

معاونت آموزشی و تحصیلات تکمیلی دانشگاه مدیریت برنامه‌ریزی آموزشی دانشگاه

طرح دانش‌افزایی و توانمندسازی اعضای هیأت علمی

کارگاه آموزشی:
"کاربرد هوش مصنوعی در آموزش"

AI in Education

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

The image features the Basmala (Bismillah) in a highly stylized, calligraphic font. The text is rendered in a dark blue color and is set against a light blue background with a repeating geometric pattern of interlocking stars and polygons. The calligraphy is dynamic, with long, sweeping lines and decorative flourishes. Three small, dark blue squares are placed at the end of the main lines of the text, serving as decorative markers or 'dots'.

Introduction; Industry 4 & Cyber Physical Systems

Artificial Intelligence

Data Mining Machine Learning & Deep Learning

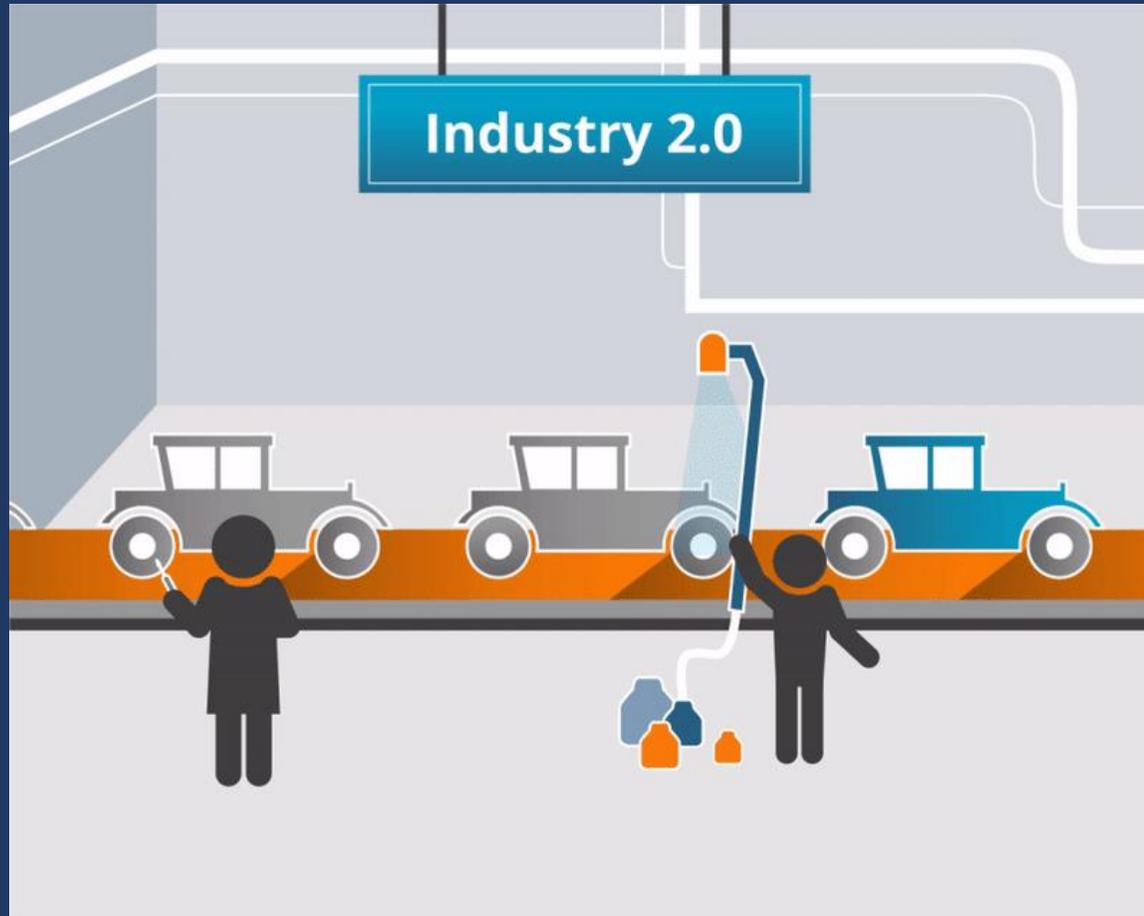
AI Tools

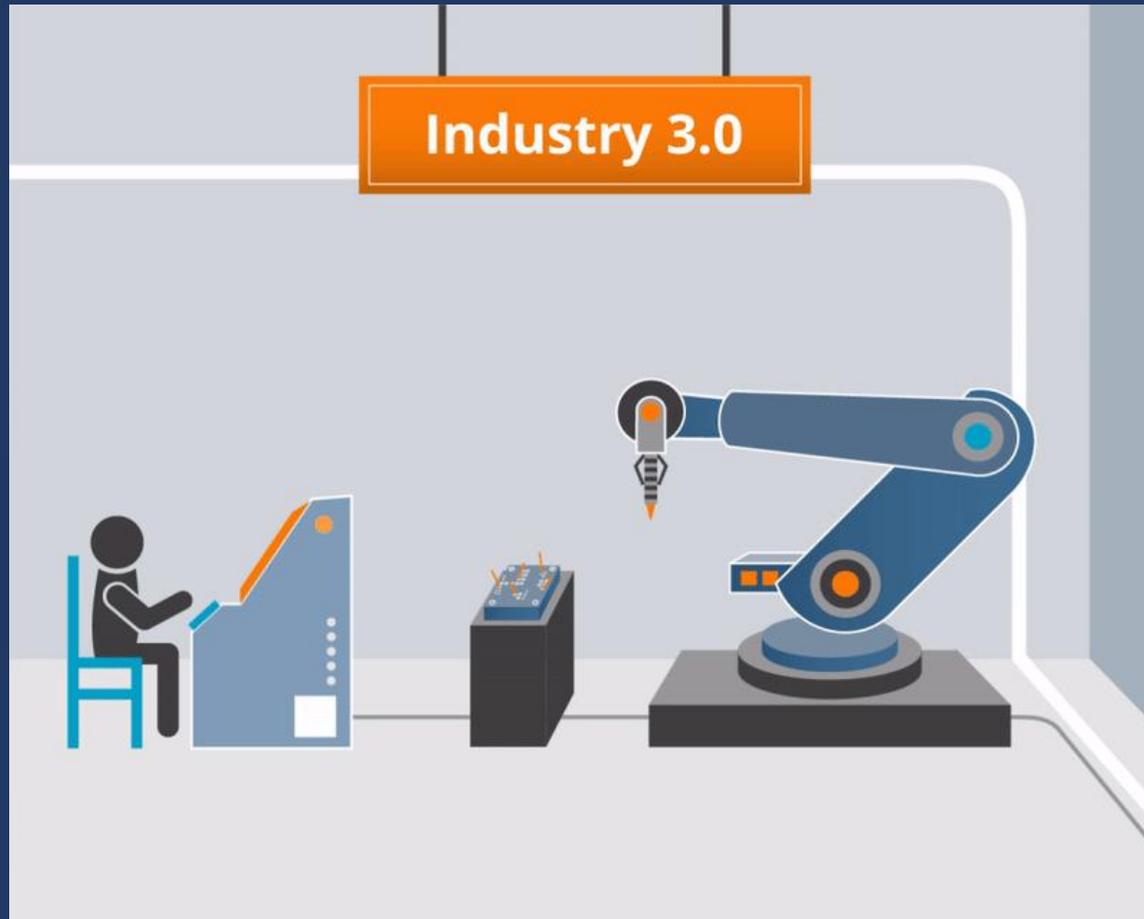
Brief Notes on Educations Technologies

AI in Educations: Applicable Uses

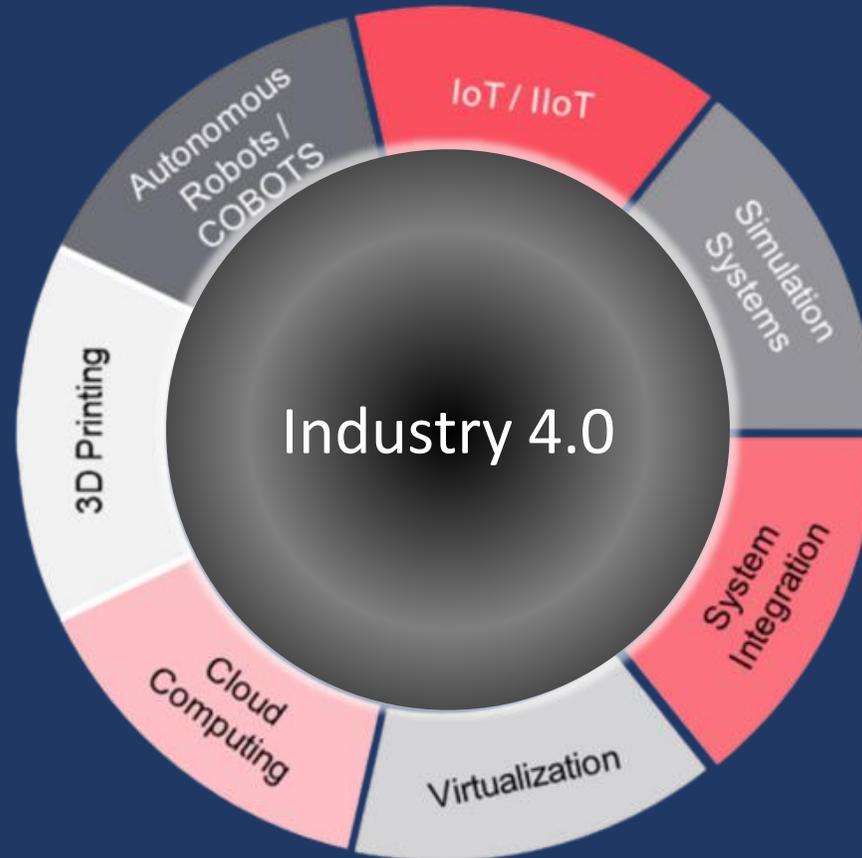
Conclusion: Will AI Transform Higher Education?

