

# Deep Learning Basic

Lecture 1: Historical Review

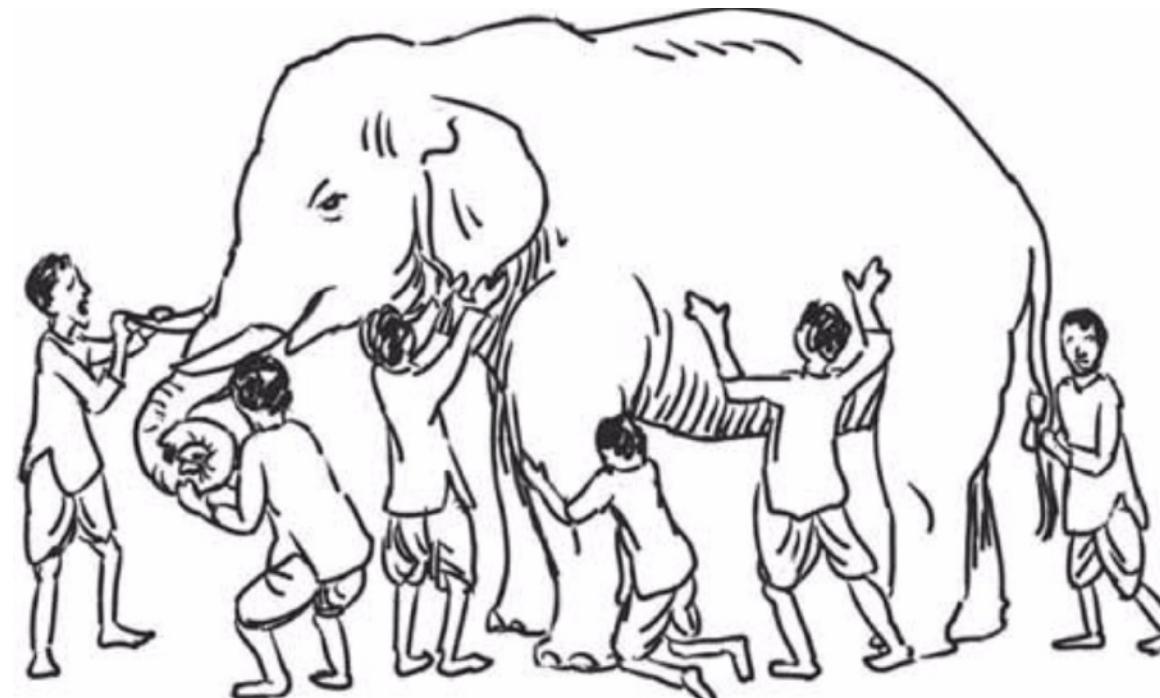
최성준 (고려대학교 인공지능학과)

# Introduction

# Introduction

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- Disclaimer



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

# Introduction

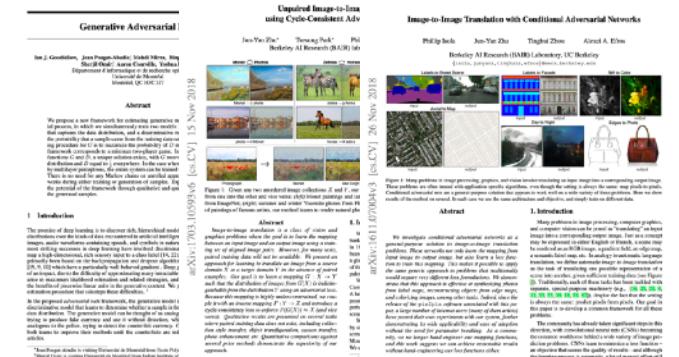
- ## • What make you a good deep learner?



