Historical Review of Deep Learning

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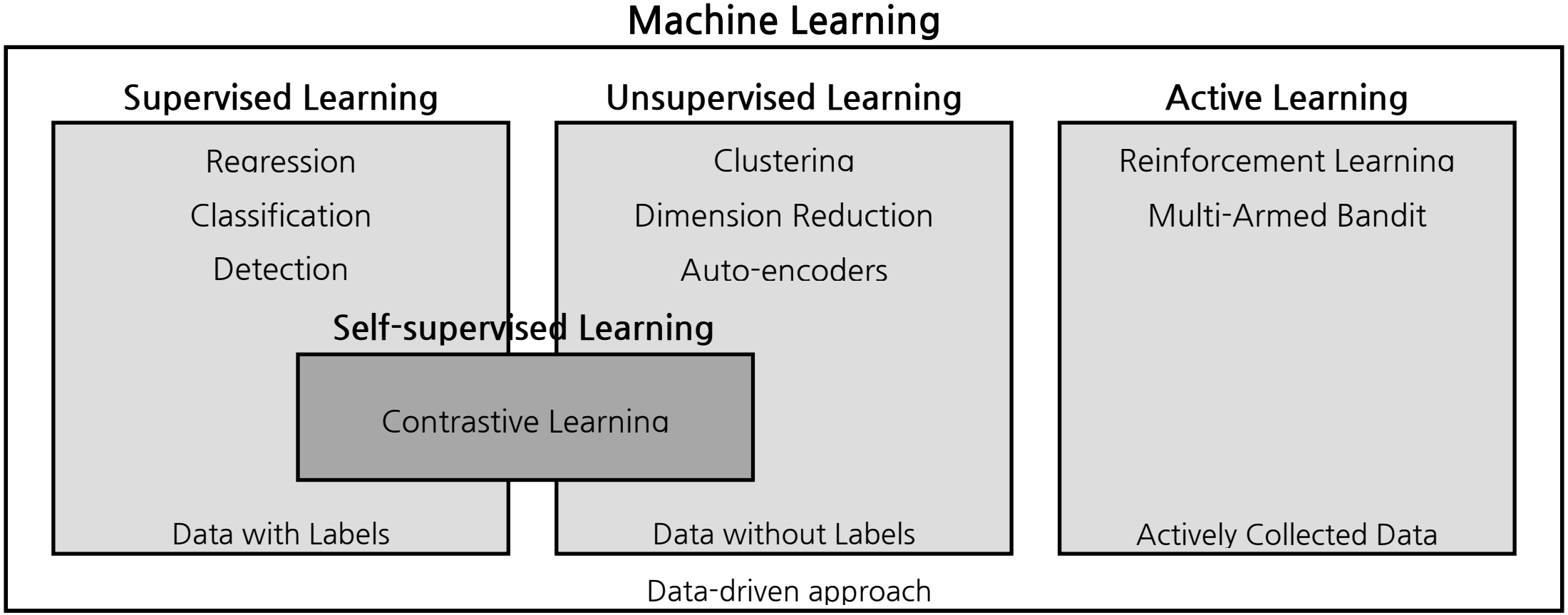
kakaobrain

Introduction



Introduction

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

Data

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Classification

Semantic Segmentation

Detection

Pose Estimation

Visual QnA

Model Architectures

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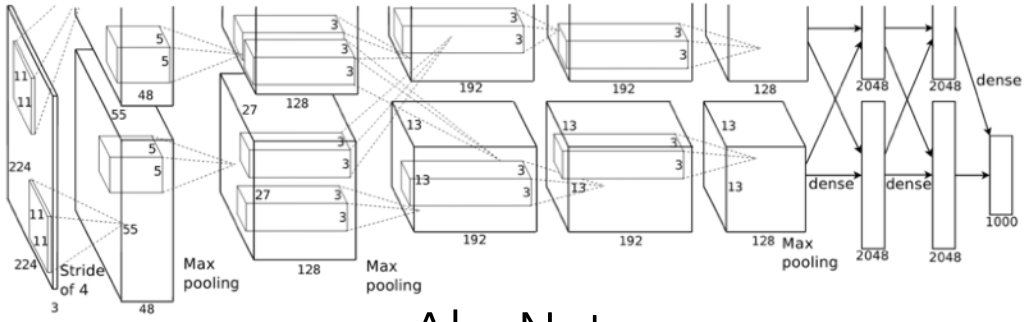
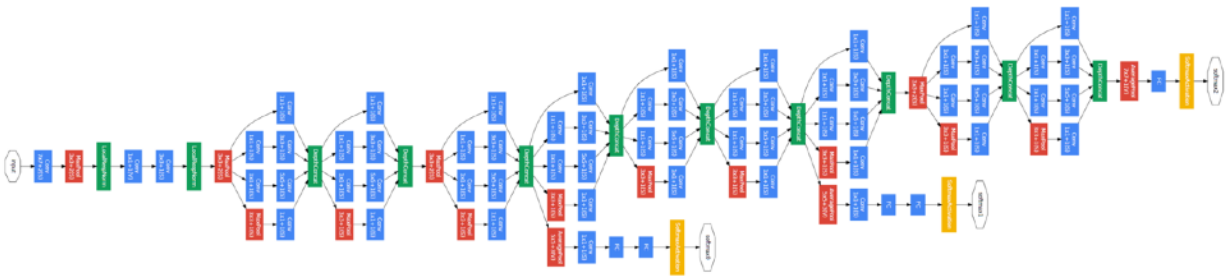
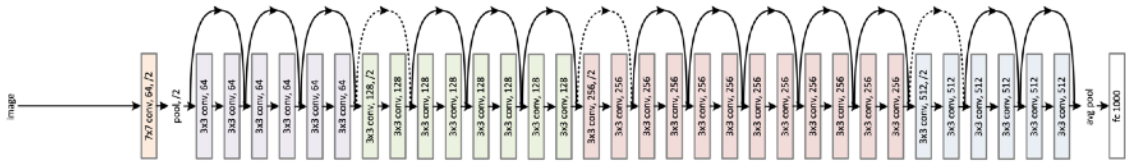