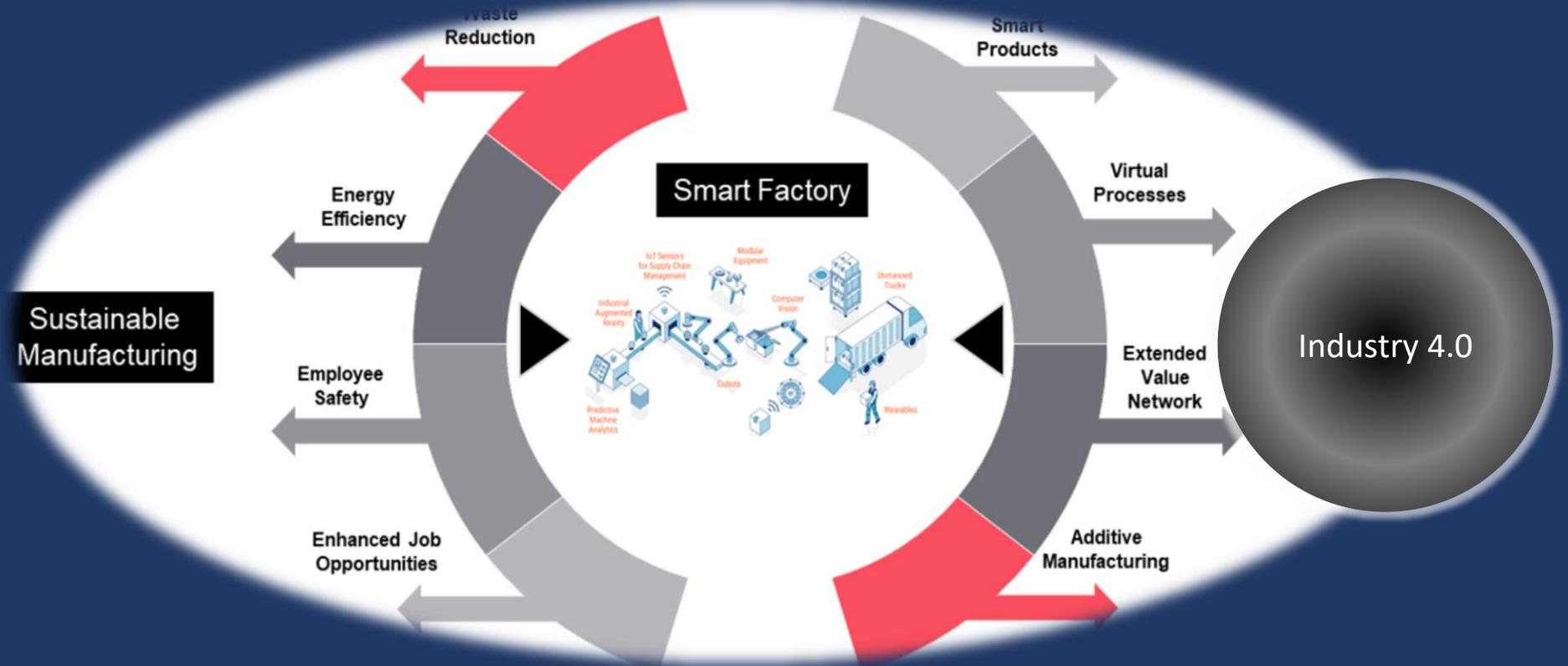








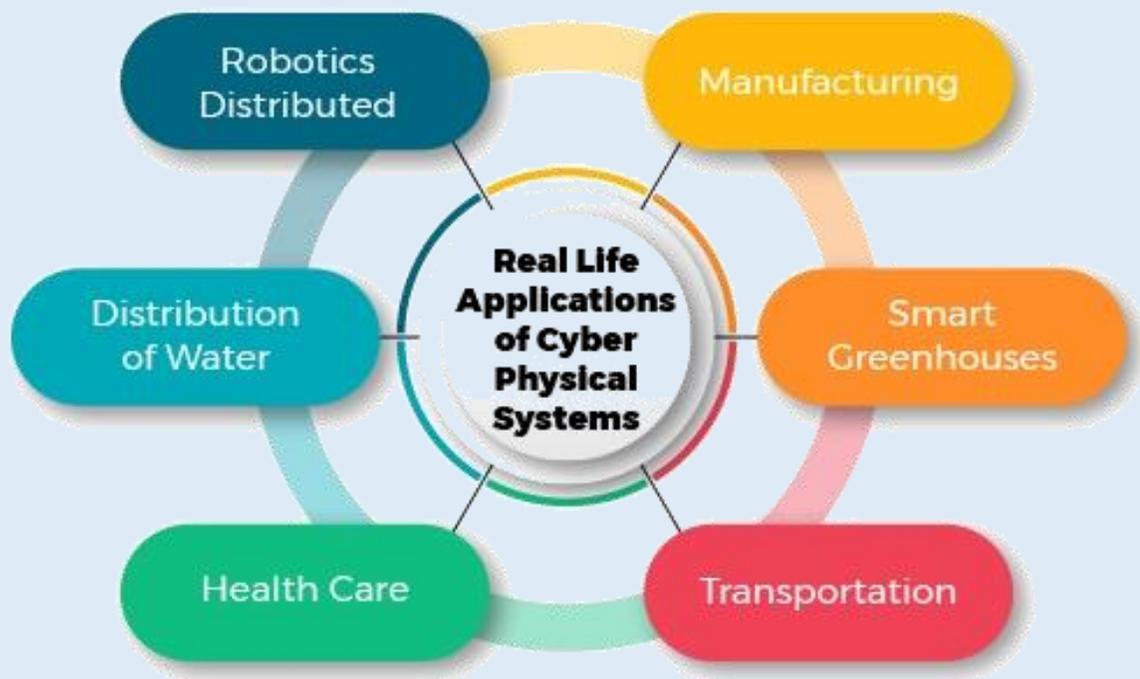




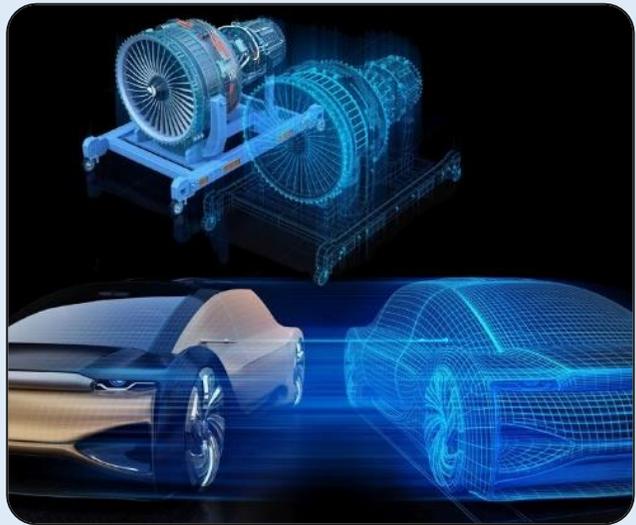
در صنعت نسل چهارم (Industry 4.0)، سطوح مختلف اتوماسیون، کامپیوترها، ربات‌ها، الگوریتم‌های یادگیری ماشین، هوش مصنوعی، انسان و شبکه‌های ارتباطی چنان در کنار یکدیگر به کار گرفته می‌شوند تا ربات‌های یادگیرنده را با کمترین دخالت انسان به منظور تولید و ارائه خدمات، کنترل نمایند. به همین دلیل در صنعت نسل ۴، مفهوم "کارخانه هوشمند" شکل می‌گیرد.



