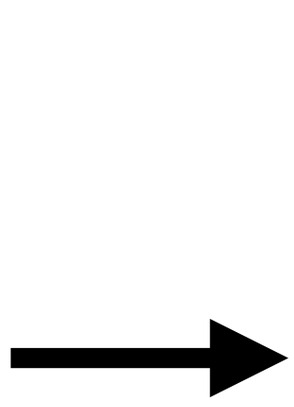
Segmentation.ipynb

Image denoising

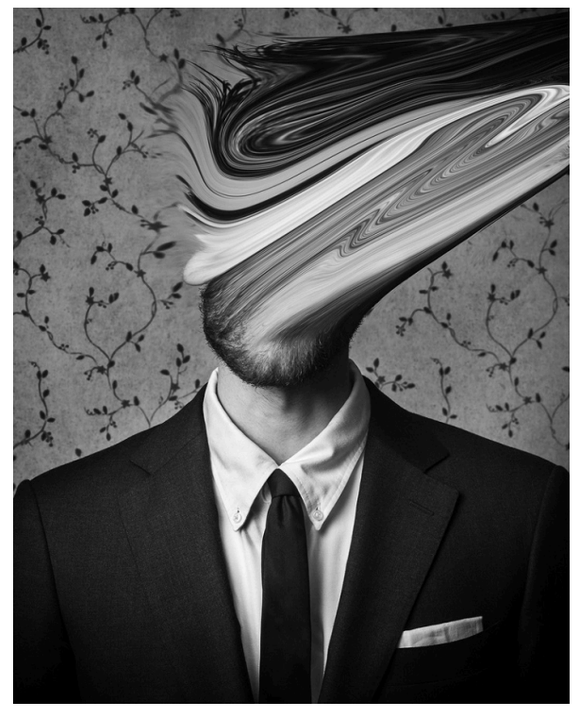


Generative models with neural networks

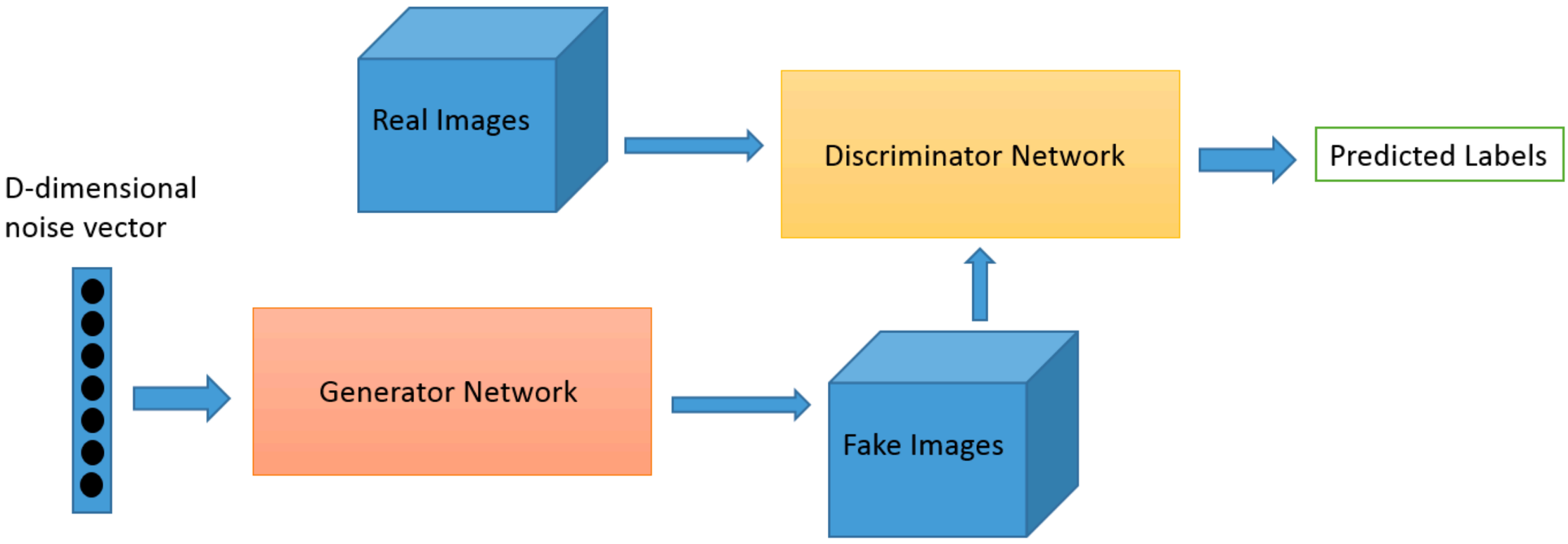
Random noice



Artificial Neural network



Generative Adversarial Networks



Superresolution

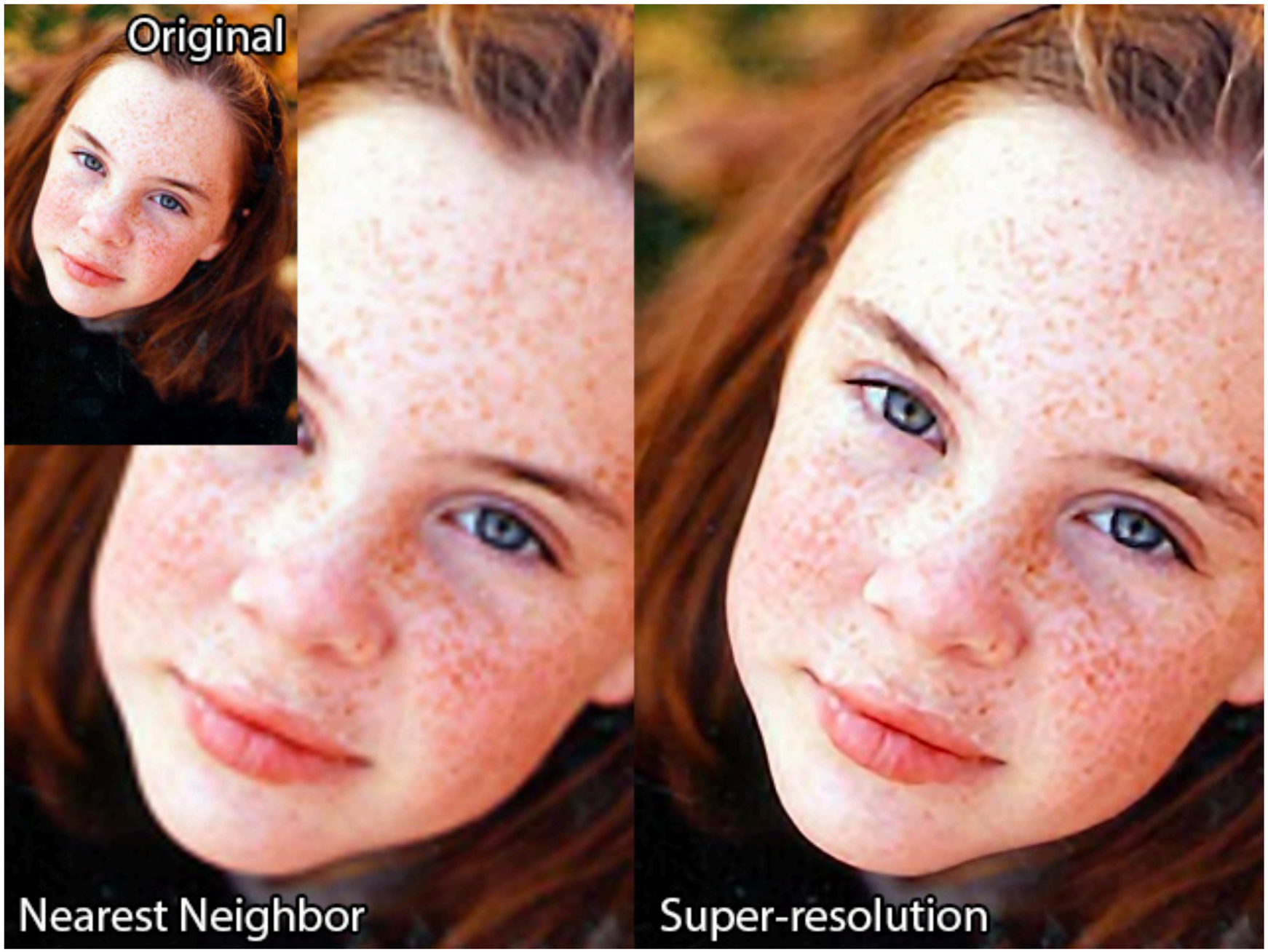
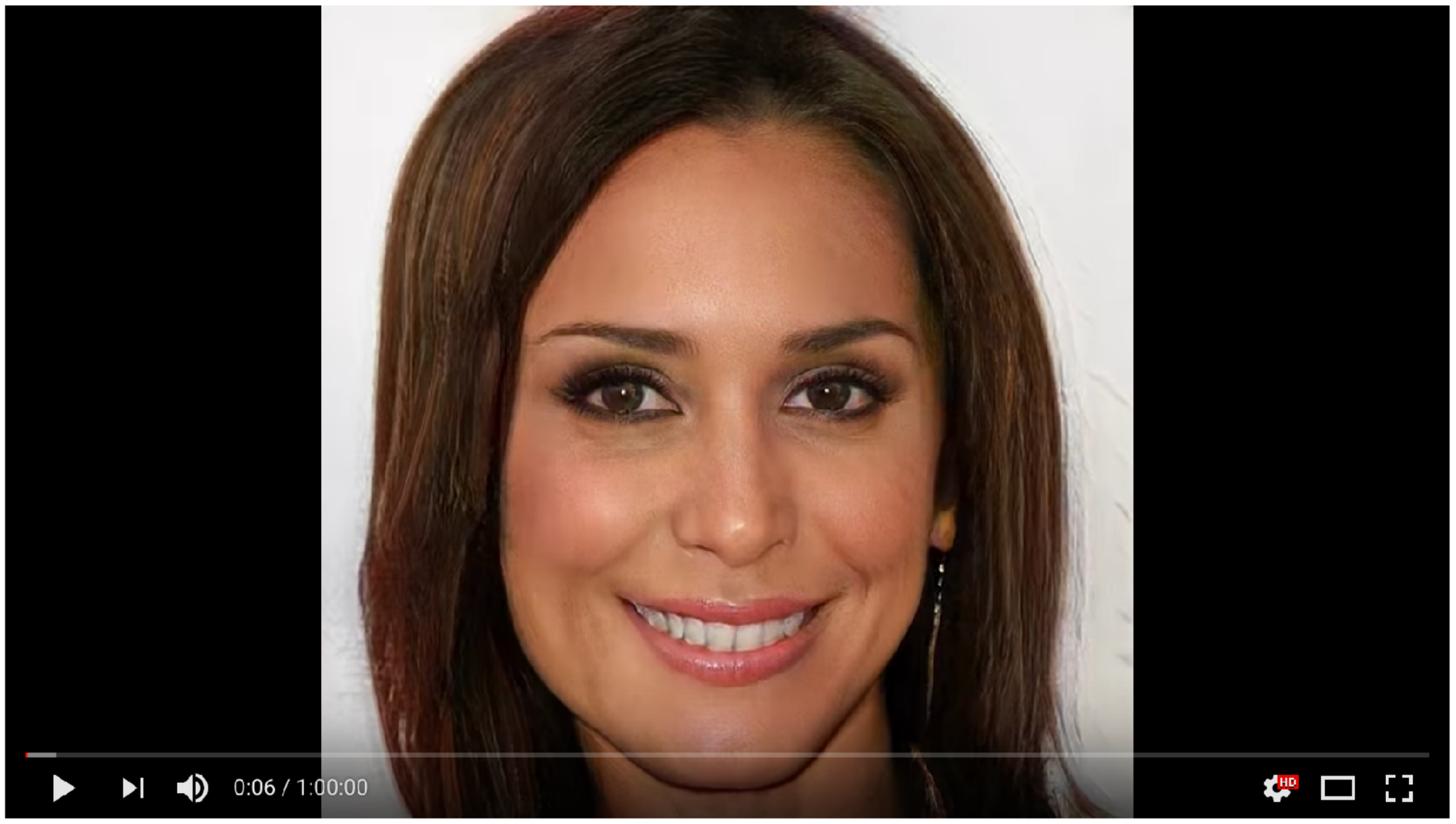