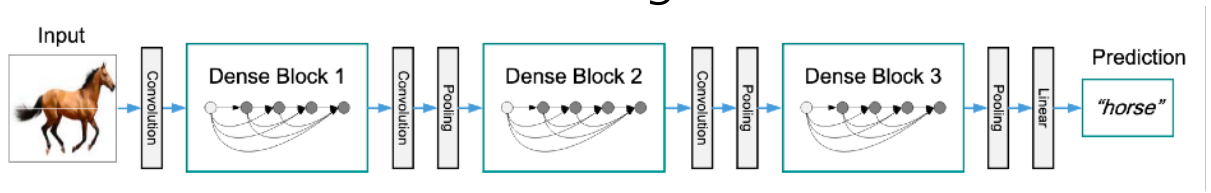
AlexNet



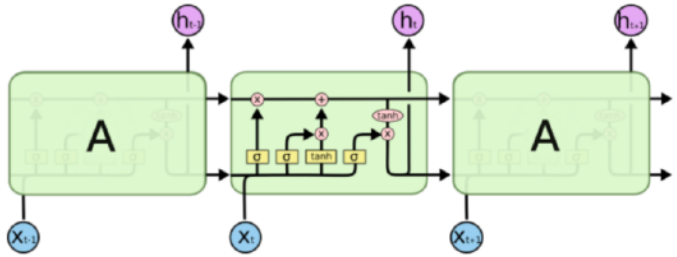
GoogLeNet



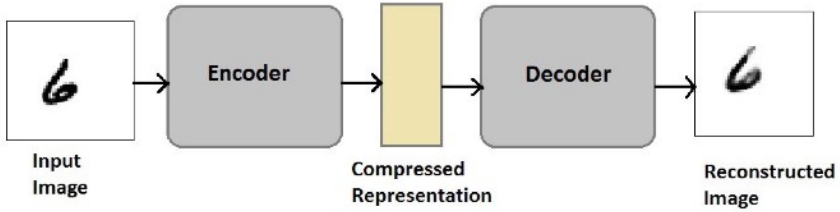
ResNet



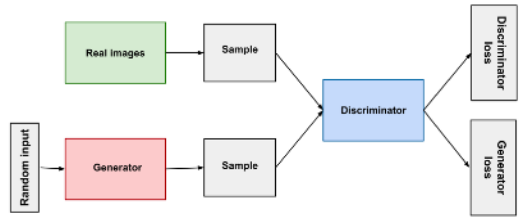
DenseNet



LSTM



Deep AutoEncoders



GAN

Loss

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Regression Task

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

Classification Task

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

Probabilistic Task

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

Algorithm

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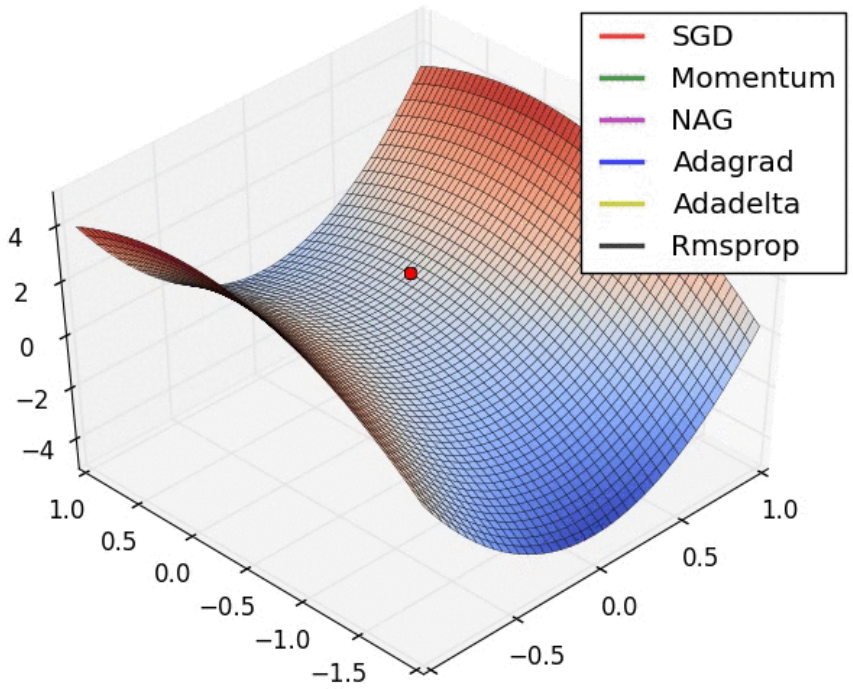

