

Introduction to Deep Learning

FrOSCon 2019

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- Conclusion & tips for starting with deep learning

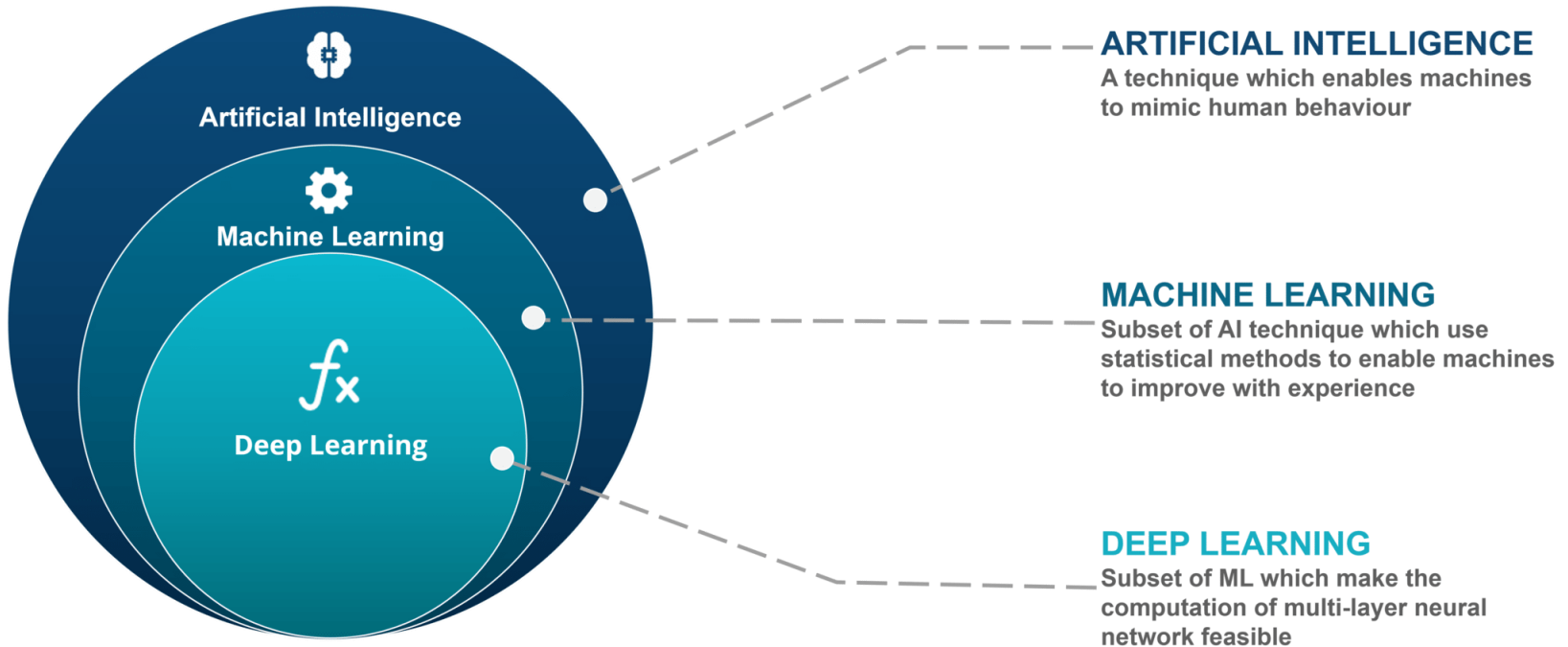
Viaboxx - a few facts



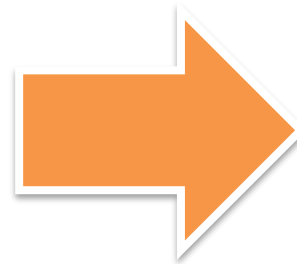
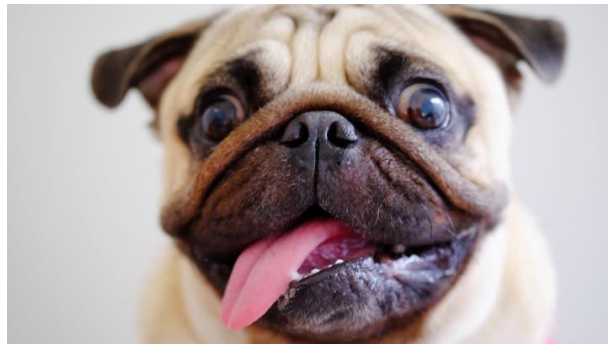
- Founded in 2009
- Located in Königswinter
- 13 employees + network of freelancers
- Active in the developer meetups around Bonn
- ISO 9001 certified
- Award „Innovativ durch Forschung“



What is Deep Learning?