# Implementation Skills

$\sin(x+y) = \sin x \cos y + \cos x \sin y$   
 $\lim_{x \rightarrow 0} \frac{\sin x}{x} = 1$   
 $(\sin x)^k = \sum_{n=0}^{\infty} \frac{(-1)^n}{n!} x^n \sin^n x = \frac{x}{\sin x}$   
 $\int_0^{\pi/2} \sin x dx = 1$   
 $\int_0^{\pi/2} \sin^2 x dx = \frac{1}{2} \int_0^{\pi/2} (1 + \cos 2x) dx = \frac{\pi}{4}$   
 $\int_0^{\pi/2} \sin^3 x dx = \frac{1}{4} \int_0^{\pi/2} (3 - 4\cos 2x + \cos 4x) dx = \frac{3\pi}{16}$   
 $\int_0^{\pi/2} \sin^4 x dx = \frac{1}{8} \int_0^{\pi/2} (5 - 12\cos 2x + 6\cos 4x - \cos 8x) dx = \frac{5\pi}{32}$   
 $\int_0^{\pi/2} \sin^5 x dx = \frac{1}{16} \int_0^{\pi/2} (31 - 120\cos 2x + 180\cos 4x - 120\cos 6x + 30\cos 8x - \cos 10x) dx = \frac{31\pi}{128}$   
 $\int_0^{\pi/2} \sin^6 x dx = \frac{1}{32} \int_0^{\pi/2} (63 - 240\cos 2x + 480\cos 4x - 480\cos 6x + 240\cos 8x - 60\cos 10x + \cos 12x) dx = \frac{63\pi}{256}$   
 $\int_0^{\pi/2} \sin^7 x dx = \frac{1}{64} \int_0^{\pi/2} (351 - 1400\cos 2x + 3500\cos 4x - 3500\cos 6x + 1400\cos 8x - 350\cos 10x + 50\cos 12x - \cos 14x) dx = \frac{351\pi}{512}$   
 $\int_0^{\pi/2} \sin^8 x dx = \frac{1}{128} \int_0^{\pi/2} (1053 - 4200\cos 2x + 9000\cos 4x - 9000\cos 6x + 4200\cos 8x - 1050\cos 10x + 150\cos 12x - 10\cos 14x + \cos 16x) dx = \frac{1053\pi}{1024}$   
 $\int_0^{\pi/2} \sin^9 x dx = \frac{1}{256} \int_0^{\pi/2} (4059 - 16800\cos 2x + 37800\cos 4x - 37800\cos 6x + 16800\cos 8x - 4050\cos 10x + 525\cos 12x - 45\cos 14x + \cos 16x) dx = \frac{4059\pi}{2048}$   
 $\int_0^{\pi/2} \sin^{10} x dx = \frac{1}{512} \int_0^{\pi/2} (16383 - 67200\cos 2x + 151200\cos 4x - 151200\cos 6x + 67200\cos 8x - 16380\cos 10x + 1890\cos 12x - 180\cos 14x + \cos 16x) dx = \frac{16383\pi}{4096}$   
 $\int_0^{\pi/2} \sin^{11} x dx = \frac{1}{1024} \int_0^{\pi/2} (65535 - 268800\cos 2x + 604800\cos 4x - 604800\cos 6x + 268800\cos 8x - 65535\cos 10x + 6750\cos 12x - 525\cos 14x + \cos 16x) dx = \frac{65535\pi}{8192}$   
 $\int_0^{\pi/2} \sin^{12} x dx = \frac{1}{2048} \int_0^{\pi/2} (262143 - 936000\cos 2x + 2187000\cos 4x - 2187000\cos 6x + 936000\cos 8x - 262143\cos 10x + 27000\cos 12x - 1800\cos 14x + \cos 16x) dx = \frac{262143\pi}{16384}$   
 $\int_0^{\pi/2} \sin^{13} x dx = \frac{1}{4096} \int_0^{\pi/2} (976563 - 3110400\cos 2x + 7290000\cos 4x - 7290000\cos 6x + 3110400\cos 8x - 976563\cos 10x + 94500\cos 12x - 6300\cos 14x + \cos 16x) dx = \frac{976563\pi}{32768}$   
 $\int_0^{\pi/2} \sin^{14} x dx = \frac{1}{8192} \int_0^{\pi/2} (3593751 - 10485760\cos 2x + 24300000\cos 4x - 24300000\cos 6x + 10485760\cos 8x - 3593751\cos 10x + 324000\cos 12x - 18000\cos 14x + \cos 16x) dx = \frac{3593751\pi}{65536}$   
 $\int_0^{\pi/2} \sin^{15} x dx = \frac{1}{16384} \int_0^{\pi/2} (13543975 - 3593751\cos 2x + 8910000\cos 4x - 8910000\cos 6x + 3593751\cos 8x - 13543975\cos 10x + 121500\cos 12x - 6750\cos 14x + \cos 16x) dx = \frac{13543975\pi}{131072}$   
 $\int_0^{\pi/2} \sin^{16} x dx = \frac{1}{32768} \int_0^{\pi/2} (51845963 - 107374182\cos 2x + 270000000\cos 4x - 270000000\cos 6x + 107374182\cos 8x - 51845963\cos 10x + 453000\cos 12x - 22500\cos 14x + \cos 16x) dx = \frac{51845963\pi}{65536}$   
 $\int_0^{\pi/2} \sin^{17} x dx = \frac{1}{65536} \int_0^{\pi/2} (20737615 - 4294967296\cos 2x + 1089000000\cos 4x - 1089000000\cos 6x + 4294967296\cos 8x - 20737615\cos 10x + 181500\cos 12x - 8500\cos 14x + \cos 16x) dx = \frac{20737615\pi}{32768}$   
 $\int_0^{\pi/2} \sin^{18} x dx = \frac{1}{131072} \int_0^{\pi/2} (8295051 - 17179869184\cos 2x + 4374900000\cos 4x - 4374900000\cos 6x + 17179869184\cos 8x - 8295051\cos 10x + 727500\cos 12x - 3500\cos 14x + \cos 16x) dx = \frac{8295051\pi}{16384}$   
 $\int_0^{\pi/2} \sin^{19} x dx = \frac{1}{262144} \int_0^{\pi/2} (33180203 - 42949672960\cos 2x + 10890000000\cos 4x - 10890000000\cos 6x + 42949672960\cos 8x - 33180203\cos 10x + 291500\cos 12x - 1300\cos 14x + \cos 16x) dx = \frac{33180203\pi}{32768}$   
 $\int_0^{\pi/2} \sin^{20} x dx = \frac{1}{524288} \int_0^{\pi/2} (13271683 - 85899345920\cos 2x + 217800000000\cos 4x - 217800000000\cos 6x + 85899345920\cos 8x - 13271683\cos 10x + 1167500\cos 12x - 4500\cos 14x + \cos 16x) dx = \frac{13271683\pi}{16384}$   
 $\int_0^{\pi/2} \sin^{21} x dx = \frac{1}{1048576} \int_0^{\pi/2} (5308673 - 171798691840\cos 2x + 437490000000\cos 4x - 437490000000\cos 6x + 171798691840\cos 8x - 5308673\cos 10x + 479500\cos 12x - 1900\cos 14x + \cos 16x) dx = \frac{5308673\pi}{32768}$   
 $\int_0^{\pi/2} \sin^{22} x dx = \frac{1}{2097152} \int_0^{\pi/2} (21234703 - 429496729600\cos 2x + 1089000000000\cos 4x - 1089000000000\cos 6x + 429496729600\cos 8x - 21234703\cos 10x + 191500\cos 12x - 700\cos 14x + \cos 16x) dx = \frac{21234703\pi}{16384}$   
 $\int_0^{\pi/2} \sin^{23} x dx = \frac{1}{4194304} \int_0^{\pi/2} (8493881 - 858993459200\cos 2x + 2178000000000\cos 4x - 2178000000000\cos 6x + 858993459200\cos 8x - 8493881\cos 10x + 769500\cos 12x - 200\cos 14x + \cos 16x) dx = \frac{8493881\pi}{32768}$   
 $\int_0^{\pi/2} \sin^{24} x dx = \frac{1}{8388608} \int_0^{\pi/2} (33975523 - 1717986918400\cos 2x + 4374900000000\cos 4x - 4374900000000\cos 6x + 1717986918400\cos 8x - 33975523\cos 10x + 307500\cos 12x - 40\cos 14x + \cos 16x) dx = \frac{33975523\pi}{16384}$   
 $\int_0^{\pi/2} \sin^{25} x dx = \frac{1}{16777216} \int_0^{\pi/2} (13590203 - 343597383680\cos 2x + 858993459200\cos 4x - 858993459200\cos 6x + 343597383680\cos 8x - 13590203\cos 10x + 123500\cos 12x - 10\cos 14x + \cos 16x) dx = \frac{13590203\pi}{32768}$   
 $\int_0^{\pi/2} \sin^{26} x dx = \frac{1}{33554432} \int_0^{\pi/2} (5436081 - 8589934592000\cos 2x + 21780000000000\cos 4x - 21780000000000\cos 6x + 8589934592000\cos 8x - 5436081\cos 10x + 491500\cos 12x - 10\cos 14x + \cos 16x) dx = \frac{5436081\pi}{16384}$   
 $\int_0^{\pi/2} \sin^{27} x dx = \frac{1}{67108864} \int_0^{\pi/2} (21744323 - 17179869184000\cos 2x + 43749000000000\cos 4x - 43749000000000\cos 6x + 17179869184000\cos 8x - 21744323\cos 10x + 1967500\cos 12x - 10\cos 14x + \cos 16x) dx = \frac{21744323\pi}{32768}$   
 $\int_0^{\pi/2} \sin^{28} x dx = \frac{1}{134217728} \int_0^{\pi/2} (869773 - 4294967296000\cos 2x + 10890000000000\cos 4x - 10890000000000\cos 6x + 4294967296000\cos 8x - 869773\cos 10x + 803500\cos 12x - 10\cos 14x + \cos 16x) dx = \frac{869773\pi}{16384}$   
 $\int_0^{\pi/2} \sin^{29} x dx = \frac{1}{268435456} \int_0^{\pi/2} (3478773 - 85899345920000\cos 2x + 217800000000000\cos 4x - 217800000000000\cos 6x + 85899345920000\cos 8x - 3478773\cos 10x + 301500\cos 12x - 10\cos 14x + \cos 16x) dx = \frac{3478773\pi}{32768}$   
 $\int_0^{\pi/2} \sin^{30} x dx = \frac{1}{536870912} \int_0^{\pi/2} (13895053 - 171798691840000\cos 2x + 437490000000000\cos 4x - 437490000000000\cos 6x + 171798691840000\cos 8x - 13895053\cos 10x + 1287500\cos 12x - 10\cos 14x + \cos 16x) dx = \frac{13895053\pi}{16384}$   
 $\int_0^{\pi/2} \sin^{31} x dx = \frac{1}{1073741824} \int_0^{\pi/2} (5558021 - 34359738368000\cos 2x + 85899345920000\cos 4x - 85899345920000\cos 6x + 34359738368000\cos 8x - 5558021\cos 10x + 503500\cos 12x - 10\cos 14x + \cos 16x) dx = \frac{5558021\pi}{32768}$   
 $\int_0^{\pi/2} \sin^{32} x dx = \frac{1}{2147483648} \int_0^{\pi/2} (22232083 - 858993459200000\cos 2x + 2178000000000000\cos 4x - 2178000000000000\cos 6x + 858993459200000\cos 8x - 22232083\cos 10x + 201500\cos 12x - 10\cos 14x + \cos 16x) dx = \frac{22232083\pi}{16384}$   
 $\int_0^{\pi/2} \sin^{33} x dx = \frac{1}{4294967296} \int_0^{\pi/2} (8893613 - 1717986918400000\cos 2x + 4374900000000000\cos 4x - 4374900000000000\cos 6x + 1717986918400000\cos 8x - 8893613\cos 10x + 807500\cos 12x - 10\cos 14x + \cos 16x) dx = \frac{8893613\pi}{32768}$   
 $\int_0^{\pi/2} \sin^{34} x dx = \frac{1}{8589934592} \int_0^{\pi/2} (35574453 - 3435973836800000\cos 2x + 858993459200000\cos 4x - 858993459200000\cos 6x + 343597383680000\cos 8x - 35574453\cos 10x + 303500\cos 12x - 10\cos 14x + \cos 16x) dx = \frac{35574453\pi}{16384}$   