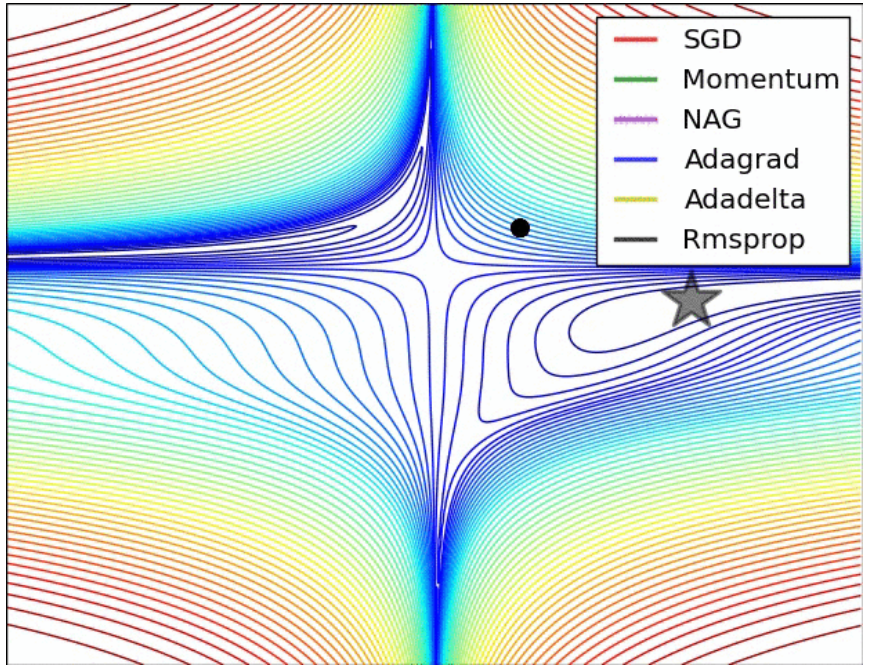

Dropout

Early stopping

k-fold validation

Weight decay

Batch normalization

MixUp

Ensemble

Bayesian Optimization

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Historical Review

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

Denny Britz

2020-07-29

Historical Review

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The goal of this post is to review those ideas that have stood the **test of time**.

2012 - AlexNet

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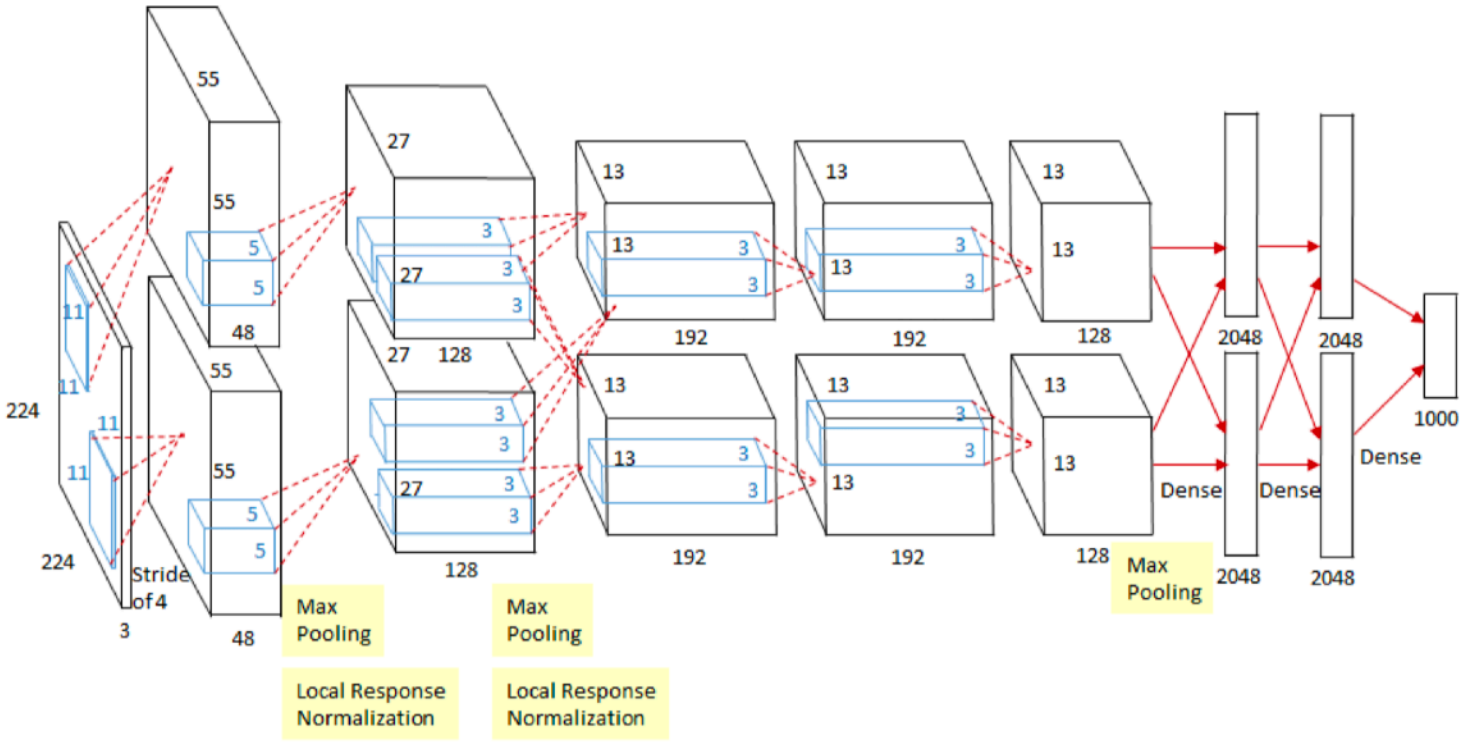