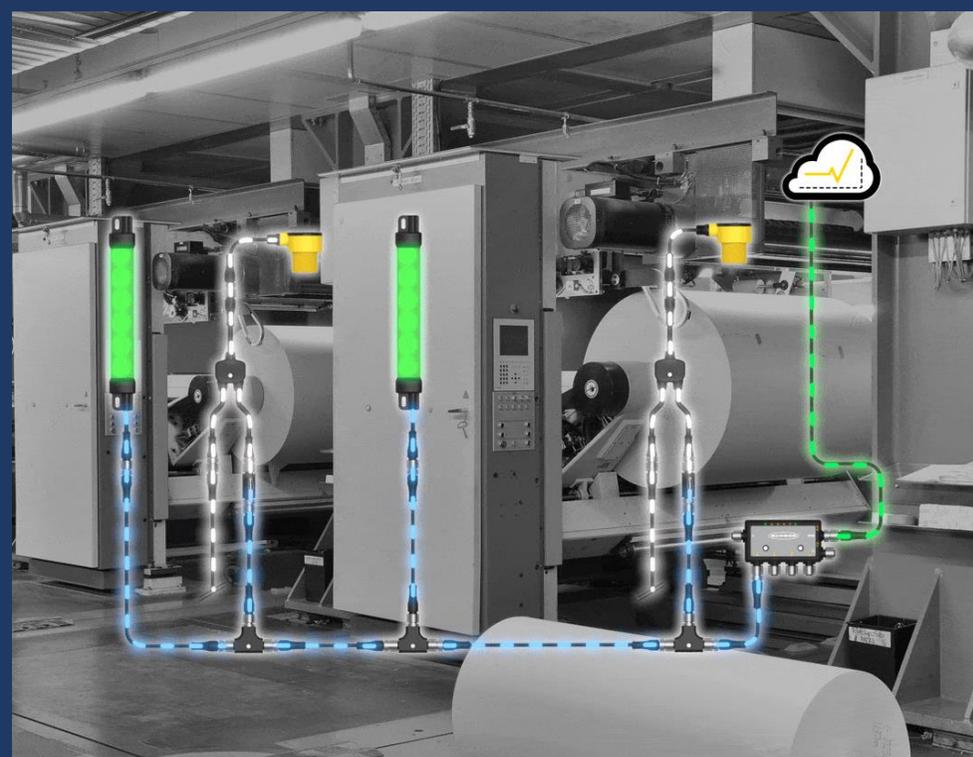
در Industry 4.0، فرآیندهای فیزیکی موجود در کارخانه هوشمند و زنجیره ارزش آن به واسطه سامانه‌هایی که به آنها Cyber Physical Systems (CPS) اطلاق می‌شود، با استفاده از پایش مداوم داده‌های حاصل از حسگرهای هوشمند و معمول که در شبکه‌های صنعتی قرار دارند و با پردازش و تفسیر آن‌ها، اطلاعات با ارزشی برای خلق یک **نسخه مجازی** از فرآیندهای مزبور ایجاد می‌کند.