 $\int_0^{\pi/2} \sin^{35} x dx = \frac{1}{17179869184} \int_0^{\pi/2} (14230173 - 8589934592000000\cos 2x + 2178000000000000\cos 4x - 2178000000000000\cos 6x + 8589934592000000\cos 8x - 14230173\cos 10x + 121500\cos 12x - 10\cos 14x + \cos 16x) dx = \frac{14230173\pi}{32768}$   
 $\int_0^{\pi/2} \sin^{36} x dx = \frac{1}{34359738368} \int_0^{\pi/2} (56920693 - 17179869184000000\cos 2x + 4374900000000000\cos 4x - 4374900000000000\cos 6x + 17179869184000000\cos 8x - 56920693\cos 10x + 507500\cos 12x - 10\cos 14x + \cos 16x) dx = \frac{56920693\pi}{16384}$   
 $\int_0^{\pi/2} \sin^{37} x dx = \frac{1}{6871947672} \int_0^{\pi/2} (22768273 - 34359738368000000\cos 2x + 8589934592000000\cos 4x - 8589934592000000\cos 6x + 3435973836800000\cos 8x - 22768273\cos 10x + 203500\cos 12x - 10\cos 14x + \cos 16x) dx = \frac{22768273\pi}{32768}$   
 $\int_0^{\pi/2} \sin^{38} x dx = \frac{1}{13743895344} \int_0^{\pi/2} (91073093 - 85899345920000000\cos 2x + 21780000000000000\cos 4x - 21780000000000000\cos 6x + 85899345920000000\cos 8x - 91073093\cos 10x + 903500\cos 12x - 10\cos 14x + \cos 16x) dx = \frac{91073093\pi}{16384}$   
 $\int_0^{\pi/2} \sin^{39} x dx = \frac{1}{27487790688} \int_0^{\pi/2} (36437233 - 171798691840000000\cos 2x + 43749000000000000\cos 4x - 43749000000000000\cos 6x + 171798691840000000\cos 8x - 36437233\cos 10x + 301500\cos 12x - 10\cos 14x + \cos 16x) dx = \frac{36437233\pi}{32768}$   
 $\int_0^{\pi/2} \sin^{40} x dx = \frac{1}{54975581376} \int_0^{\pi/2} (14575013 - 343597383680000000\cos 2x + 85899345920000000\cos 4x - 85899345920000000\cos 6x + 34359738368000000\cos 8x - 14575013\cos 10x + 1287500\cos 12x - 10\cos 14x + \cos 16x) dx = \frac{14575013\pi}{16384}$   
 $\int_0^{\pi/2} \sin^{41} x dx = \frac{1}{109951162752} \int_0^{\pi/2} (58300053 - 858993459200000000\cos 2x + 217800000000000000\cos 4x - 217800000000000000\cos 6x + 858993459200000000\cos 8x - 58300053\cos 10x + 503500\cos 12x - 10\cos 14x + \cos 16x) dx = \frac{58300053\pi}{32768}$   
 $\int_0^{\pi/2} \sin^{42} x dx = \frac{1}{219902325504} \int_0^{\pi/2} (23320021 - 171798691840000000\cos 2x + 43749000000000000\cos 4x - 43749000000000000\cos 6x + 171798691840000000\cos 8x - 23320021\cos 10x + 201500\cos 12x - 10\cos 14x + \cos 16x) dx = \frac{23320021\pi}{16384}$   
 $\int_0^{\pi/2} \sin^{43} x dx = \frac{1}{439804651008} \int_0^{\pi/2} (9330013 - 343597383680000000\cos 2x + 85899345920000000\cos 4x - 85899345920000000\cos 6x + 34359738368000000\cos 8x - 9330013\cos 10x + 807500\cos 12x - 10\cos 14x + \cos 16x) dx = \frac{9330013\pi}{32768}$   
 $\int_0^{\pi/2} \sin^{44} x dx = \frac{1}{879609302016} \int_0^{\pi/2} (37320053 - 858993459200000000\cos 2x + 217800000000000000\cos 4x - 217800000000000000\cos 6x + 858993459200000000\cos 8x - 37320053\cos 10x + 303500\cos 12x - 10\cos 14x + \cos 16x) dx = \frac{37320053\pi}{16384}$   
 $\int_0^{\pi/2} \sin^{45} x dx = \frac{1}{1759218604032} \int_0^{\pi/2} (15000021 - 171798691840000000\cos 2x + 43749000000000000\cos 4x - 43749000000000000\cos 6x + 171798691840000000\cos 8x - 15000021\cos 10x + 121500\cos 12x - 10\cos 14x + \cos 16x) dx = \frac{15000021\pi}{32768}$   
 $\int_0^{\pi/2} \sin^{46} x dx = \frac{1}{3518437208064} \int_0^{\pi/2} (6000013 - 343597383680000000\cos 2x + 85899345920000000\cos 4x - 85899345920000000\cos 6x + 34359738368000000\cos 8x - 6000013\cos 10x + 507500\cos 12x - 10\cos 14x + \cos 16x) dx = \frac{6000013\pi}{16384}$   
 $\int_0^{\pi/2} \sin^{47} x dx = \frac{1}{7036874416128} \int_0^{\pi/2} (24000053 - 858993459200000000\cos 2x + 217800000000000000\cos 4x - 217800000000000000\cos 6x + 858993459200000000\cos 8x - 24000053\cos 10x + 203500\cos 12x - 10\cos 14x + \cos 16x) dx = \frac{24000053\pi}{32768}$   
 $\int_0^{\pi/2} \sin^{48} x dx = \frac{1}{14073748832256} \int_0^{\pi/2} (10000021 - 171798691840000000\cos 2x + 43749000000000000\cos 4x - 43749000000000000\cos 6x + 171798691840000000\cos 8x - 10000021\cos 10x + 903500\cos 12x - 10\cos 14x + \cos 16x) dx = \frac{10000021\pi}{16384}$   
 $\int_0^{\pi/2} \sin^{49} x dx = \frac{1}{28147497664512} \int_0^{\pi/2} (4000013 - 343597383680000000\cos 2x + 85899345920000000\cos 4x - 85899345920000000\cos 6x + 34359738368000000\cos 8x - 4000013\cos 10x + 301500\cos 12x - 10\cos 14x + \cos 16x) dx = \frac{4000013\pi}{32768}$   
 $\int_0^{\pi/2} \sin^{50} x dx = \frac{1}{56294995328032} \int_0^{\pi/2} (16000053 - 858993459200000000\cos 2x + 217800000000000000\cos 4x - 217800000000000000\cos 6x + 858993459200000000\cos 8x - 16000053\cos 10x + 1287500\cos 12x - 10\cos 14x + \cos 16x) dx = \frac{16000053\pi}{16384}$   
 $\int_0^{\pi/2} \sin^{51} x dx = \frac{1}{112589990656064} \int_0^{\pi/2} (6400021 - 171798691840000000\cos 2x + 43749000000000000\cos 4x - 43749000000000000\cos 6x + 171798691840000000\cos 8x - 6400021\cos 10x + 503500\cos 12x - 10\cos 14x + \cos 16x) dx = \frac{6400021\pi}{32768}$   
 $\int_0^{\pi/2} \sin^{52} x dx = \frac{1}{225179981312128} \int_0^{\pi/2} (2560013 - 343597383680000000\cos 2x + 85899345920000000\cos 4x - 85899345920000000\cos 6x + 34359738368000000\cos 8x - 2560013\cos 10x + 201500\cos 12x - 10\cos 14x + \cos 16x) dx = \frac{2560013\pi}{16384}$   
 $\int_0^{\pi/2} \sin^{53} x dx = \frac{1}{450359962624256} \int_0^{\pi/2} (10240053 - 858993459200000000\cos 2x + 217800000000000000\cos 4x - 217800000000000000\cos 6x + 858993459200000000\cos 8x - 10240053\cos 10x + 807500\cos 12x - 10\cos 14x + \cos 16x) dx = \frac{10240053\pi}{32768}$   
 $\int_0^{\pi/2} \sin^{54} x dx = \frac{1}{900719925248512} \int_0^{\pi/2} (4096021 - 171798691840000000\cos 2x + 43749000000000000\cos 4x - 43749000000000000\cos 6x + 171798691840000000\cos 8x - 4096021\cos 10x + 303500\cos 12x - 10\cos 14x + \cos 16x) dx = \frac{4096021\pi}{16384}$   
 $\int_0^{\pi/2} \sin^{55} x dx = \frac{1}{1801439850497024} \int_0^{\pi/2} (16384053 - 343597383680000000\cos 2x + 85899345920000000\cos 4x - 85899345920000000\cos 6x + 34359738368000000\cos 8x - 16384053\cos 10x + 121500\cos 12x - 10\cos 14x + \cos 16x) dx = \frac{16384053\pi}{32768}$   
 $\int_0^{\pi/2} \sin^{56} x dx = \frac{1}{3602879700994048} \int_0^{\pi/2} (6553621 - 858993459200000000\cos 2x + 217800000000000000\cos 4x - 217800000000000000\cos 6x + 858993459200000000\cos 8x - 6553621\cos 10x + 507500\cos 12x - 10\cos 14x + \cos 16x) dx = \frac{6553621\pi}{16384}$   
 $\int_0^{\pi/2} \sin^{57} x dx = \frac{1}{7205759401988096} \int_0^{\pi/2} (26214453 - 171798691840000000\cos 2x + 43749000000000000\cos 4x - 43749000000000000\cos 6x + 171798691840000000\cos 8x - 26214453\cos 10x + 203500\cos 12x - 10\cos 14x + \cos 16x) dx = \frac{26214453\pi}{32768}$   
 $\int_0^{\pi/2} \sin^{58} x dx = \frac{1}{14411518803976192} \int_0^{\pi/2} (104857621 - 343597383680000000\cos 2x + 85899345920000000\cos 4x - 85899345920000000\cos 6x + 34359738368000000\cos 8x - 104857621\cos 10x + 903500\cos 12x - 10\cos 14x + \cos 16x) dx = \frac{104857621\pi}{16384}$   
 $\int_0^{\pi/2} \sin^{59} x dx = \frac{1}{28823037607952384} \int_0^{\pi/2} (429496729653 - 858993459200000000\cos 2x + 217800000000000000\cos 4x - 217800000000000000\cos 6x + 858993459200000000\cos 8x - 429496729653\cos 10x + 301500\cos 12x - 10\cos 14x + \cos 16x) dx = \frac{429496729653\pi}{32768}$   
 $\int_0^{\pi/2} \sin^{60} x dx = \frac{1}{57646075215904768} \int_0^{\pi/2} (1717986918421 - 171798691840000000\cos 2x + 43749000000000000\cos 4x - 43749000000000000\cos 6x + 171798691840000000\cos 8x - 1717986918421\cos 10x + 1287500\cos 12x - 10\cos 14x + \cos 16x) dx = \frac{1717986918421\pi}{16384}$   
 $\int_0^{\pi/2} \sin^{61} x dx = \frac{1}{115292150431809536} \int_0^{\pi/2} (6871947672853 - 343597383680000000\cos 2x + 85899345920000000\cos 4x - 85899345920000000\cos 6x + 34359738368000000\cos 8x - 6871947672853\cos 10x + 507500\cos 12x - 10\cos 14x + \cos 16x) dx = \frac{6871947672853\pi}{32768}$   
 $\int_0^{\pi/2} \sin^{62} x dx = \frac{1}{230584300863619072} \int_0^{\pi/2} (2743579070741 - 858993459200000000\cos 2x + 217800000000000000\cos$