2013 - DQN

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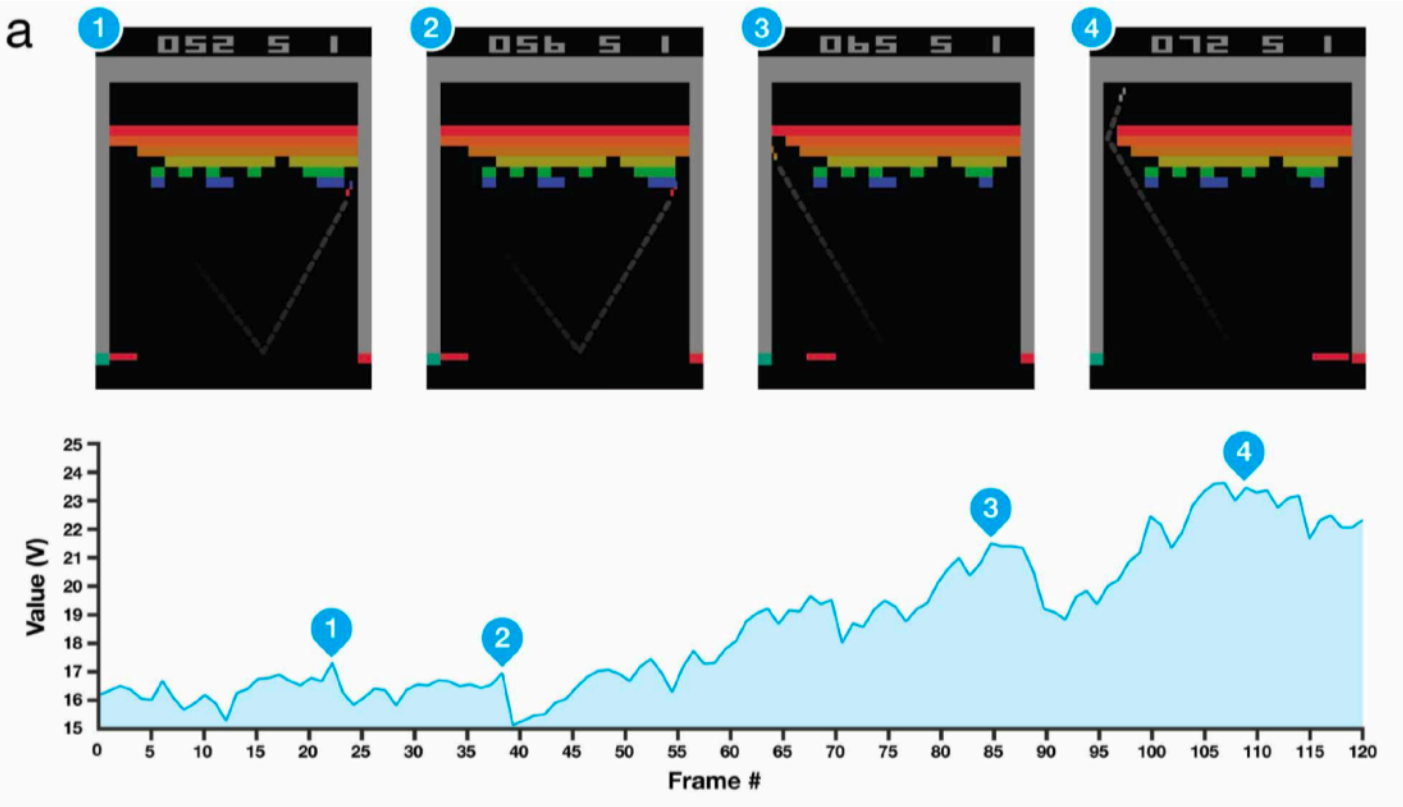

2014 - Encoder-Decoder with Attention

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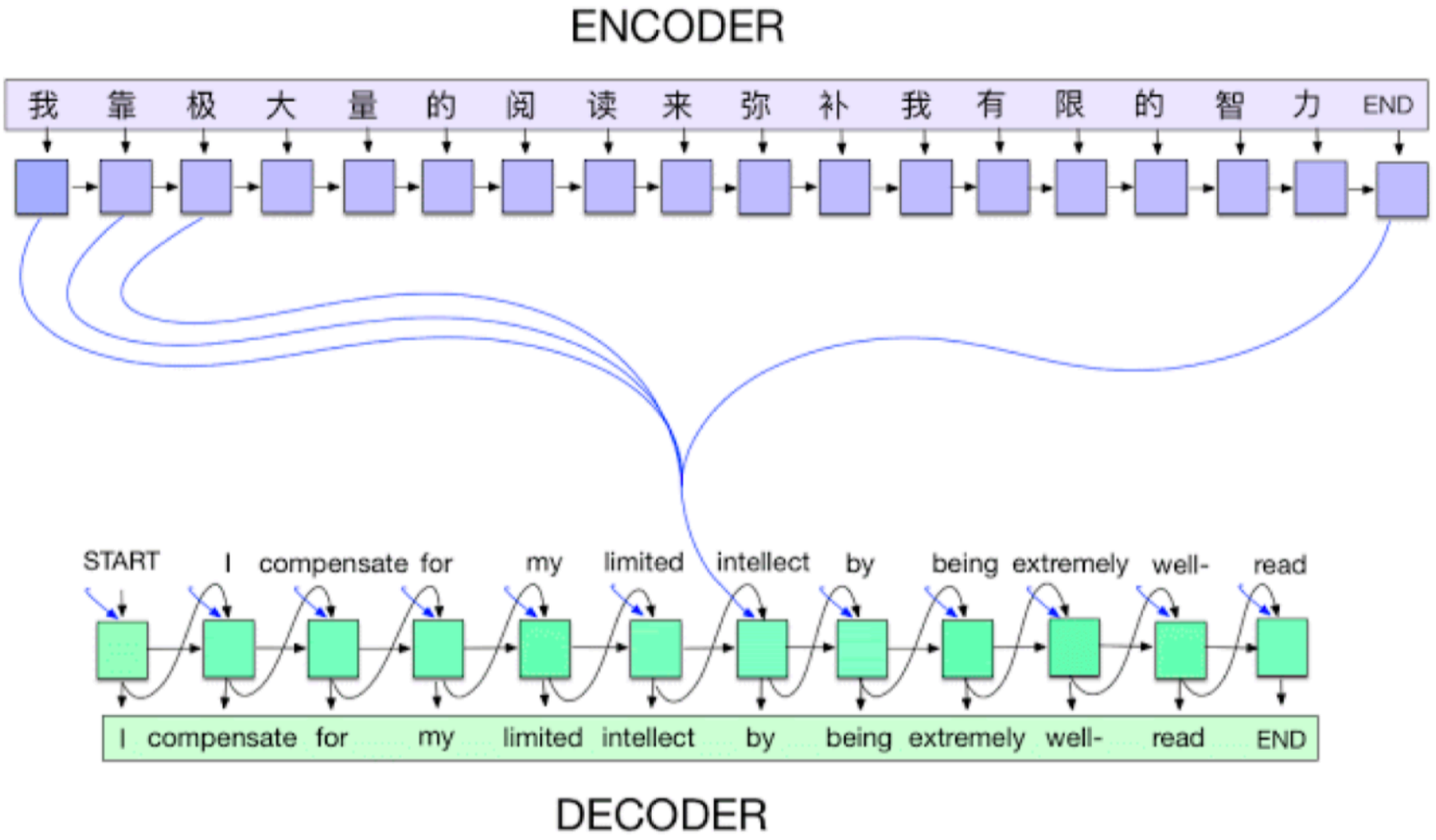

