

Deep Learning für visuelle Medien: Theorie

gernot.howanitz@uibk.ac.at · radisch@saw-leipzig.de

DHd 2020, 3. März 2020

1. Einführung
2. Von künstlichen Neuronen zum Deep Learning
3. Netzwerkarchitekturen
4. Probleme

Einführung



SenseFace





<https://www.thispersondoesnotexist.com> (3. März 2020)

Data from www.thispersondoesnotexist.com

Imagined by a GAN (generative adversarial network) [StyleGAN2](#) (Dec 2019) - Karras et al. 2019

Don't panic. Learn how it works [\[1\]](#) [\[2\]](#) [\[3\]](#)

Help this AI continue to dream [\[4\]](#) [\[5\]](#) [\[6\]](#)

Code for training your own [\[original\]](#) [\[amazing\]](#)

AI+ Cats + Flowers + Molecules | [\[news\]](#)

Another | [\[Save\]](#)



Imagined by a GAN (generative adversarial network)
[StyleGAN2](#) (Dec 2019) - Karras et al. 2019

Don't panic. Learn how it works. [\[1\]](#) [\[2\]](#) [\[3\]](#)

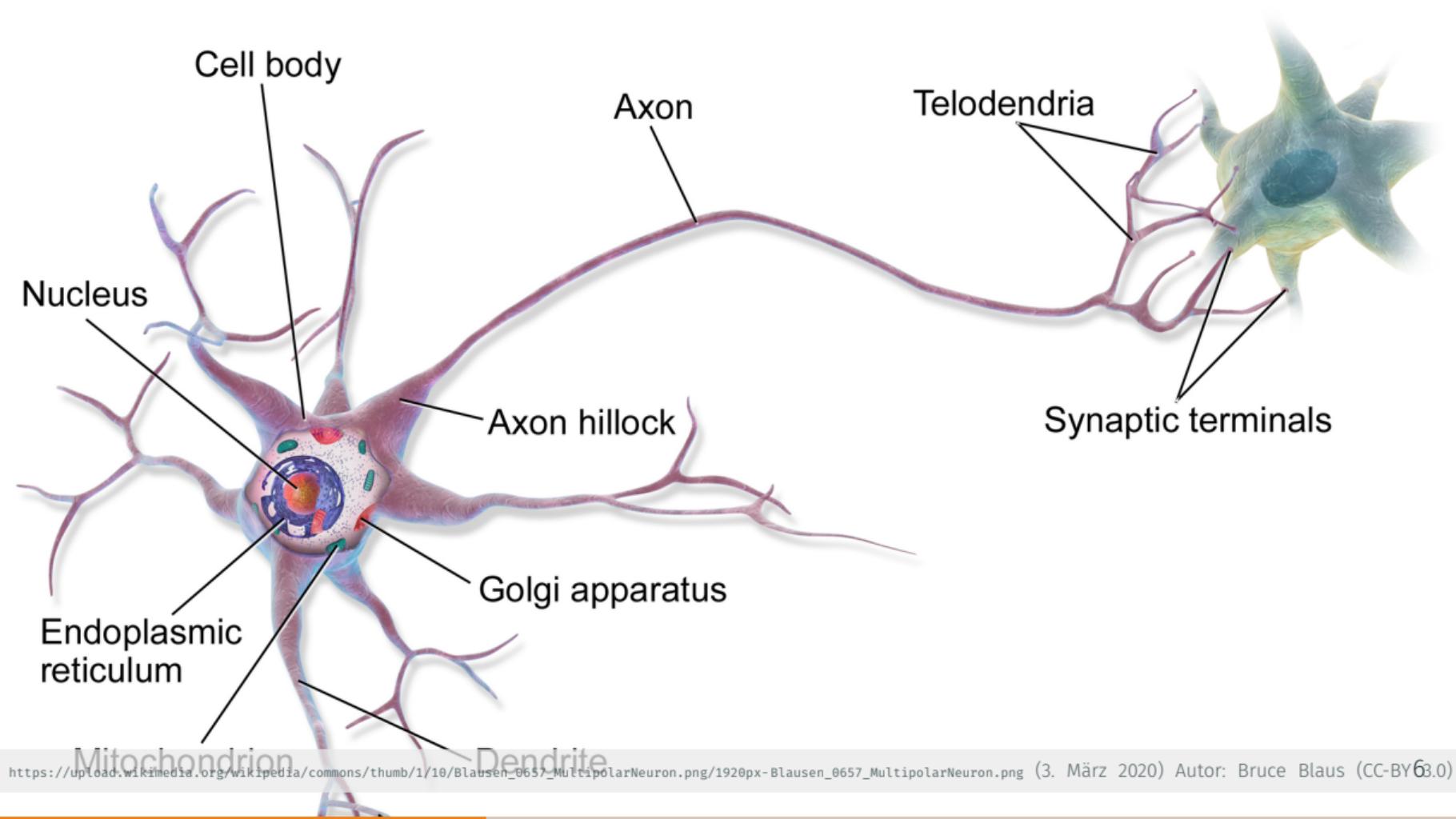
Help this AI continue to dream. [\[Contact\]](#)

