

Deep Learning Basic

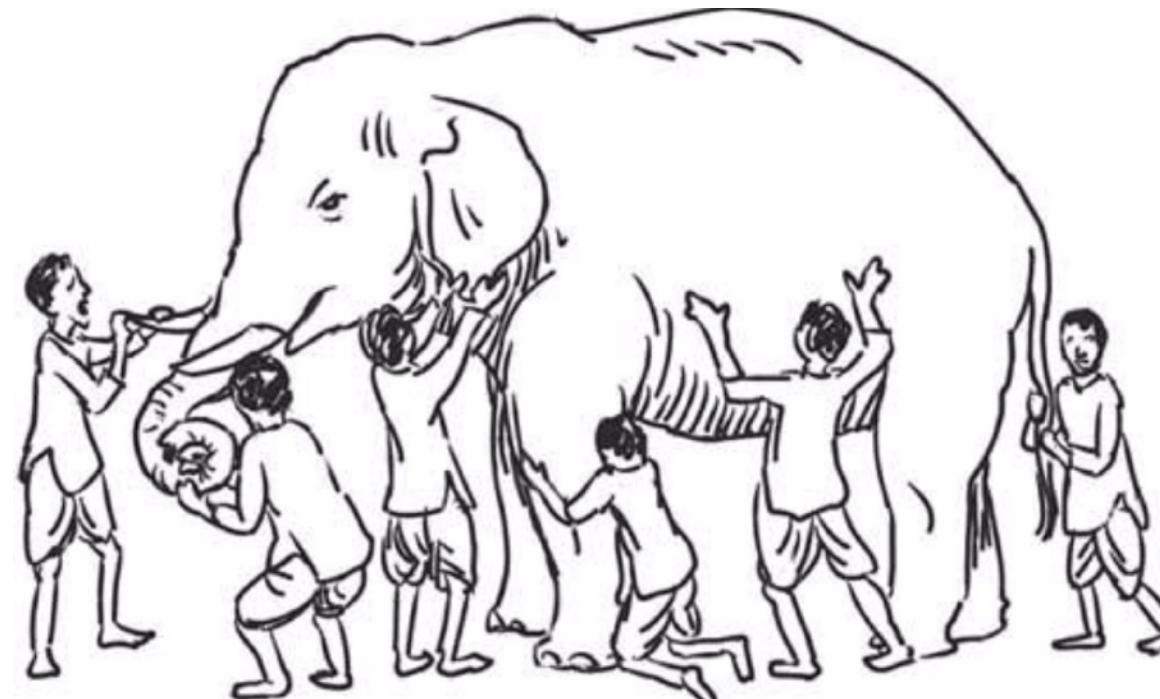
Lecture 1: Historical Review

최성준 (고려대학교 인공지능학과)

Introduction

Introduction

- ➊ Disclaimer



<https://williepietersen.com/the-lessons-of-the-blind-men-and-the-elephant-2/>

Introduction

- What make you a good deep learner?



Implementation Skills

Math Skills (Linear Algebra, Probability)