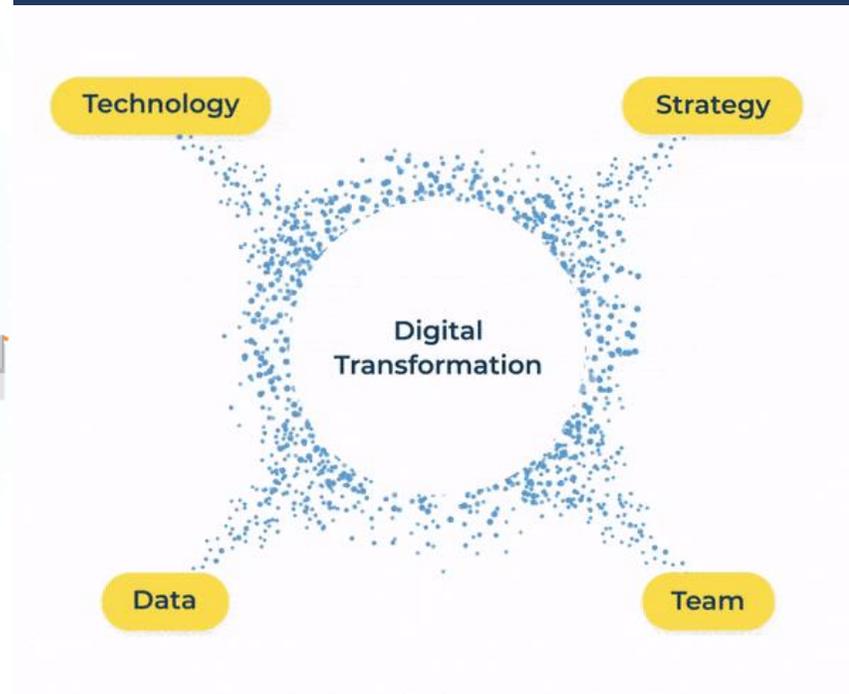
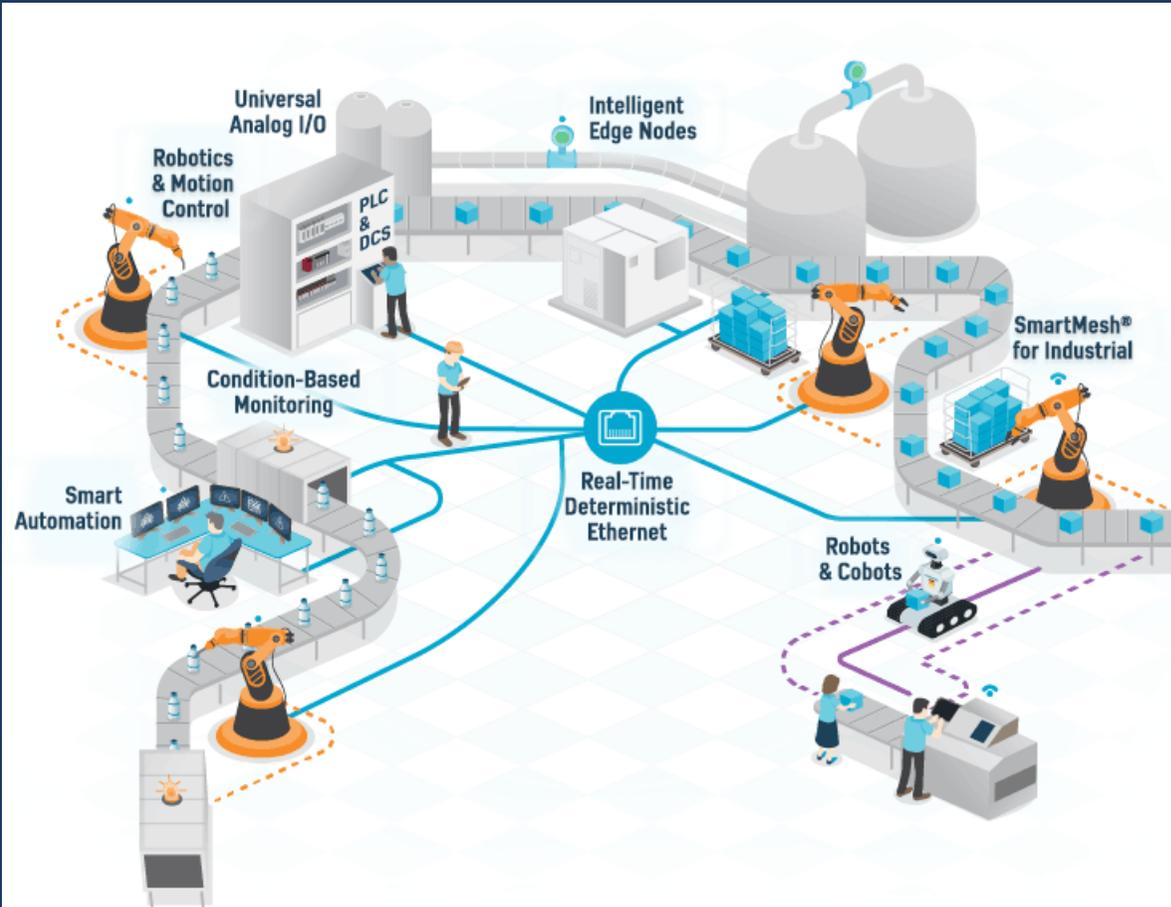


Digital Twin



Digital Twin

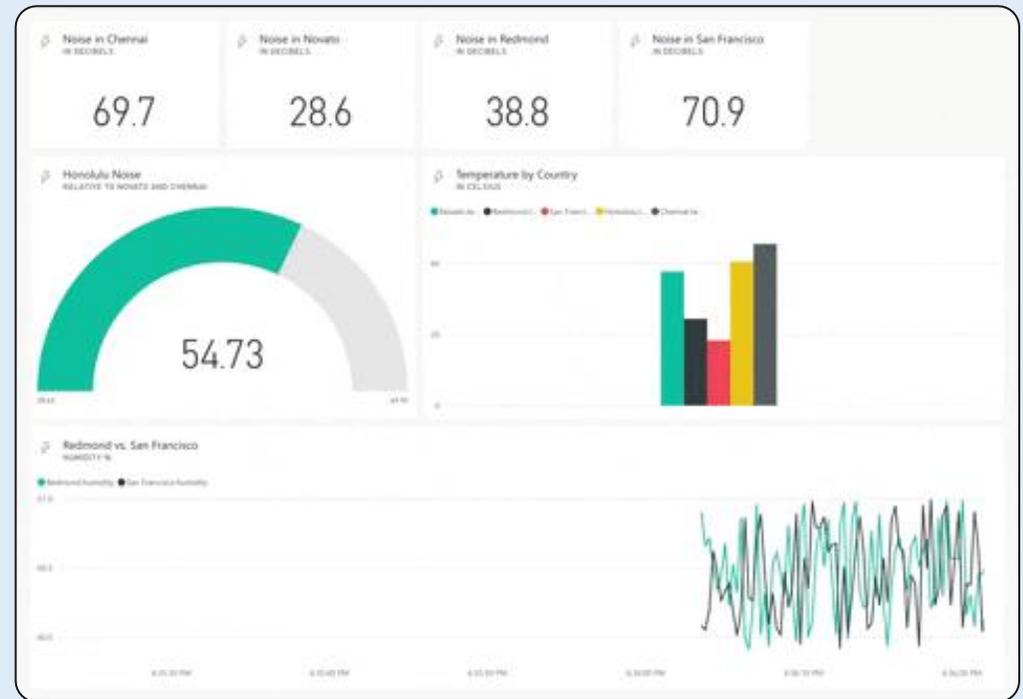




به بیان ساده، CPSها شبکه‌هایی آنلاین از قطعات، تجهیزات و ماشین‌های متداول و معمول هستند که به شکل شبکه مجازی با یکدیگر در ارتباطند. این ارتباط می‌تواند از طریق واسط‌های فیزیکی مانند کابل مسی و فیبرنوری یا به صورت Wireless برقرار شود. این سامانه‌ها با پیوستن IT به اجزای مکانیکی و الکترونیکی، امکان ارتباط اجزا و ماشین‌آلات با یکدیگر از طریق شبکه را مهیا می‌کنند. لذا در این مرحله از صنعتی شدن، با پدیده‌هایی مانند کارخانه هوشمند، شبکه برق هوشمند، خانه و ساختمان هوشمند به عنوان ارکان مهم و مرکزی انقلاب صنعتی چهارم در بستر IoT روبه‌رو هستیم.