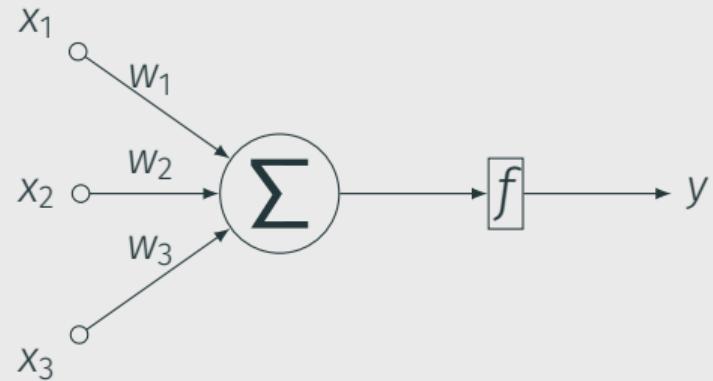
Code for training your own [\[original\]](#) [\[simulated\]](#)

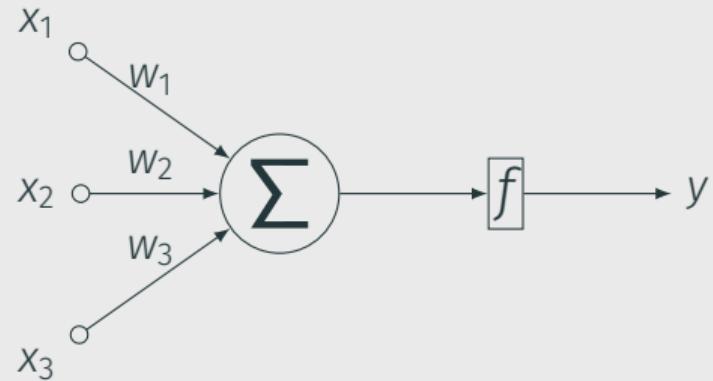
[\[AI\]](#) [\[Cars\]](#) [\[Houses\]](#) [\[Inventories\]](#) [\[News\]](#)

[\[Another\]](#) [\[Save\]](#)

