

인공지능으로 초대(2)

모두를 위한 인공지능의 활용

한동대학교

김영섭 교수

Artificial Intelligence and Machine Learning



Yes, a computer program created by Google just beat a human at one of the world's most complicated strategy games.

Artificial Intelligence and Machine Learning

구글 CEO 피차이 "알파고 승리는 변곡점...궁극적 승자는 인류"

송고시간 | 2016/04/29 10:41       |  + -

"세계는 모바일에서 인공지능(AI) 중심으로 전환 중"

(서울=연합뉴스) 이 울 기자 = 순다르 피차이 구글 최고경영자(CEO)는 29일 "알파고의 승리는 문자 그대로 모든 것을 바꿀 수 있는 변곡점"이라며 "궁극적인 승자는 인류"라고 말했다.

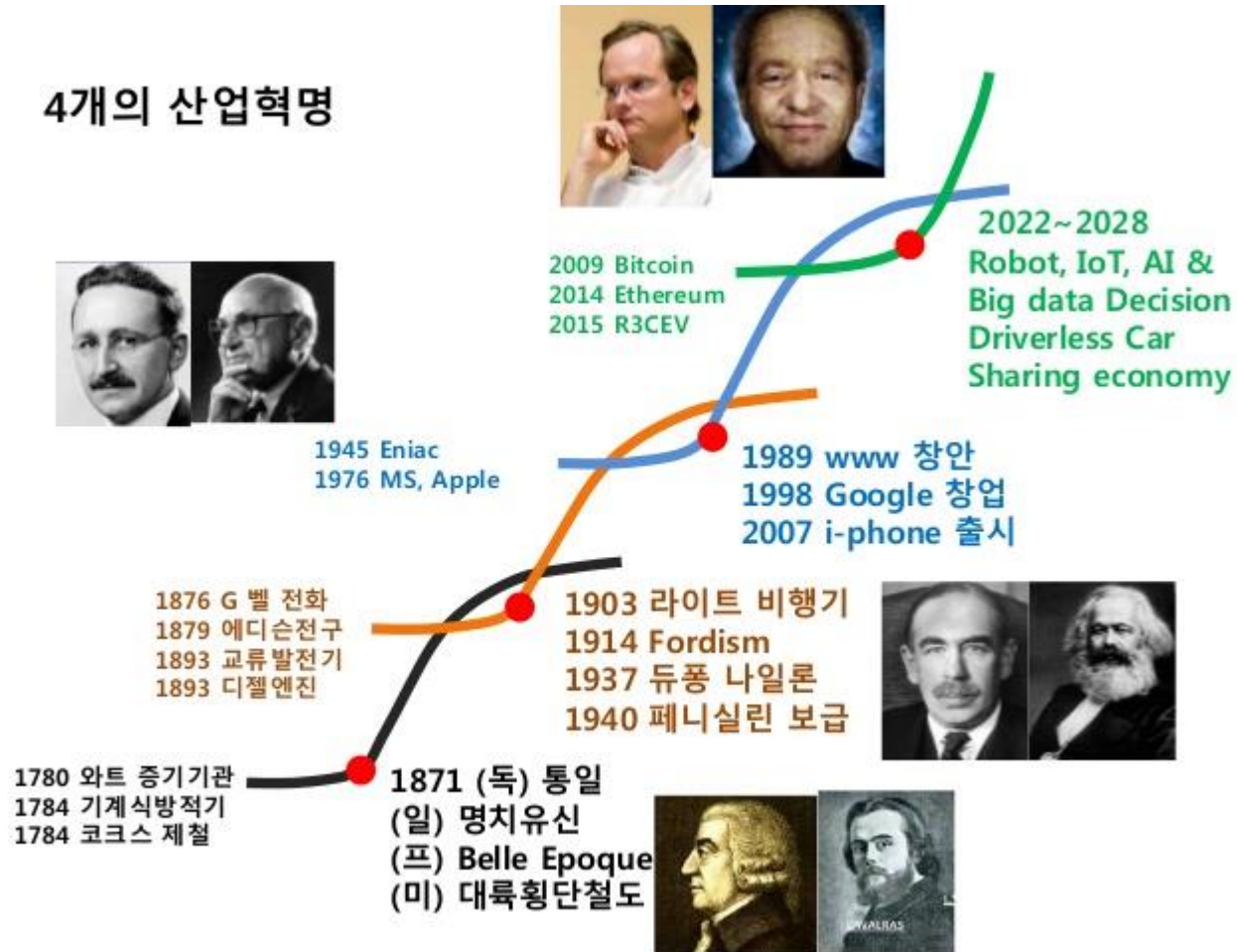


From Mobile-first to AI-first

When I look at where computing is heading, I see how machine learning and artificial intelligence are unlocking capabilities that were unthinkable only a few years ago. This means that the power of the software really matter for hardware more than ever before. Sundar Pichai – Google CEO

Artificial Intelligence and Machine Learning

4개의 산업혁명



Artificial Intelligence and Machine Learning

The slide has a black left sidebar and a red right background. A light pink rounded rectangle is centered on the red background. The text 'Artificial Intelligence' is in the top left of the sidebar. Below it are the website 'theaiconf.com' and hashtag '#TheAIConf'. At the bottom of the sidebar, it says 'PRESENTED BY' followed by the O'Reilly, Intel, and Nervana logos. The pink box contains the text 'AI is the new [blue box] .' and 'Andrew Ng Coursera'.

Artificial Intelligence

theaiconf.com
#TheAIConf

PRESENTED BY

O'REILLY intel Nervana

AI is the new [blue box] .

Andrew Ng
Coursera

It all began with this one, called a Perceptron.

1958

Cornell psychologist Frank Rosenblatt unveils the Perceptron, a single-layer neural network on a room-size computer.



1969

AI giant Marvin Minsky of MIT cowrites a book casting doubt on the viability of neural networks. They fall out of favor.