## Math Skills (Linear Algebra, Probability)



## Knowing a lot of recent Papers

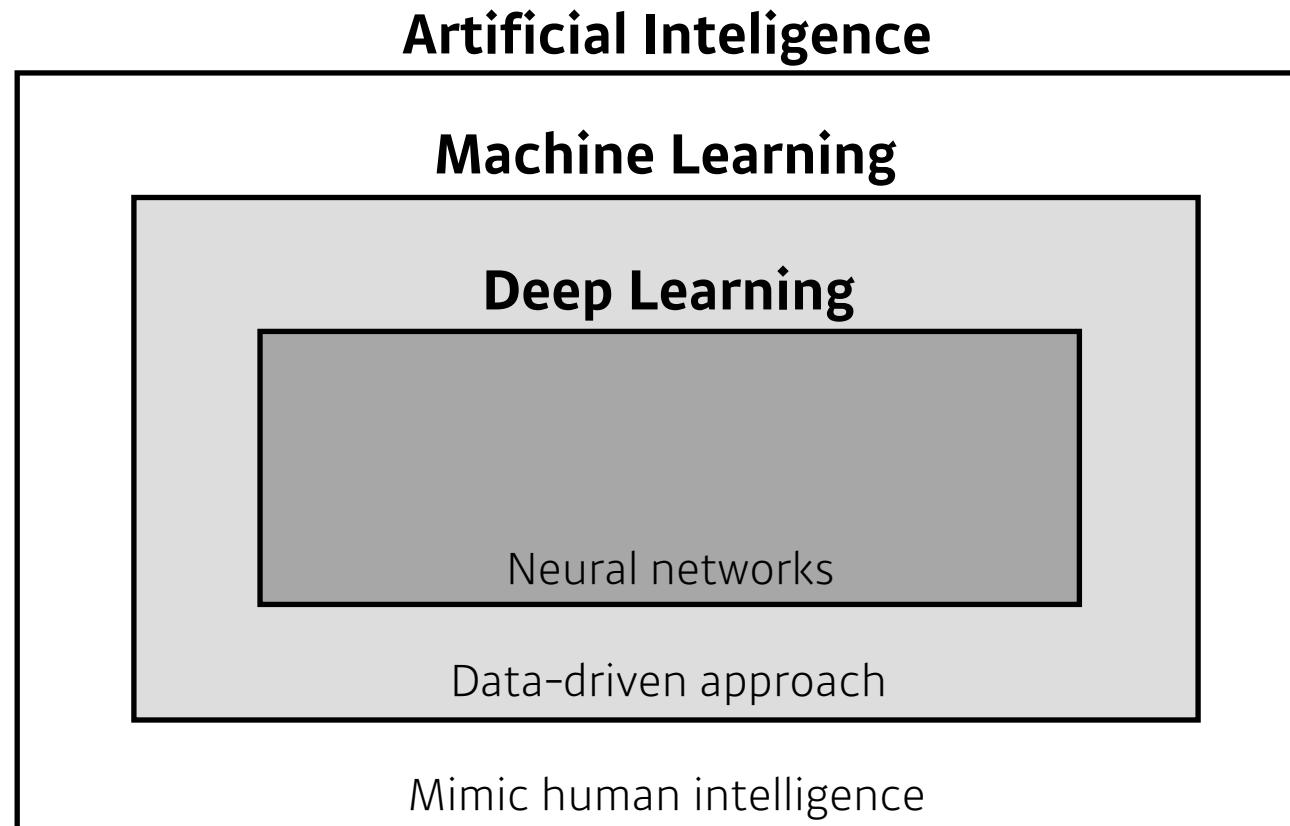
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8. Transformer
9. Generative Models Part1
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# Introduction

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# Introduction

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- 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

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

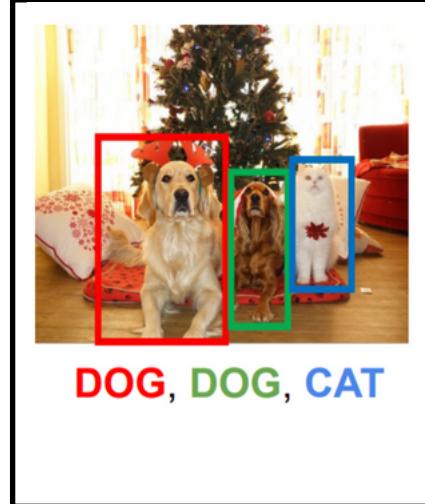
Classification



Semantic Segmentation



Detection



Pose Estimation



Visual QnA



기

이미지의 픽셀별로  
어디를 클릭했을 때 들어가는가

(dense)

이미지 물체가 어디에 놓여  
있을 때 반응할 빛은 뭉개지

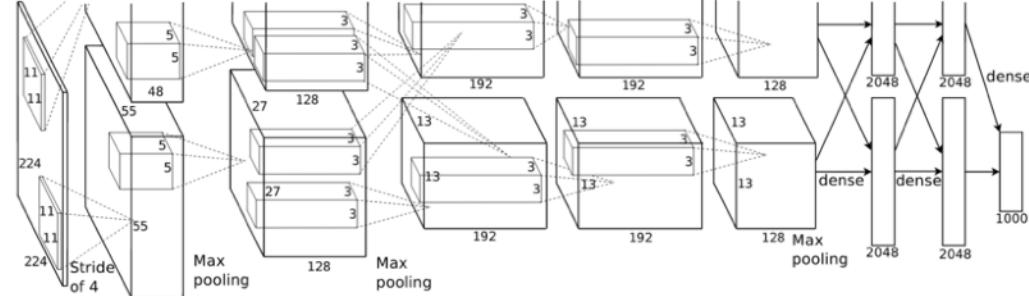
© NAVER Connect Foundation

2. 3차원 스켈레톤  
제작

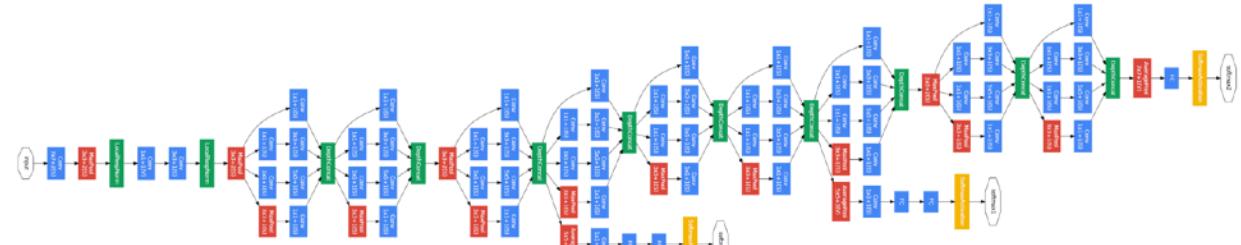
이미지 문자와 주제는 뭔지  
문장의 뜻 구하기

# Model

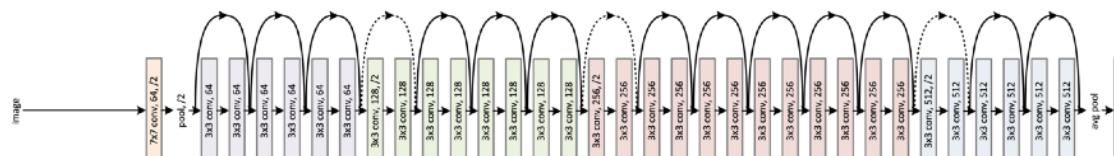
같은 계층으로, 같은 계층으로  
모델의 성능이 다른 이유는?