2014 - Adam

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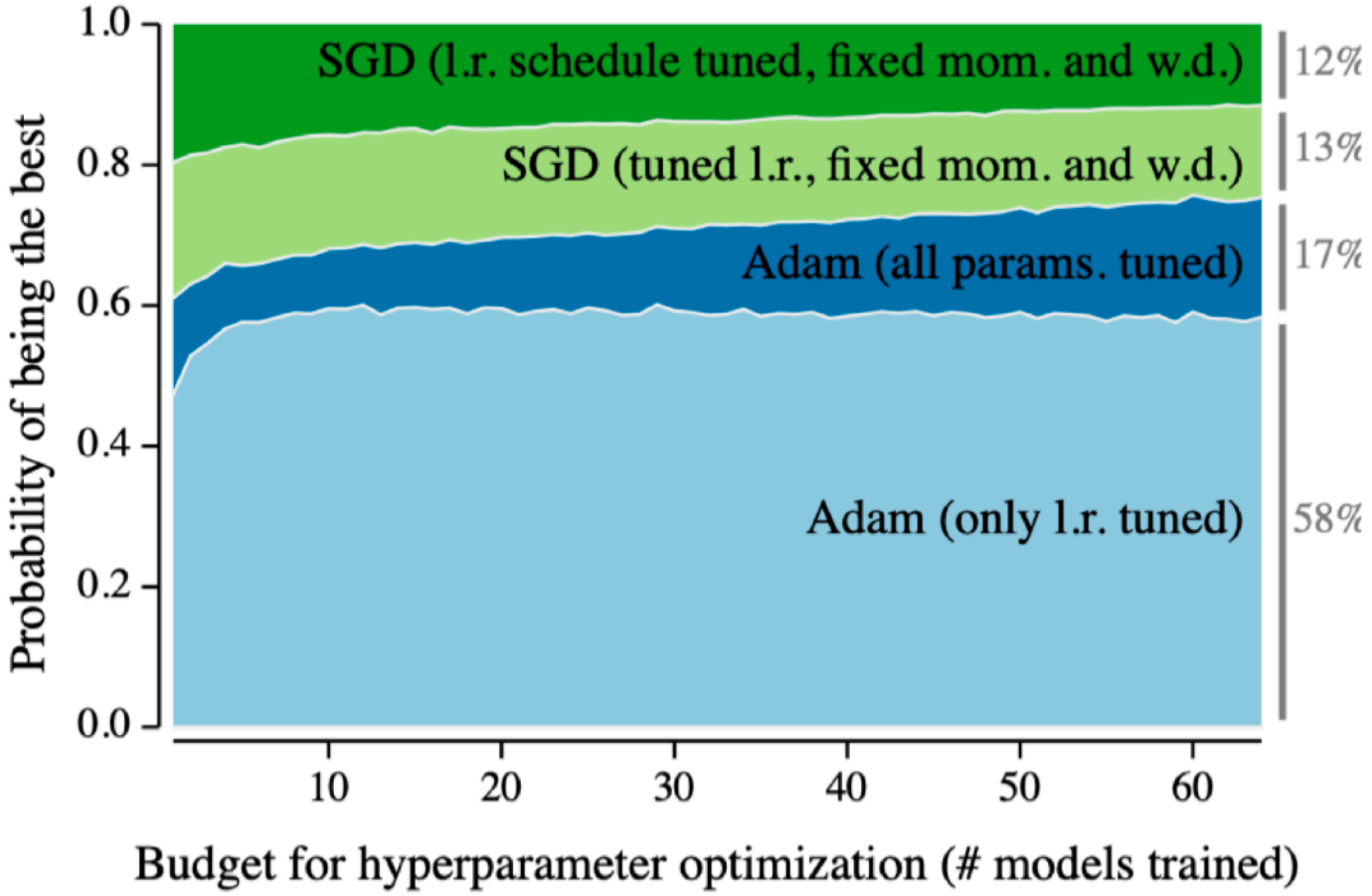