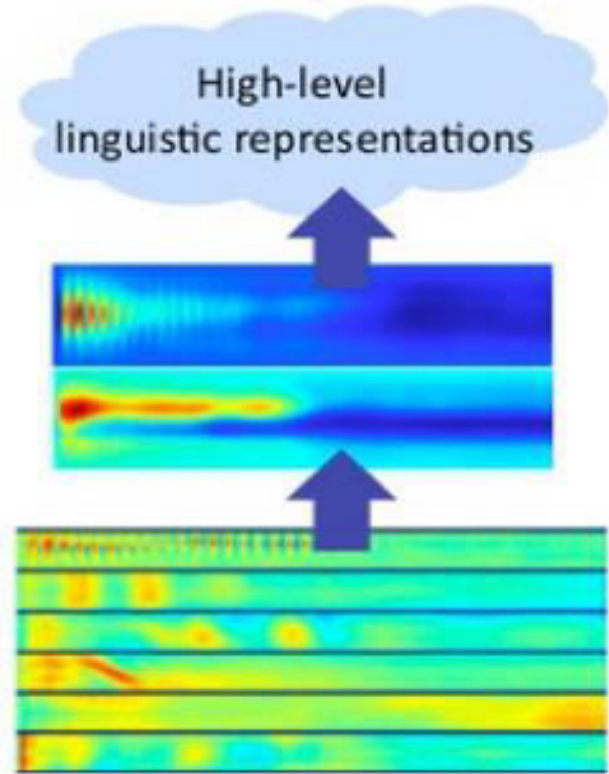
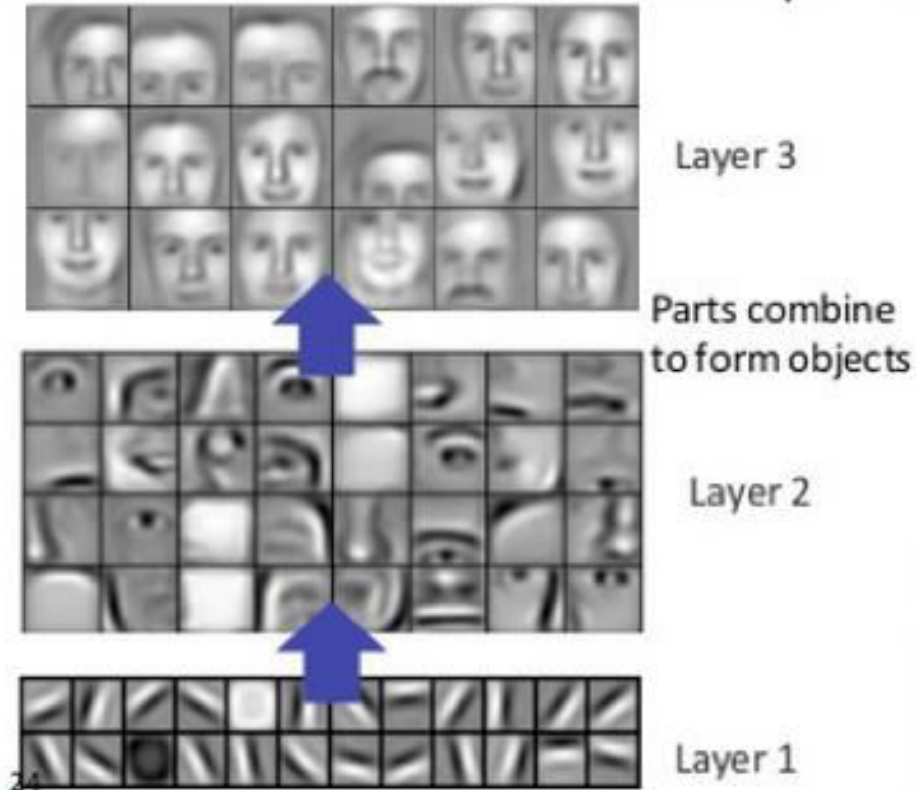


How do we learn?