Von künstlichen Neuronen zum Deep Learning





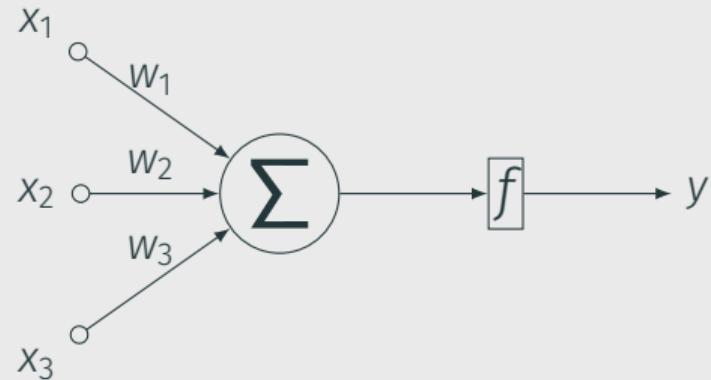


x_i = Eingabe

w_i = Gewichte

f = Aktivierungsfunktion

y = Ausgabe

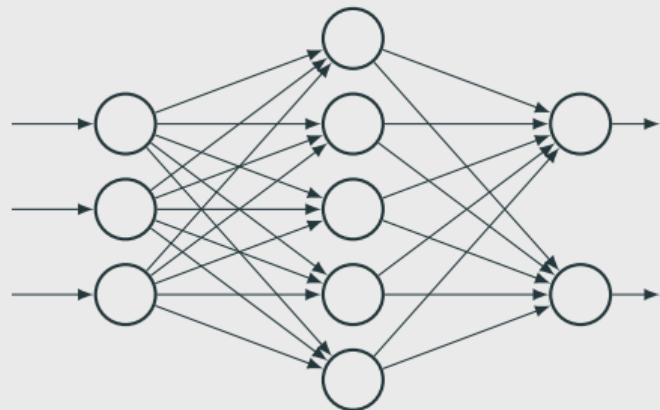


x_i = Eingabe

w_i = Gewichte

f = Aktivierungsfunktion

y = Ausgabe



Traditionelle künstliche neuronale Netze: 10.000 Neuronen

Traditionelle künstliche neuronale Netze: 10.000 Neuronen

Deep Learning: 15.000.000 Neuronen

Traditionelle künstliche neuronale Netze: 10.000 Neuronen

Deep Learning: 15.000.000 Neuronen

Menschliches Gehirn: 100.000.000.000 Neuronen

Netzwerkarchitekturen

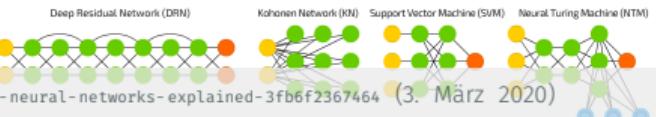
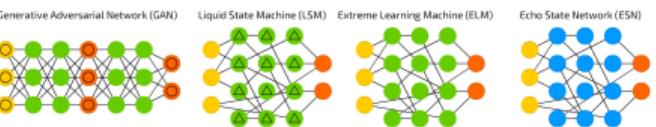
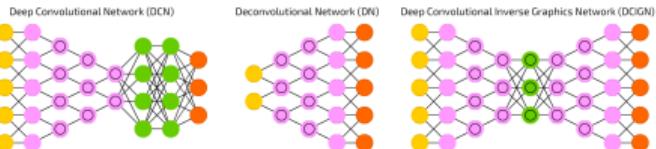
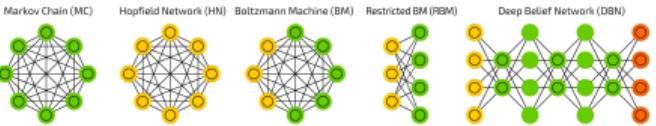
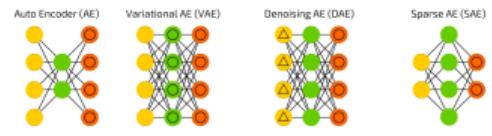
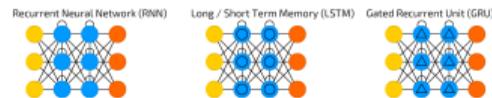
A mostly complete chart of Neural Networks

©2016 Jjordan van Veen - nnv.institute.org

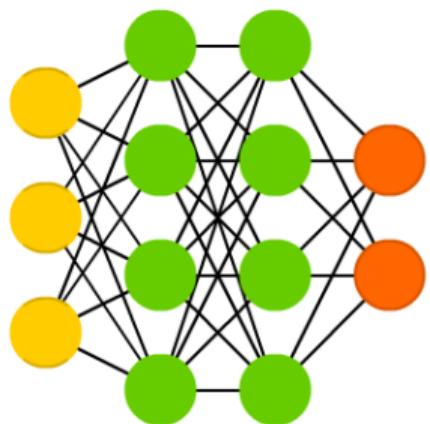
- Backfed Input Cell
- Input Cell
- △ Noisy Input Cell
- Hidden Cell
- Probabilistic Hidden Cell
- △ Spiking Hidden Cell
- Output Cell
- Match Input Output Cell
- Recurrent Cell
- Memory Cell
- △ Different Memory Cell
- Kernel
- Convolution or Pool