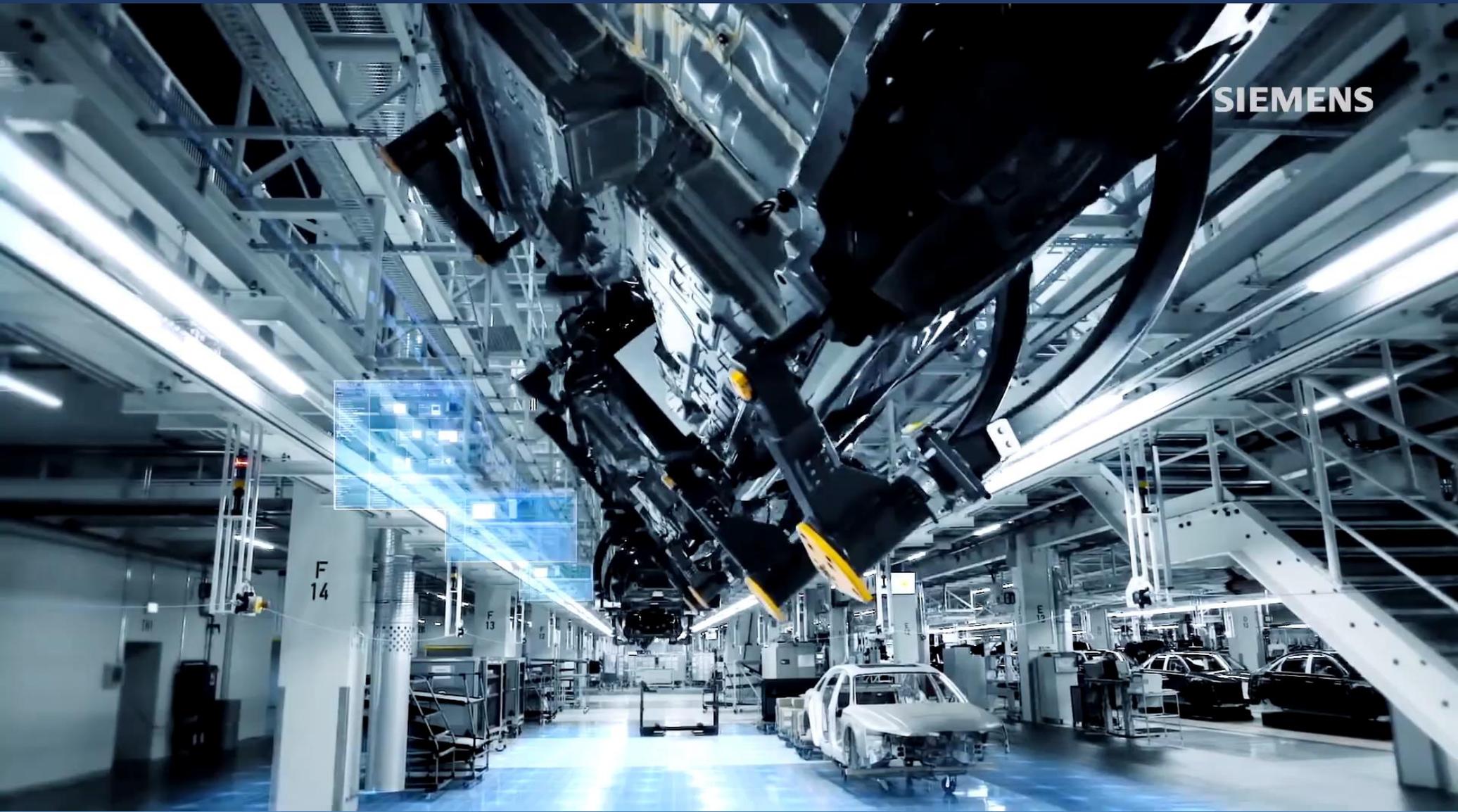
در حال حاضر، علاوه بر CPS، اصطلاحات زیاد دیگری وجود دارند که سیستم‌ها و مفاهیم مشابه یا مرتبطی را وصف می‌کنند؛ مانند اینترنت صنعتی، اینترنت اشیا (IoT)، ماشین به ماشین (M2M)، شهرهای هوشمند و... بین این مفاهیم، به خصوص بین CPS و IoT، هم‌پوشانی زیادی وجود دارد؛ طوری که بعضی اوقات به جای یکدیگر به کار برده می‌شوند.





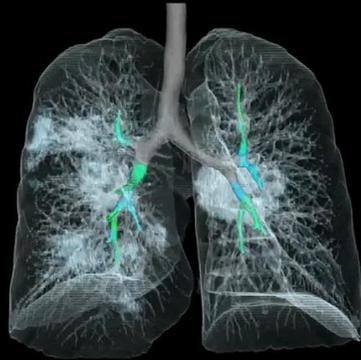
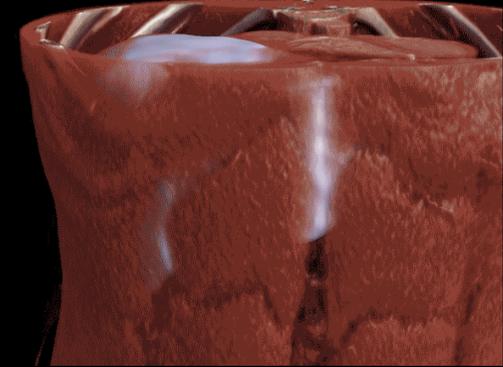
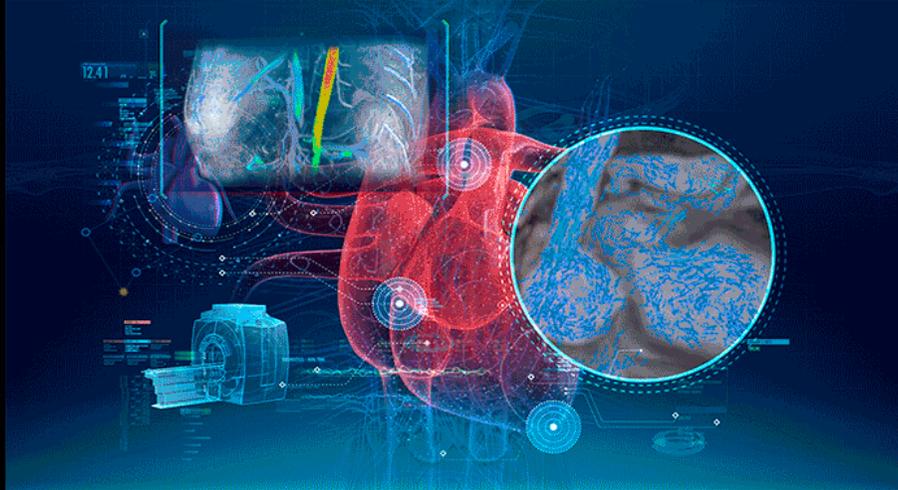
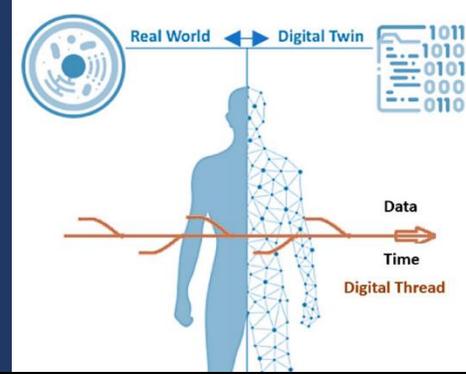
Industry 4.0