1986

Neural nets pioneer Geoffrey Hinton and others find a way to train multilayer neural networks to correct mistakes. A flurry of activity ensues.

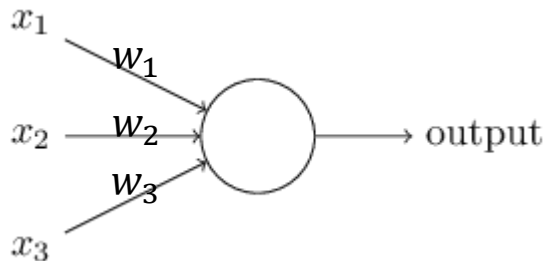
1989

French researcher Yann LeCun, then at Bell Labs, begins foundational work on a type of neural net that becomes crucial for image recognition.

1991

German researchers Sepp Hochreiter and Jürgen Schmidhuber pioneer a neural net with memory features, which eventually proves superior for natural-language processing.

FREDERIC LEWIS—ARCHIVE PHOTOS/GETTY IMAGES, LEFT: ANN E. YOW-DYSON—GETTY IMAGES



$$\text{output} = \begin{cases} 0 & \text{if } (w_1x_1 + w_2x_2 + w_3x_3) \leq \text{threshold} \\ 1 & \text{if } (w_1x_1 + w_2x_2 + w_3x_3) > \text{threshold} \end{cases}$$

$$\text{output} = \begin{cases} 0 & \text{if } \sum_j w_j x_j \leq \text{threshold} \\ 1 & \text{if } \sum_j w_j x_j > \text{threshold} \end{cases}$$

It all began with this one, called a Perceptron.

1958

Cornell psychologist Frank Rosenblatt unveils the Perceptron, a single-layer neural network on a room-size computer.



1969

AI giant Marvin Minsky of MIT cowrites a book casting doubt on the viability of neural networks. They fall out of favor.



1986

Neural nets pioneer Geoffrey Hinton and others find a way to train multilayer neural networks to correct mistakes. A flurry of activity ensues.

1989

French researcher Yann LeCun, then at Bell Labs, begins foundational work on a type of neural net that becomes crucial for image recognition.

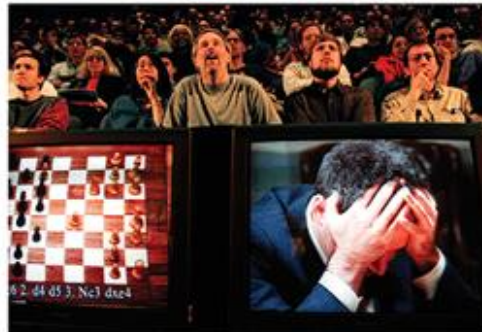
1991

German researchers Sepp Hochreiter and Jürgen Schmidhuber pioneer a neural net with memory features, which eventually proves superior for natural-language processing.

FREDERIC LEWIS—ARCHIVE PHOTOS/GETTY IMAGES, LEFT; ANN E. YOW-DYSON—GETTY IMAGES

1997

IBM's Deep Blue beats **world champion Garry Kasparov** (right) in chess using traditional AI techniques.



STAN HONDA—AFP/GETTY IMAGES

Mid-1990s

Neural nets fall into disfavor again, eclipsed by other machine-learning techniques.

2007

Fei-Fei Li founds ImageNet and begins assembling a database of 14 million labeled images that can be used for machine-learning research. →



CARLOS CHAVARRIA—THE NEW YORK TIMES/REDUX PICTURES

2011

Microsoft introduces neural nets into its speech-recognition features.

It all began with this one, called a Perceptron.

2011

IBM's Watson beats two champions at Jeopardy using traditional AI techniques.



2012
JUNE

Google Brain publishes the "cat experiment." A neural net, shown 10 million unlabeled YouTube images, has trained itself to recognize cats.



AUGUST

Google introduces neural nets into its speech-recognition features.

OCTOBER

A neural net designed by two of Hinton's students wins the annual ImageNet contest by a wide margin.

2013

MAY

Google improves photo search using neural nets.

2014

JANUARY

Google acquires DeepMind, a startup specializing in combining deep learning and reinforcement learning, for \$600 million.

JIM WILSON—THE NEW YORK TIMES/REDUX PICTURES

2015

DECEMBER

A team from Microsoft, using neural nets, outperforms a human on the ImageNet challenge.

2016

MARCH

DeepMind's AlphaGo, using deep learning, defeats world champion **Lee Sedol** in the Chinese game of go, four games to one.



LEE JIN-MAN—AP PHOTO

<http://fortune.com/ai-artificial-intelligence-deep-machine-learning/>

Introduction to AI and ML

1. Introduction to AI and ML

2. AI and ML Tools

3.. First Step

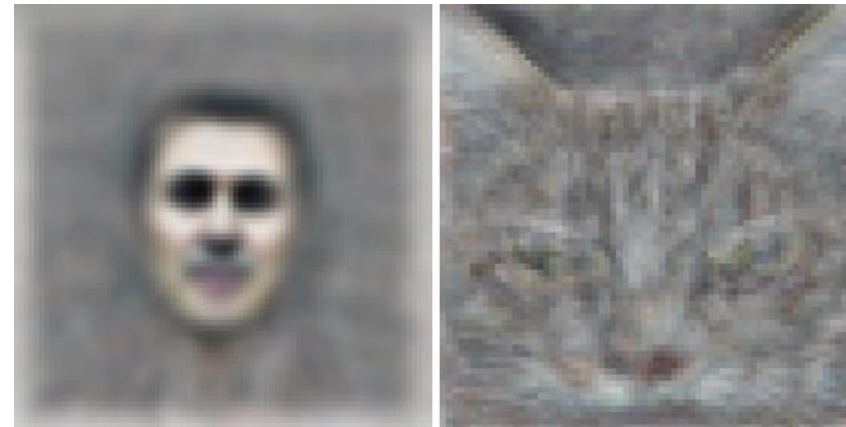
4. Logic

1. Introduction to AI and ML

- 기계학습이란 컴퓨터가 사전에 명시적으로 프로그램을 하지 않았
은 상태에서 축적된 자료를 학습하여 새로운 자료에 대해서도 같
은 작업을 수행할 수 있는 알고리즘이나 처리 과정
- "Field of Study that gives computers the ability to learn without being
explicitly programmed", Arthur Samuel, 1959

