Deep Learning Basic

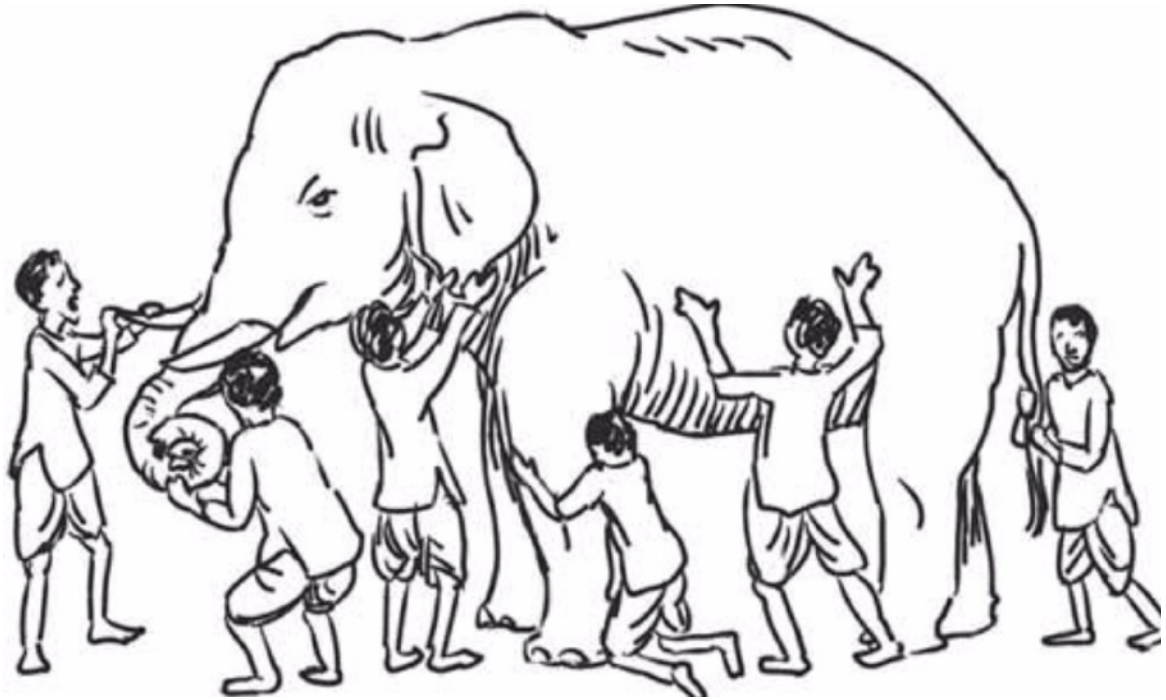
Lecture 1: Historical Review

최성준 (고려대학교 인공지능학과)

Introduction

Introduction

- Disclaimer

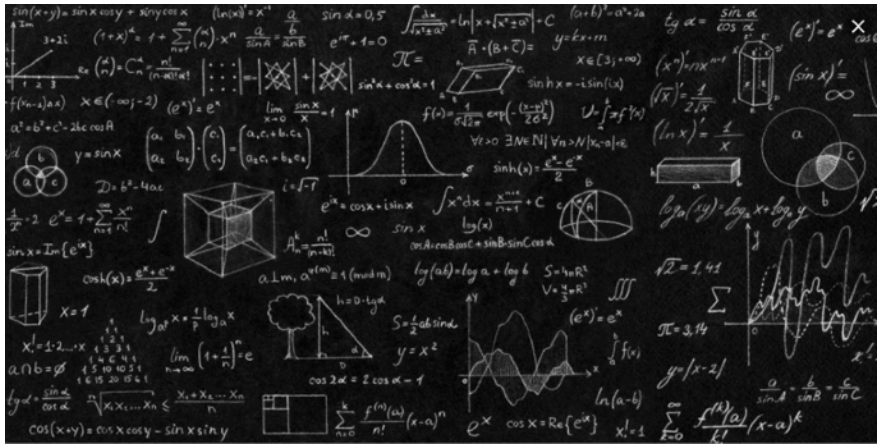


https://williepietersen.com/the-lessons-of-the-blind-men-and-the-elephant-2/

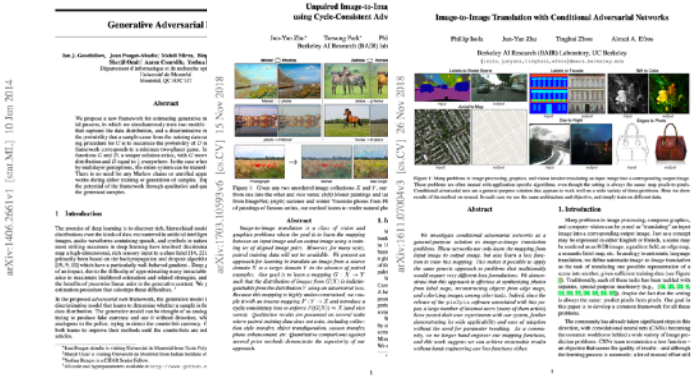
Introduction

- What make you a good deep learner?