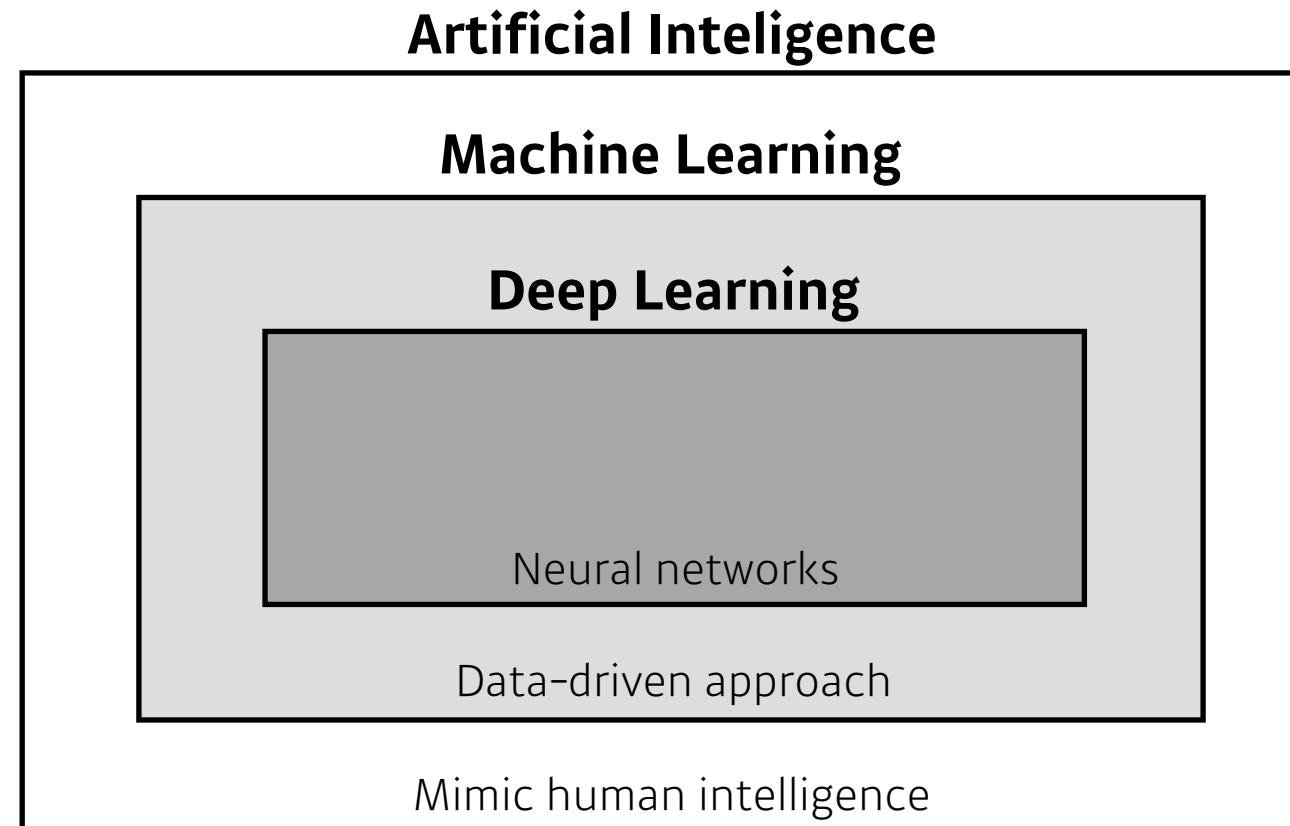


Knowing a lot of recent Papers

Contents

1. Historical Review
2. Neural Networks & Multi-Layer Perceptron
3. Optimization Methods
4. Convolutional Neural Networks
5. Modern CNN
6. Computer Vision Applications
7. Recurrent Neural Networks
8. Transformer
9. Generative Models Part1
10. Generative Models Part2

Introduction



Introduction

- ➊ Key Components of Deep Learning
 - ➌ The **data** that the model can learn from
 - ➌ The **model** how to transform the data
 - ➌ The **loss function** that quantifies the badness of the model
 - ➌ The **algorithm** to adjust the parameters to minimize the loss

Data

- ➊ Data depend on the type of the problem to solve.