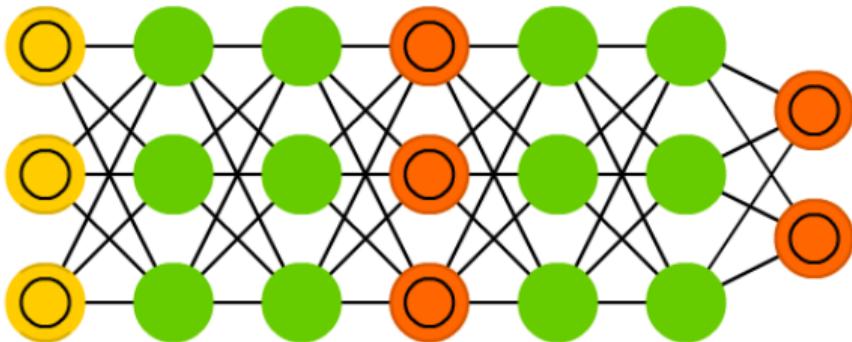
Perceptron (P) Feed Forward (FF) Radial Basis Network (RBF)



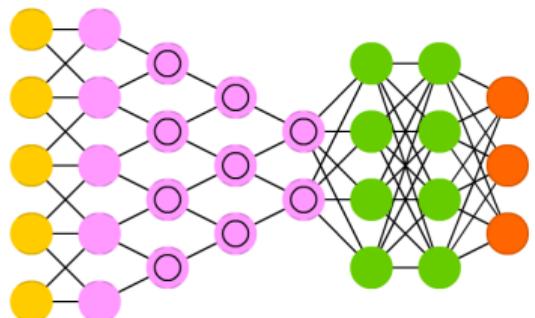
Deep Feed Forward (DFF)



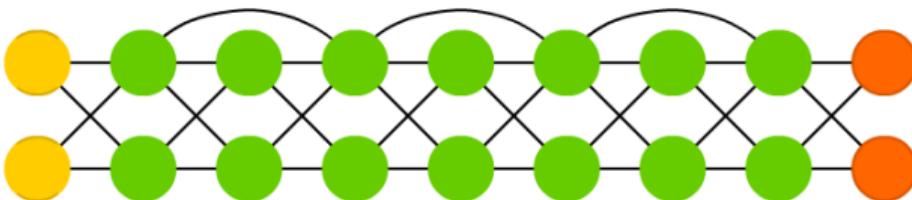
Generative Adversarial Network (GAN)

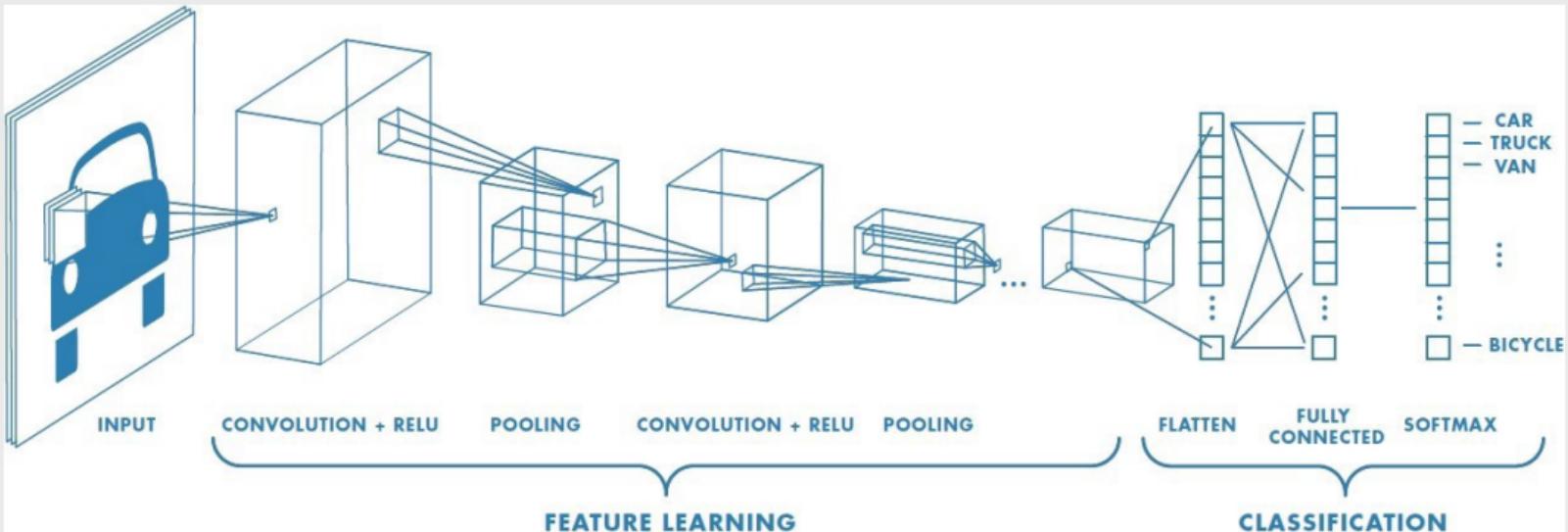


Deep Convolutional Network (DCN)