2015 - GAN

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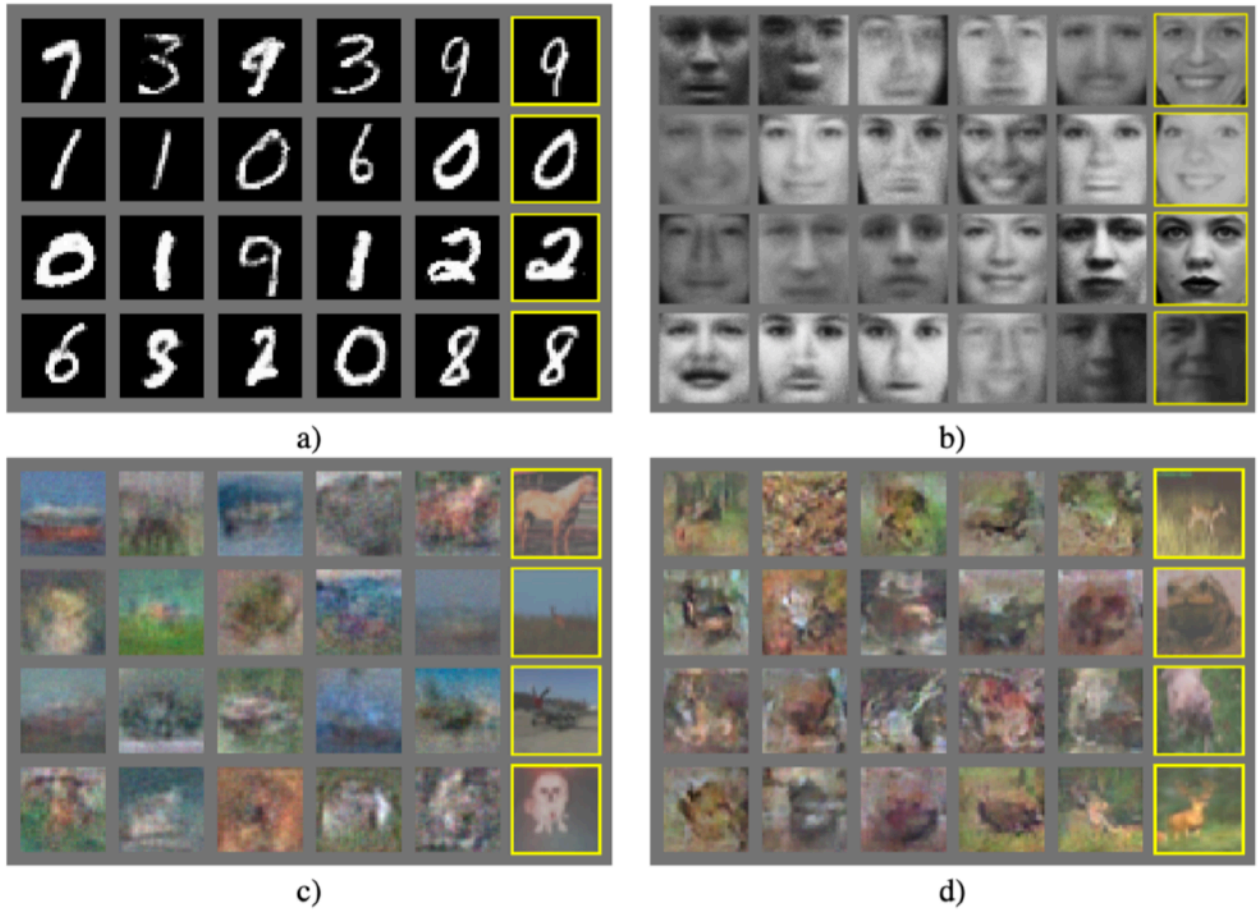