Implementation Skills



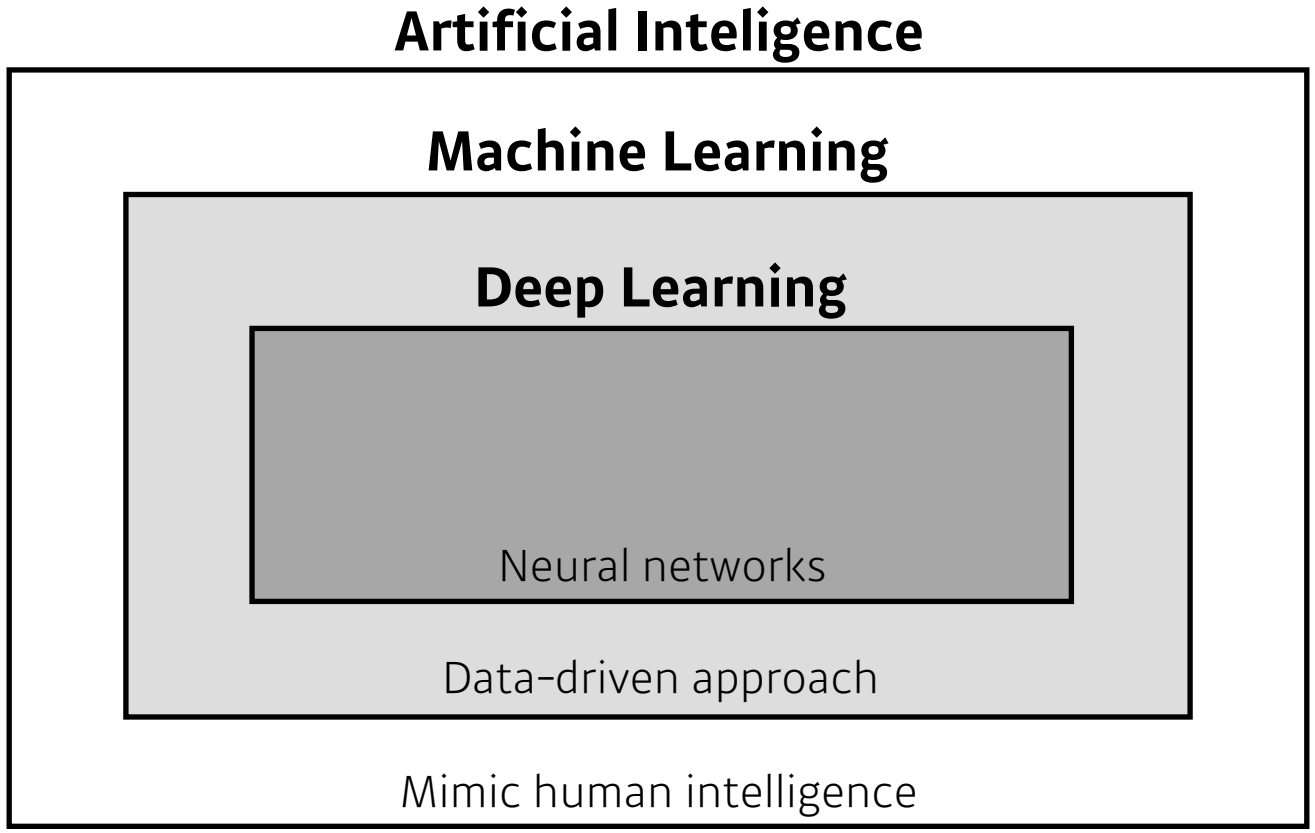
Math Skills (Linear Algebra, Probability)