Image synthesis



One hour of imaginary celebrities

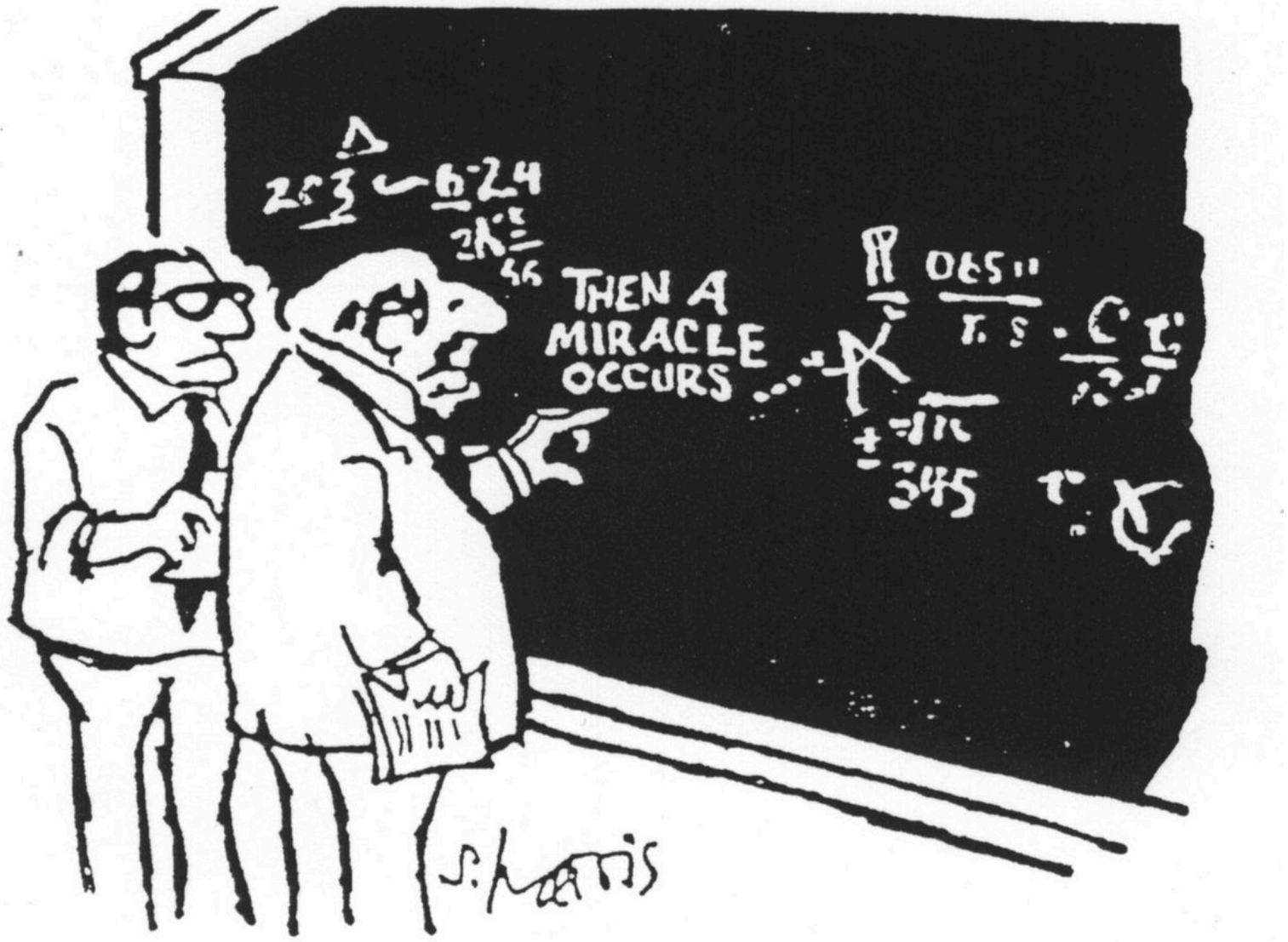
95 832 zhlédnutí

TO SE MI LÍBÍ NELÍBÍ SE SDÍLET

Which one is fake?

Another deep fake

Neural network explainability

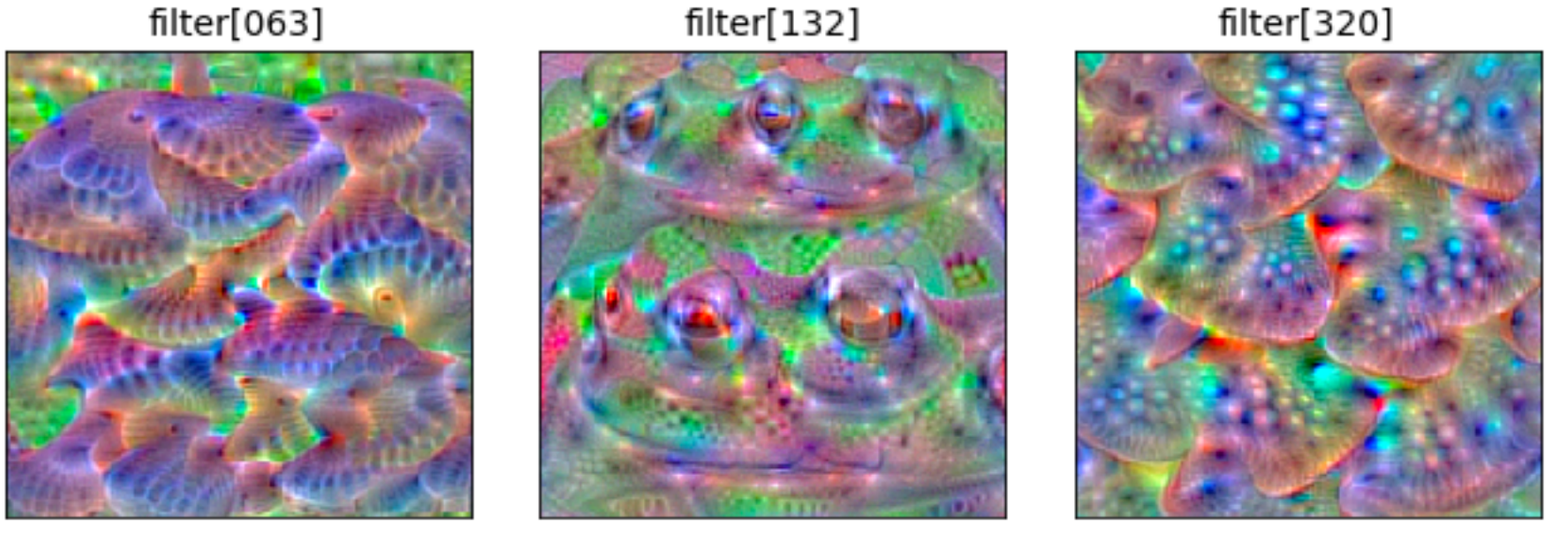


https://analyticsindiamag.com/deep-learning-is-not-so-much-a-black-box-anymore-and-thats-a-great-development/