Start with two problems

- Multiply these numbers
- Recognize things in these images

$$\begin{array}{r} 3.14159\ 26535 \\ \times 2.71828\ 18284 \\ \times 1.41421\ 35623 \\ \times 1.61803\ 39887 \\ \hline \end{array}$$


Start with two problems

- There are things that the computer can do better than man.
There are things that man can do better than the computer.
- Is this right?
- It was right a few year back.
Now?
That is a question!

AlphaGo seals 4-1 victory over Go grandmaster Lee Sedol

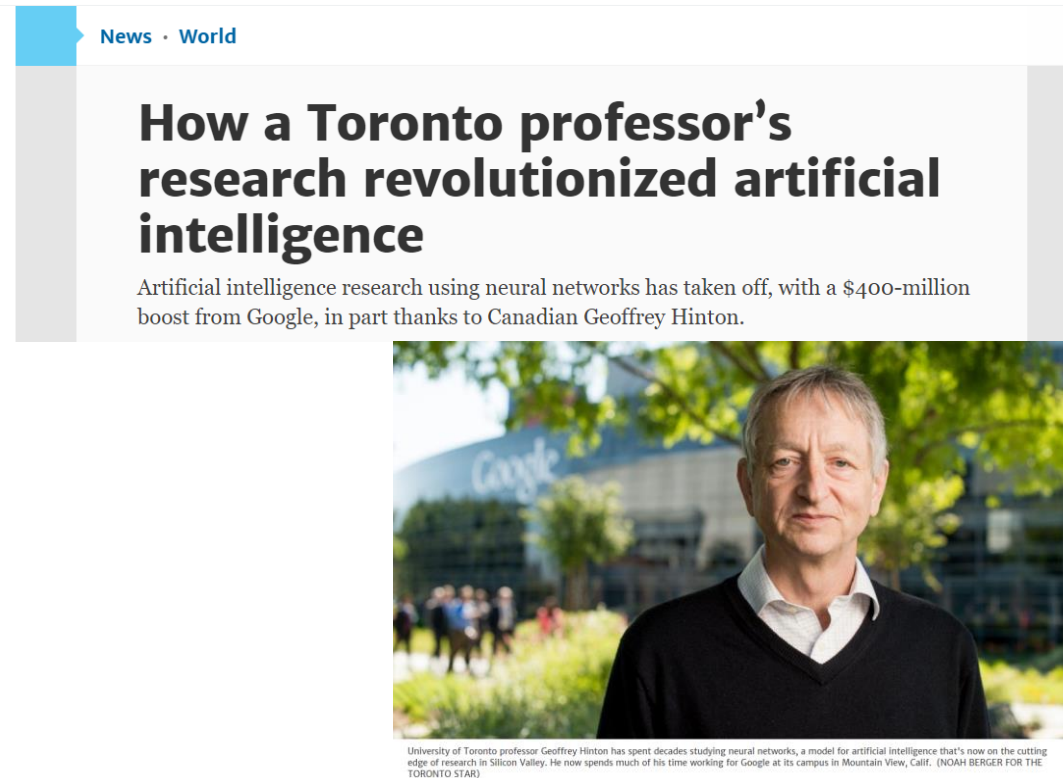
DeepMind's artificial intelligence astonishes fans to defeat human opponent and offers evidence computer software has mastered a major challenge



The world's top Go player, Lee Sedol, lost the final game of the Google DeepMind challenge match.
Photograph: Yonhap/Reuters

What happened?

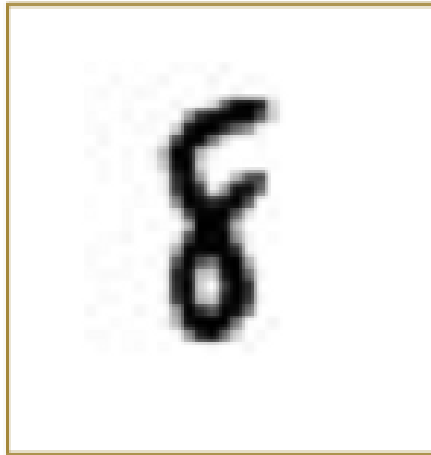
- Two things happened:
 1. There was a breakthrough in computation recently(2006).
 2. **Big data**



Start simple:



Not simple



Simple

Start simple:



Two young girls are playing with Lego toy.



A young boy is holding a baseball bat.



A cat is sitting on a couch with a remote control.

https://www.ted.com/talks/fei_fei_li_how_we_re_teaching_computers_to_understand_pictures

Start simple:

- Fei Fei Li,
How we're teaching computers to understand pictures
- [In English](#)
- [In Korean](#)