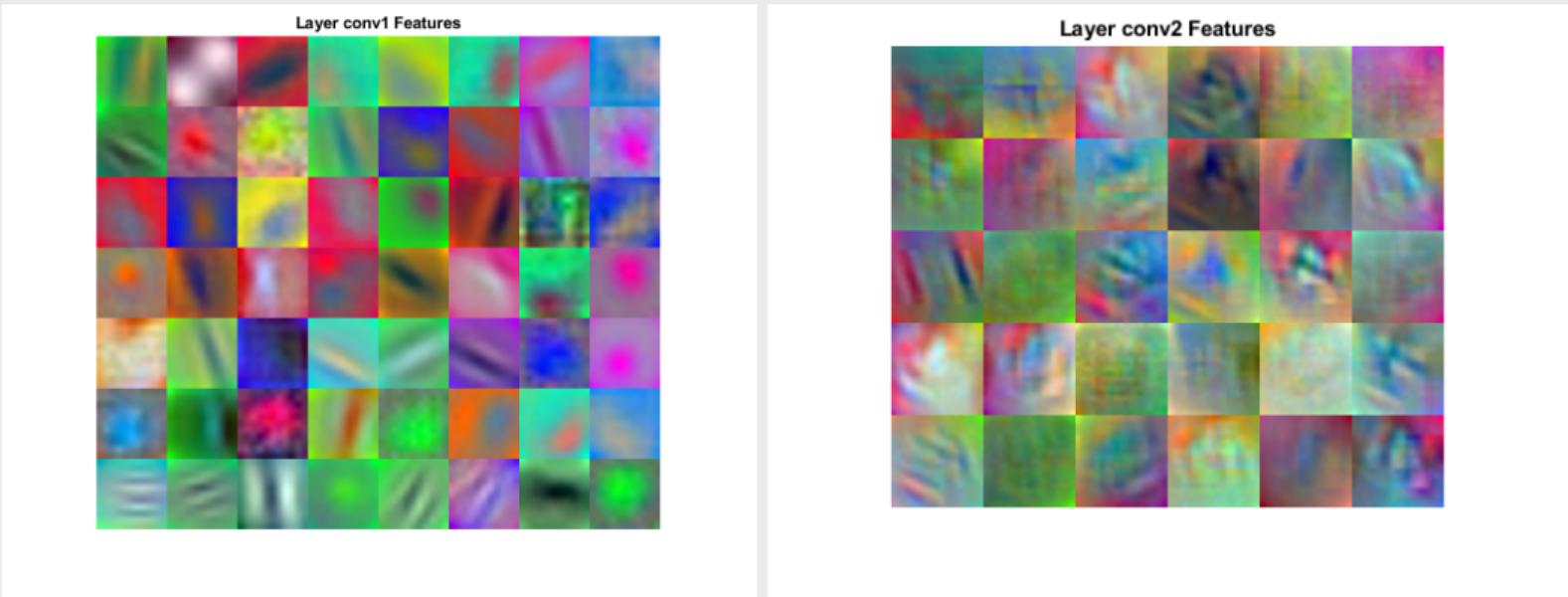


Deep Residual Network (DRN)



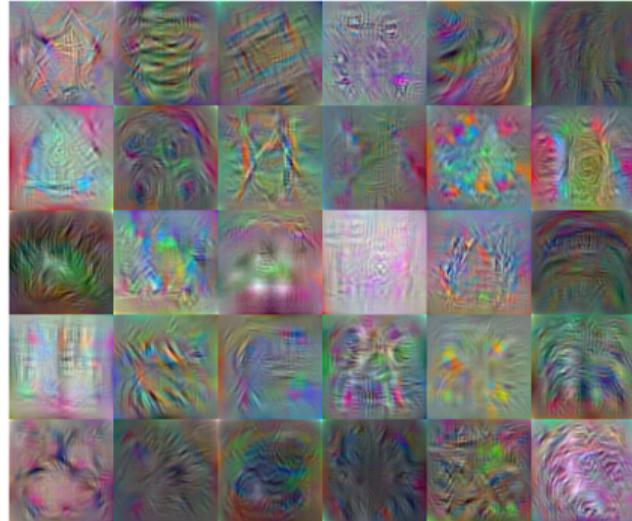


https://miro.medium.com/max/2510/1*XbuWBWuRrAY5pC4t-9DZAQ.jpeg (3. März 2020)