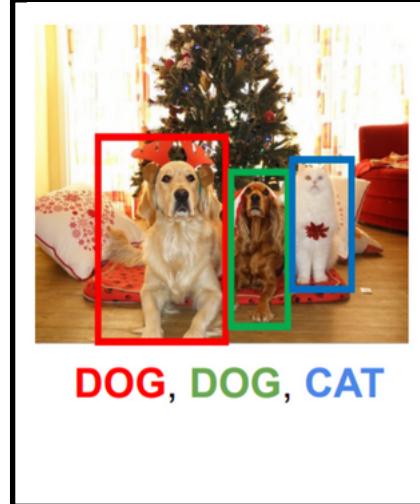
Classification



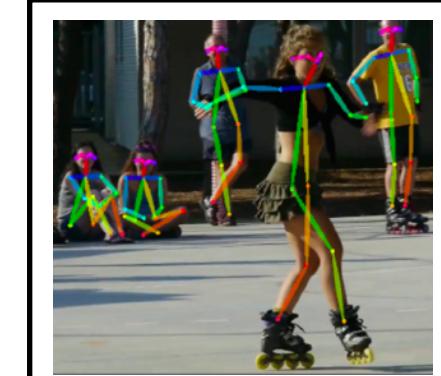
Semantic Segmentation



Detection



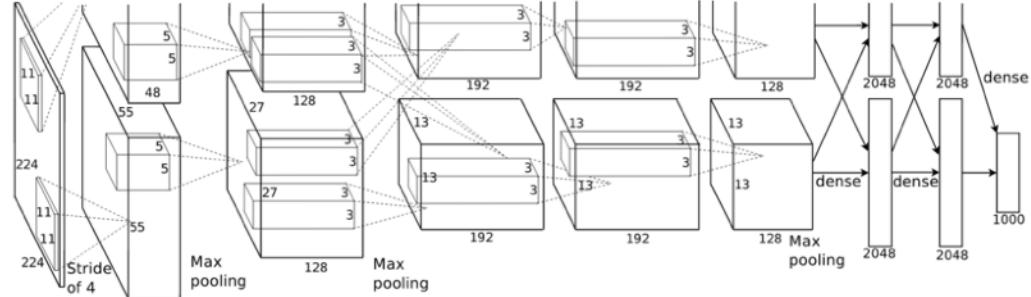
Pose Estimation



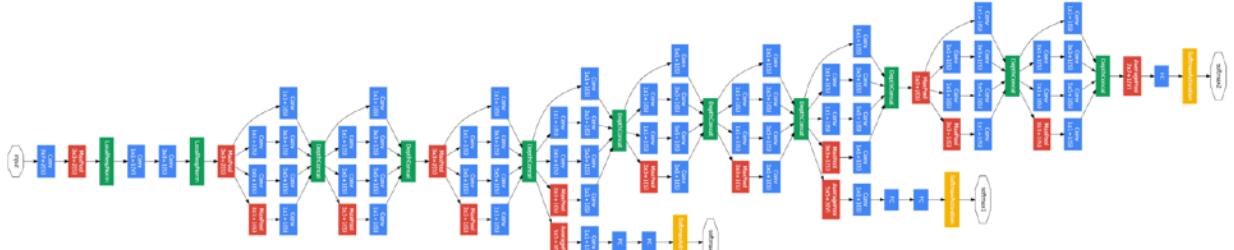
Visual QnA



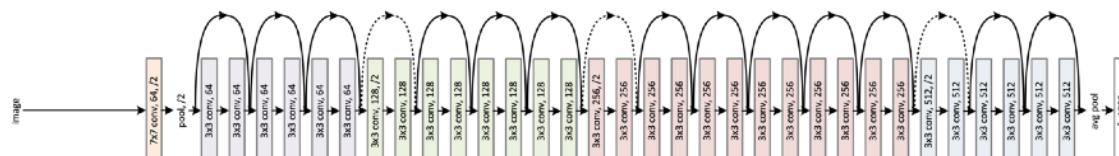
Model



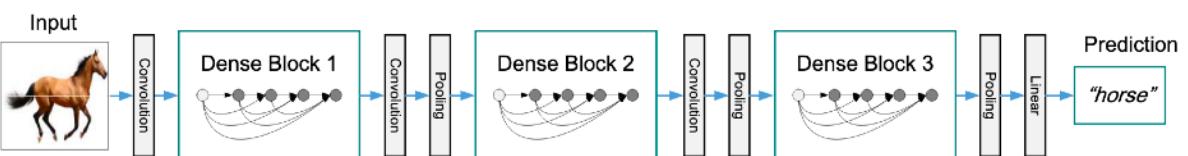
AlexNet



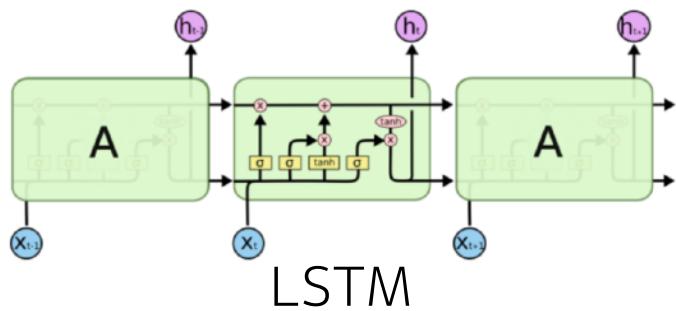
GoogLeNet



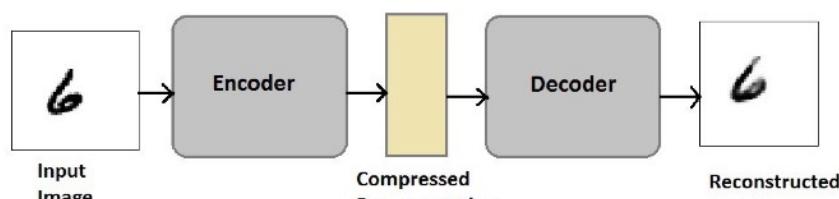
ResNet



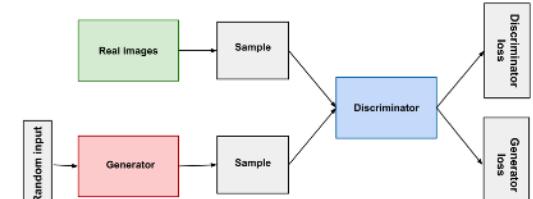
DenseNet



LSTM



Deep AutoEncoders



GAN

LOSS

- ➊ The loss function is a proxy of what we want to achieve.

Regression Task

$$\text{MSE} = \frac{1}{N} \sum_{i=1}^N \sum_{d=1}^D (y_i^{(d)} - \hat{y}_i^{(d)})^2$$

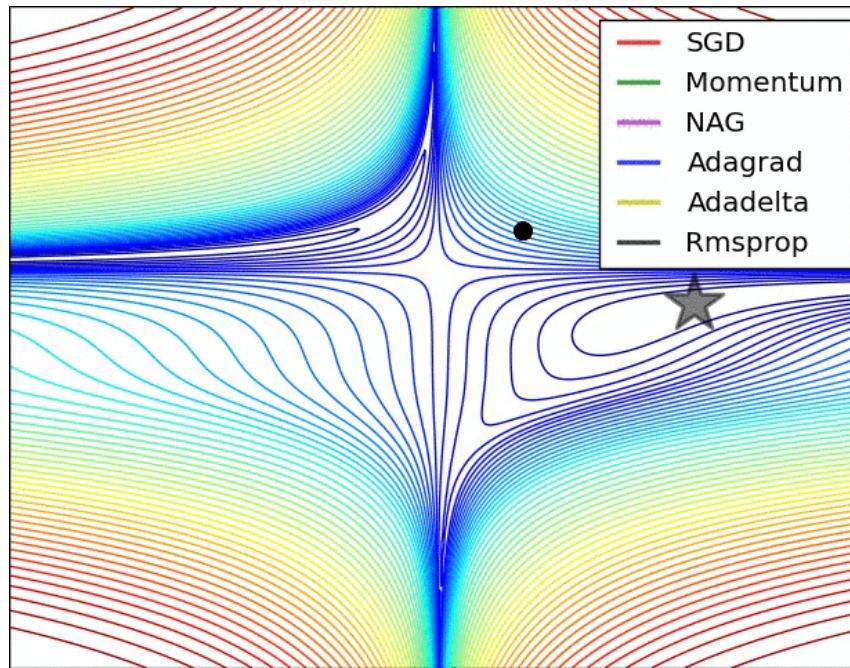
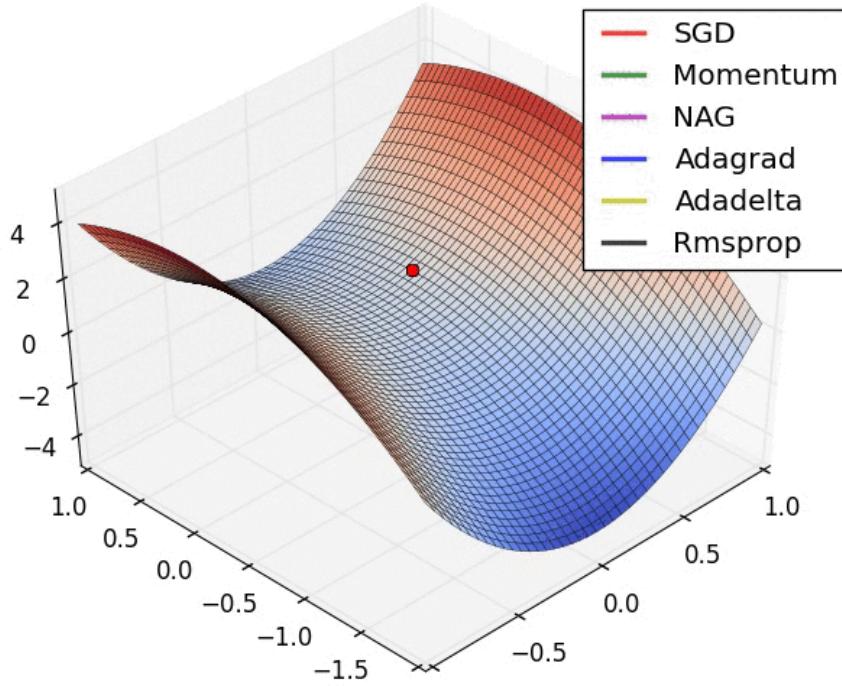
Classification Task

$$\text{CE} = -\frac{1}{N} \sum_{i=1}^N \sum_{d=1}^D y_i^{(d)} \log \hat{y}_i^{(d)}$$