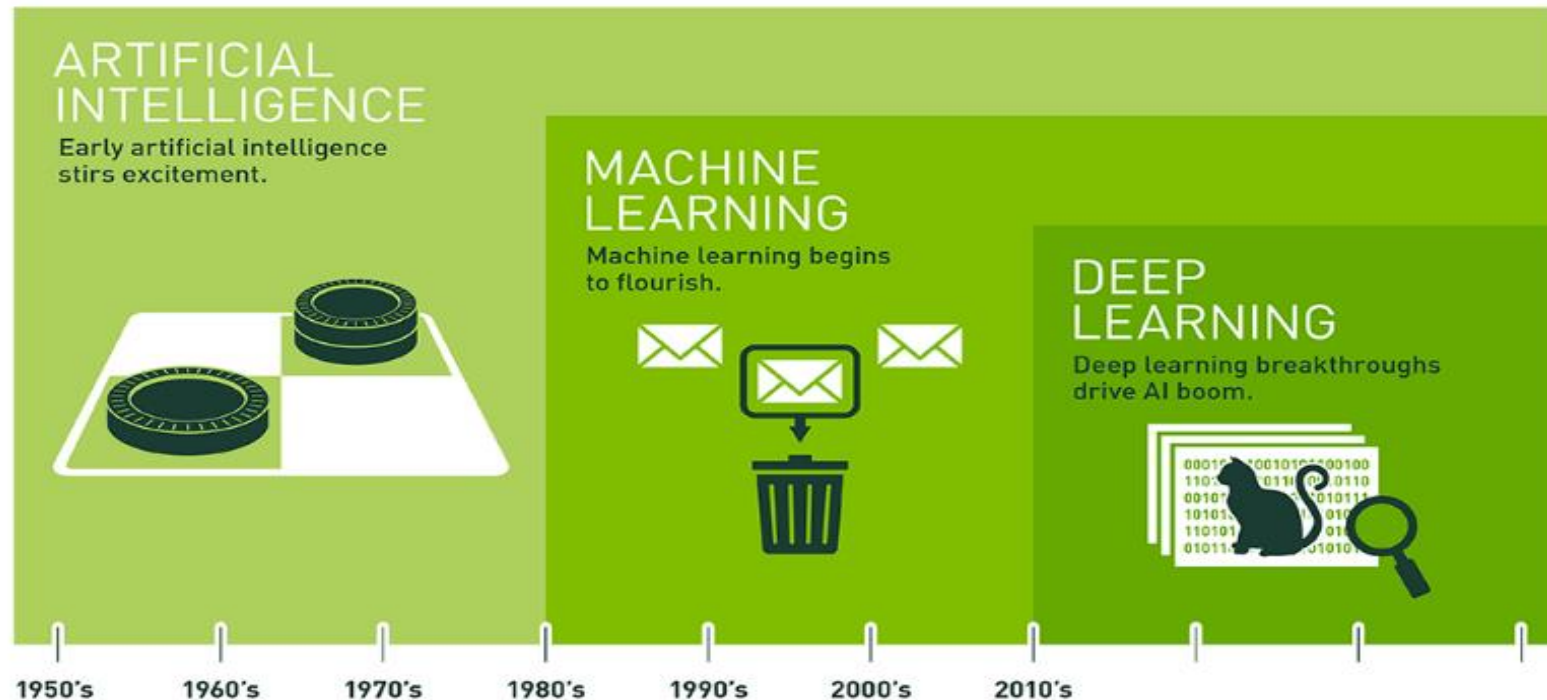
1. Introduction to AI and ML

Definitions

- **AI – Artificial Intelligence**
- **ML – Machine Learning**
- **DL – Deep Learning**
- **ANN – Artificial Neural Networks**

1. Introduction to AI and ML

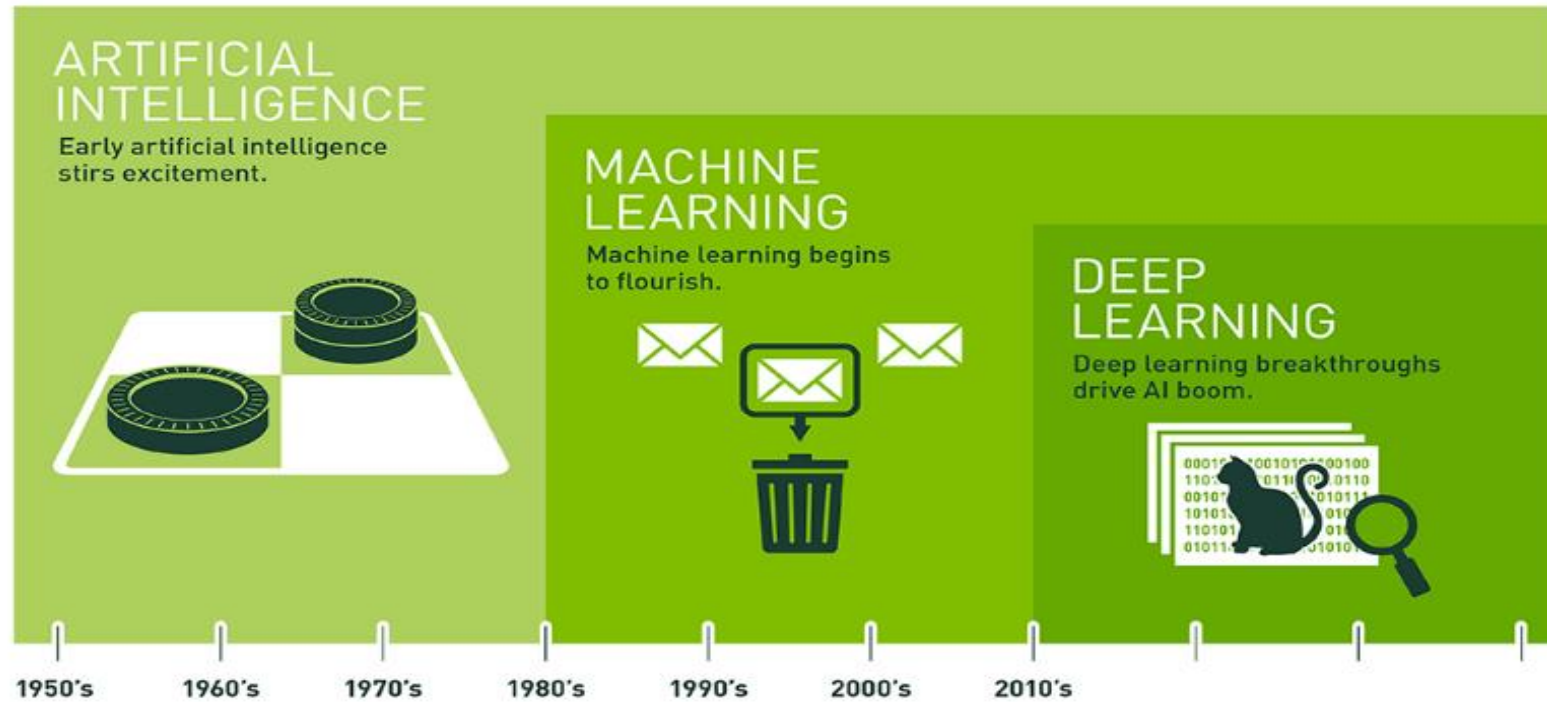
AI is the broadest term, applying to any technique that **enables computers to mimic human intelligence**, using logic, if-then rules, decision trees, and machine learning (including deep learning).