Feature Hierarchies

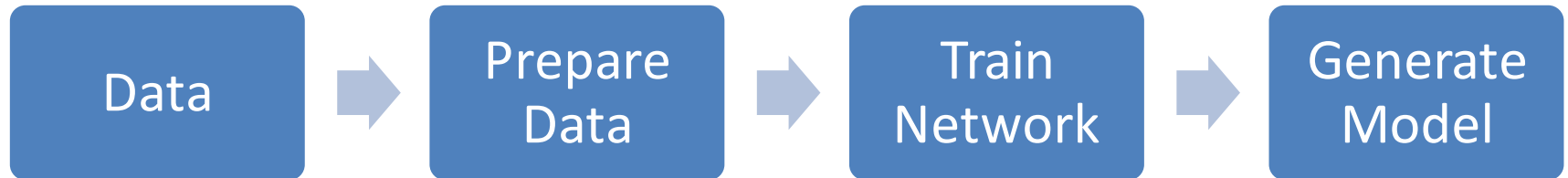
Successive model layers learn deeper intermediate representations



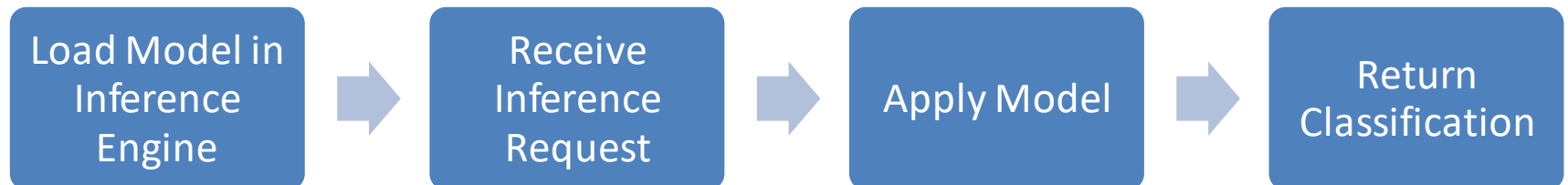
Prior: underlying factors & concepts compactly expressed w/ multiple levels of abstraction

How Does Deep Learning Work?