Knowing a lot of recent Papers

Contents

Introduction



Introduction

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

Data

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

Classification

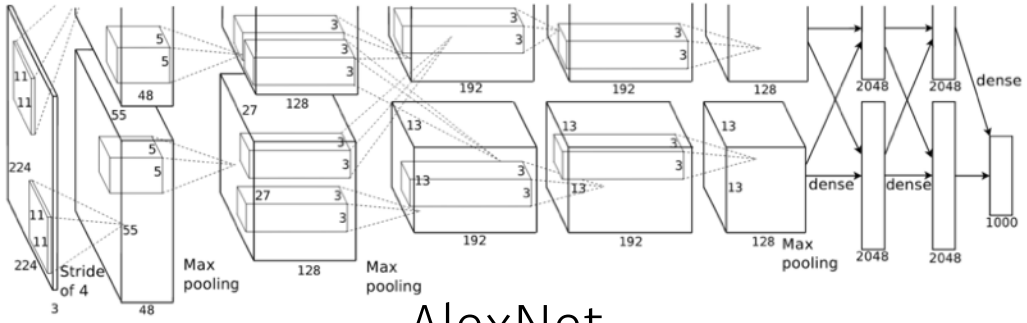
Semantic Segmentation

Detection

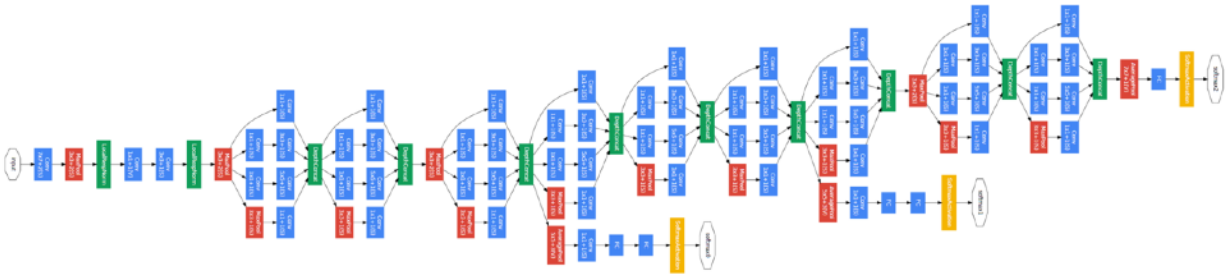
Pose Estimation

Visual QnA

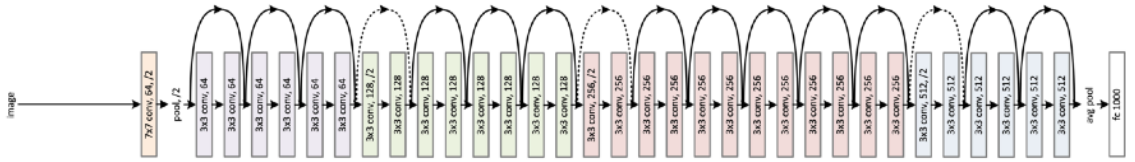
Model



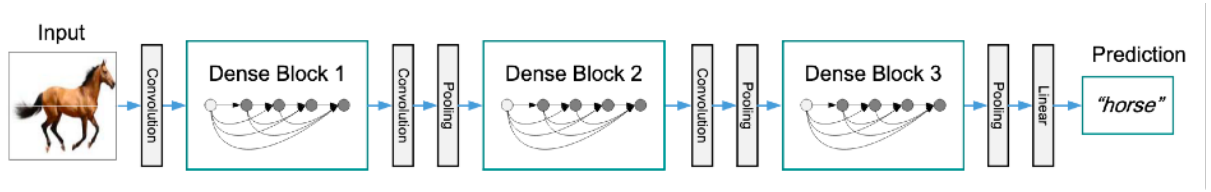
AlexNet



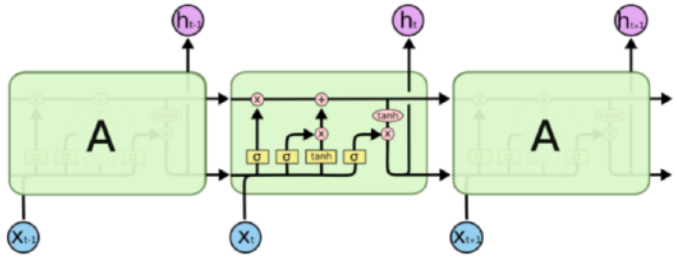
GoogLeNet



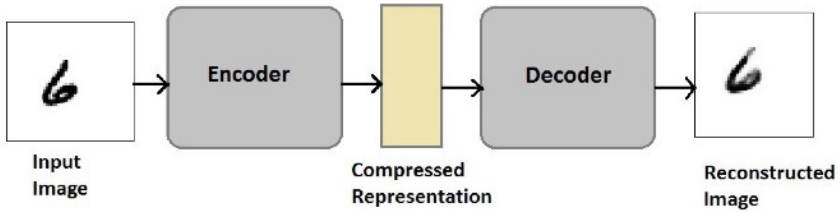
ResNet



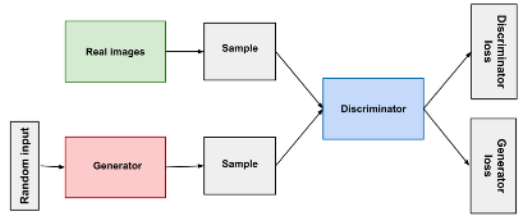
DenseNet



LSTM



Deep AutoEncoders



GAN

Loss

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

Regression Task

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

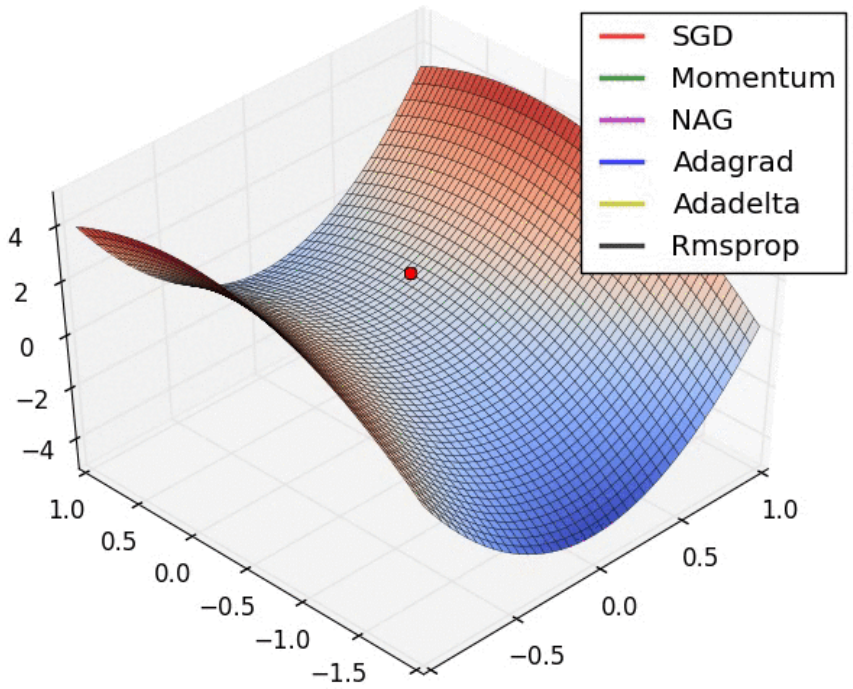
Classification Task

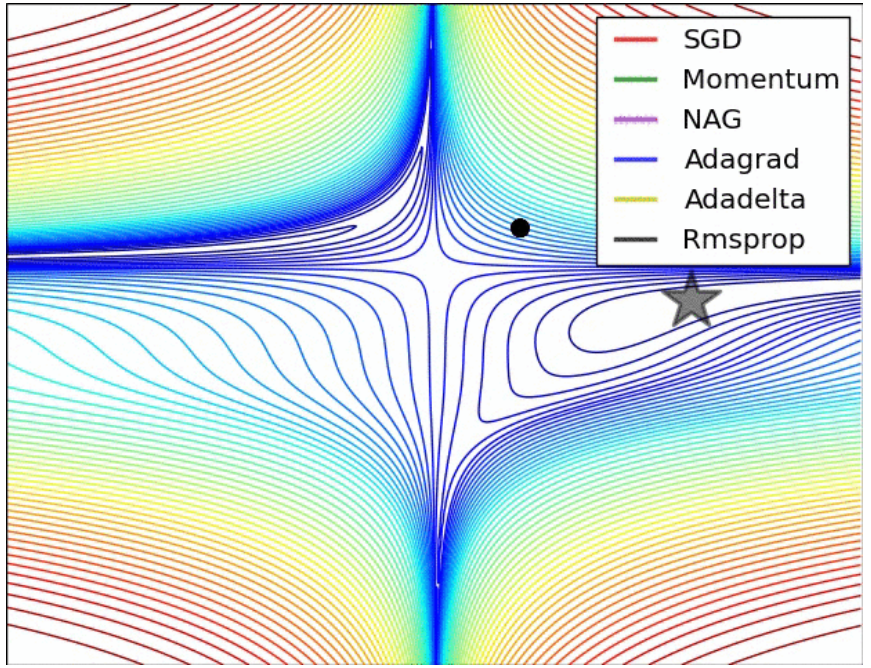
$$\text{CE} = -\frac{1}{N}\sum_{i=1}^{N}\sum_{d=1}^{D} y_i^{(d)} \log \hat{y}_i^{(d)}$$