Activation Maximization

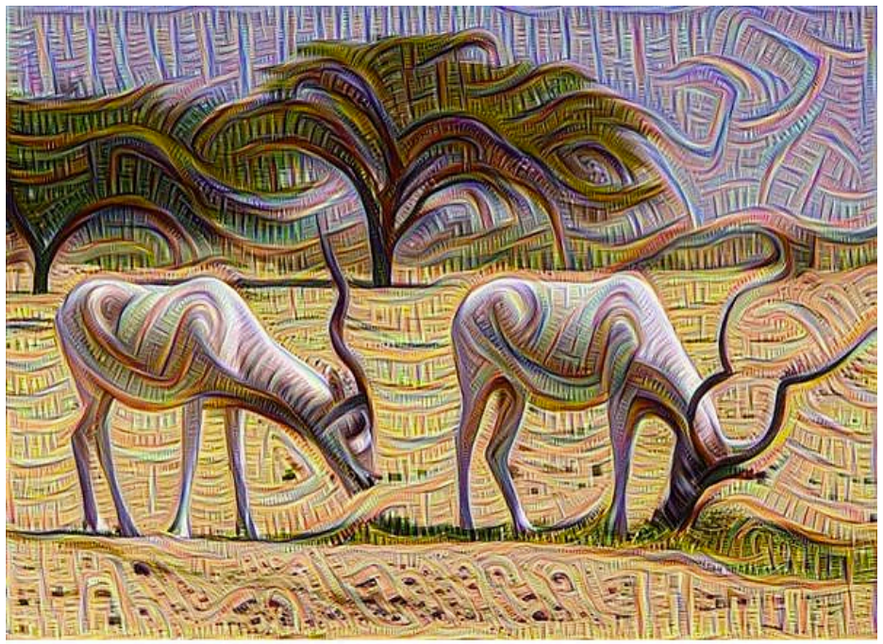
Visualized output classification Layer

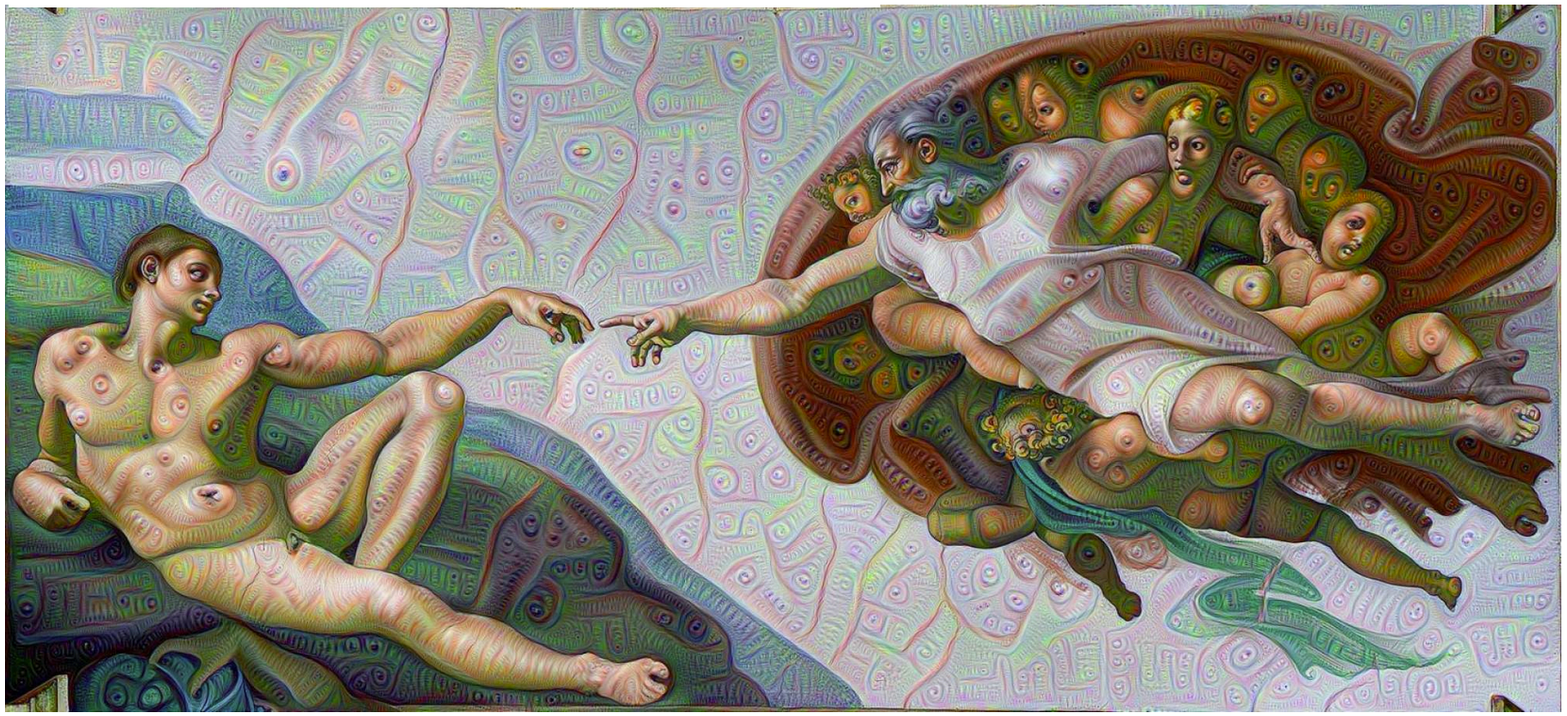
Visualized hidden convolutional layers



https://pypi.org/project/tf-keras-vis/

Google DeepDream

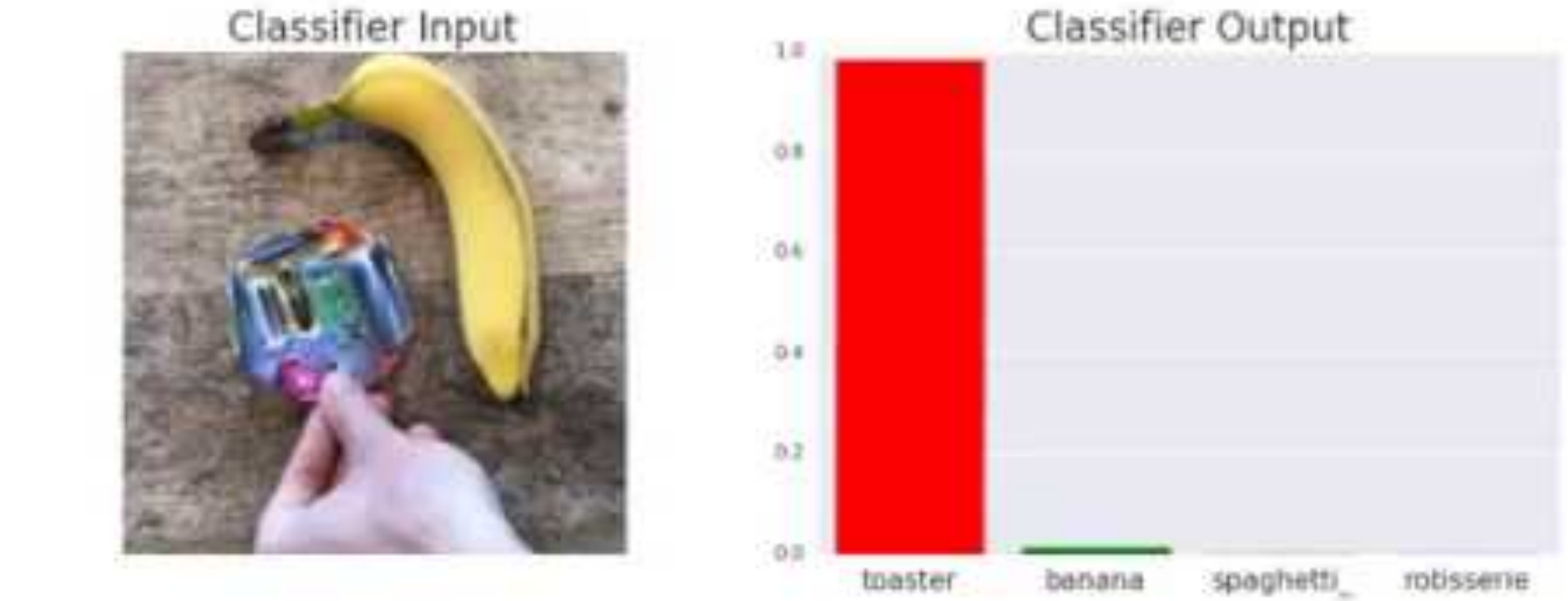




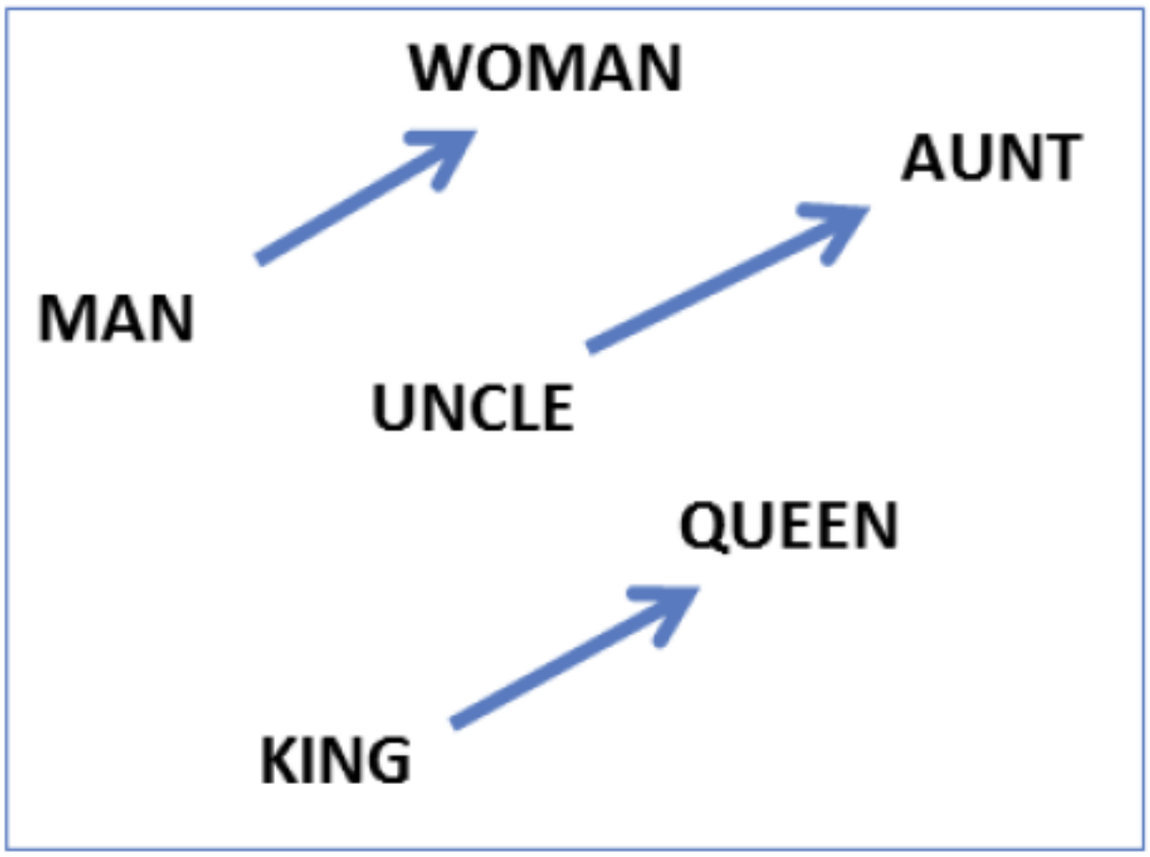