Since an early flush of optimism in the 1950s, smaller subsets of artificial intelligence – first machine learning, then deep learning, a subset of machine learning – have created ever larger disruptions.

1. Introduction to AI and ML

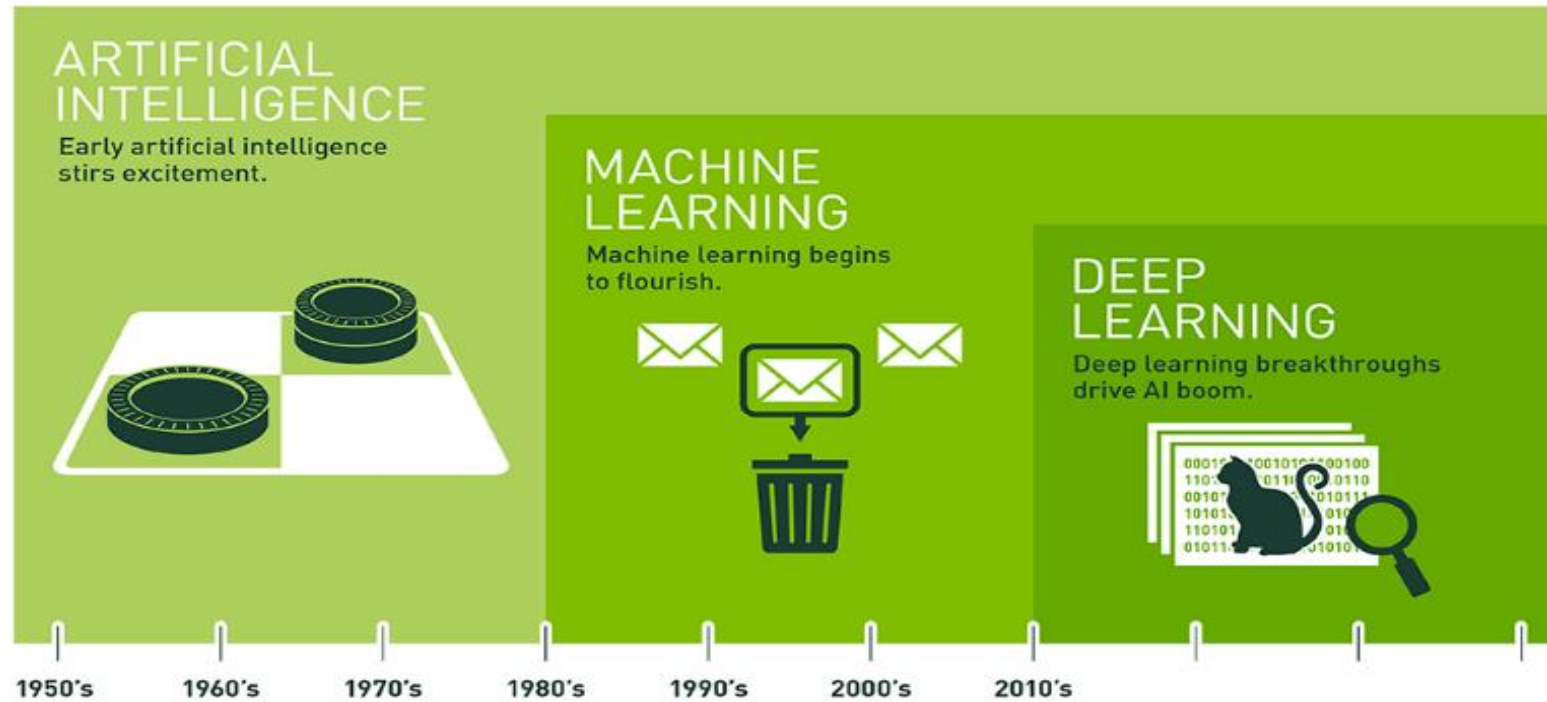
ML is the subset of AI that includes abstruse statistical techniques that enable **machines to improve at tasks with experience**. The category includes deep learning.



Since an early flush of optimism in the 1950s, smaller subsets of artificial intelligence – first machine learning, then deep learning, a subset of machine learning – have created ever larger disruptions.