Probabilistic Task

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

Optimization Algorithm





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

Historical Review

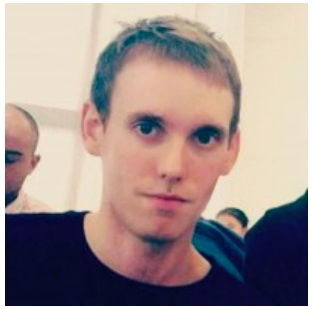
https://www.umc.org/en/who-we-are/history

Historical Review

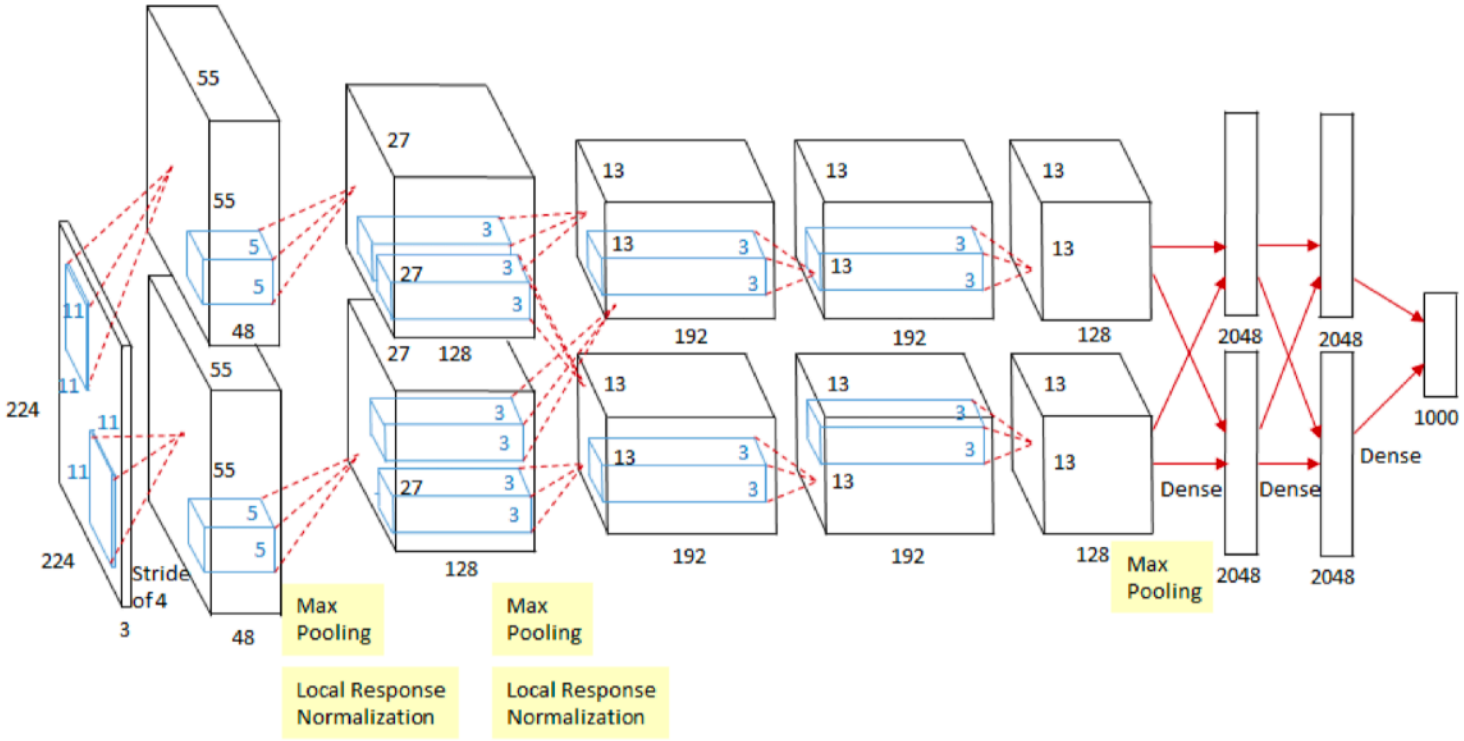
Deep Learning's Most Important Ideas - A Brief Historical Review