Probabilistic Task

$$\text{MLE} = \frac{1}{N} \sum_{i=1}^N \sum_{d=1}^D \log \mathcal{N}(y_i^{(d)}; \hat{y}_i^{(d)}, 1) \quad (= \text{MSE})$$

Optimization Algorithm



Dropout
Early stopping
k-fold validation
Weight decay
Batch normalization
MixUp
Ensemble
Bayesian Optimization

Historical Review



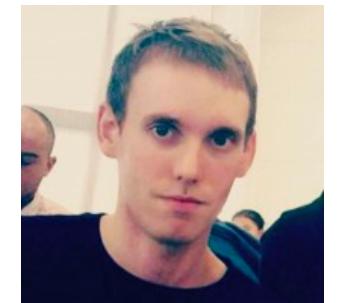
<https://www.umc.org/en/who-we-are/history>

Historical Review

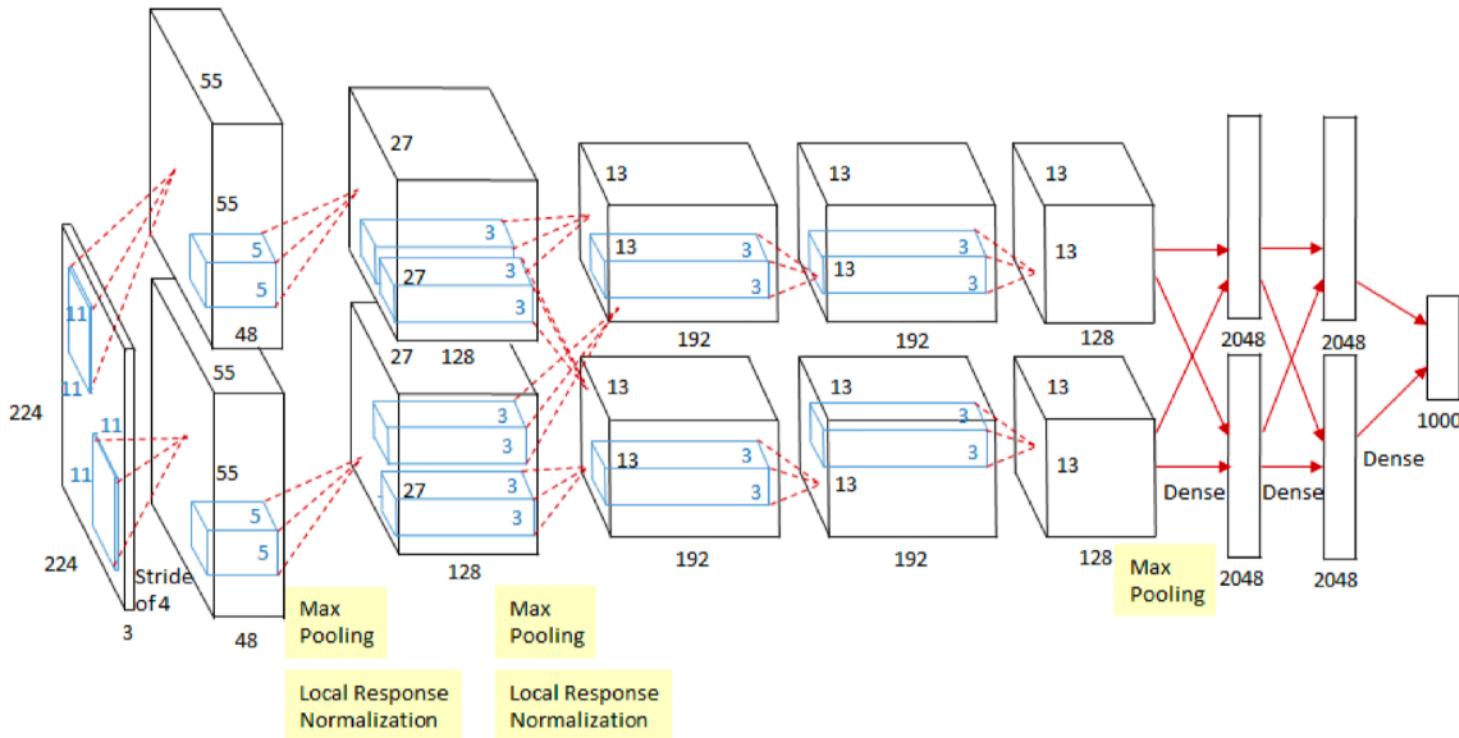
Deep Learning's Most Important Ideas - A Brief Historical Review