Grad-CAM heat maps

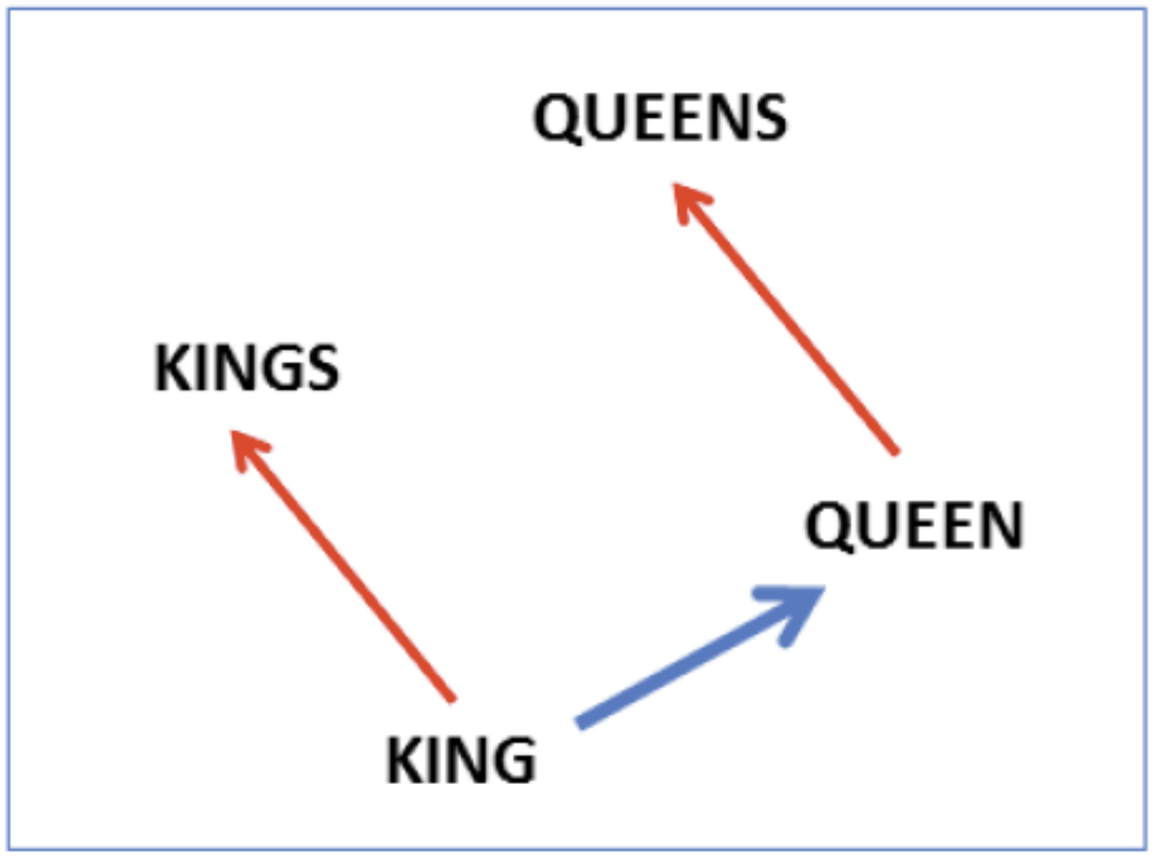
https://keras.io/examples/vision/grad_cam/

Adversarial patch



word2vec

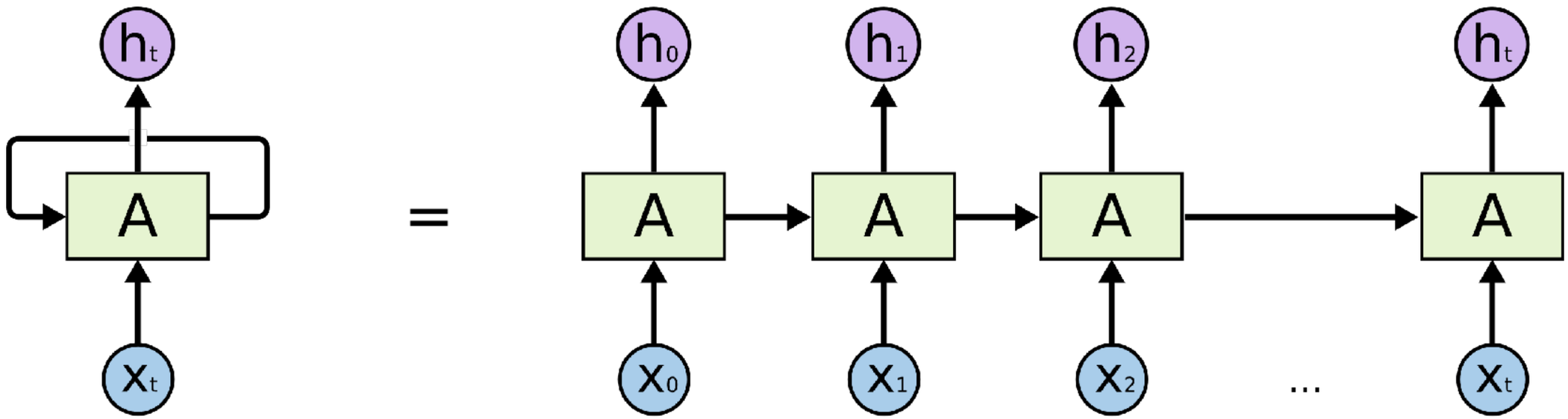




king is to **kings** as **queen** to ***?***.

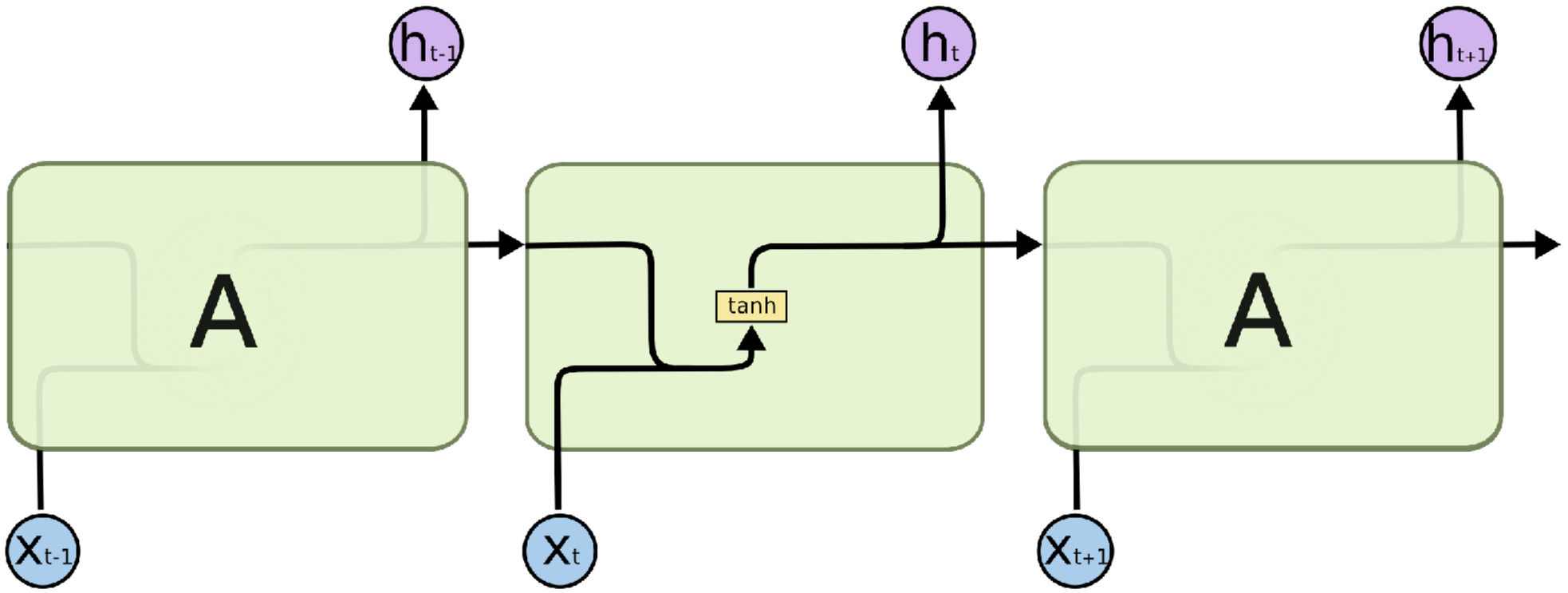
v(**kings**) - v(**king**) = v(**queens**) - v (**queen**)