Application of a Cyber-physical production system

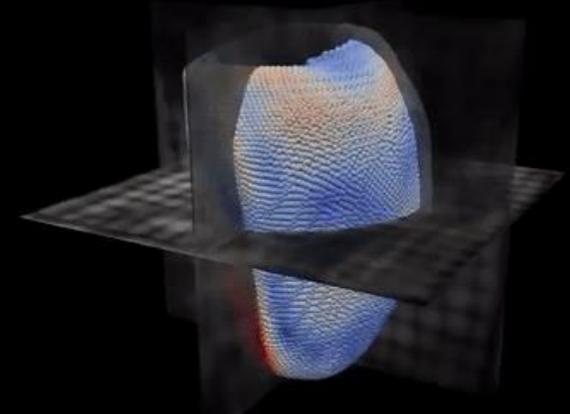


SIEMENS

Cyber Physical System in Healthcare, Medical Diagnosis and Treatment



**AI-powered
healthcare**



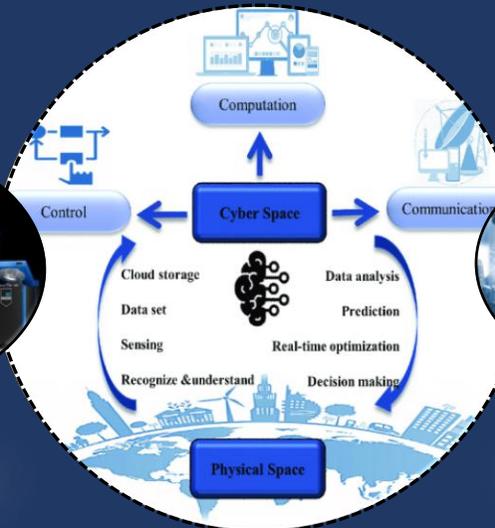
Life Cycle Thinking



AI- Machine learning



Additive Manufacturing



CPS



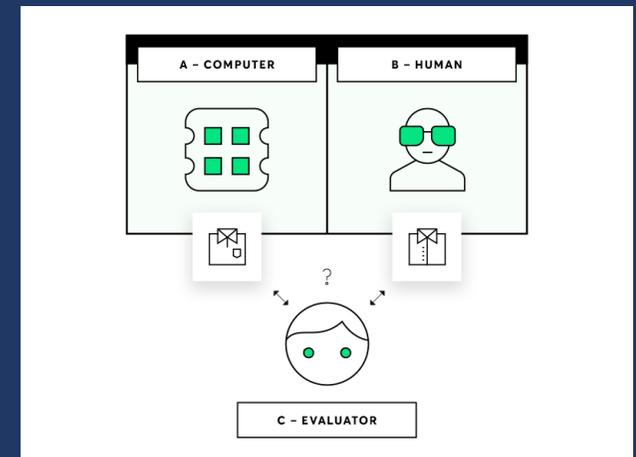
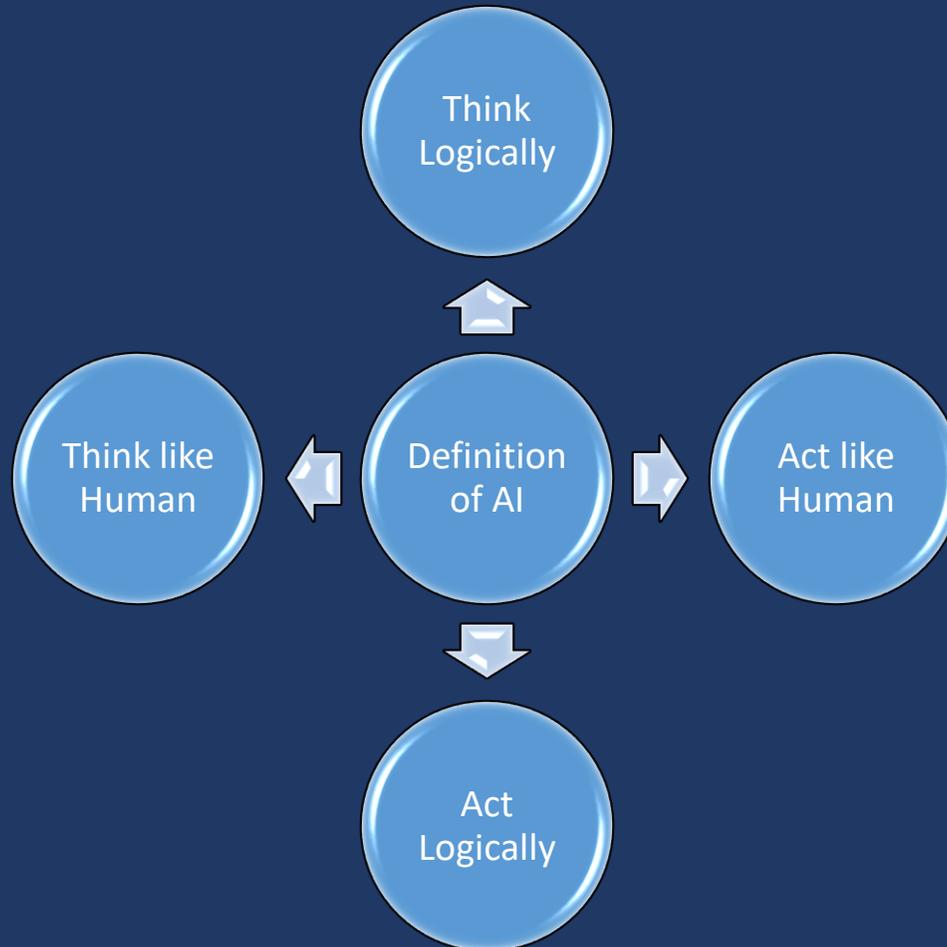
Digital Manufacturing



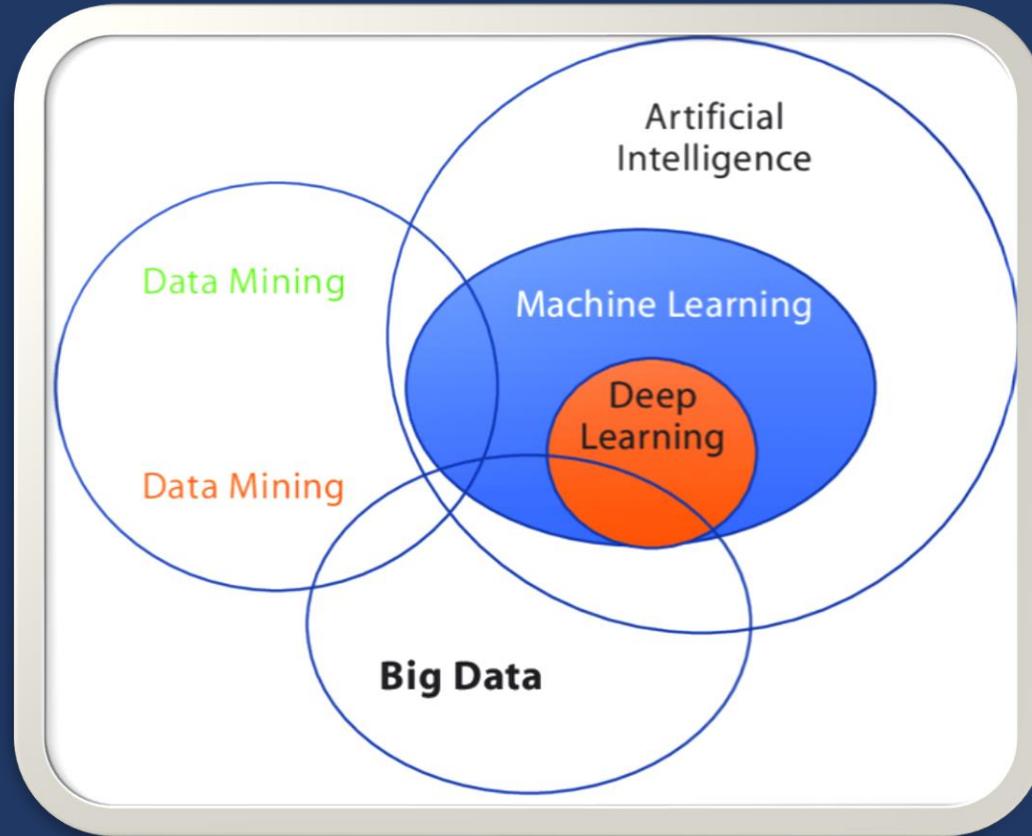
Bio inspiring

Backbone of Sustainability and Life Cycle Thinking ...