Denny Britz

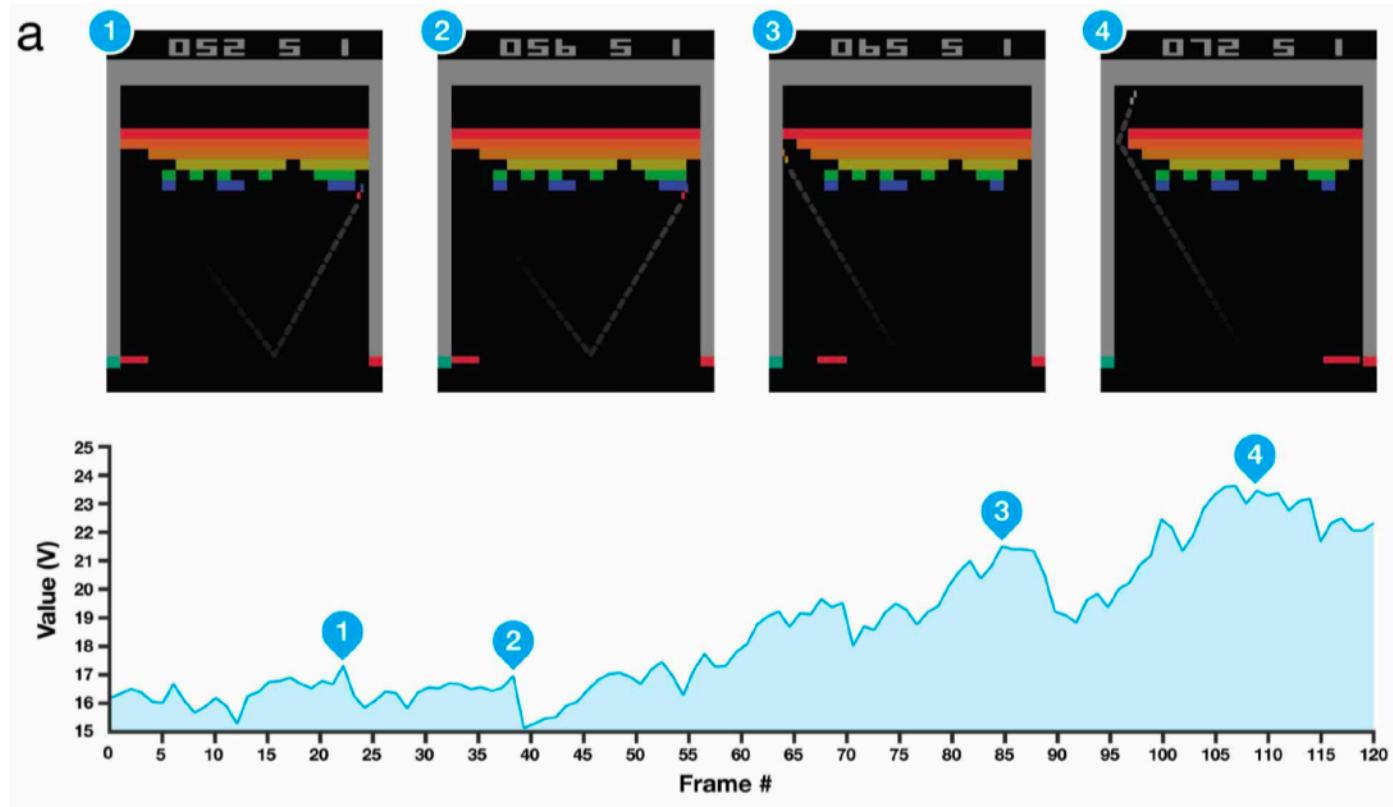
2020-07-29



2012 - AlexNet

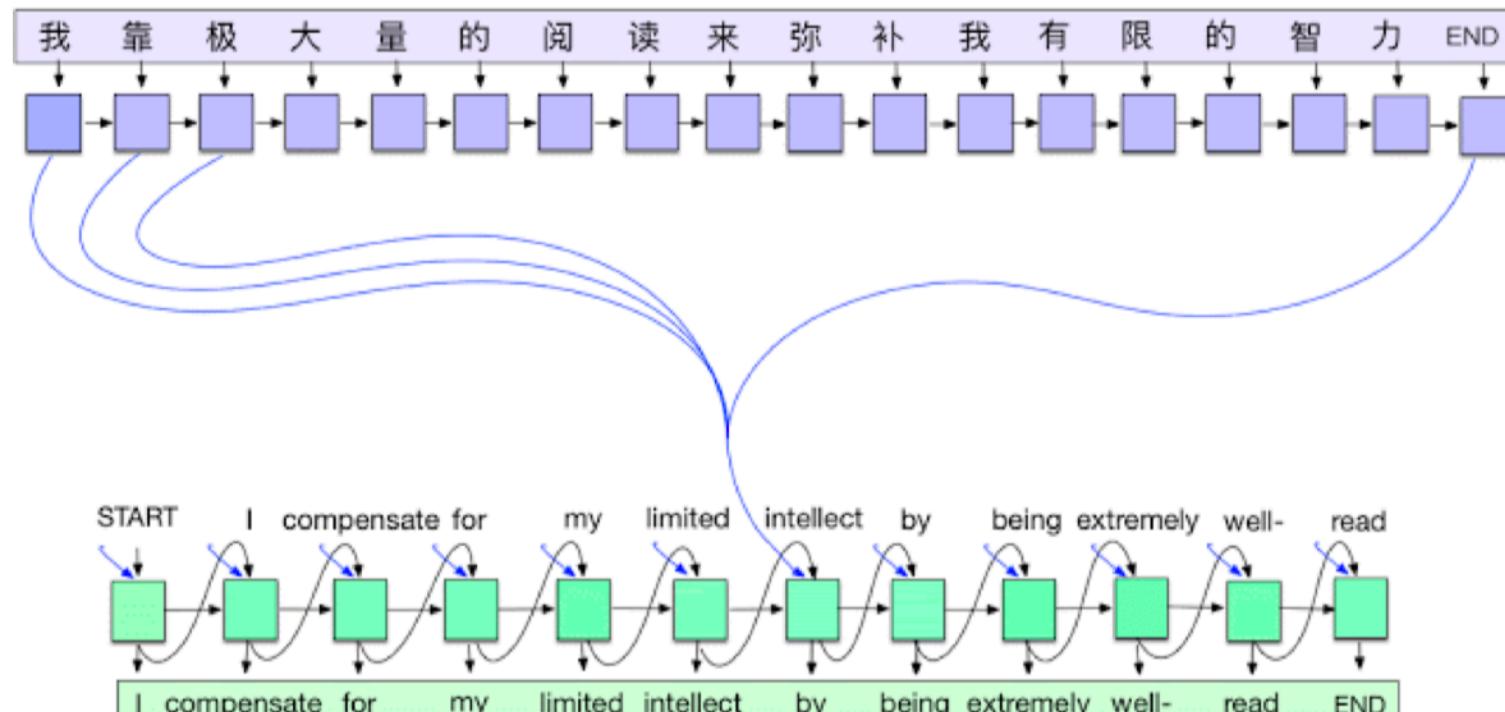


2013 - DQN



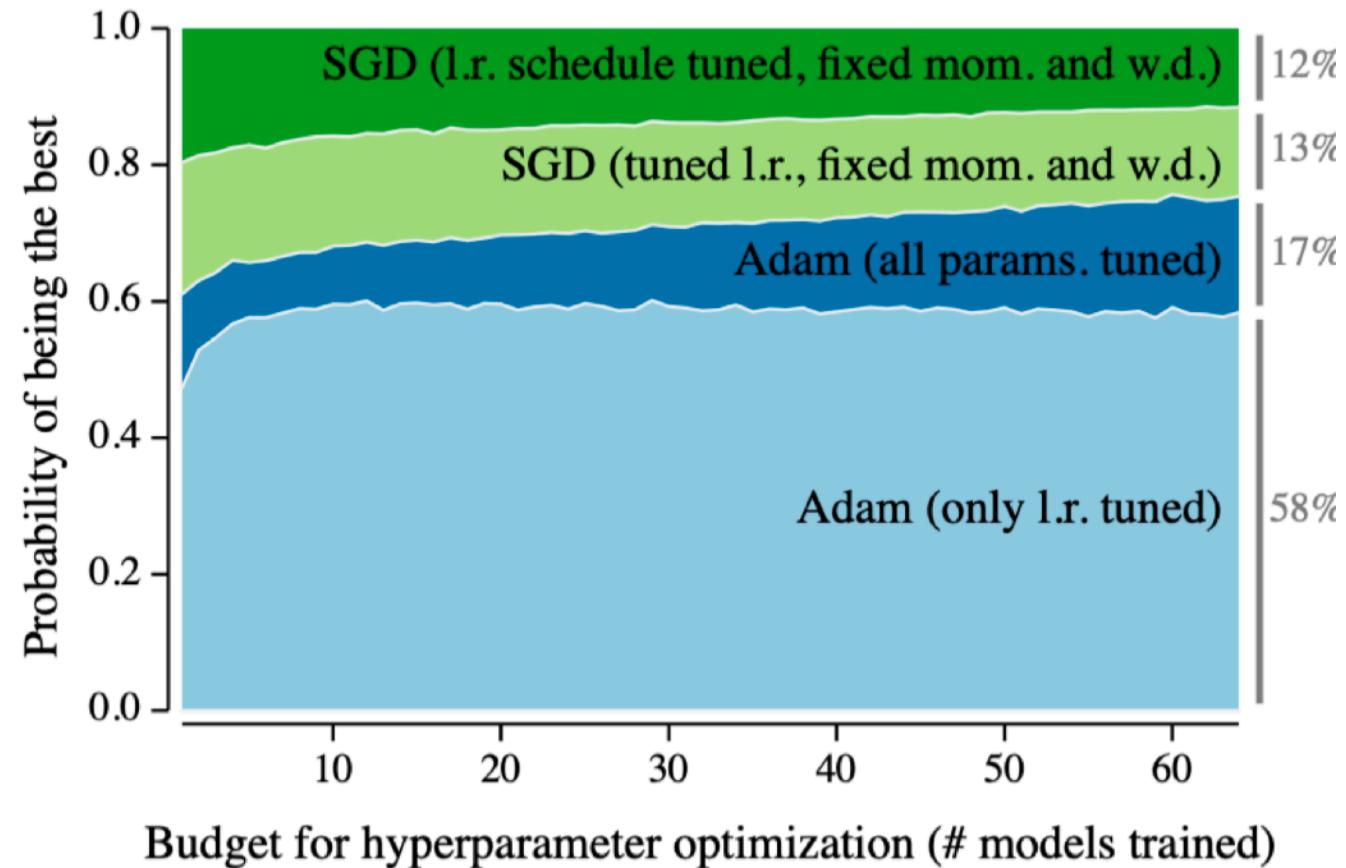
2014 - Encoder / Decoder

ENCODER

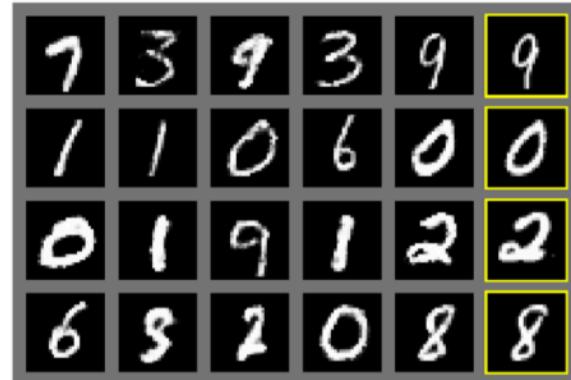


DECODER

2014 - Adam Optimizer



2015 – Generative Adversarial Network



a)



b)



c)