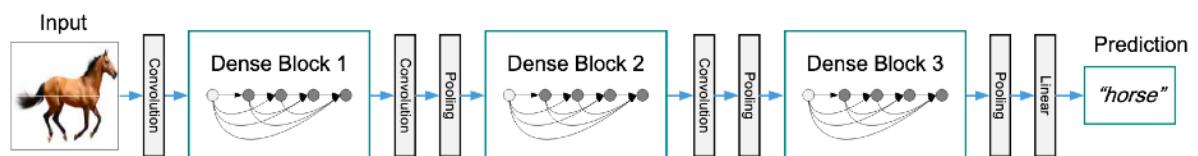
AlexNet



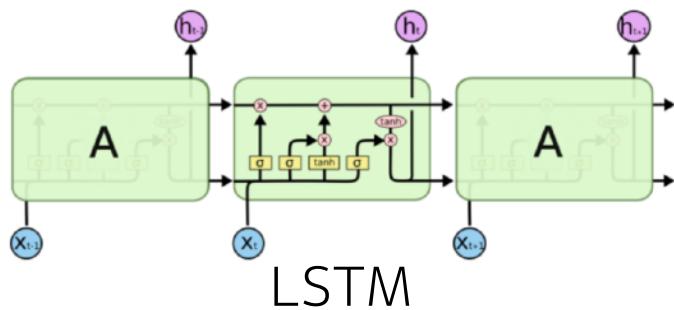
GoogLeNet



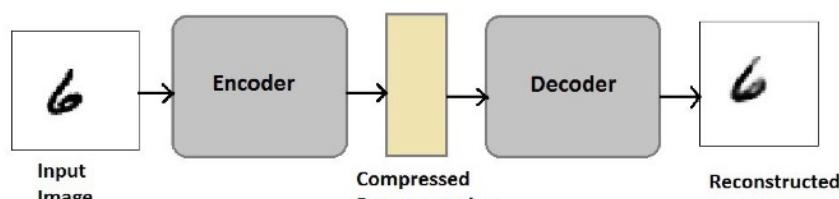
ResNet



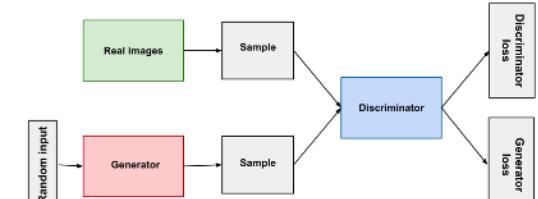
DenseNet



LSTM



Deep AutoEncoders



GAN

# LOSS

모델·데이터 정해진Loss

모델을 어떻게 학습할지

→ 학습→ 뉴럴 네트워크

// 이끌고자 하는 목표  
근사화임.