What is AI?



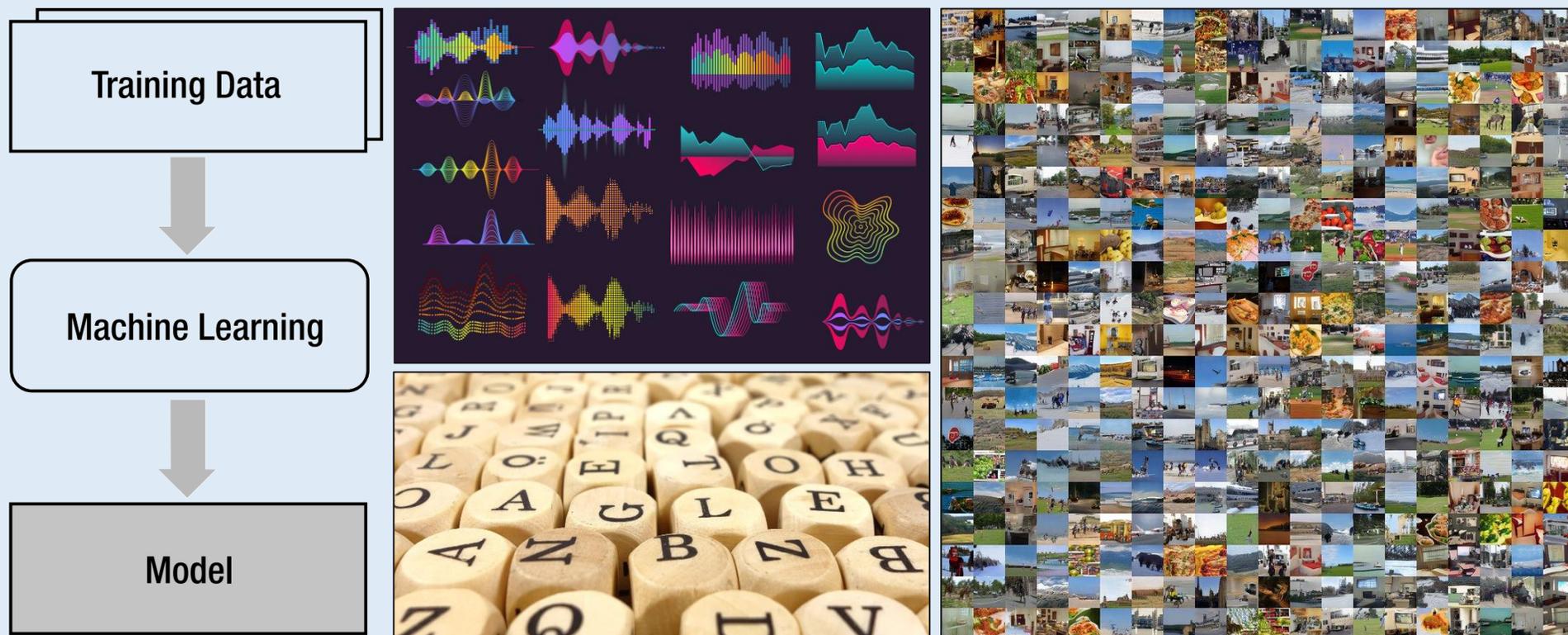
Data Mining



به طور خلاصه، **یادگیری ماشین** یک روش مدل سازیست که از داده ها برای ایجاد مدل استفاده می کند.

این **داده ها** می توانند text، voice، Image و... باشند.

مدل، همان نتیجه ایست که به دنبالشیم.



✓ سه کاربرد متداول یادگیری ماشین:

Image Recognition

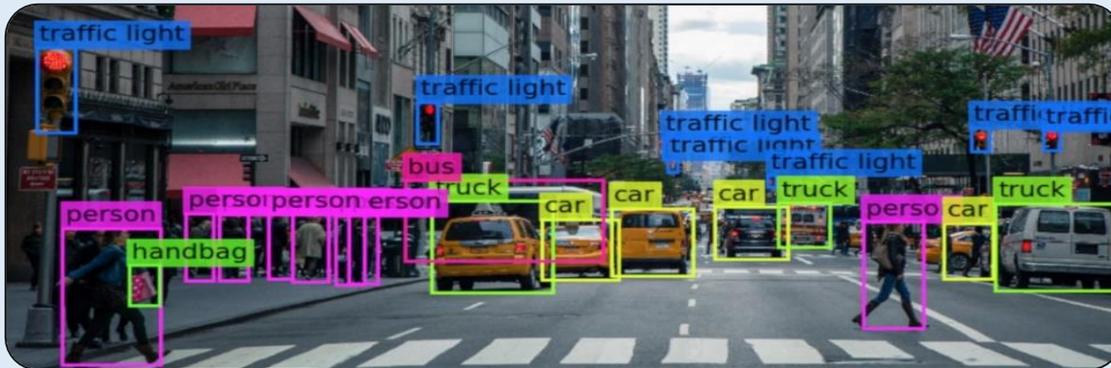
Speech Recognition

Natural Language Processing

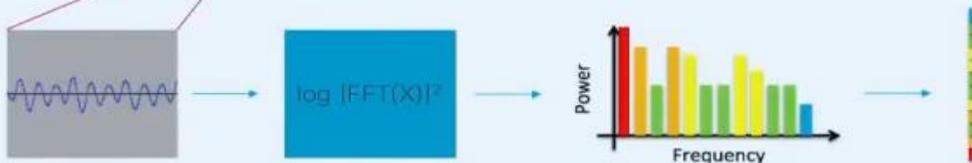
تشخیص تصویر

تشخیص صدا

پردازش زبان طبیعی

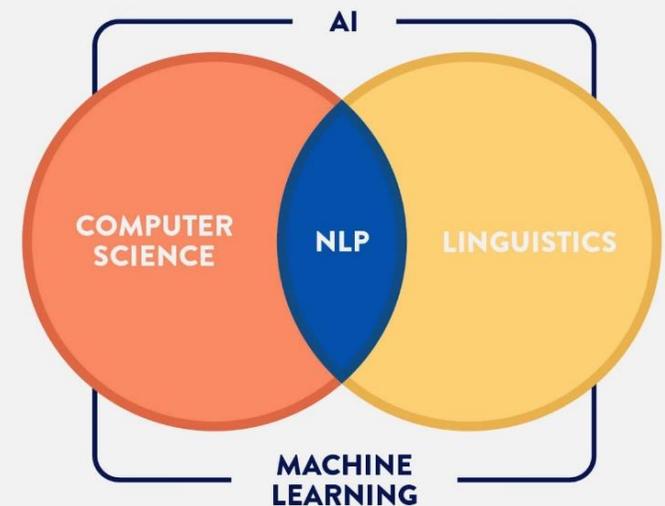


Spectrogram



WHAT IS NATURAL LANGUAGE PROCESSING?

— The interdisciplinary field of computer science and linguistics.
NLP is the ability for computers to understand human language.