Training

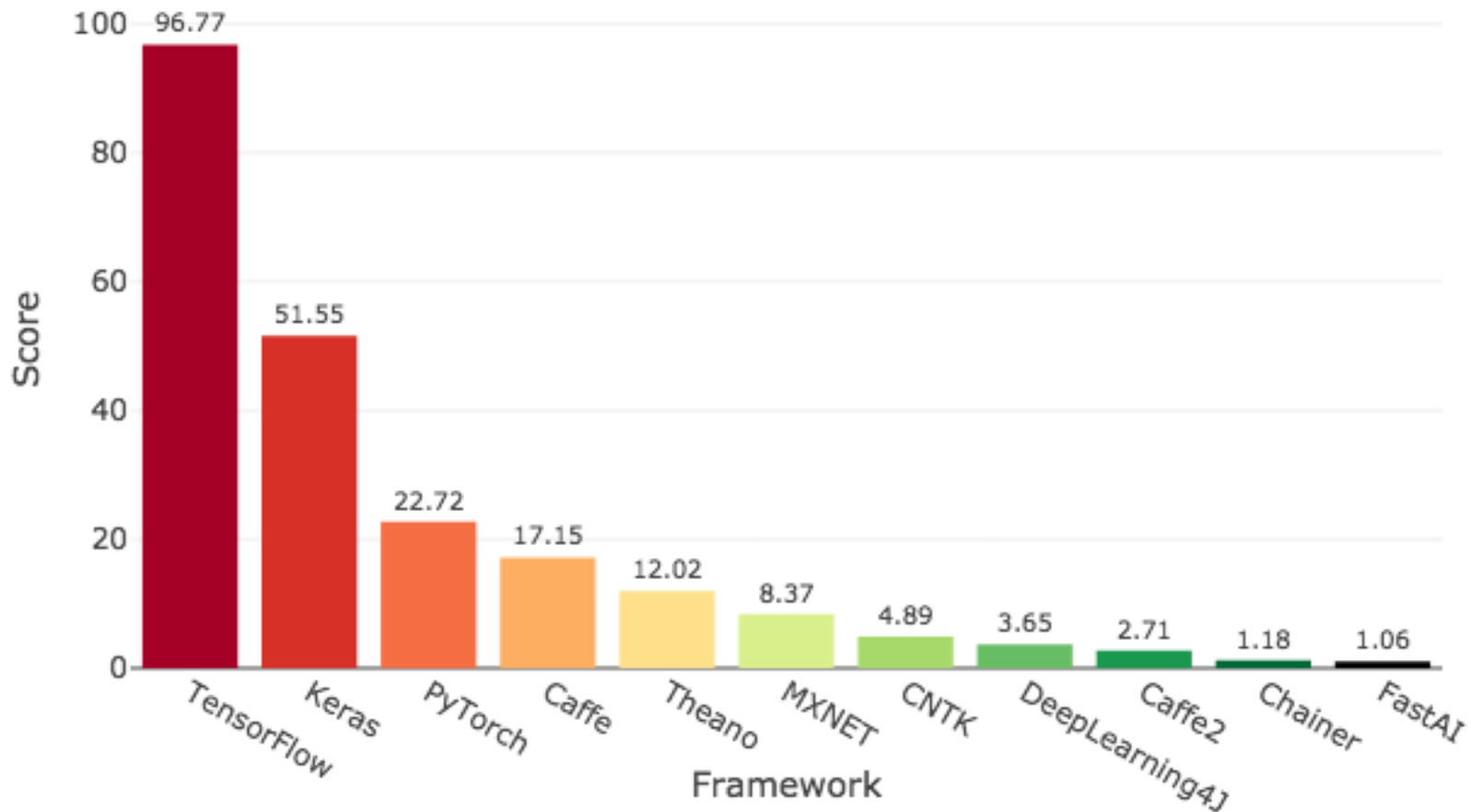


Inference



Framework Power Ranking 2018

(Statista.com)



Frameworks



TensorFlow

- + Most popular, good documentation and community support
- + Tensorboard for data visualisation
- + Python, C++, R
- + Applications: Text-based, image recognition, Sound recognition, Time series analysis, and Video analysis.

- Steep learning curve

Frameworks



- + High level library: easier for a quick start
- + Can work on top of Tensorflow, CNTK, and Theano
- + Supports Sequential and functional styles

- Support for only Python
- Less control over details in the deep learning process

Frameworks

PyTorch

- + Easy to use due to its pythonic nature
- + Applications: Image detection and classification, NLP, Reinforcement Learning
- + Fast training and classification

- Support for only Python
- Only recently released for production (Dec 2018)