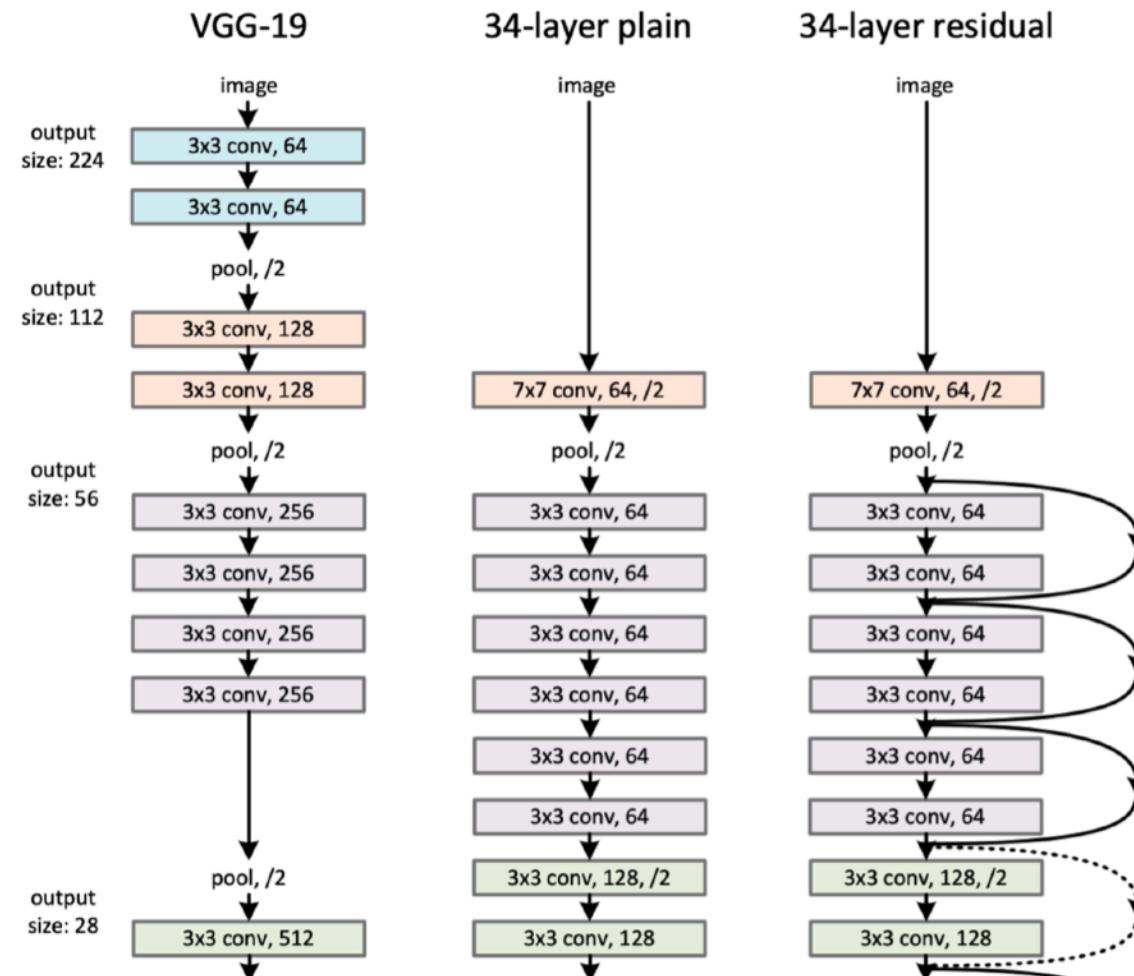


d)



“Finally, we would like to thank **Les Trois Brasseurs** for stimulating our creativity.”

2015 - Residual Networks



2017 - Transformer

Attention Is All You Need

Ashish Vaswani*
Google Brain
avaswani@google.com

Noam Shazeer*
Google Brain
noam@google.com

Niki Parmar*
Google Research
nikip@google.com

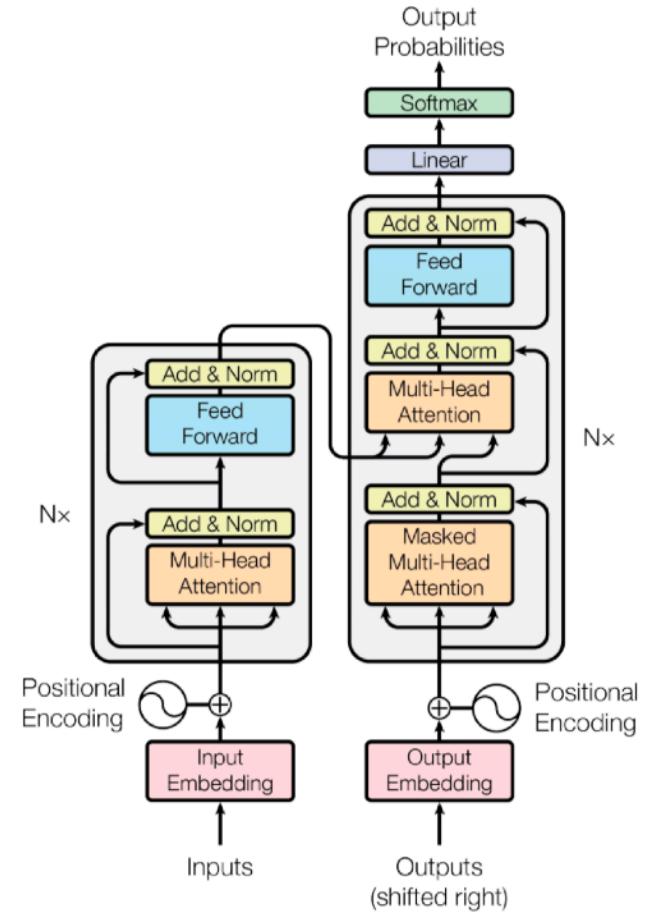
Jakob Uszkoreit*
Google Research
usz@google.com