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

Loss

Regression Task

Classification Task

Probabilistic Task

Min Square Error

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

(Loss) 값을 줄여도

온라인 값을 얻을거란

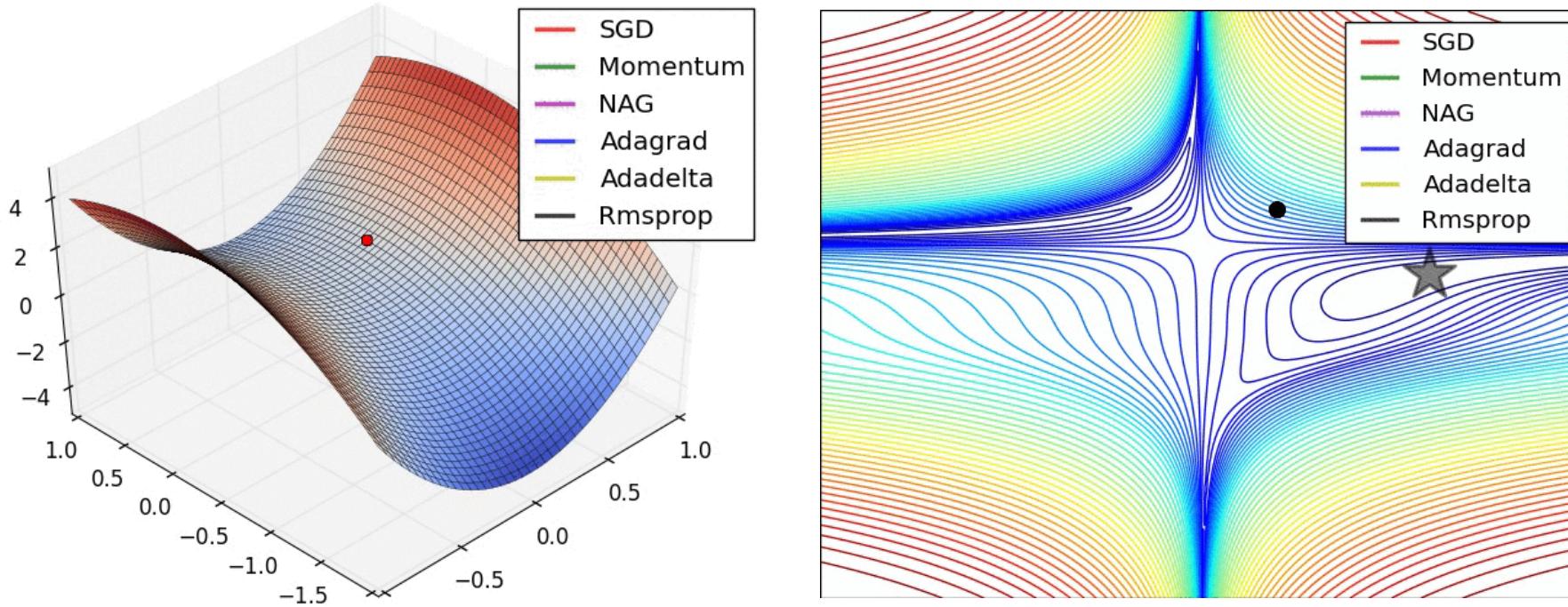
보통의 일상

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

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

# Optimization Algorithm

초기화



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

글로벌 최적화 알고리즘  
제대로 수렴할까

# Historical Review



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

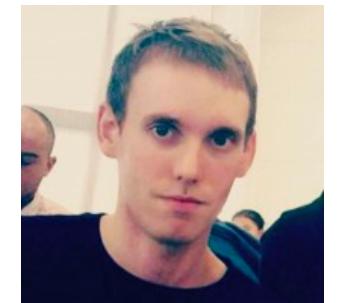
# Historical Review

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

Denny Britz

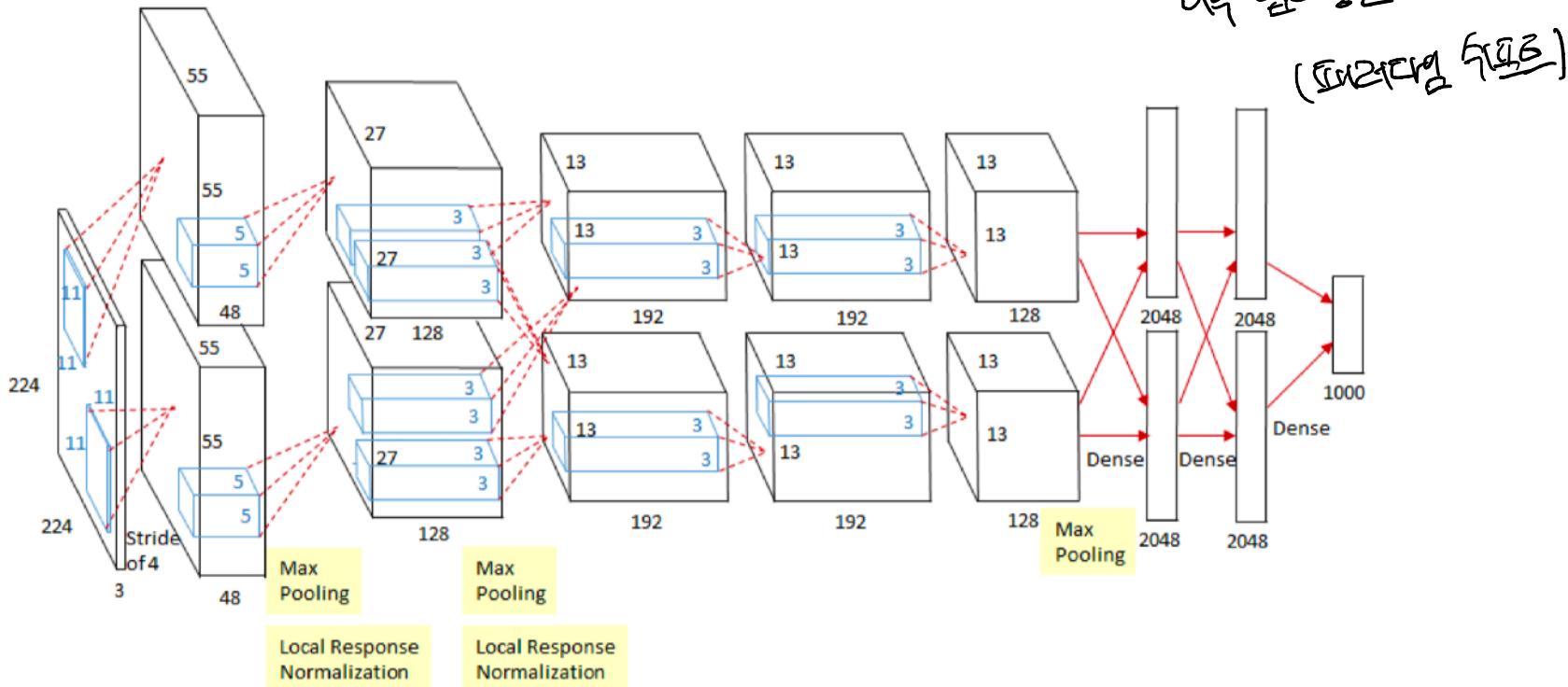
2020-07-29



# 2012 - AlexNet

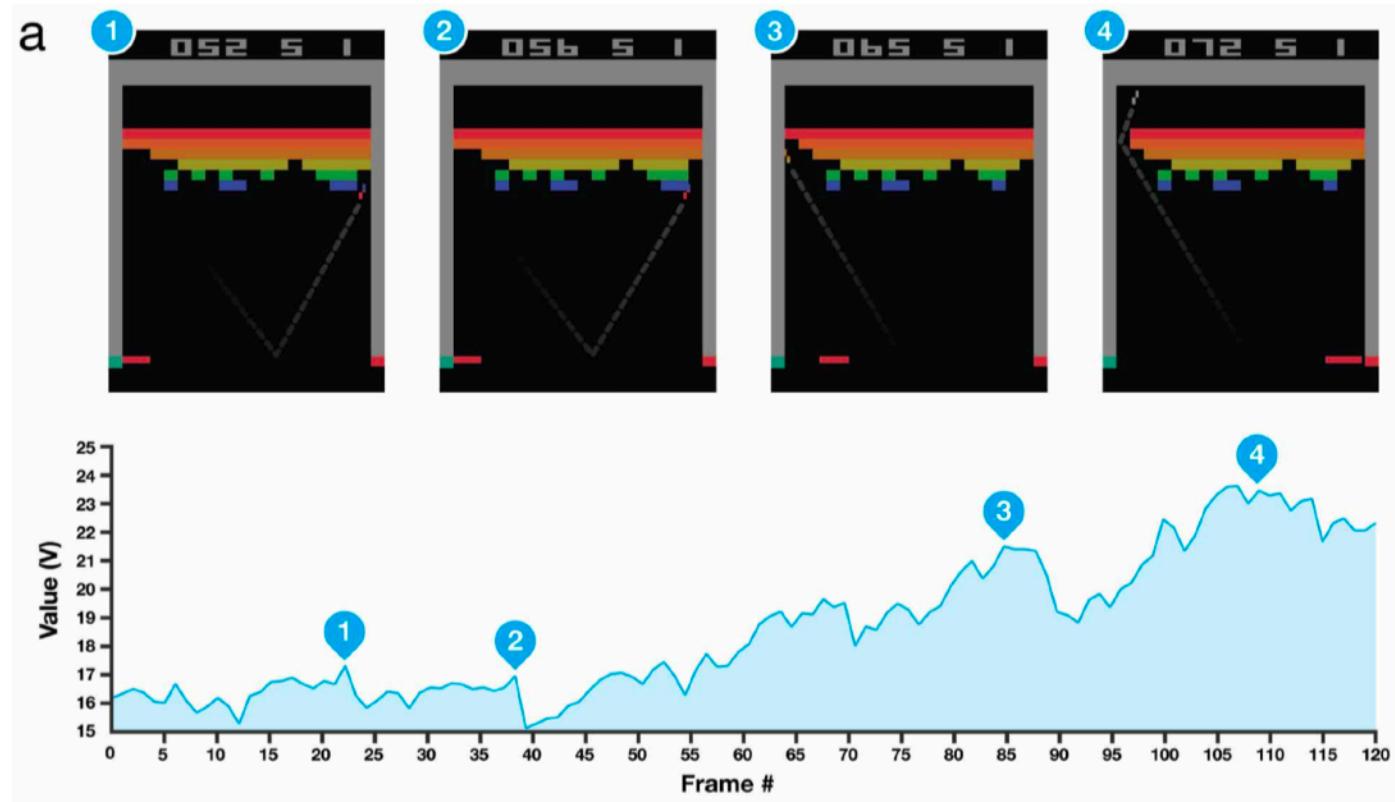
Convolution  
network

딥러닝을 이용해  
동물 인종 찾기  
쓰지전호를  
모기 A4



# 2013 - DQN

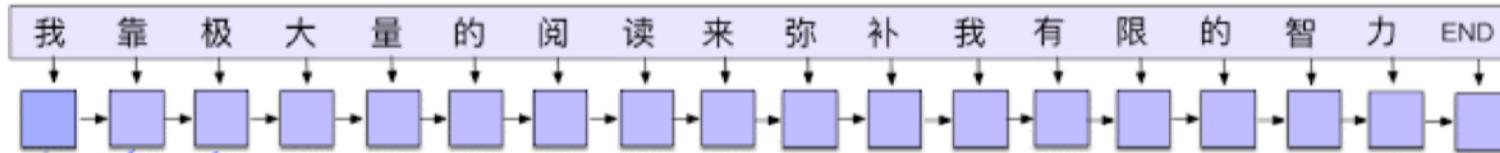
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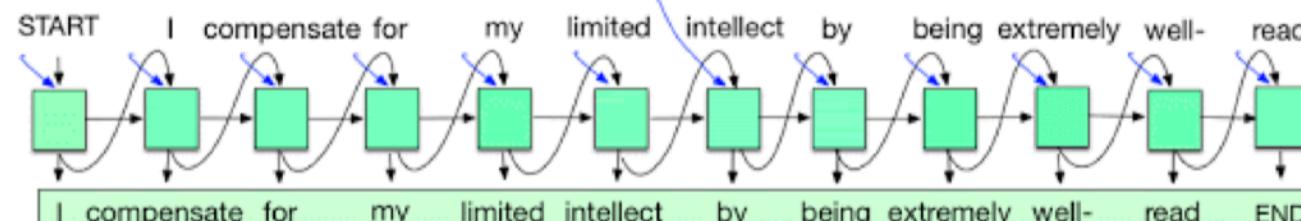
# 2014 - Encoder / Decoder