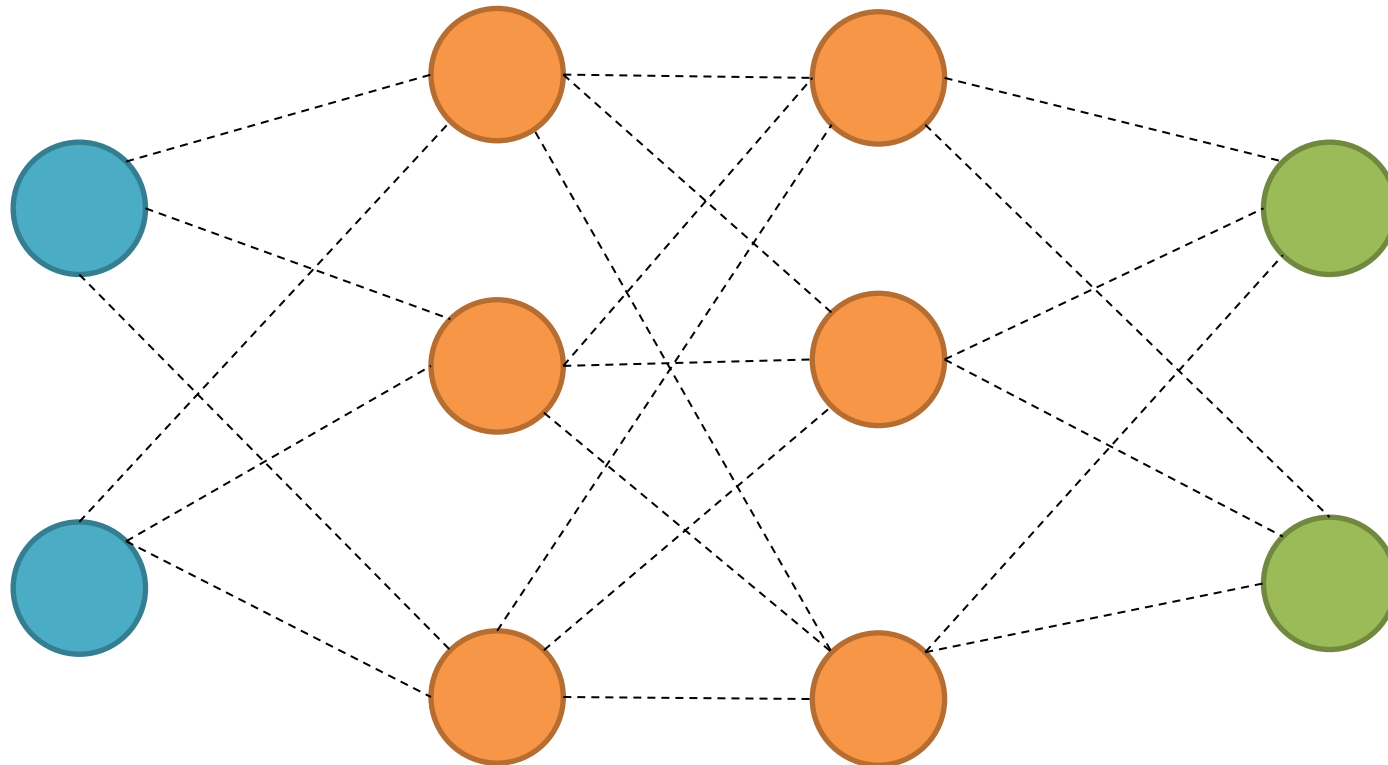
Frameworks

Caffe

- + Speed of image processing (learning and inference)
- + Languages: C, C++, Python, MATLAB
- + Applications: academic research, and large-scale applications in vision, speech, and multimedia