2015 - GAN

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

2015 - ResNet

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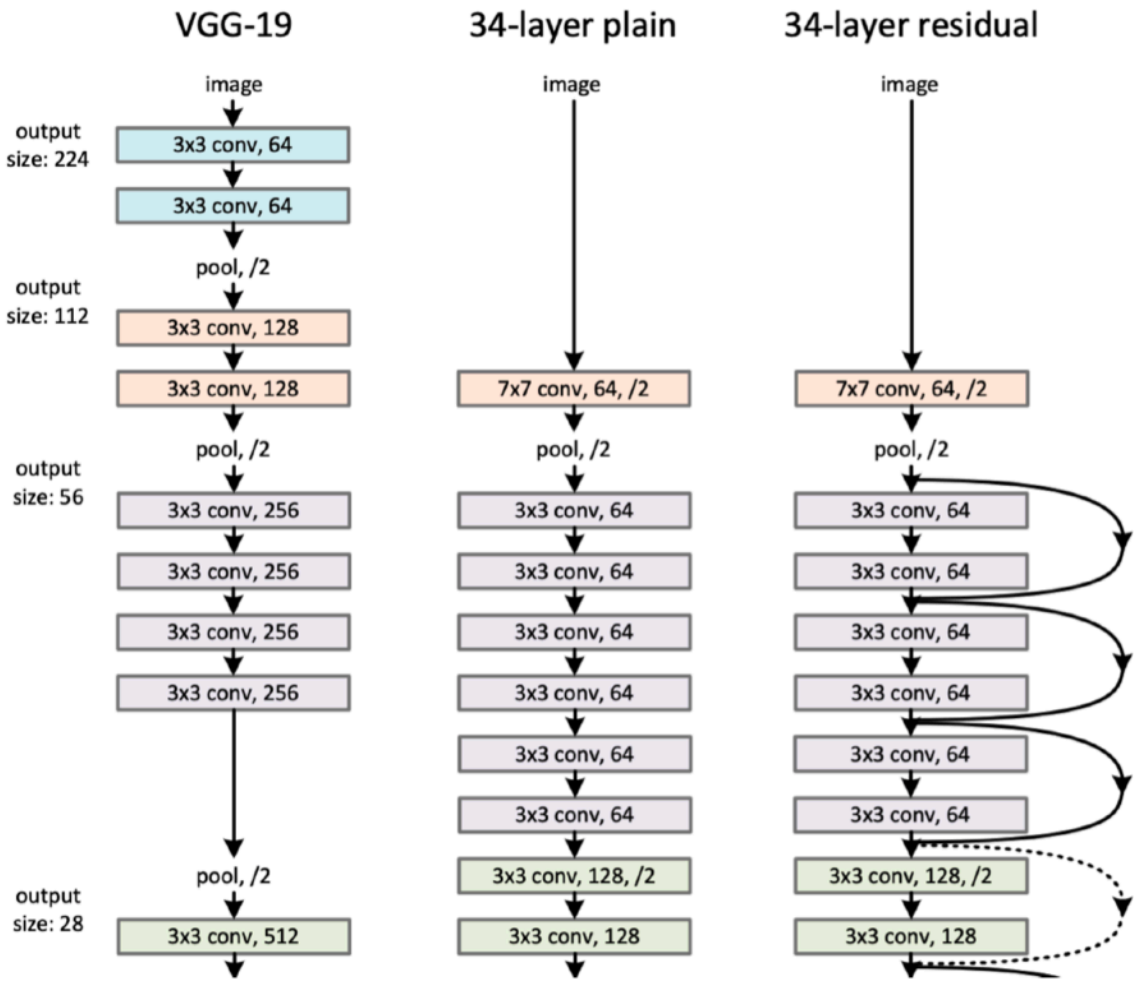

2017 - Transformer

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Attention Is All You Need

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2017 - Transformer

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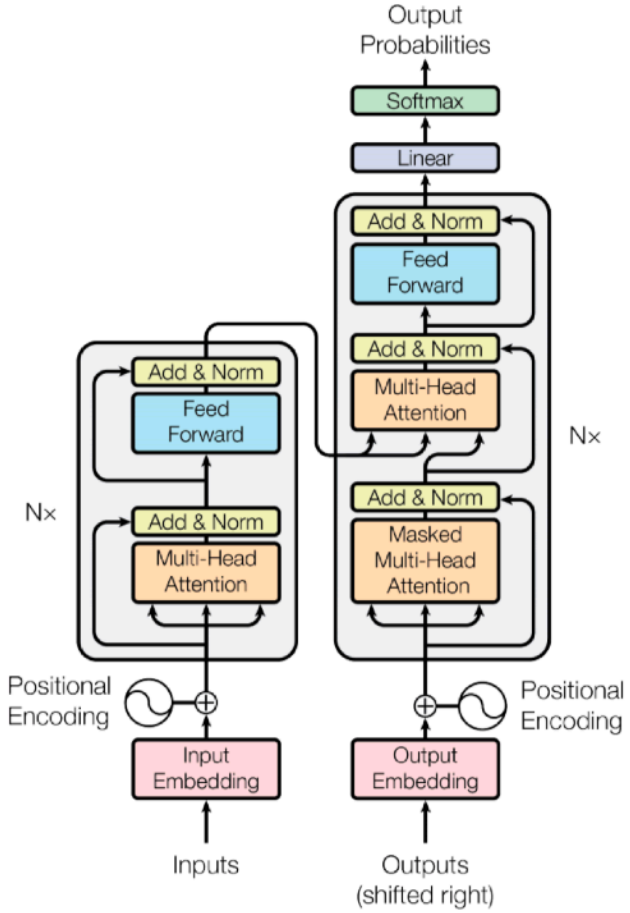

Figure 1: The Transformer - model architecture.