Encoder / Decoder

ENCODER



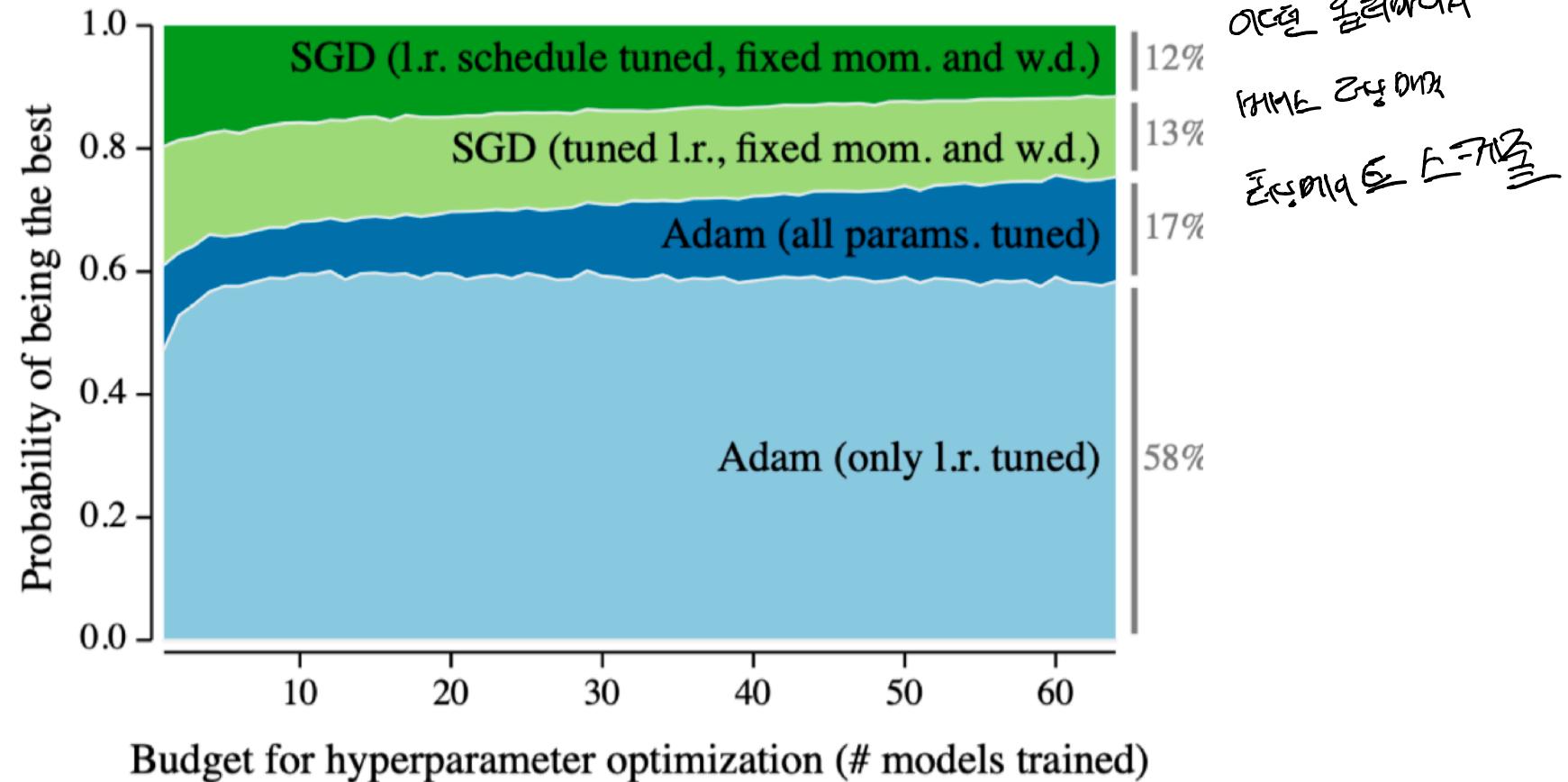
Encoder API



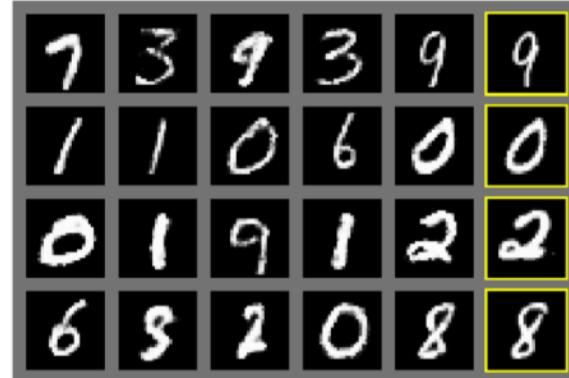
DECODER

# 2014 - ~~Adam~~ Optimizer

.. 결과자 프로토  
.. 잘 나온 .. 프로토 나온



# 2015 - ★ Generative Adversarial Network



a)



b)



c)



d)



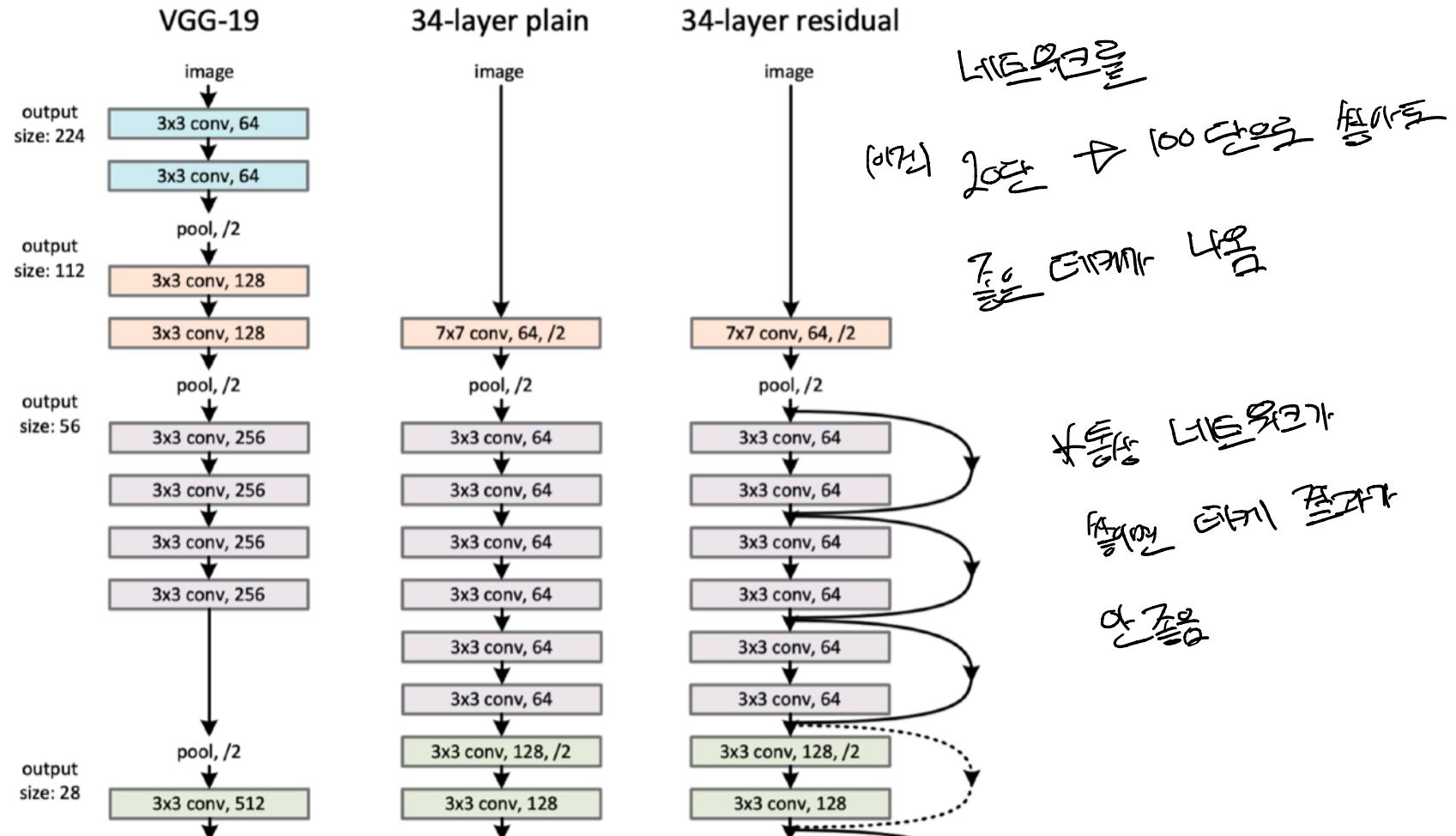
“Finally, we would like to thank **Les Trois Brasseurs** for stimulating our creativity.”