- No support for RNN (Recurrent Neural Network)
- Steep learning curve

What is a Neural Network



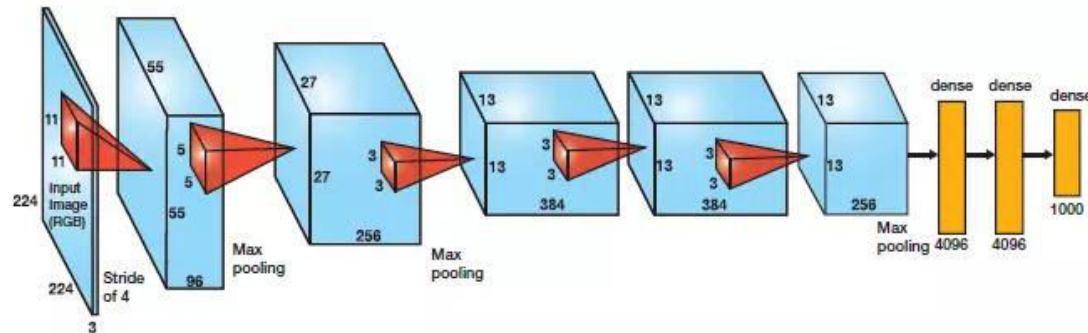
Input Layer

Hidden Layer

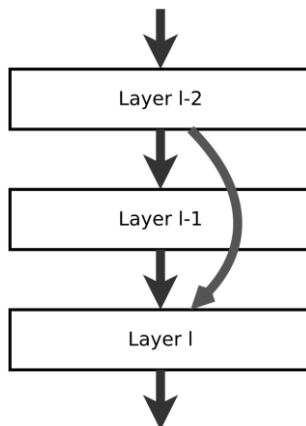
Output Layer

Popular Deep Learning Networks

AlexNet

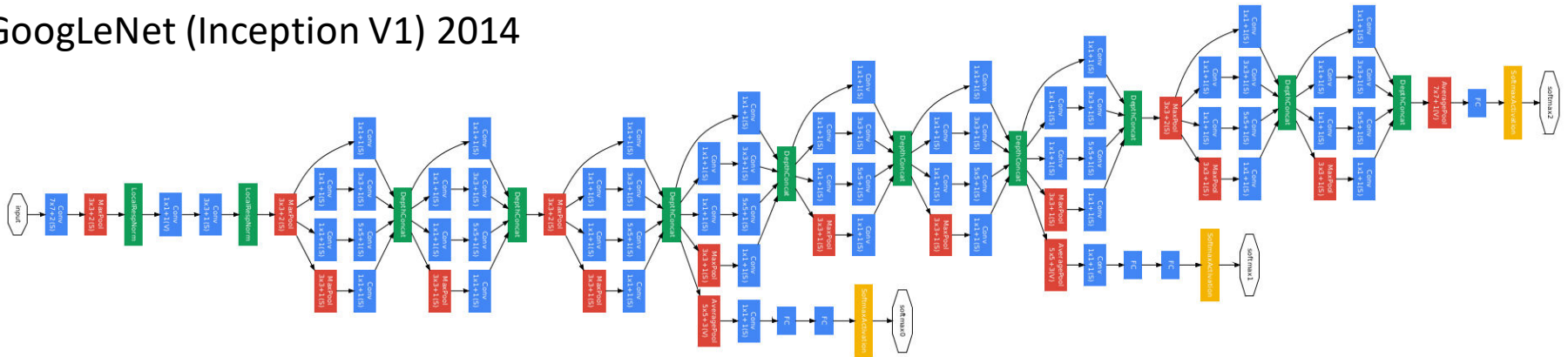


Residual Networks (ResNet)

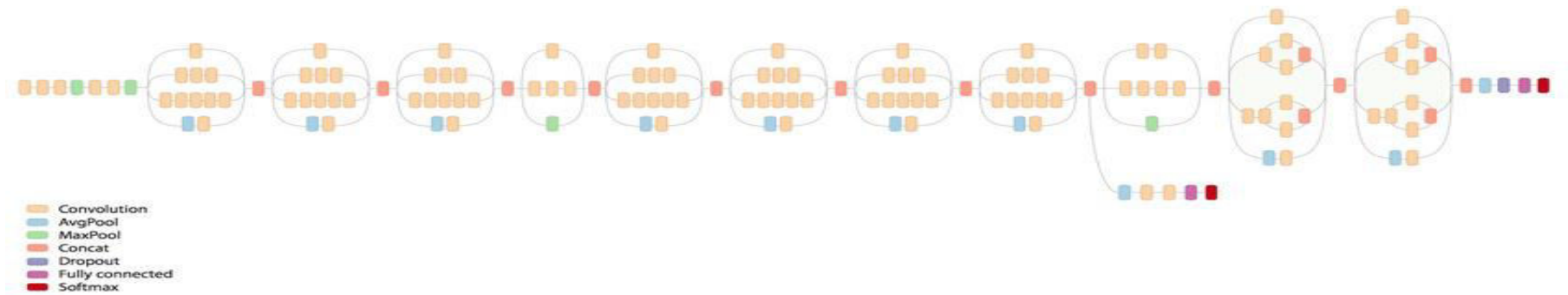


Popular Deep Learning Networks

GoogLeNet (Inception V1) 2014



Google Inception V3 2015



Popular Cloud providers



Google Cloud Platform

- Easy to setup machines
- Many deep learning frameworks available: Pytorch, tensorflow 1.13 or 2.0, MXNet, or Chainer.
- 12-month 300\$ trial for new customers

Popular Cloud providers



- Offers deep learning AMIs: Ubuntu VMs pre-configured with deep learning frameworks.
- Free trial period of 12 months -with limitations on services-