1. Introduction to AI and ML

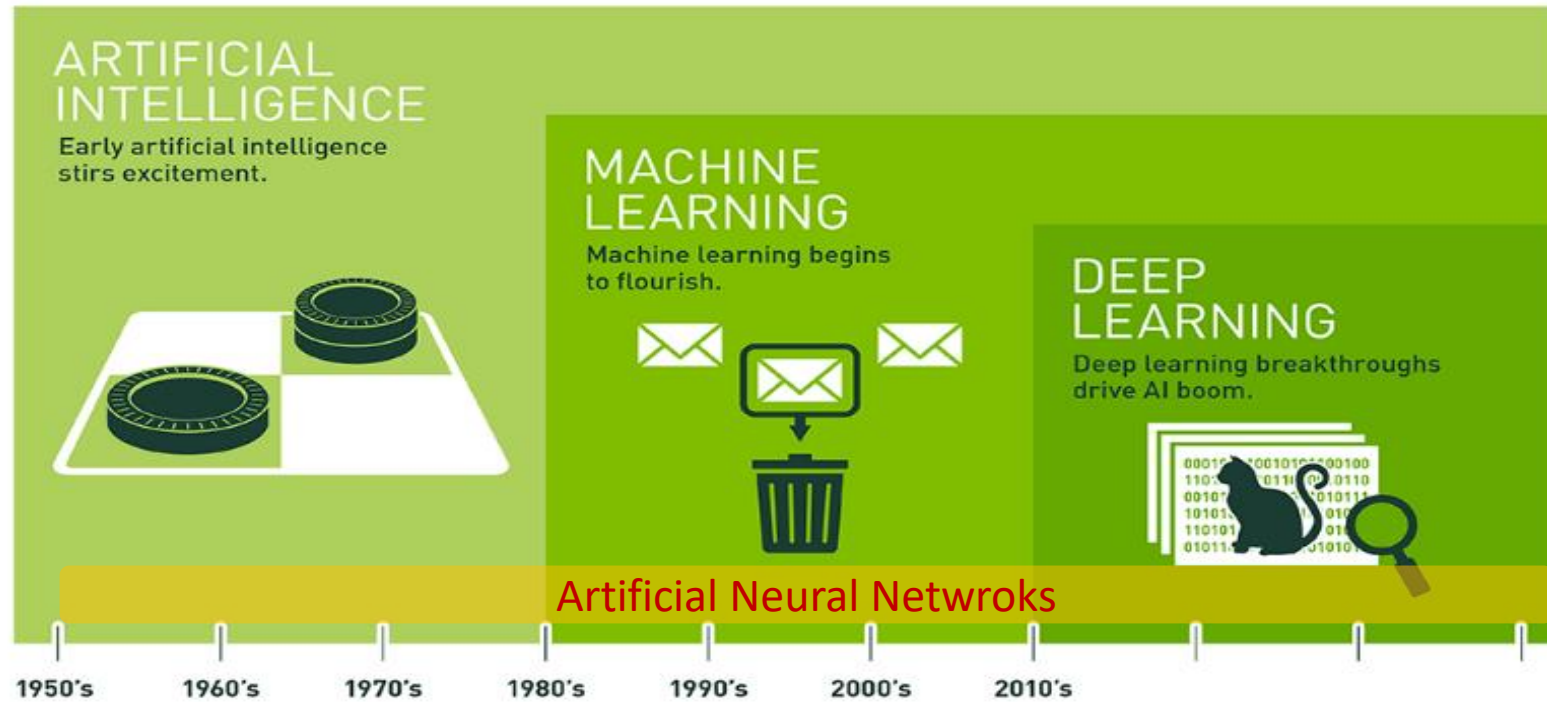
DL is the subset of machine learning composed of algorithms that permit software to train itself to perform tasks, like speech and image recognition, by exposing multilayered neural networks to vast amounts of data.



Since an early flush of optimism in the 1950s, smaller subsets of artificial intelligence – first machine learning, then deep learning, a subset of machine learning – have created ever larger disruptions.

1. Introduction to AI and ML

NNs are computing systems inspired by the biological neural networks that constitute animal brains. Such systems learn (progressively improve performance) to do tasks by considering examples, **generally without task-specific programming**.



Since an early flush of optimism in the 1950s, smaller subsets of artificial intelligence – first machine learning, then deep learning, a subset of machine learning – have created ever larger disruptions.

I'm working on Machine Learning...

- What society thinks I do

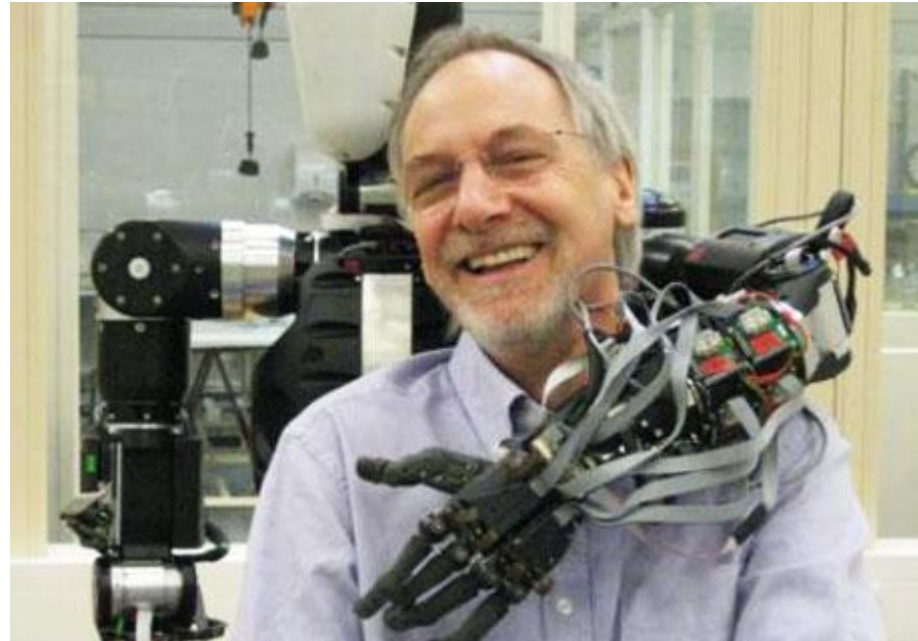


<http://www.activistpost.com/2015/10/this-is-a-tipping-point-robots-cheaper-than-any-human-worker-means-the-end-of-jobs.html>

[@KirkDBorne](#)

I'm working on Machine Learning...

- What my friends thinks I do



<http://upakovano.ru/news/403816>

[@KirkDBorne](#)

I'm working on Machine Learning...

- What my wife thinks I do



<http://www.quikrpost.com/813/indias-param-among-worlds-most-power-efficient-supercomputer/#.WZ2FgihJb4Y>

I'm working on Machine Learning...