Recurrent Neural networks 1/2



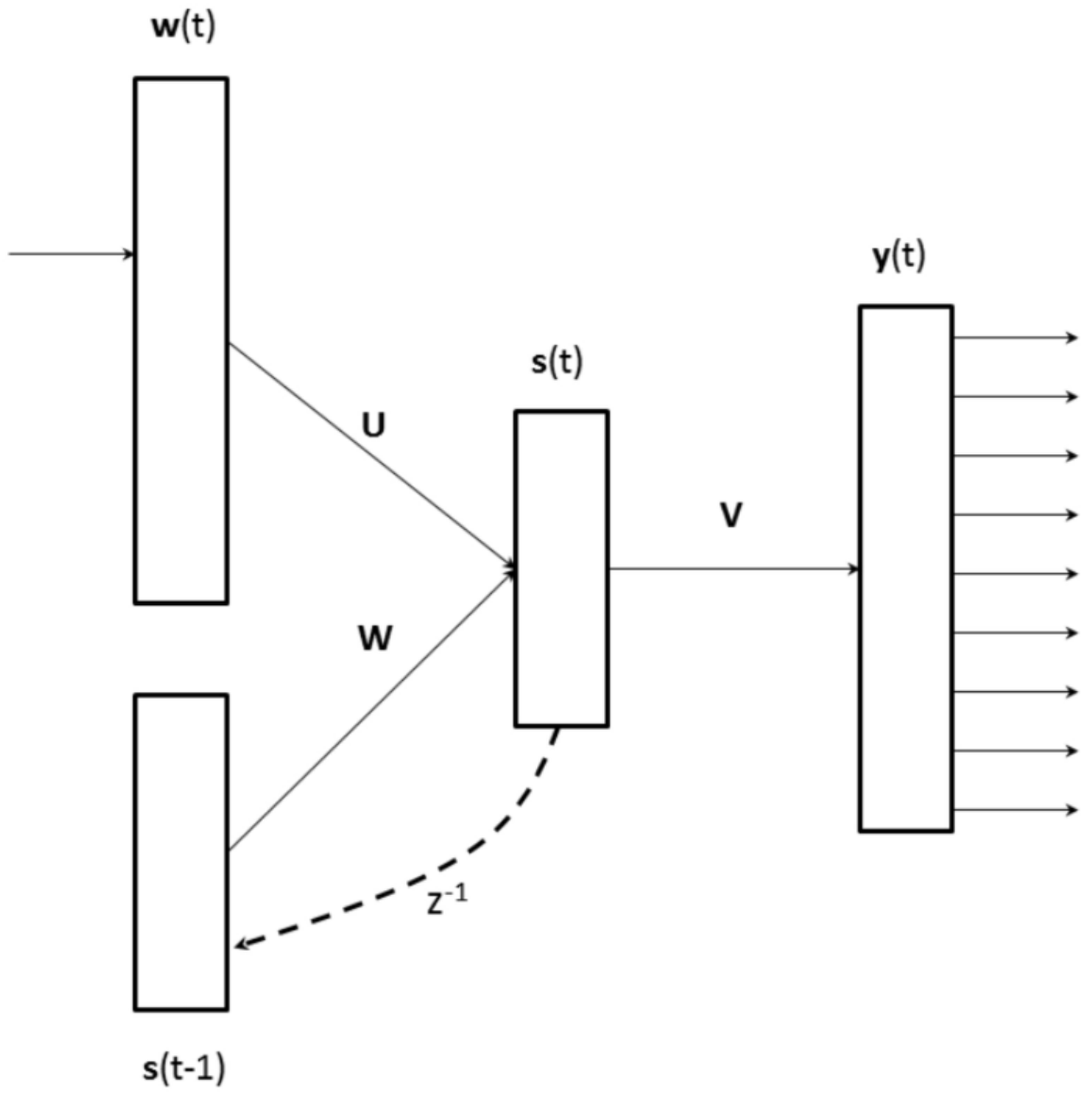
source: http://colah.github.io/posts/2015-08-Understanding-LSTMs/

Recurrent Neural Networks 2/2



https://www.tensorflow.org

Recurrent Neural Network Language Modeling Toolkit



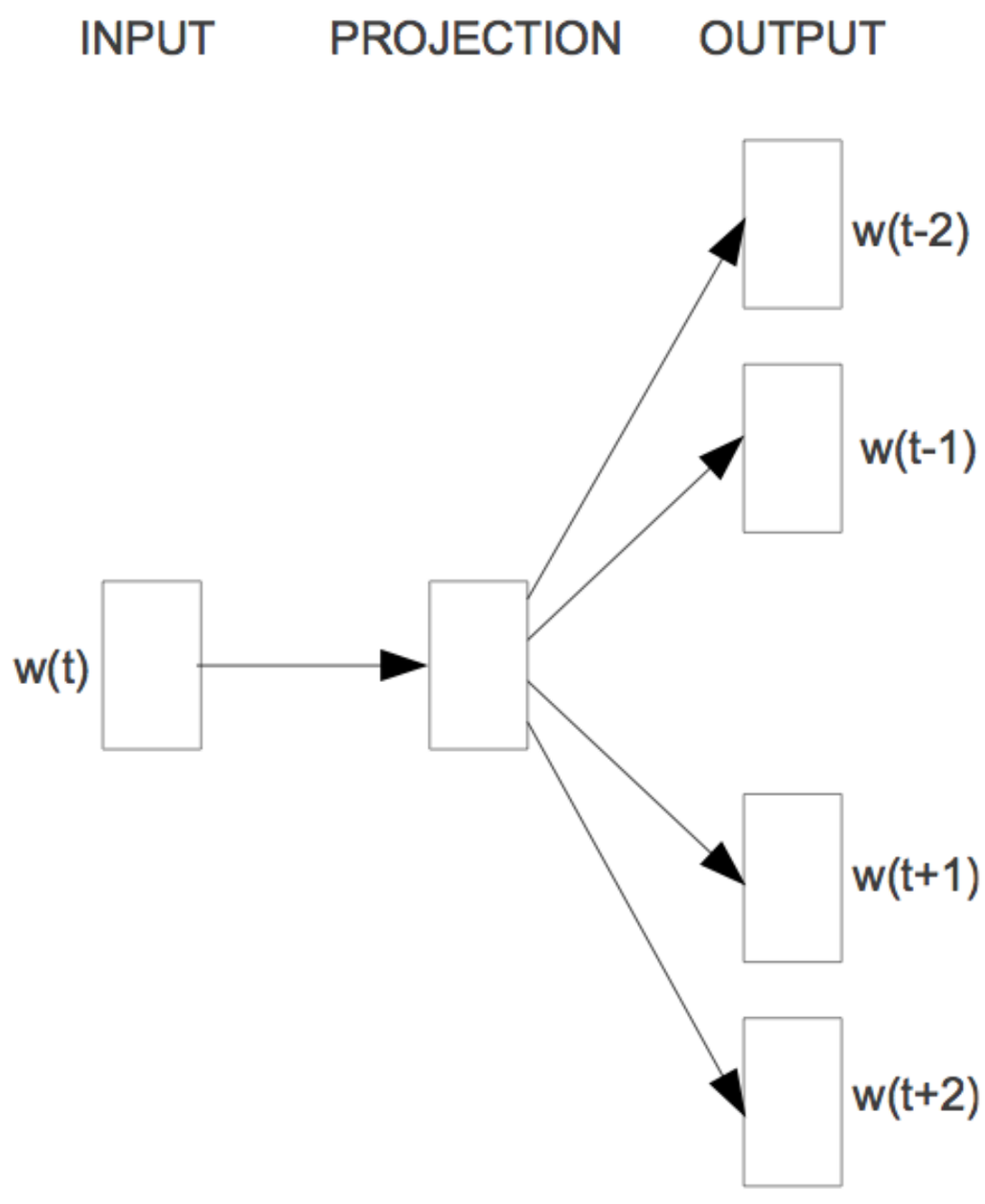
$$\mathbf{s}(t) = f\left(\mathbf{U}\mathbf{w}(t) + \mathbf{W}\mathbf{s}(t-1)\right)$$

$$\mathbf{y}(t) = g\left(\mathbf{V}\mathbf{s}(t)\right),$$

$$f(z) = \frac{1}{1+e^{-z}}, \quad g(z_m) = \frac{e^{z_m}}{\sum_k e^{z_k}}.$$

source: http://www.fit.vutbr.cz/~imikolov/rnnlm/

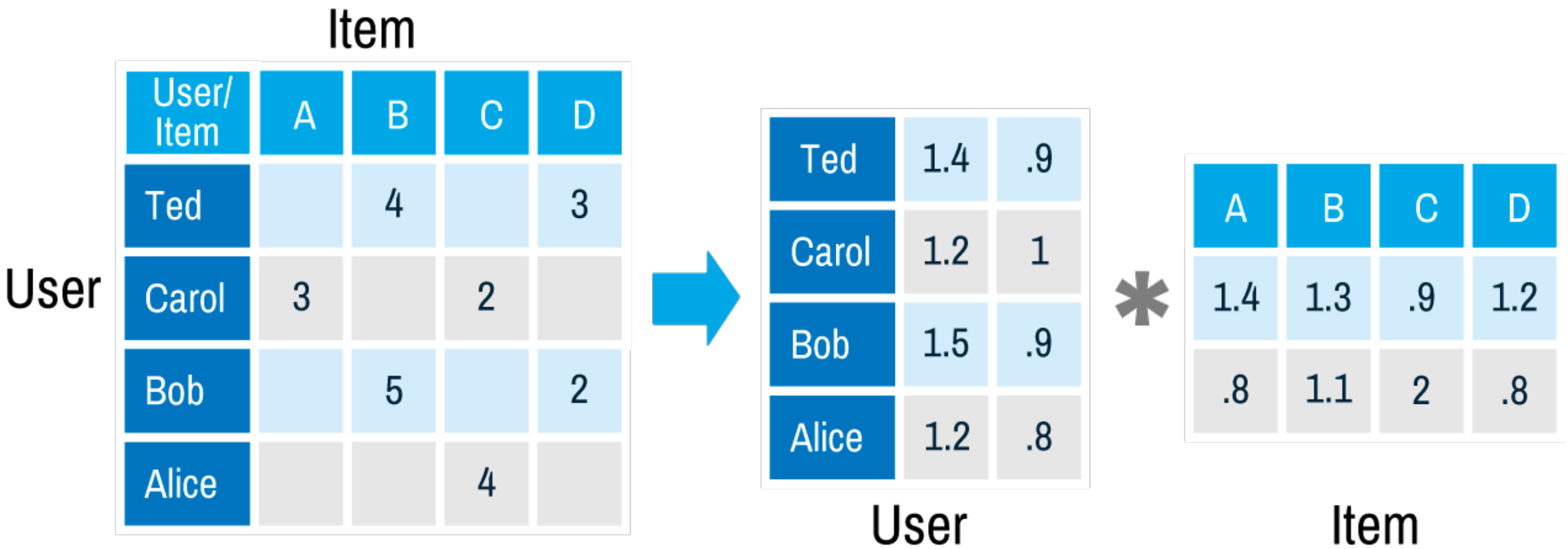
The skip-gram model



Experiments with word2vec

Word2vec-in-gensim.ipynb

Collaborative filtering



https://mapr.com/ebooks/spark

Embedding-based recommendation

Recommendation-assignment.ipynb

Language models for text generating

Ukázka pdf

Ukázka epub

Ukázka mobi

Poezie umělého světa [E-kniha]