Popular Cloud providers



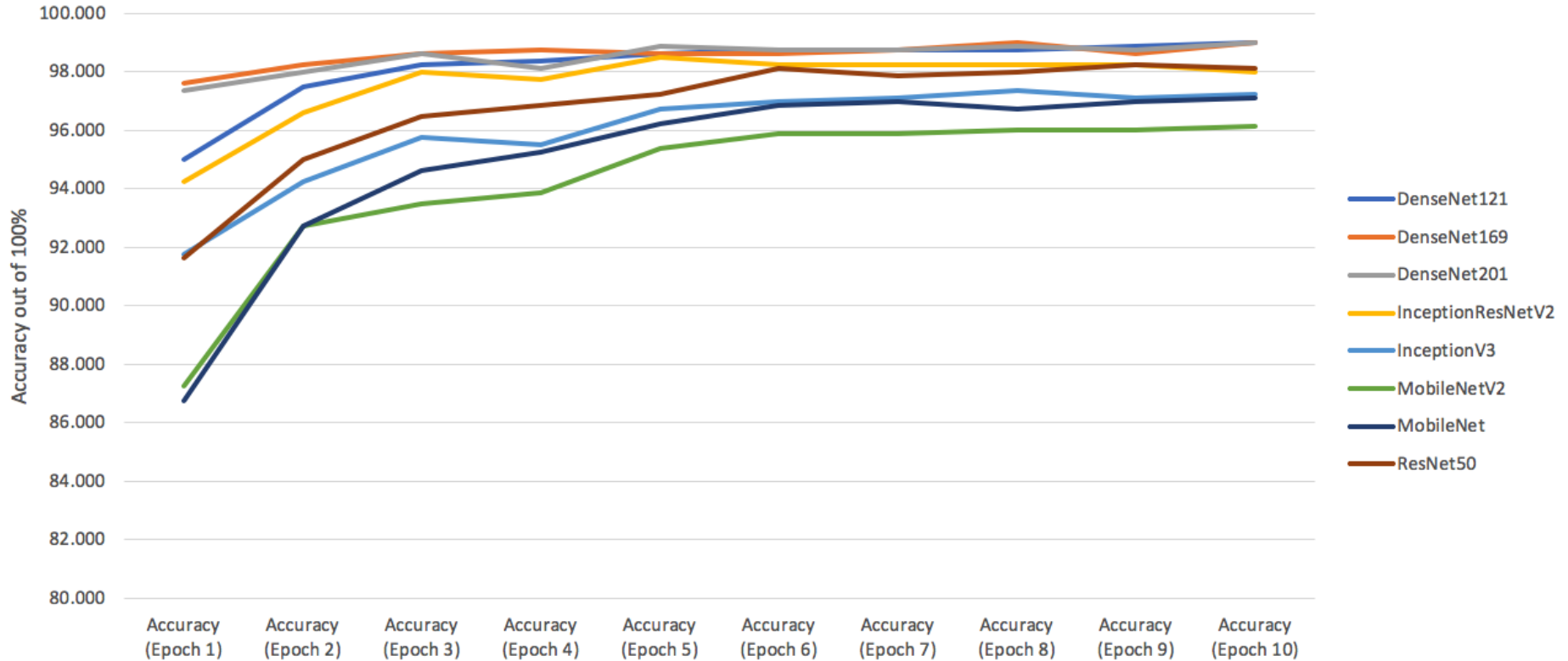
Paperspace

- Offers ML-in-a-box VMs
- Pricing model
- Excellent customer support

DL-Experiment at Viaboxx

- Task: Cats vs dogs
- Paperspace as cloud provider
- Kaggle as data source
- Keras backed by Tensorflow 1.13
- CNNs: DenseNet121, DenseNet169, DenseNet201, InceptionV3, ResNet50, InceptionResNetV2, MobileNet, MobileNetV2
- Metrics: Accuracy, loss, training speed, inference speed

Results – Validation Accuracy



Results – Training Duration (in seconds)



Results – Some Conclusions

- Favorite: DenseNet169
 - Impressive results in many areas
 - Long classification time is one downside
- InceptionV3:
 - Fast classification time
 - Low accuracy

Kickstart Deep Learning

- What purpose do you want to do?
 - Image processing, natural language processing,..
- What languages do you want to use?
- Can you use existing popular models?
- What restrictions or requirements for providers do you have?

Questions?

References

- AI image : <https://www.edureka.co/blog/ai-vs-machine-learning-vs-deep-learning/>
- Deep Learning Framework Power Scores 2018: <https://towardsdatascience.com/deep-learning-framework-power-scores-2018-23607ddf297a>