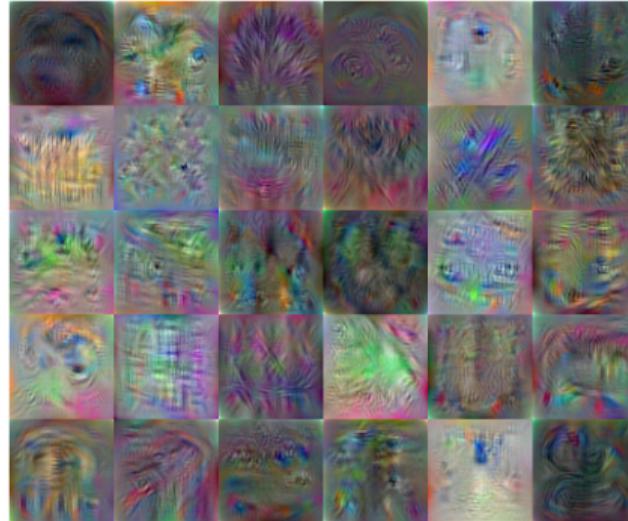


<https://de.mathworks.com/help/deeplearning/examples/visualize-features-of-a-convolutional-neural-network.html;jsessionid=bcc4a0e5a1e484b57b8ef67d2859> (3. März 2020)