Jiří Materna

★★★★★ Hodnotilo 7 uživatelů, zatím žádné recenze, napsat vlastní recenzi

Popis: Elektronická kniha, 50 stran, bez zabezpečení DRM, ePUB, Mobi, PDF, česky - více

Stáhnout

Zdarma
K dispozici pro **okamžité** stáhnutí

Ke stažení

Anotace

Všechny básně v této knize byly automaticky vygenerovány počítačem za pomoci umělých neuronových sítích. Neuronová síť sama o sobě nic neumí a je třeba ji natrénovat pro činnost, kterou má vykonávat.

LISTOPAD

usínám, pláču, umírám, přemýšlím
co cítíš ty?
cítím tvou slabost
a whisky

SPRAVEDLNOST

na tvou dekadentní duši
ráno i v poledne
bůh má připravenou kuši

IMAGINACE

v pivu je poezie
jako jsou motýli v housenkách
popelník je pro prach
a strach

neboj se vidět a tvořit
spoutané srdce je hrob

Metafory

...tělo plné červánků...

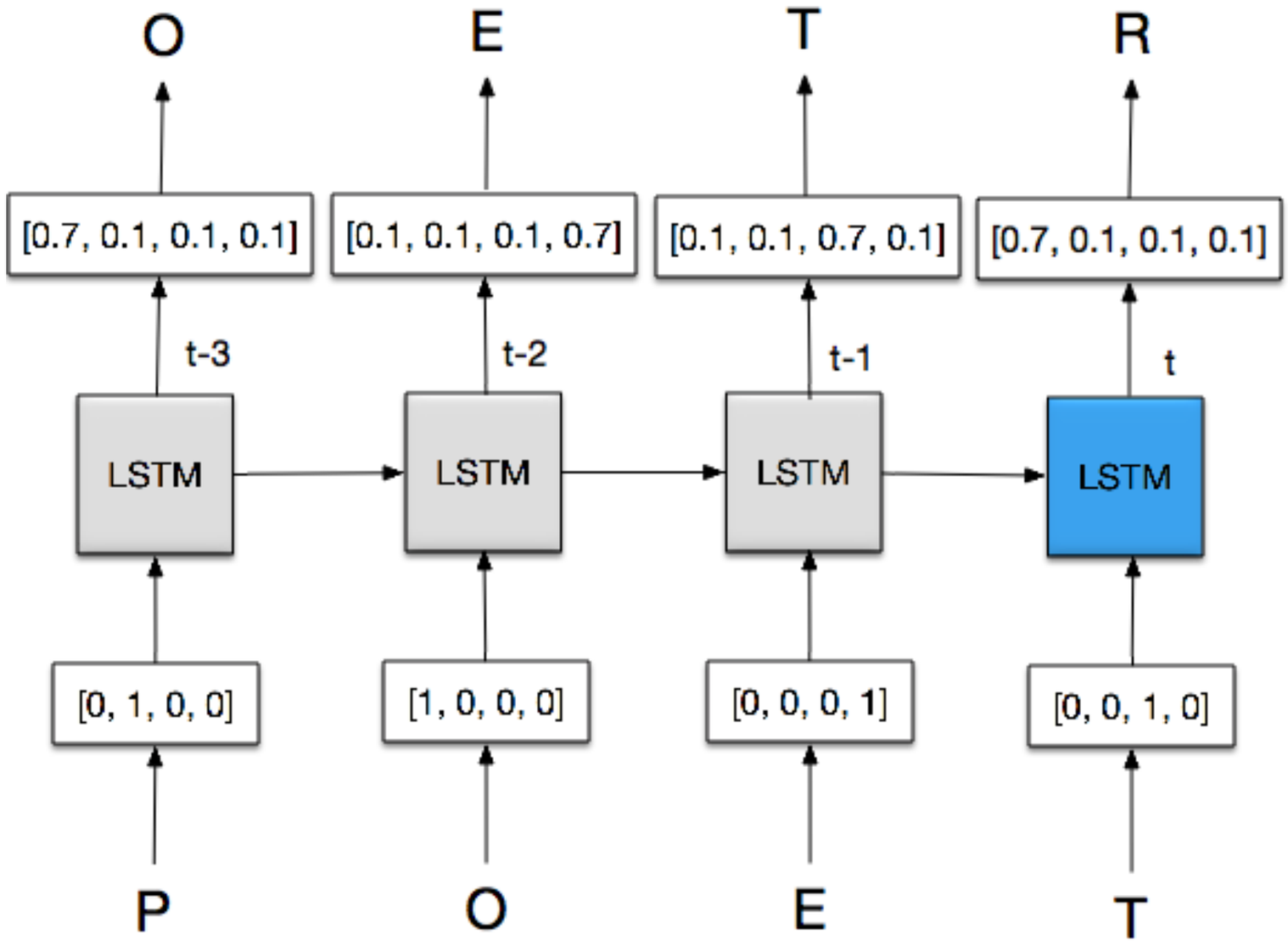
...tak vzácný jako listí...

Language models for text generating

P(maso | máma, mele) = 0.5
P(Emu | máma, mele) = 0.3
P(tátu | máma, mele) = 0.2

```
t ~ Uniform(0, 1)
s = 0
for v in Vocabulary:
   s += v.prob
   if t < s:
      return v.word
```

LSTM language model



Title generator

AUTUMN SONG

Memory state

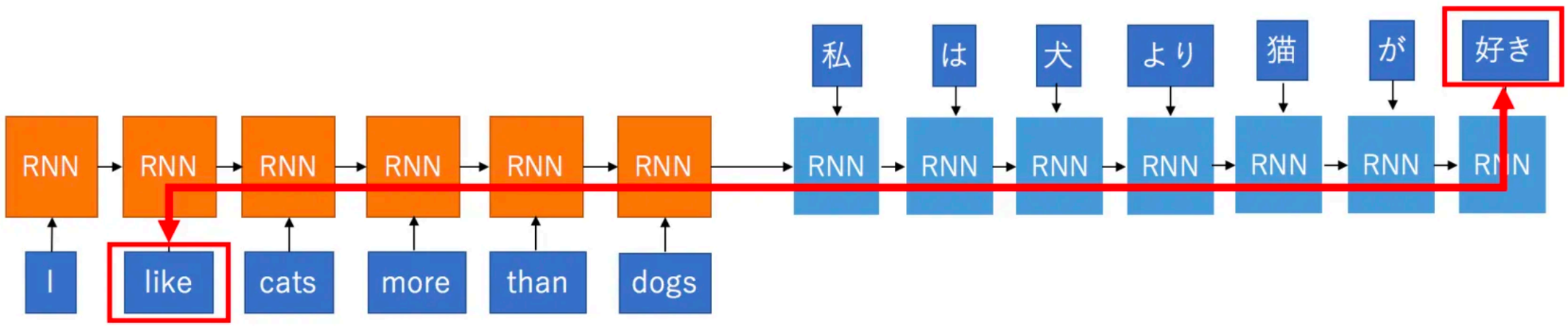
Body generator

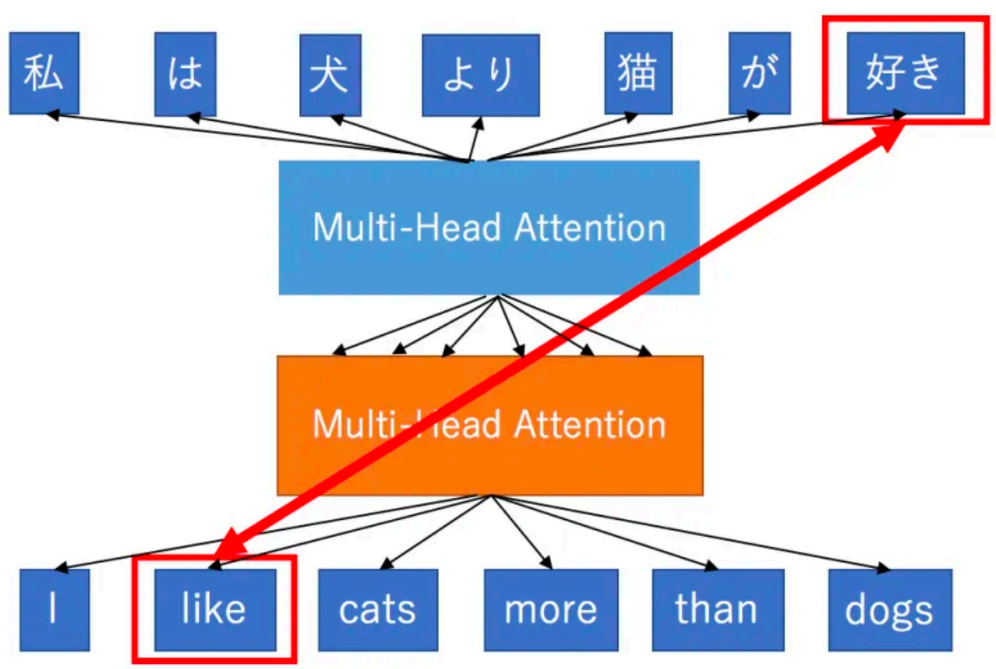
why don't you kill yourself?
a phone call isn't hope
this planet is still your home
your time is still going on

na na na...