Denny Britz

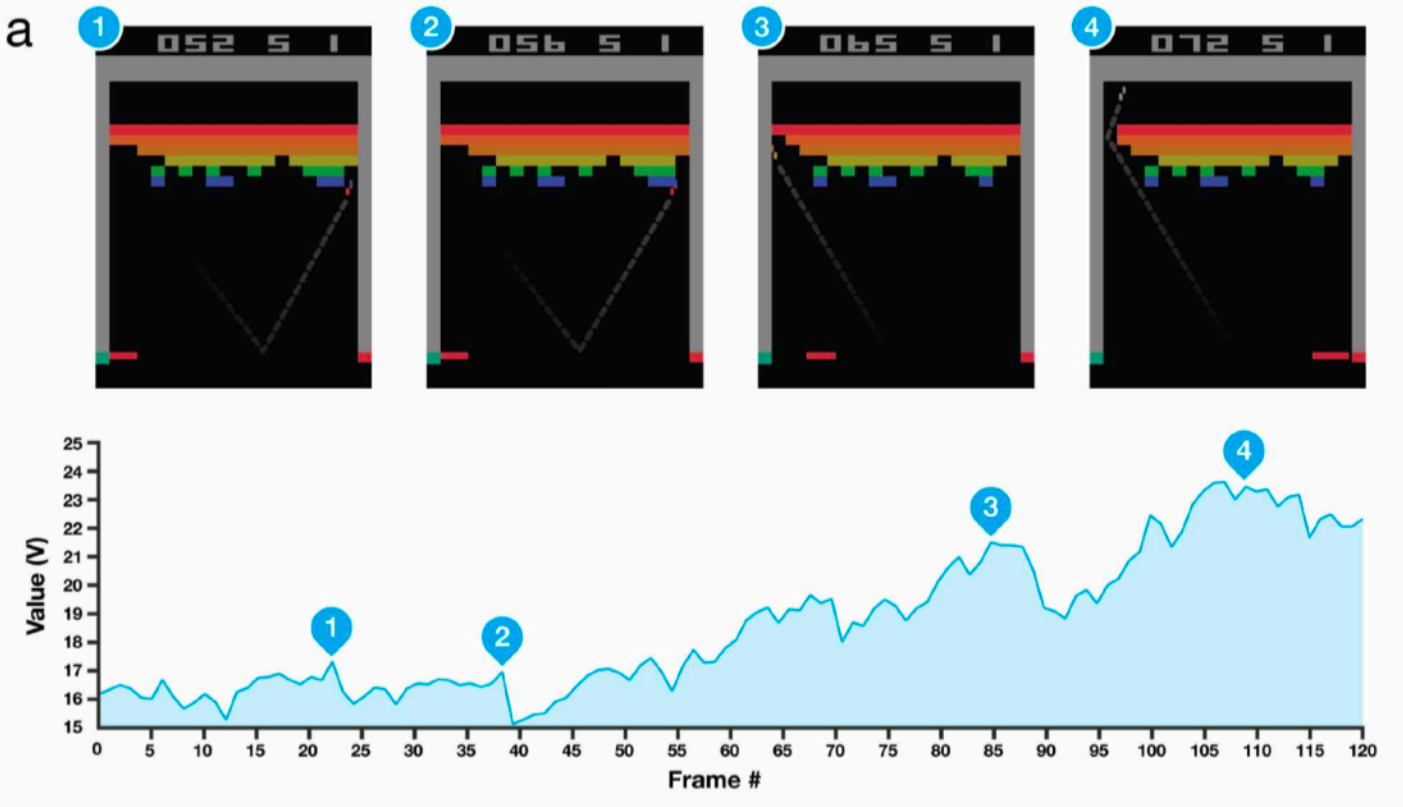
2020-07-29



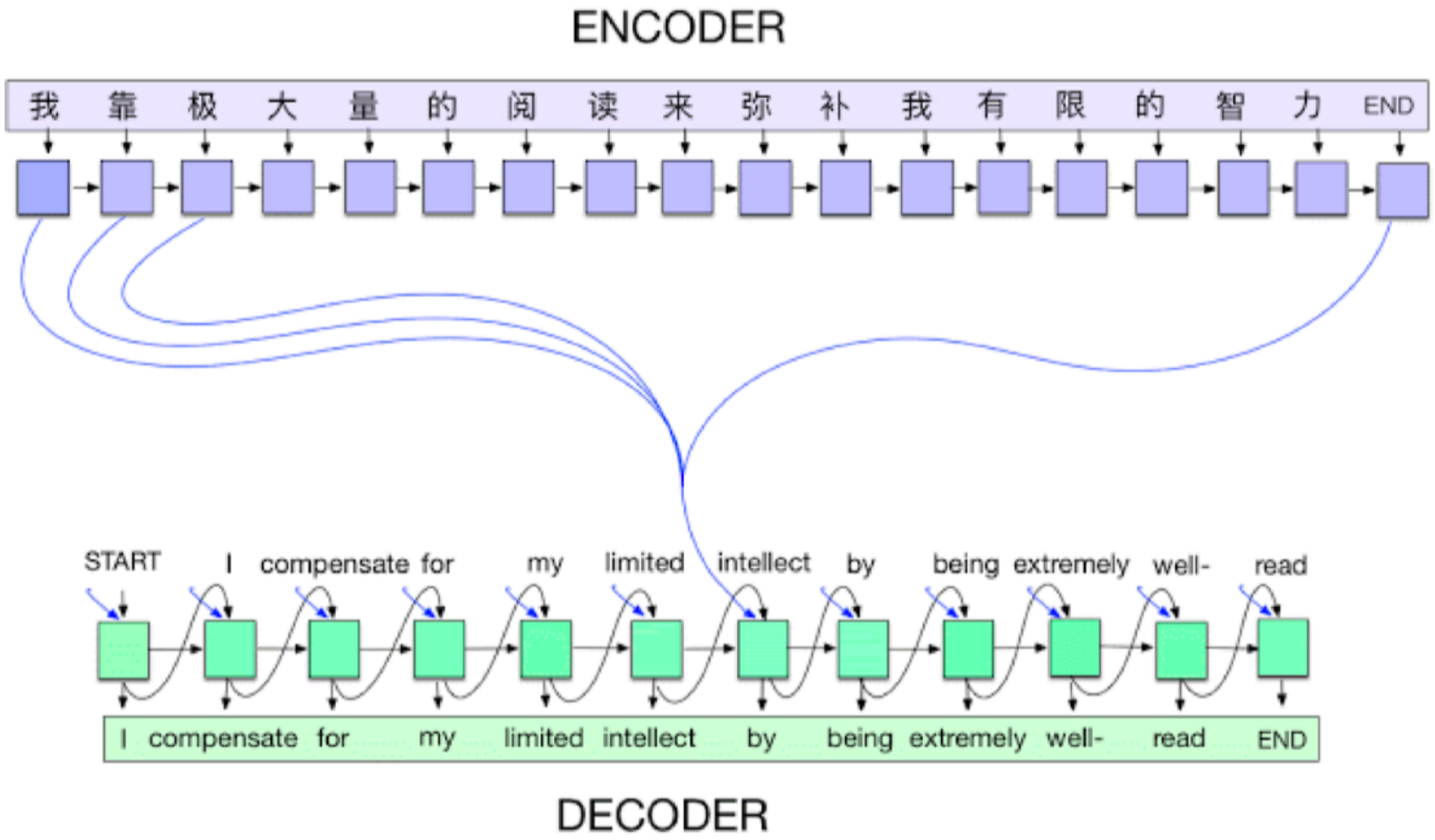
2012 – AlexNet



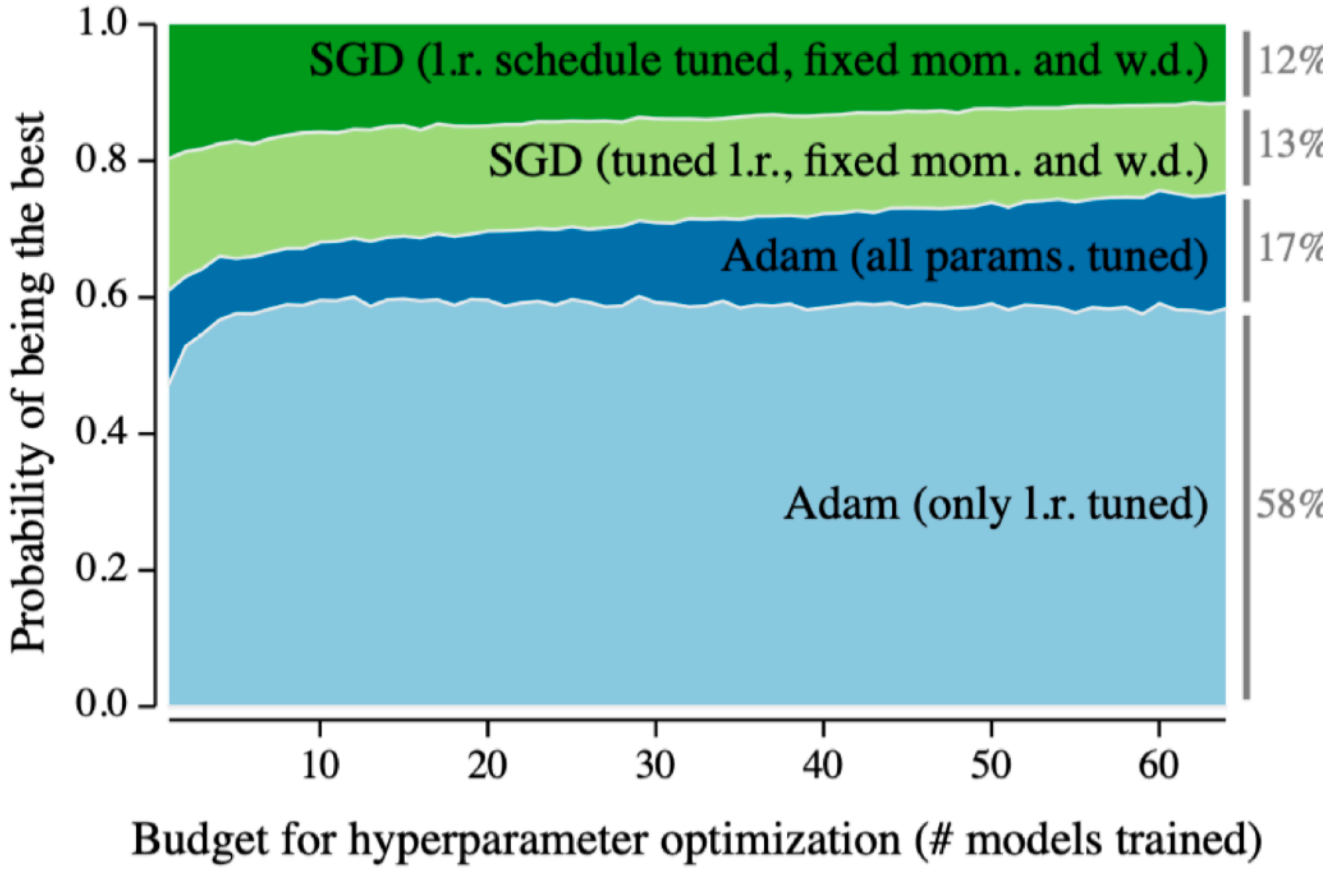