- What other programmers thinks I do

Cost function

Logistic regression:

$$J(\theta) = -\frac{1}{m} \left[\sum_{i=1}^m y^{(i)} \log h_{\theta}(x^{(i)}) + (1 - y^{(i)}) \log(1 - h_{\theta}(x^{(i)})) \right] + \frac{\lambda}{2m} \sum_{j=1}^n \theta_j^2$$

Neural network:

$\rightarrow h_{\Theta}(x) \in \mathbb{R}^K$ $(h_{\Theta}(x))_i = i^{th}$ output

$$\rightarrow J(\Theta) = -\frac{1}{m} \left[\sum_{i=1}^m \sum_{k=1}^K y_k^{(i)} \log(h_{\Theta}(x^{(i)}))_k + (1 - y_k^{(i)}) \log(1 - (h_{\Theta}(x^{(i)}))_k) \right]$$

$$+ \frac{\lambda}{2m} \sum_{l=1}^{L-1} \sum_{i=1}^{s_l} \sum_{j=1}^{s_{l+1}} (\Theta_{ji}^{(l)})^2$$

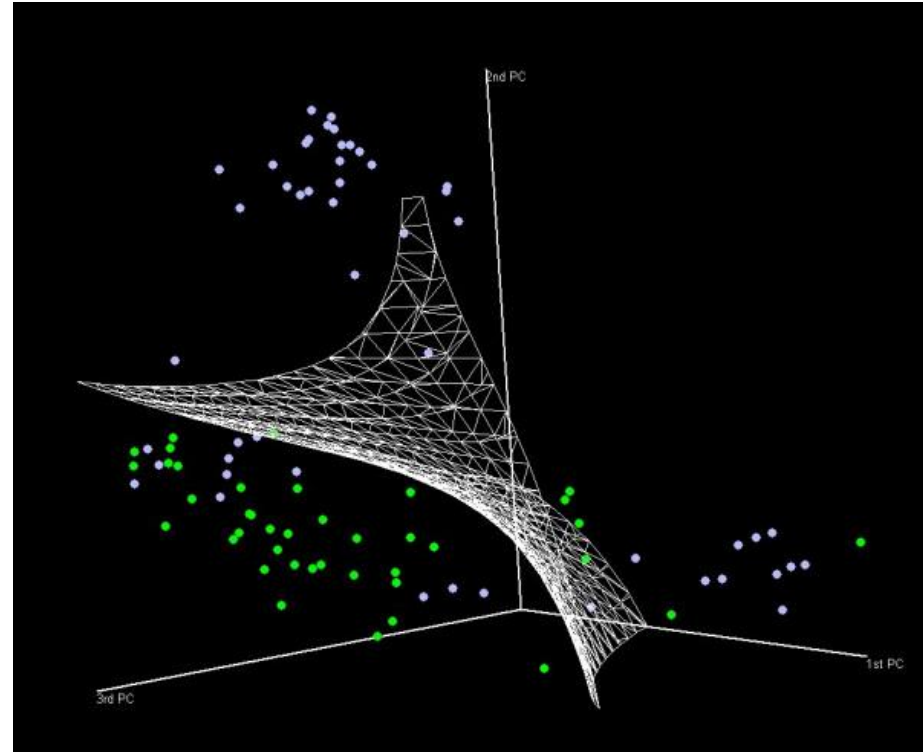
$\Theta_{ji}^{(l)}$ $\Theta_{i0}^{(2)} x_0 + \Theta_{i1}^{(2)} x_1 + \dots$ y_k $\begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}$

$\leftarrow i=0 \dots s_l$ a_0

Andrew Ng

I'm working on Machine Learning...

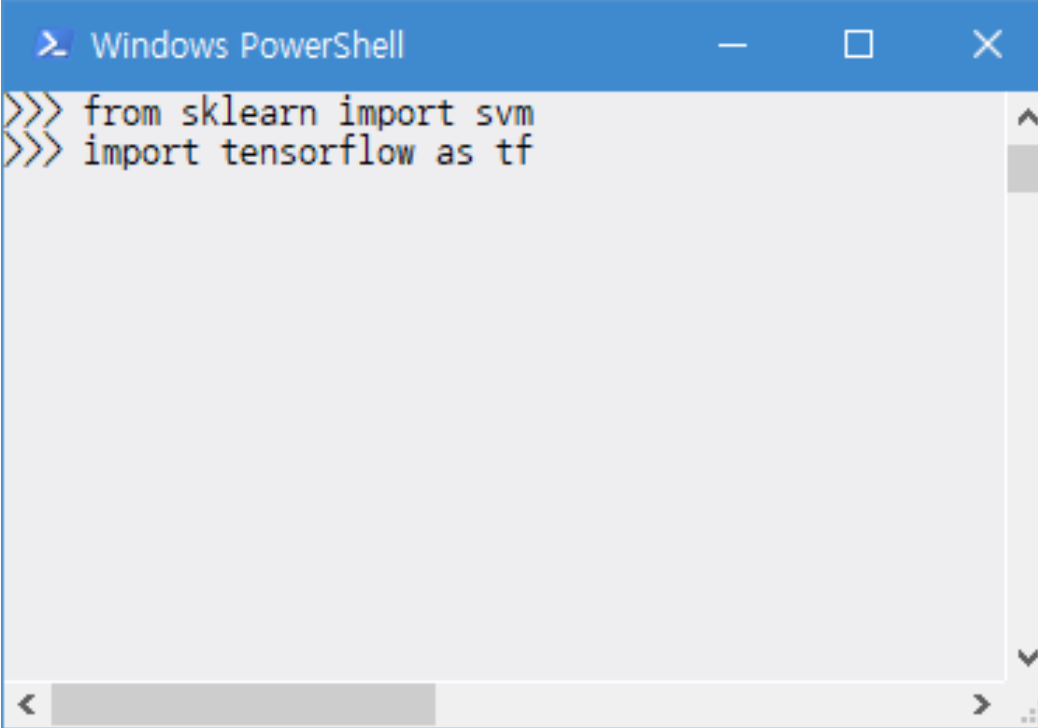
- What I thinks I do



<https://computervisionblog.wordpress.com/2012/04/05/viewing-computer-vision-from-a-bigger-picture/>

I'm working on Machine Learning...