I know, I'm revealing a book of dreams
I'll find out I'm nothing more than this

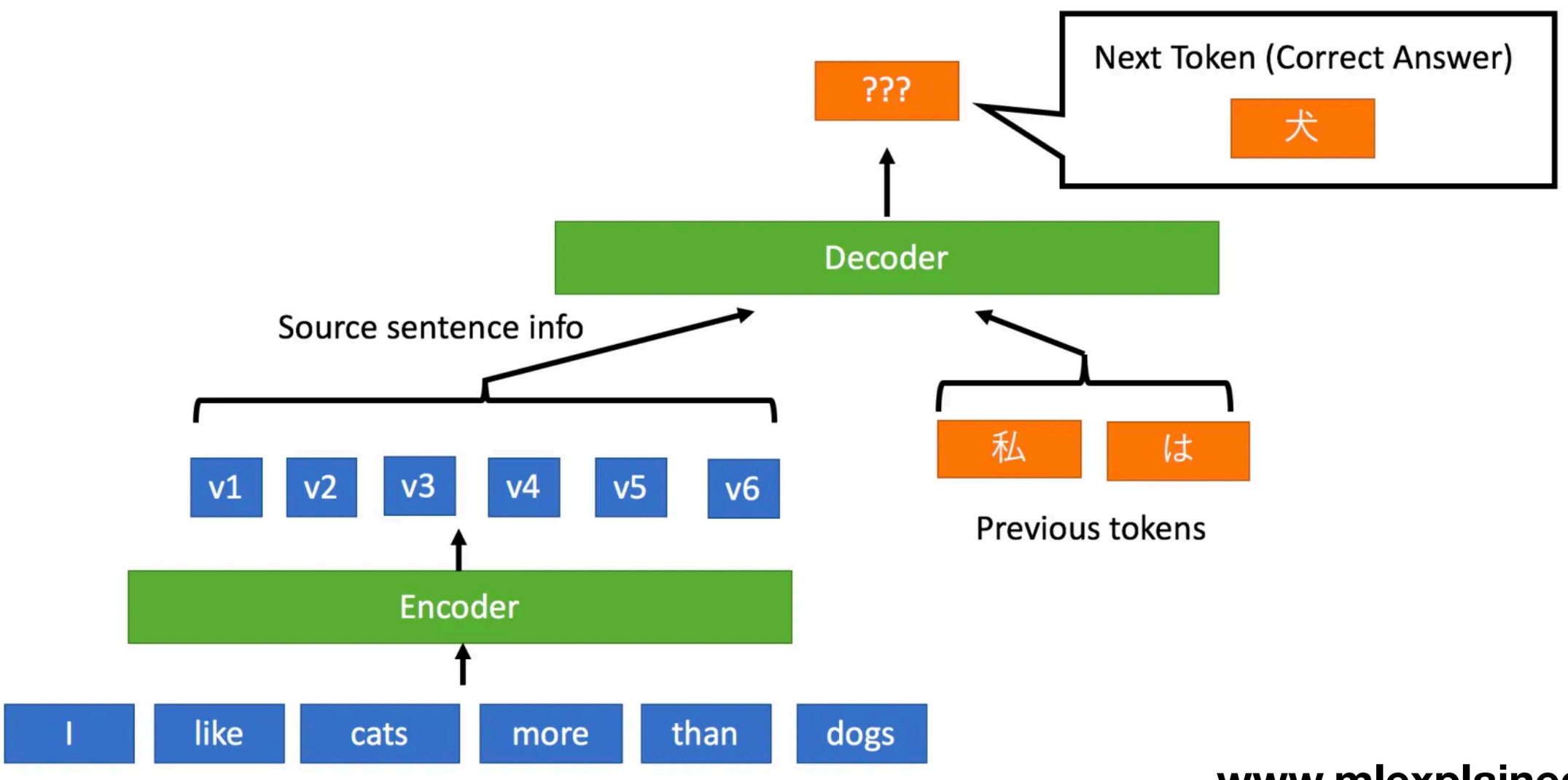
Transformer





source: www.mlexplained.com

Translation with Transformers



www.mlexplained.com

GPT-2 Language model

Donald Trump told...

Demo: https://talktotransformer.com/

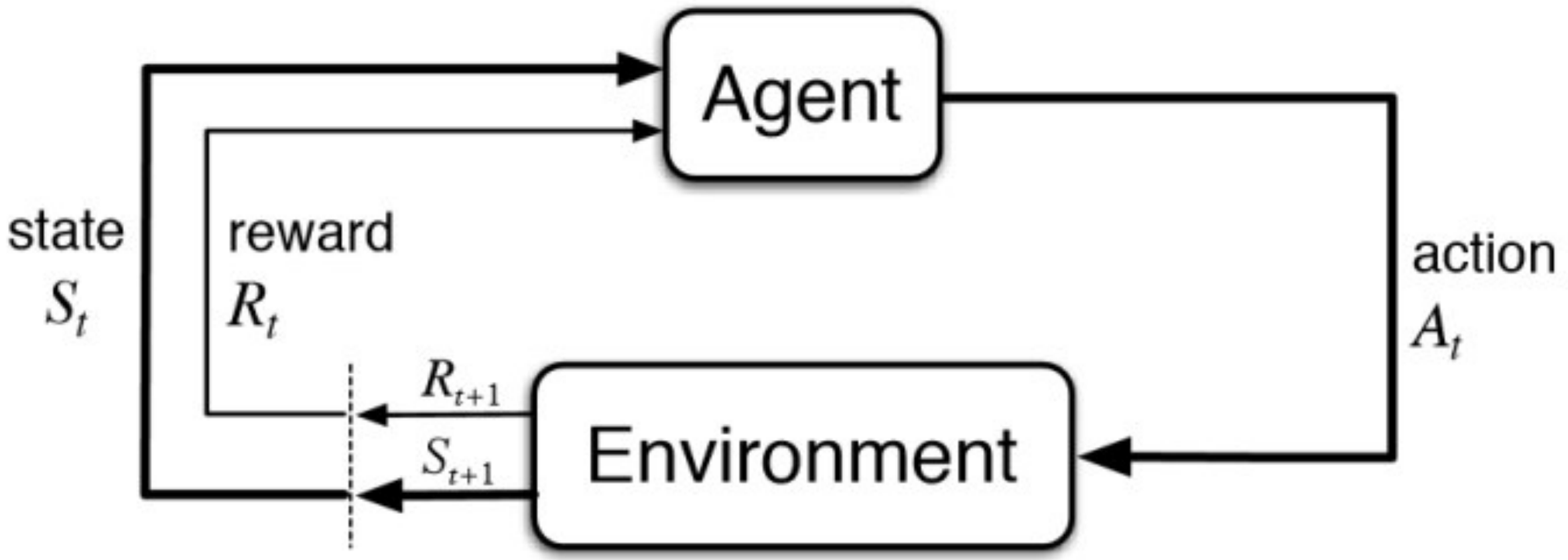
GPT-2 Language model

Donald Trump told the Times he is preparing a "major speech" on his economic plans, but did not provide details on what it will entail.

“I’m getting ready for the speech. And I will have a major speech on Tuesday.” Trump said during an interview in the White House residence.