2013 – DQN



2014 - Encoder / Decoder



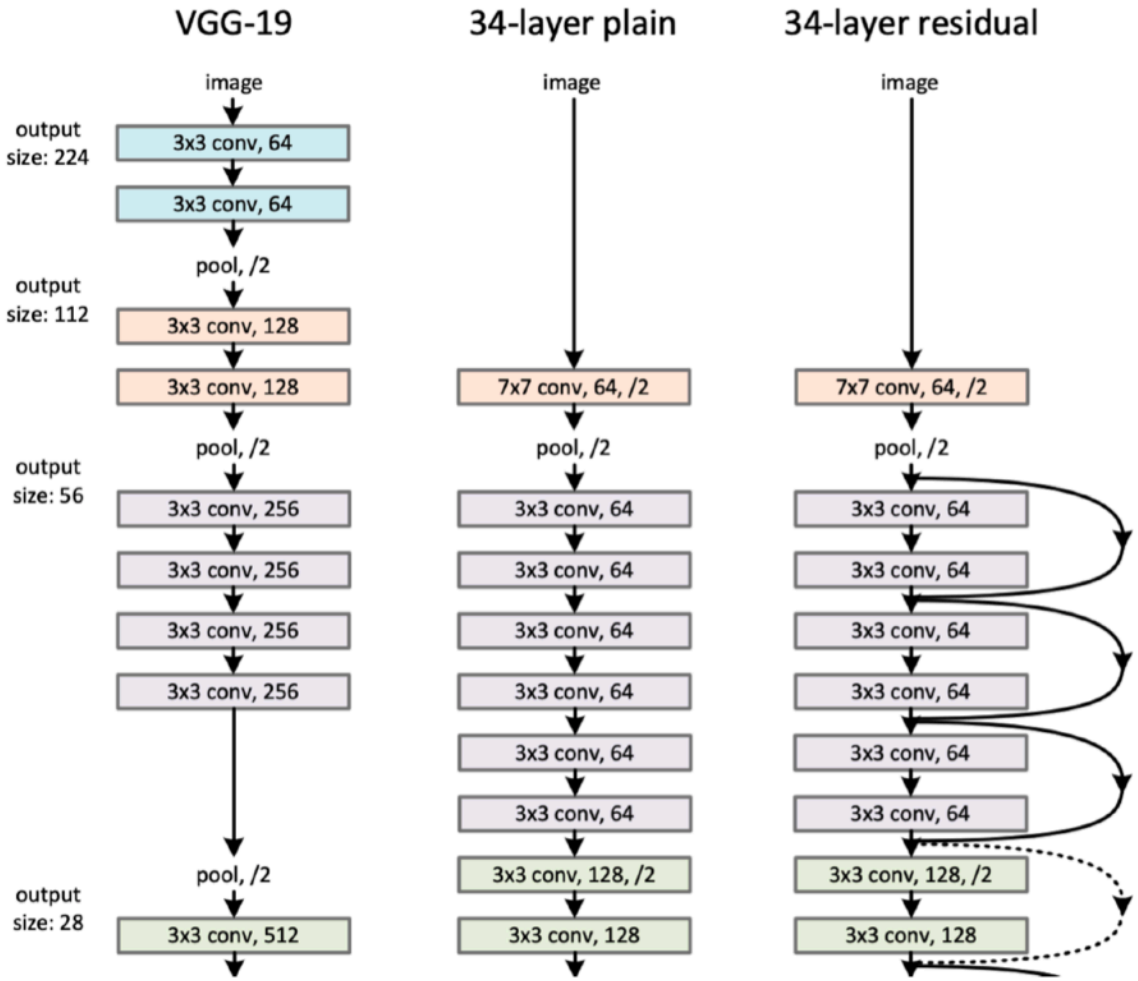
2014 – Adam Optimizer



2015 – Generative Adversarial Network