Single Head Self-Attention Calculation

$$\text{softmax}\left(\frac{Q \times K^T}{\sqrt{d_k}}\right) V = Z$$

2018 - BERT

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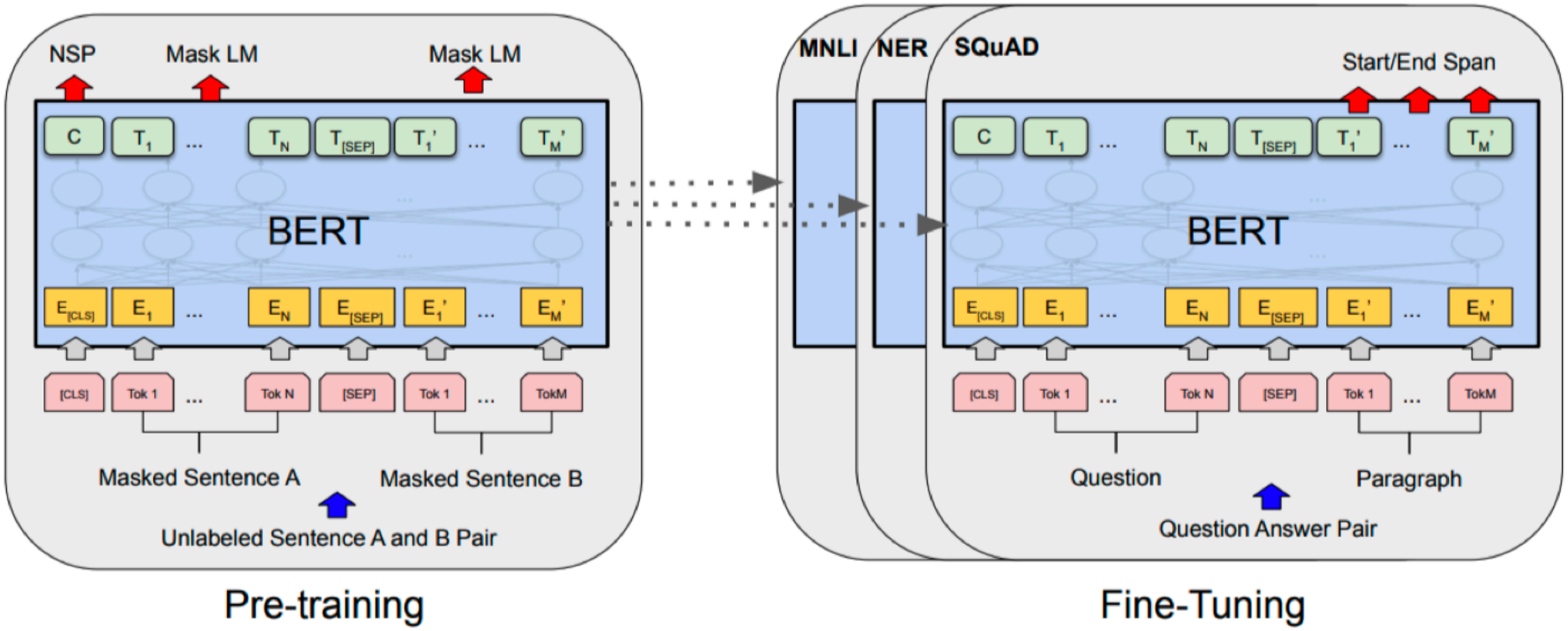

2019 - Pre-trained Language Model

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OpenAI

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

2020~ - Self Supervised Learning

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A Simple Framework for Contrastive Learning of Visual Representations

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Ting Chen [1] **Simon Kornblith** [1] **Mohammad Norouzi** [1] **Geoffrey Hinton** [1]

2020~ - Self Supervised Learning

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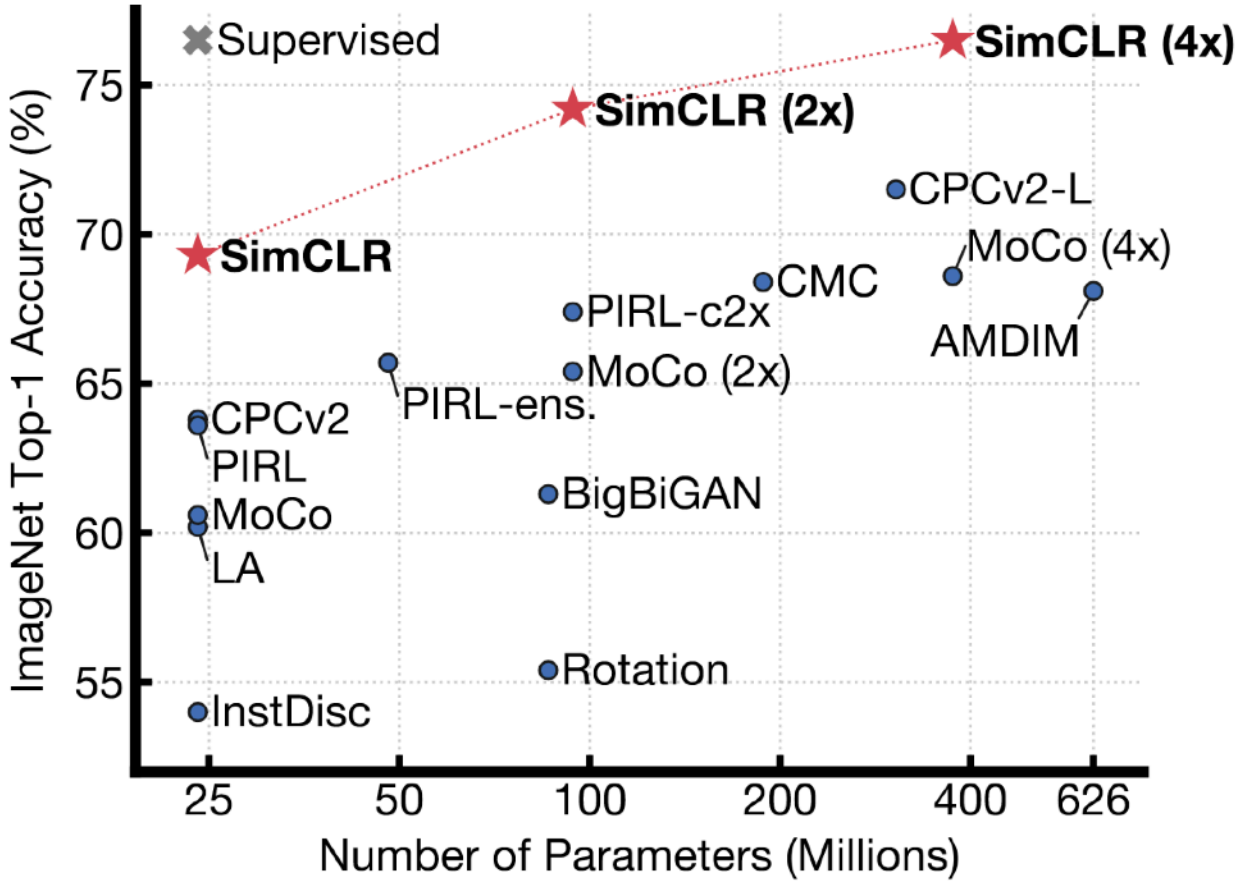

Thank You