https://www.theaitre.com/

Reinforcement learning

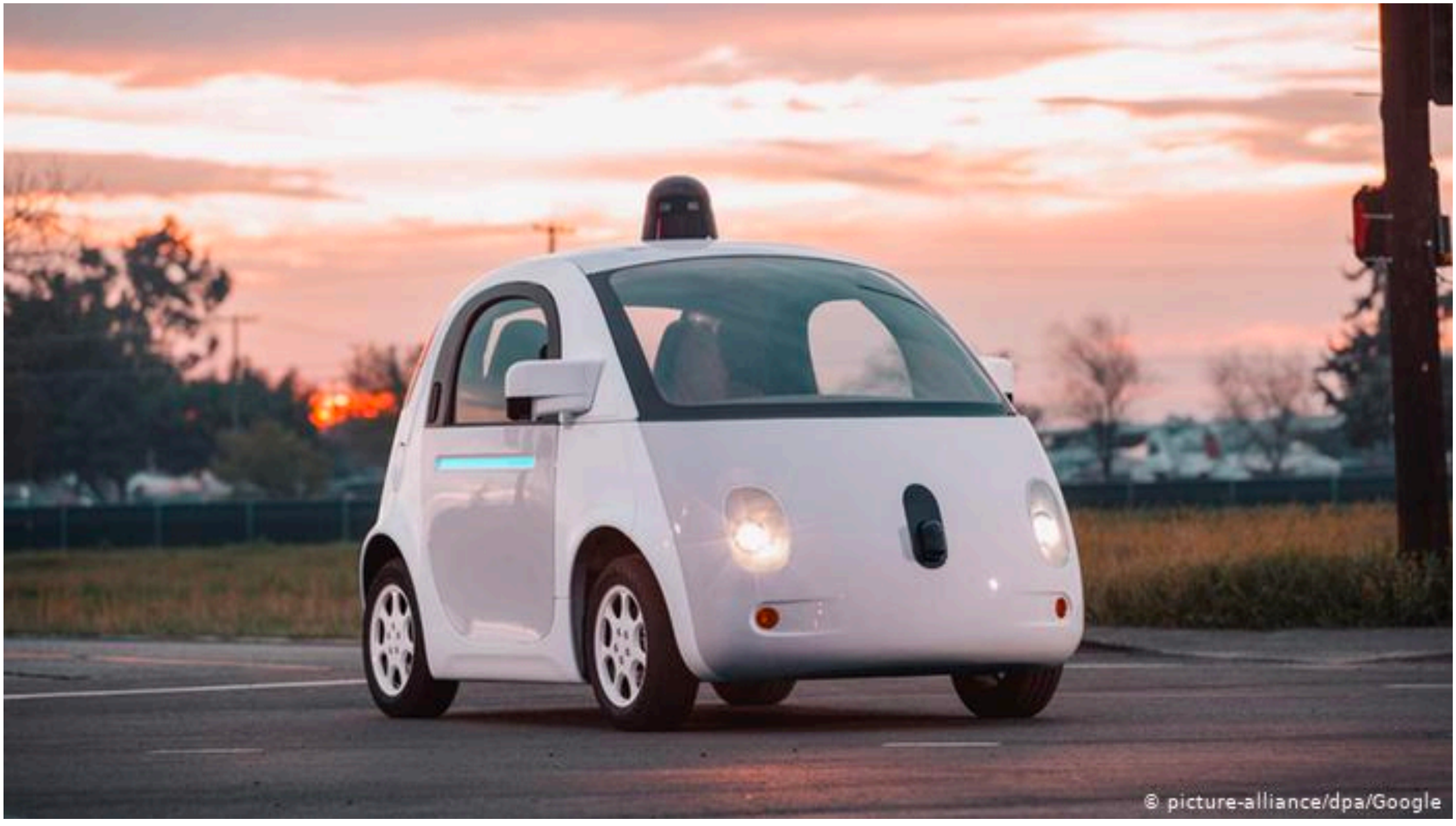


Alpha Go Zero

AlphaStar


Workers: 3/3
Workers: 25/16
Workers: 3/3
14:32
Catalyst LE
AlphaStar
177 /200
SUPPLY
945 +2015
MINERALS
758 +873
GAS
64
WORKERS
113
ARMY
940
APM
PRODUCTION

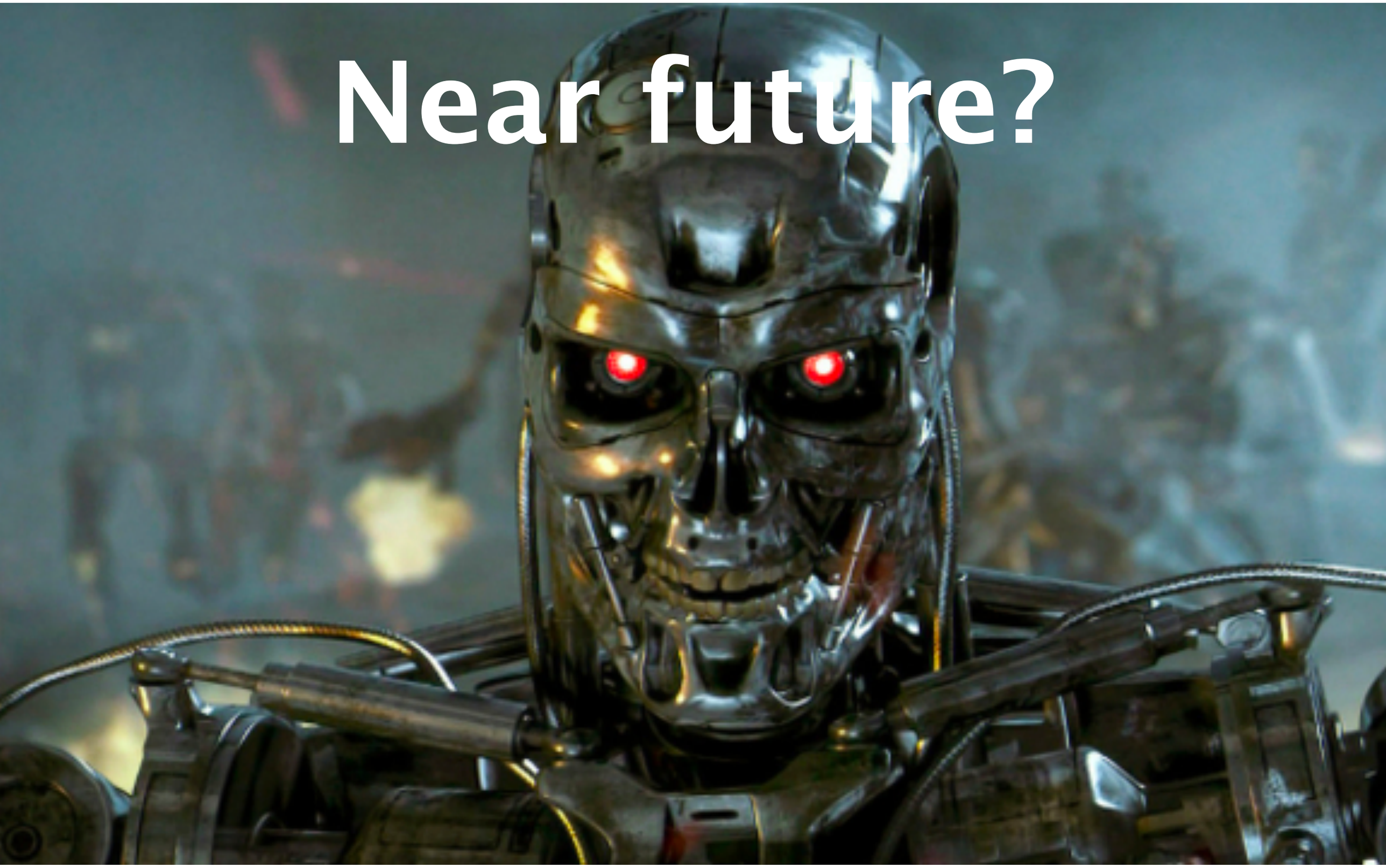
Autonomous driving



© picture-alliance/dpa/Google

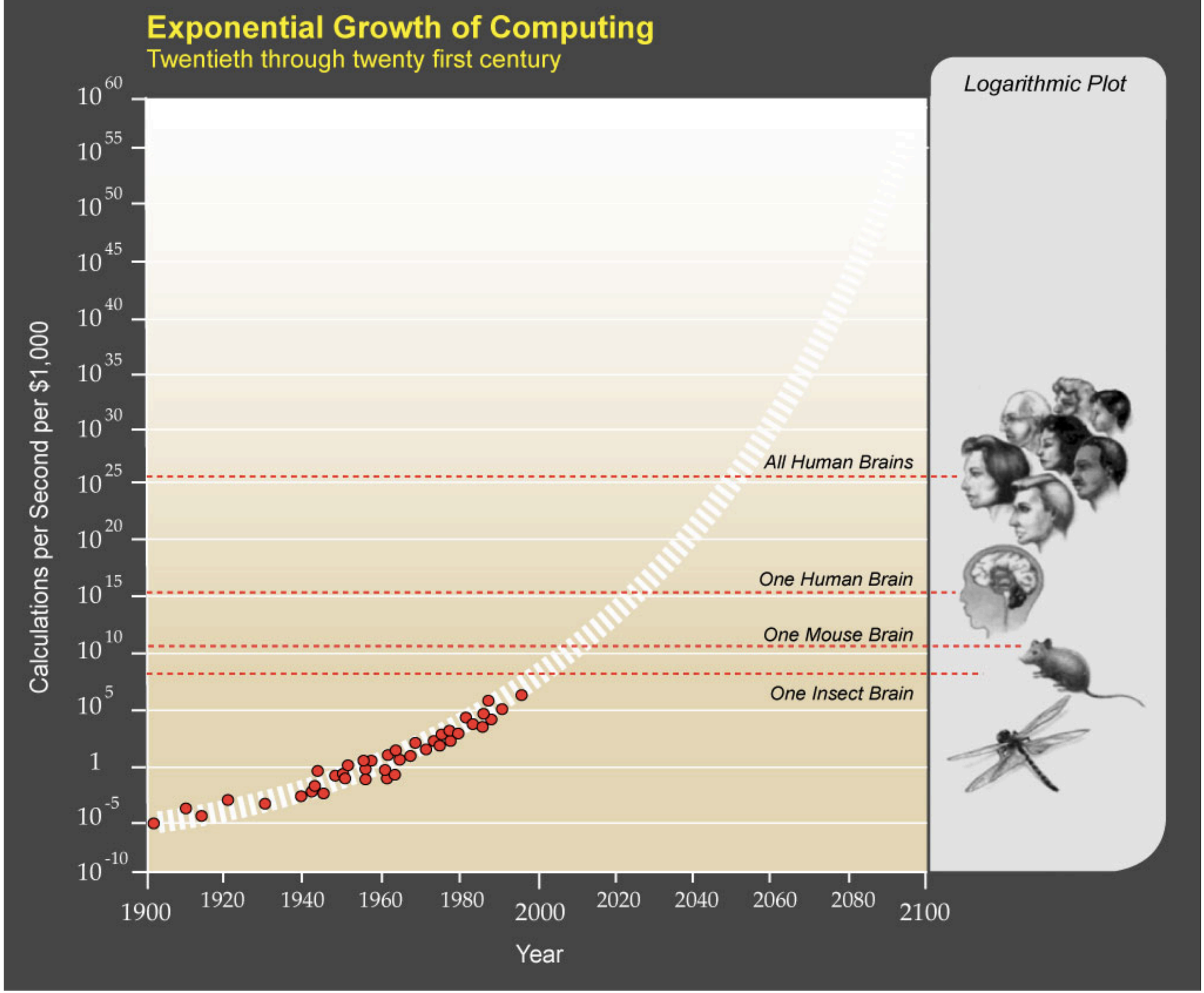
Autonomous flying

Near future?



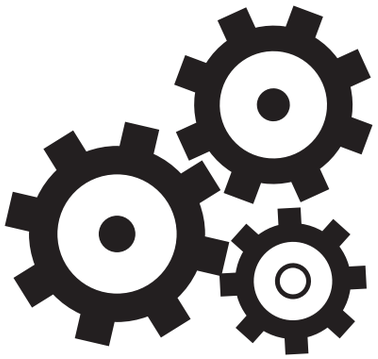
Exponential Growth of Computing

Twentieth through twenty first century



Source: Ray Kurzweil

What next?



Machine Learning Prague

MACHINE LEARNING meetups

https://www.deeplearningbook.org/

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