"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

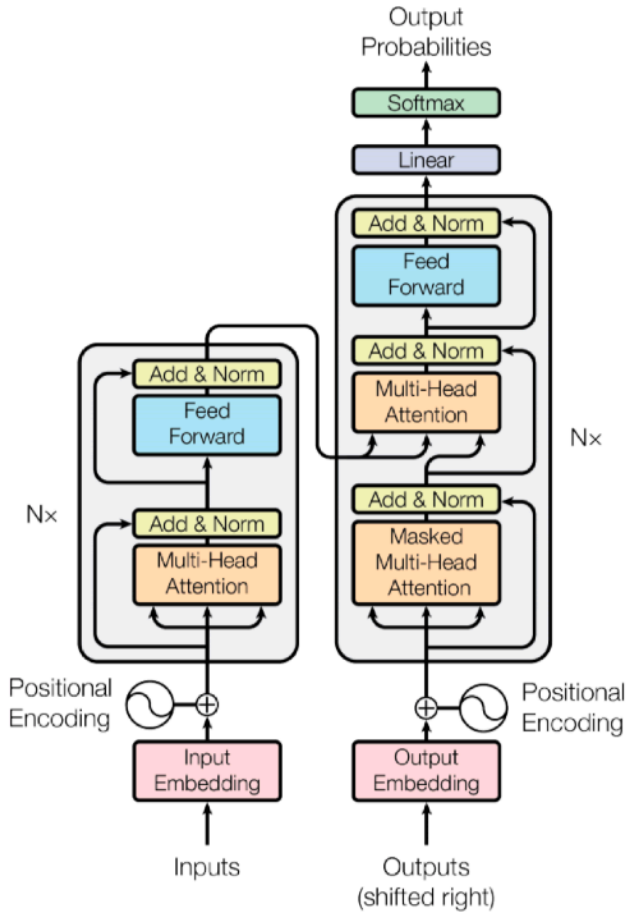
Jakob Uszkoreit* Google Research usz@google.com