온도를  
설정해

# 2015 - Residual Networks

→ 딥러닝의  
딥러닝의 가능하게 만들었다



# 2017 - Transformer

## Attention Is All You Need

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Google Brain  
[avaswani@google.com](mailto:avaswani@google.com)

**Noam Shazeer\***  
Google Brain  
[noam@google.com](mailto:noam@google.com)

**Niki Parmar\***  
Google Research  
[nikip@google.com](mailto:nikip@google.com)

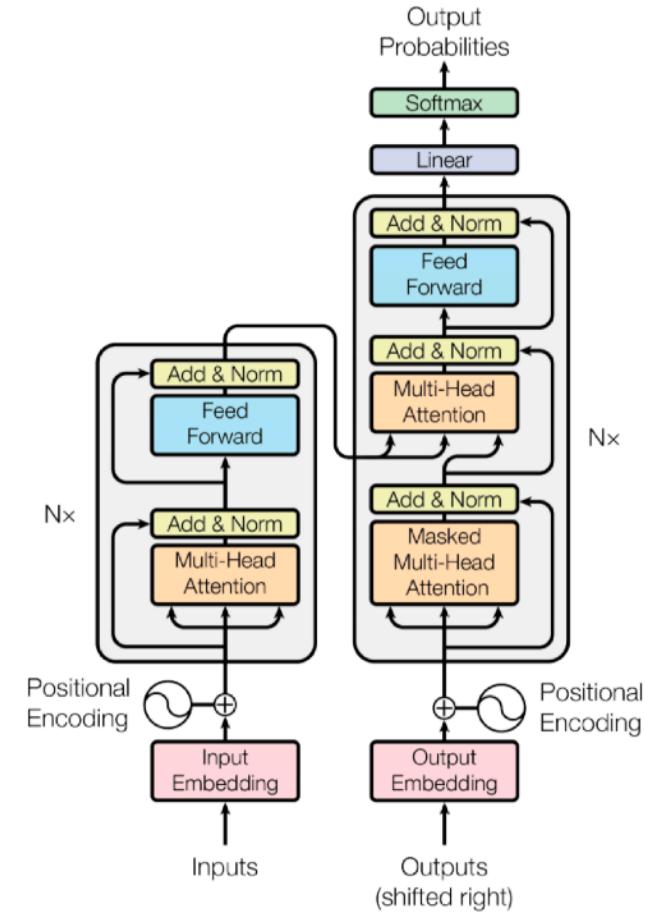
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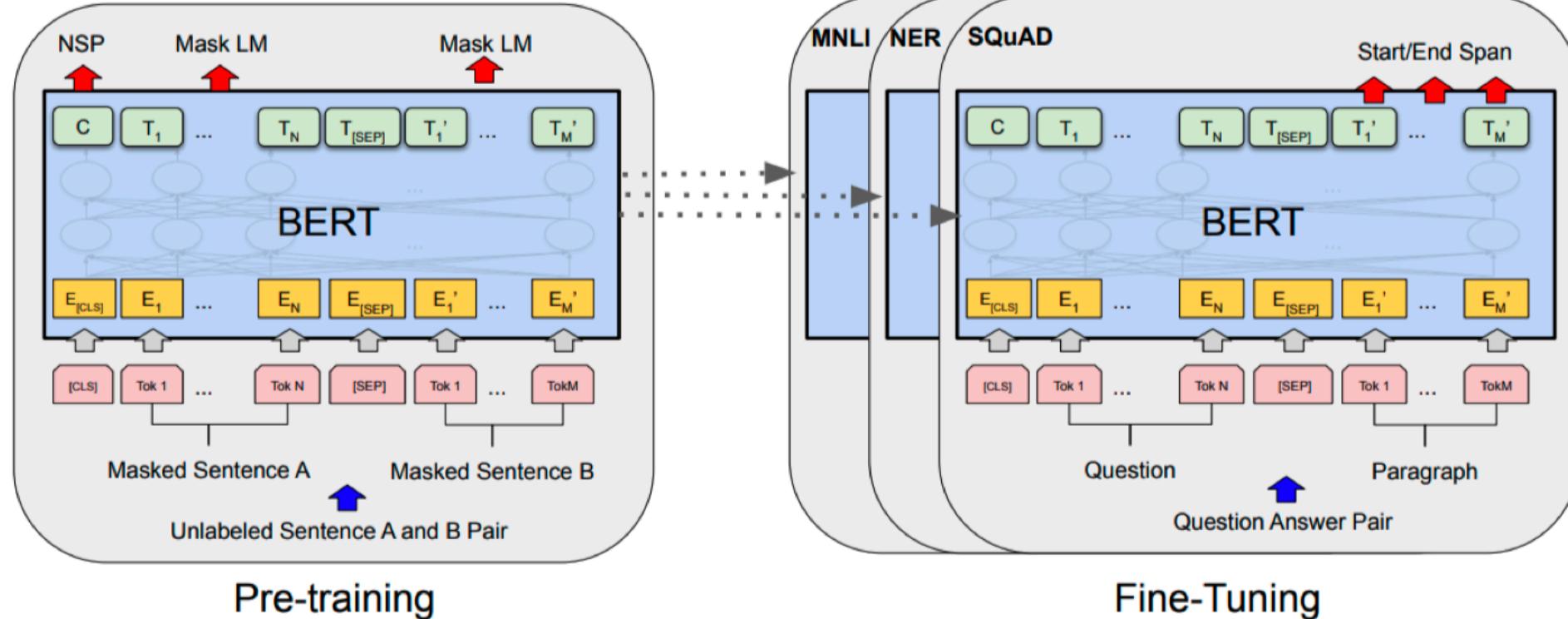
**Illia Polosukhin\* ‡**  
[illia.polosukhin@gmail.com](mailto:illia.polosukhin@gmail.com)



# 2018 - BERT (fine-tuned NLP models)

자연어 처리 → language model

이전 단어를 보았을 때  
다음 단어를 예측



**B**idirectional **E**ncoder **R**epresentations from **T**ransformers

# 2019 - BIG Language Models

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fine tuned NLP model  
플랫폼

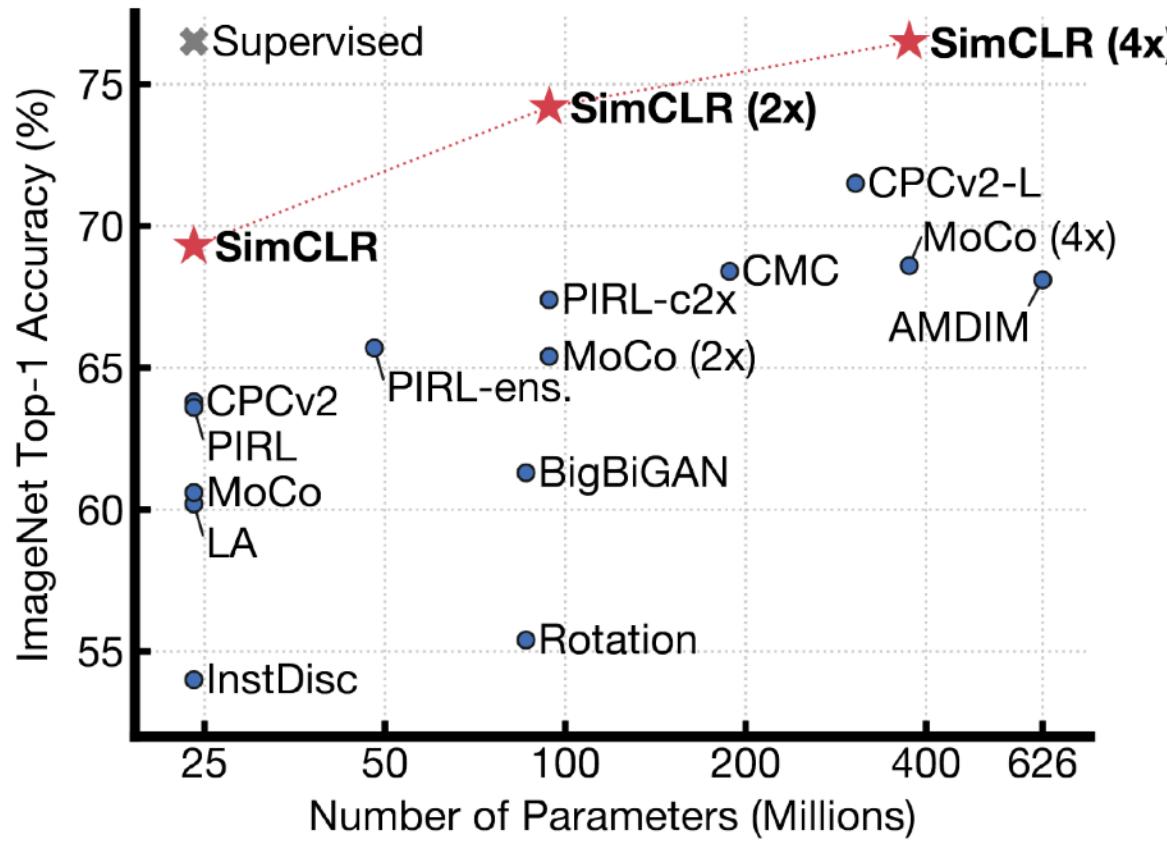


장점과 단점은 다음과 같다

# OpenAI

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

# 2020 - Self Supervised Learning



한국어 번역  
Self-supervised learning은 주어진 데이터만으로 학습하는 기법입니다.  
이번 발표에서는 Self-supervised learning에 대한 소개와 최근 연구 동향을 살펴보겠습니다.  
특히 SimCLR이라는 방법에 대해 자세히 알아보겠습니다.  
SimCLR은 시각적 표현의 학습을 위한 간단한 프레임워크입니다.  
이해하기 쉽도록 간단한 예제와 함께 내용을 살펴보겠습니다.

**SimCLR**: a simple framework for contrastive learning of visual representations

# Thank you for listening

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