- What really I do



```
>>> from sklearn import svm
>>> import tensorflow as tf
```

A screenshot of a Windows PowerShell window. The title bar is blue and contains the text "Windows PowerShell" along with standard window control buttons (minimize, maximize, close). The main area is a light gray text editor with two lines of Python code: ">>> from sklearn import svm" and ">>> import tensorflow as tf". The text is in a monospaced font. On the right side of the text area, there is a vertical scrollbar. At the bottom of the window, there is a horizontal scrollbar and a small status bar area.

What really we do ...

1. Watch and share video about AI/ML/DL
 - understand the technology
 - find about past, today, and future of them.
 - think through my apps
2. Find and build someone's implementations by myself.
3. Implement hand-written character recognition using neural network.



What really we do ...

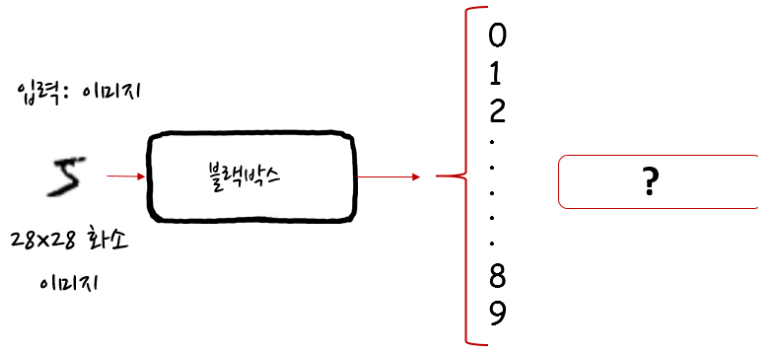
- Implement hand-written character recognition using neural network.

What really we do ...



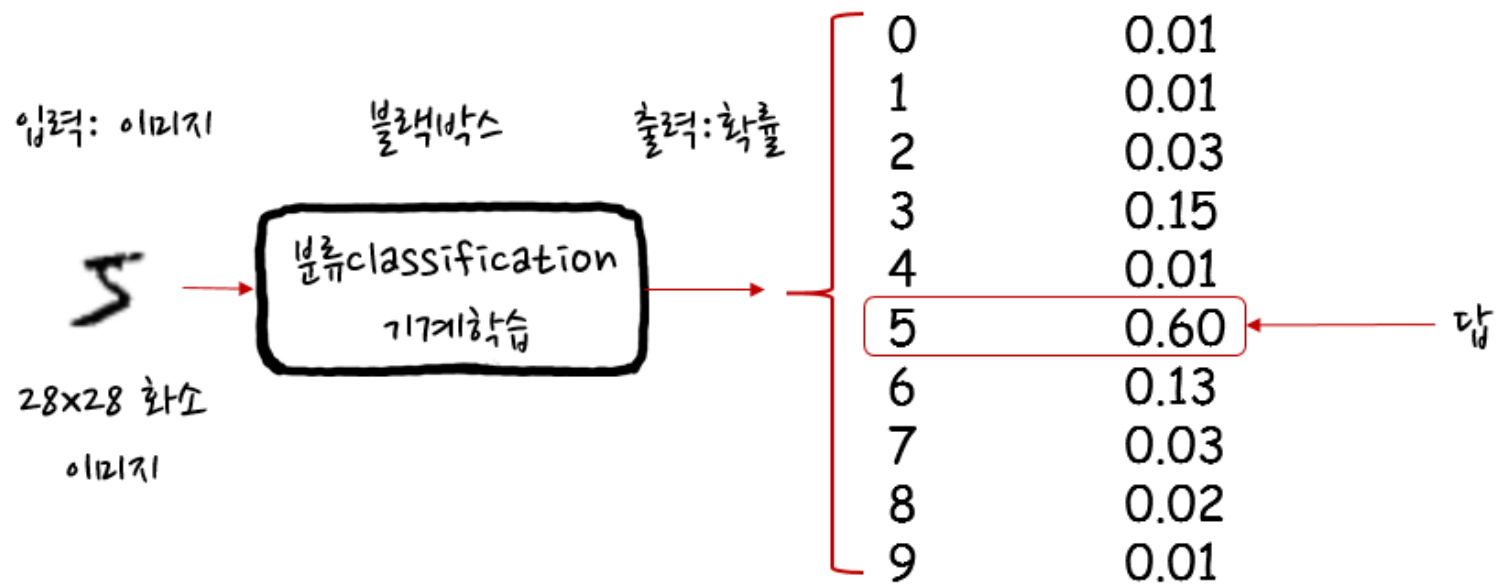
- Implement hand-written character recognition using neural network.
- MNIST([National Institute of Standards and Technology](https://www.nist.gov/special-interests/mnist))
 - The MNIST database of **handwritten digits** has a training set of 60,000 examples, and a test set of 10,000 examples.

What really we do ...



- Implement hand-written character recognition using neural network.
- MNIST([National Institute of Standards and Technology](http://www.nist.gov/special_services/mnist/))
 - The MNIST database of **handwritten digits** has a training set of 60,000 examples, and a test set of 10,000 examples.

What really
we do ...



Introduction to AI and ML

1. Introduction to AI and ML

2. AI and ML Tools

3.. First Step

4. Logic

Tools for ML

1. Python & Jupyter notebook(IDE to use)
 - NumPy
 - matplotlib
 - pandas
2. ML Open Library
 - scikit-learn
3. ML Open Framework
 - TensorFlow
 - Keras
 - PyTorch
4. Anaconda
5. CoLaboratory