Llion Jones*
Google Research
llion@google.com

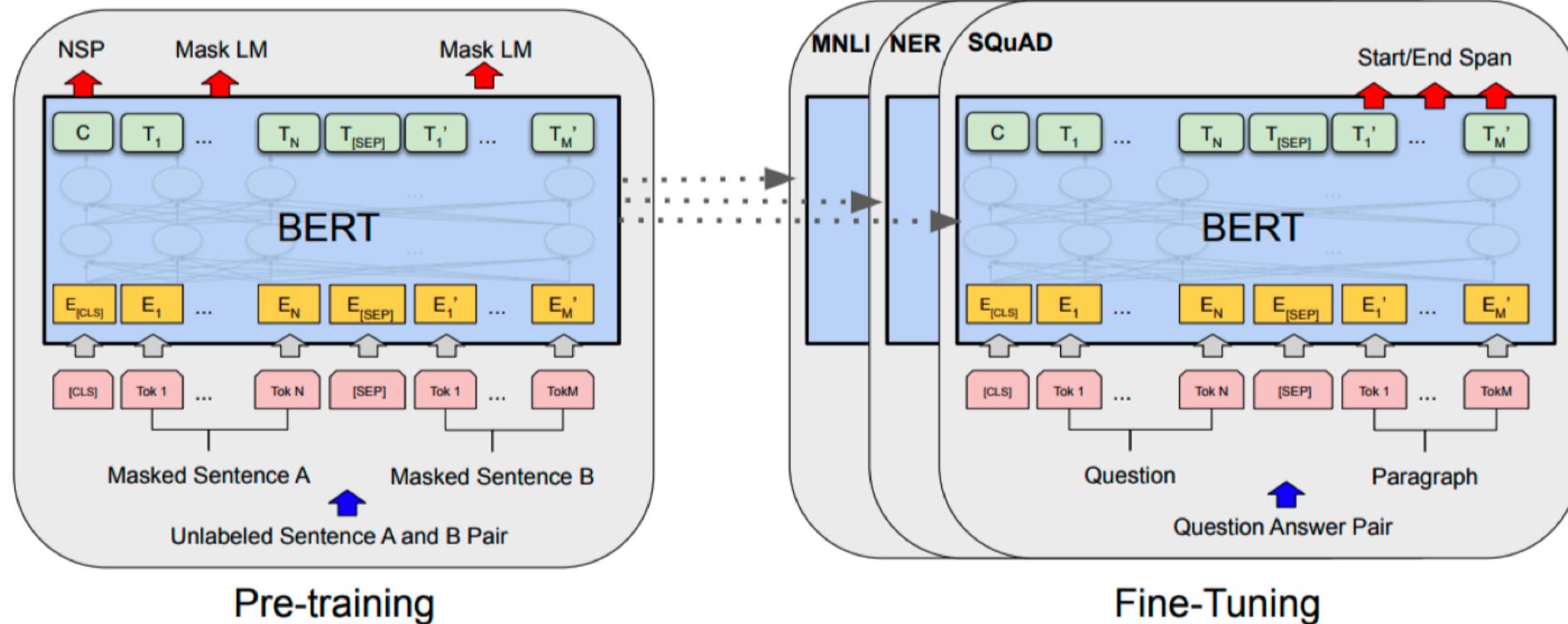
Aidan N. Gomez* †
University of Toronto
aidan@cs.toronto.edu

Lukasz Kaiser*
Google Brain
lukaszkaiser@google.com

Illia Polosukhin* ‡
illia.polosukhin@gmail.com



2018 - BERT (fine-tuned NLP models)



Bidirectional **E**ncoder **R**epresentations from **T**ransformers

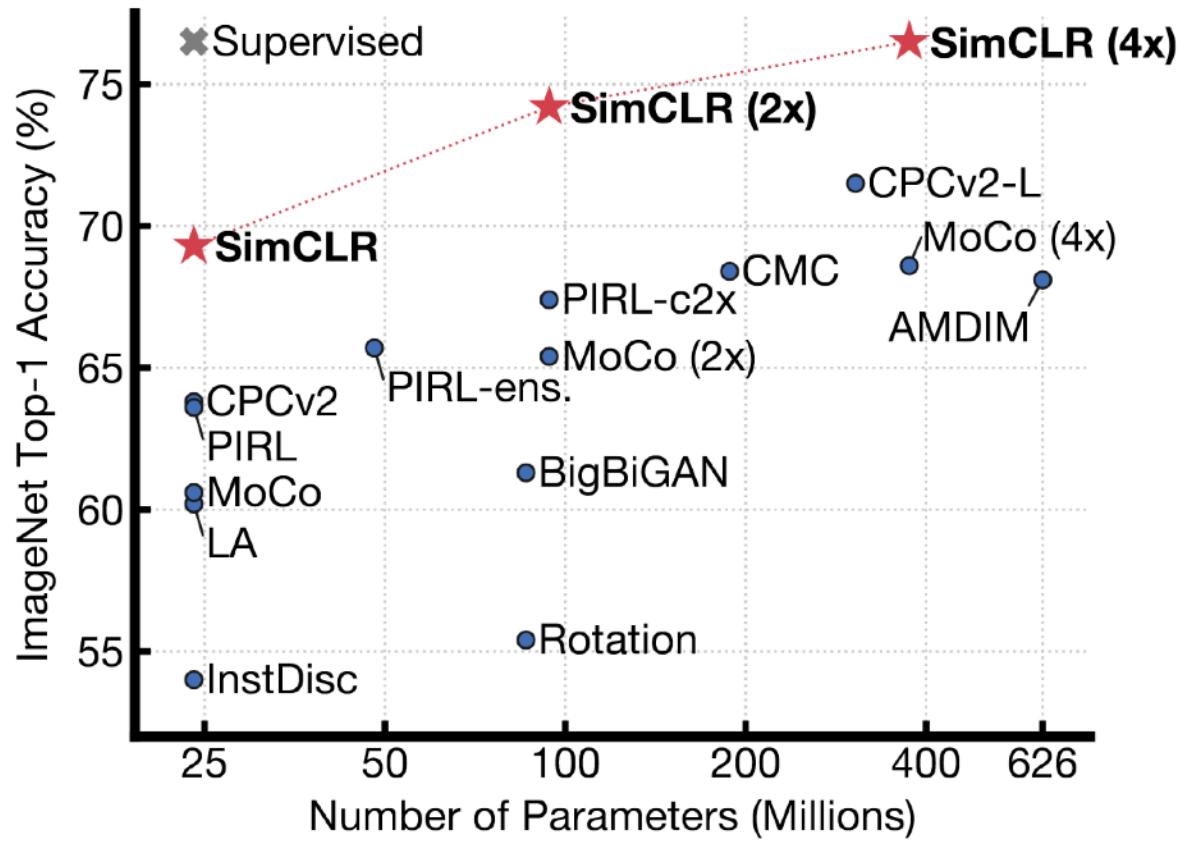
2019 - BIG Language Models



OpenAI

GPT-3, an autoregressive language model with 175 billion parameters

2020 - Self Supervised Learning



SimCLR: a simple framework for contrastive learning of visual representations

Thank you for listening