Layer conv3 Features



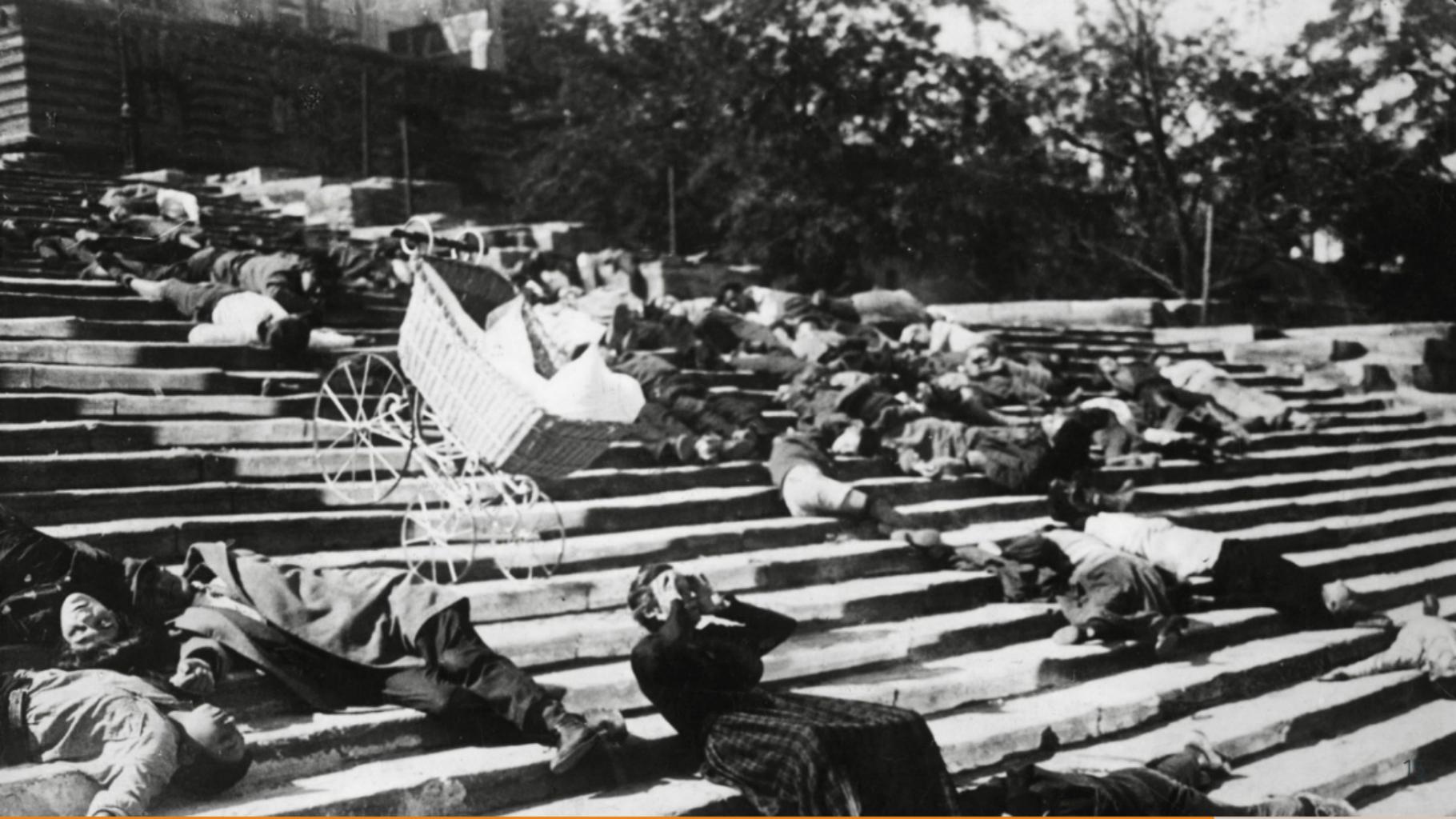
Layer conv4 Features



<https://de.mathworks.com/help/deeplearning/examples/visualize-features-of-a-convolutional-neural-network.html;jsessionid=bcc4a0e5a1e484b57b8ef67d2859> (3. März 2020)

Probleme







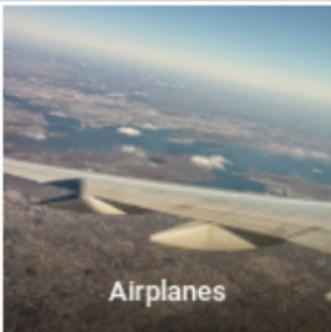


@jackyalcine

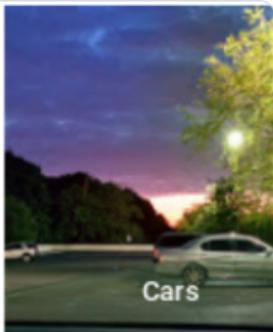
Google Photos, y'all fucked up. My friend's not a gorilla.



Skyscrapers



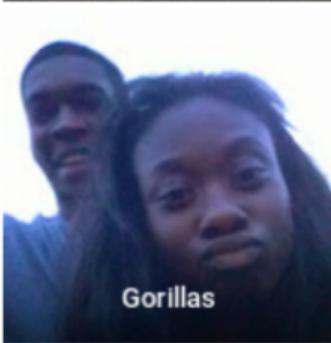
Airplanes



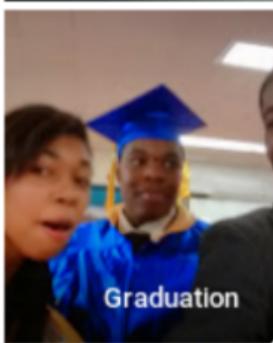
Cars



Bikes



Gorillas



Graduation

3:22 AM · Jun 29, 2015 · Twitter Web Client

<https://twitter.com/jackyalcine/status/615329515909156865> (3. März 2020)
3.3K Retweets 2.7K Likes

Maintainers

Ronan Collobert - Research Scientist @ Facebook

Clement Farabet - Senior Software Engineer @ Twitter

Koray Kavukcuoglu - Research Scientist @ Google DeepMind

Soumith Chintala - Research Engineer @ Facebook

Major Community Contributors

Nicholas Leonard - Research Engineer @ Element Inc

Jonathan Tompson - Research Scientist @ Google

Sergey Zagoruyko, Francisco Massa - PhD candidates @ IMAGINE

Aysegul Dundar, Jonghoon Jin, Alfredo Canziani - e-Lab Purdue and TeraDeep Inc.

Alban Desmaison, Cedric Delteil - Moodstocks Paris

Hugh Perkins

Friends

Elad Hoffer

Natalia Gimelshein - NVIDIA

Boris Fomitchev - NVIDIA

Research Labs and Companies

Deep Learning als Möglichkeit, (audio-)visuelle Medien quantitativ zu erfassen

Grundlegende Techniken seit 1940er Jahren, Durchbruch vor kurzem

Probleme technischer, organisatorischer und konzeptueller Natur sollen nicht verschwiegen werden