Llion Jones* Google Research llion@google.com

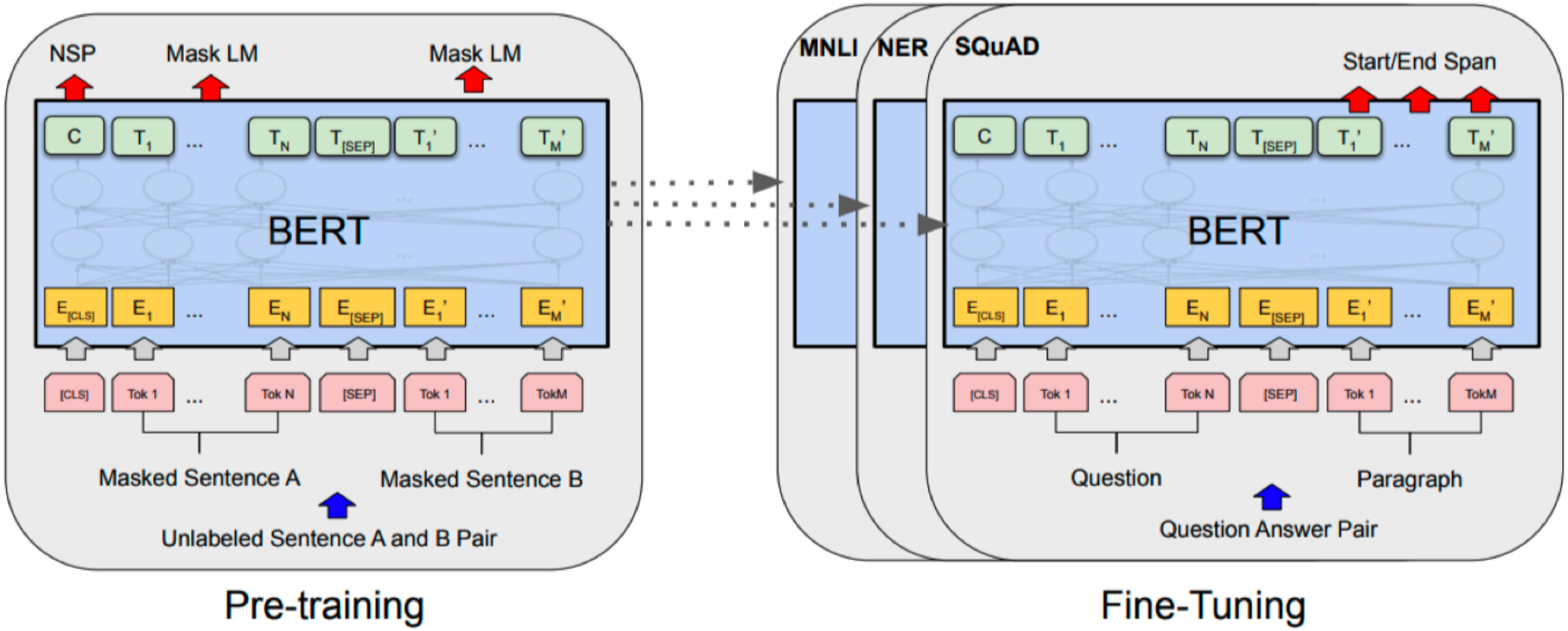
Aidan N. Gomez* † University of Toronto aidan@cs.toronto.edu

Łukasz Kaiser* Google Brain lukaszkaiser@google.com

Illia Polosukhin* ‡ illia.polosukhin@gmail.com



2018 – BERT (fine-tuned NLP models)



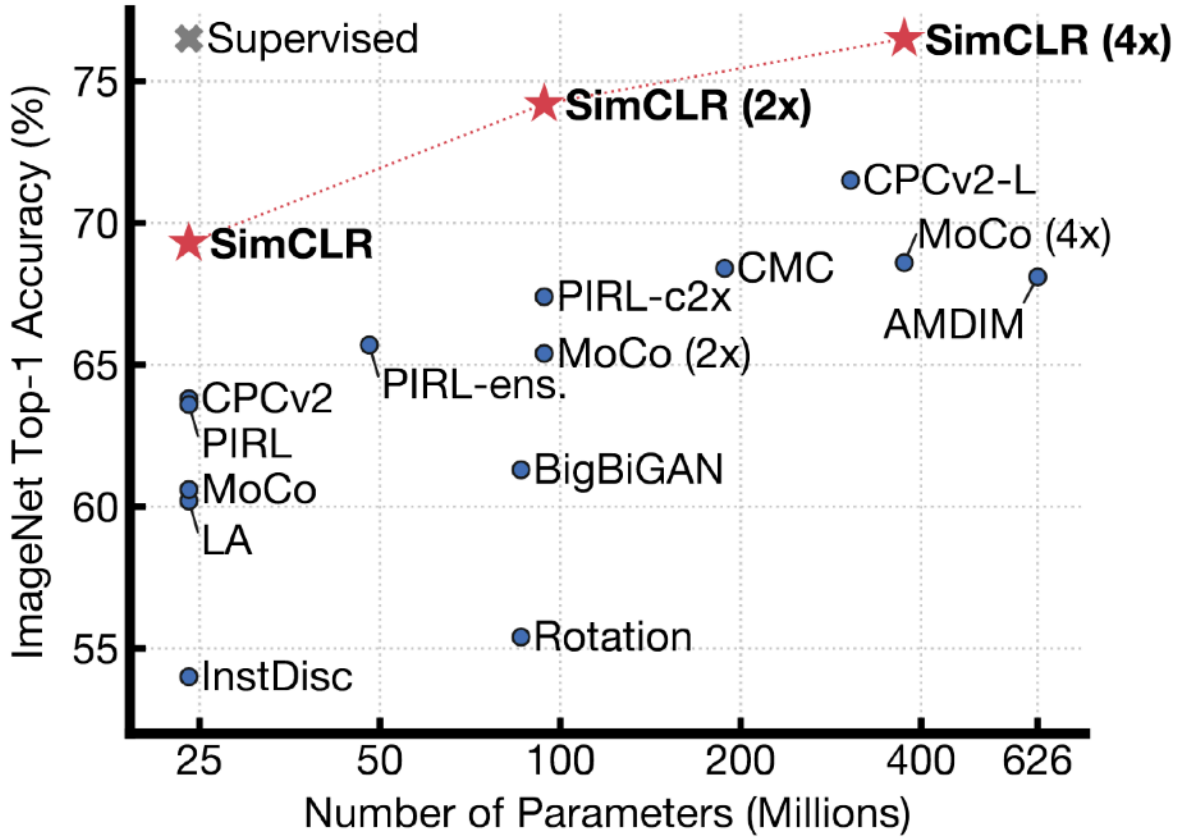
Bidirectional **E**ncoder **R**epresentations from **T**ransformers

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