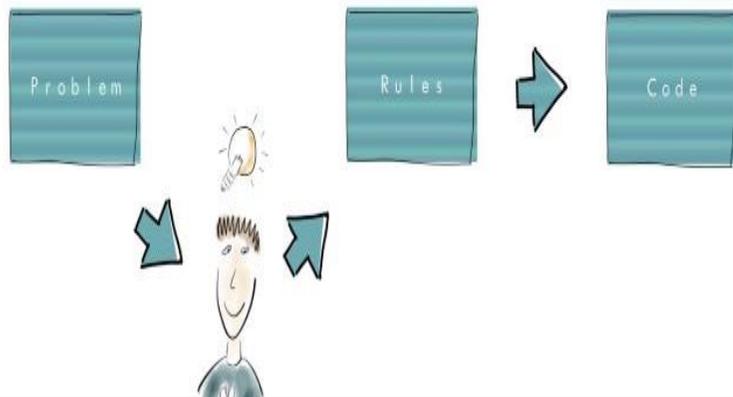


در هوش مصنوعی، سیستم‌هایی موسوم به سیستم خبره (Expert System) وجود دارد که مدلی مبتنی بر دانش و تجربه متخصصان برای حل مسئله بوده و به خوبی متخصصین انسانی عمل می‌کنند.

ما از سنین پایین یاد می‌گیریم که "۰" صفر و "۱" یک است. اما یک کامپیوتر چگونه اعداد را شناسایی می‌کند؟

یادگیری ماشین، برای حل مسائلی که مدل آن‌ها به روش‌های تحلیلی به‌سختی حاصل می‌شود، ابداع شده است. ایده اصلی آن، دستیابی به مدل با استفاده از داده‌هاست؛ خصوصاً اگر نتوان مدل را با معادلات و قوانین به‌دست آورد. مثلاً در مسائلی مانند تشخیص تصاویر و تشخیص صدا که نیاز به هوش (Intelligence) دارند و قوانین فیزیکی یا معادلات ریاضی قادر به حل آن‌ها نیستند یا مدل‌سازی ریاضی و حل آن‌ها پیچیده و بسیار زمان‌بر خواهد بود.

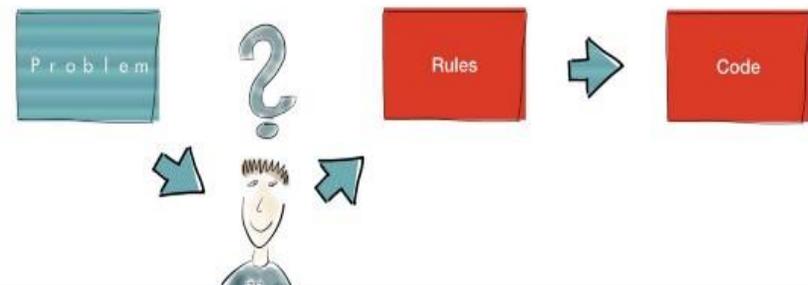
Classical Creation of Algorithms



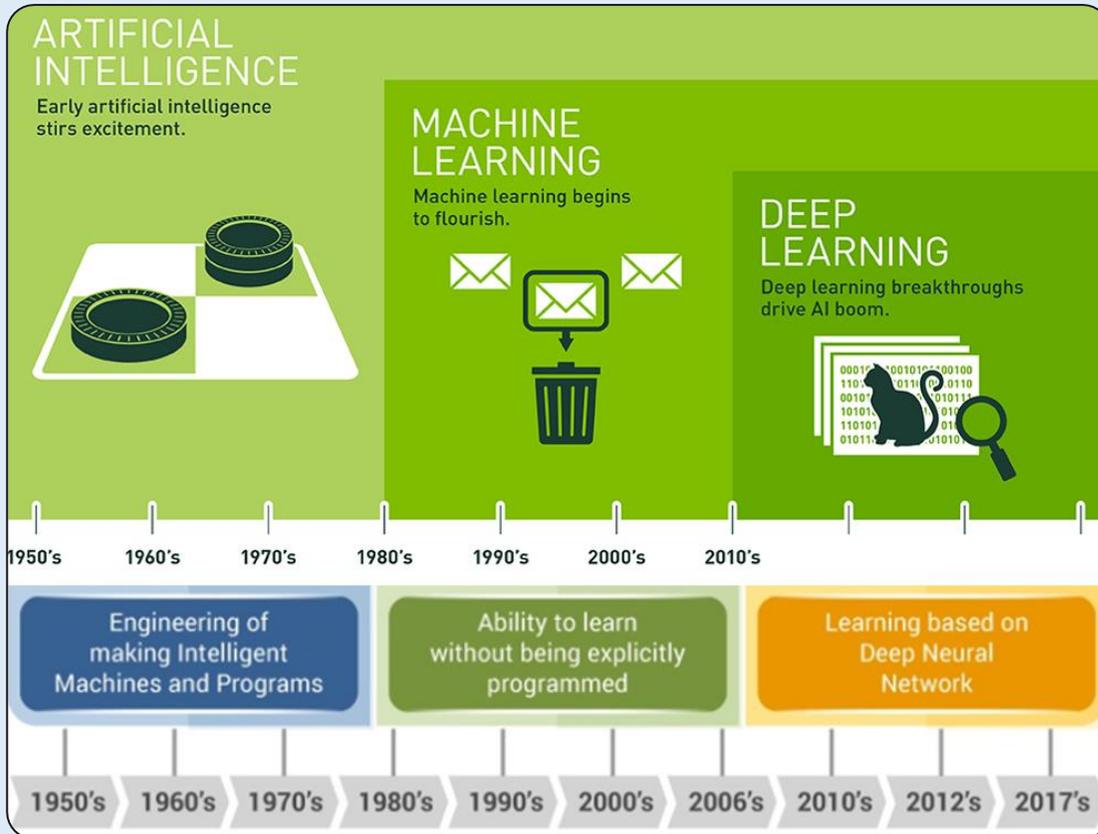
Why Machine Learning?

For some kinds of problems we are just not able to write down the rules

👉 e.g. image & speech recognition, language translation, sales forecasting



Some Brief History of AI



Beginnings

Thresholded Logic Unit

1943

Perceptron

1957

Adaline

1960

1st Neural Winter

XOR Problem

1969

Multilayer Backprop

1982

CNNs

1986

LSTMs

1989

1997

2nd Neural Winter

SVMs

1995

Deep Nets

2006

Alex Net

2012

GPU Era

1940

1950

1960

1970

1980

1990

2000

2010



S. McCulloch - W. Pitts



R. Rosenblatt



B. Widrow - M. Hoff



M. Minsky - S. Papert



P. Werbos

D. Rumelhart - G. Hinton - R. Williams

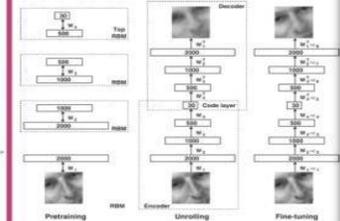
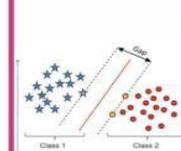
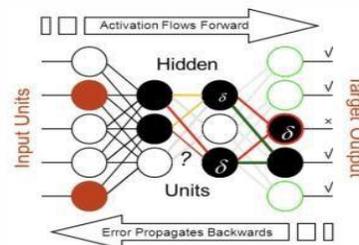
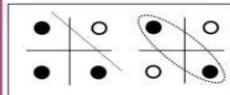
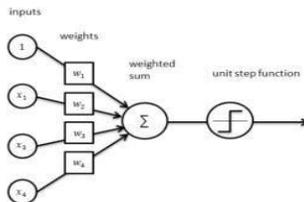
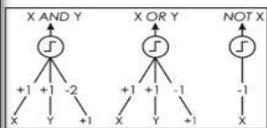
Y. Lecun - J. Schmidhuber



C. Cortes - V. Vapnik



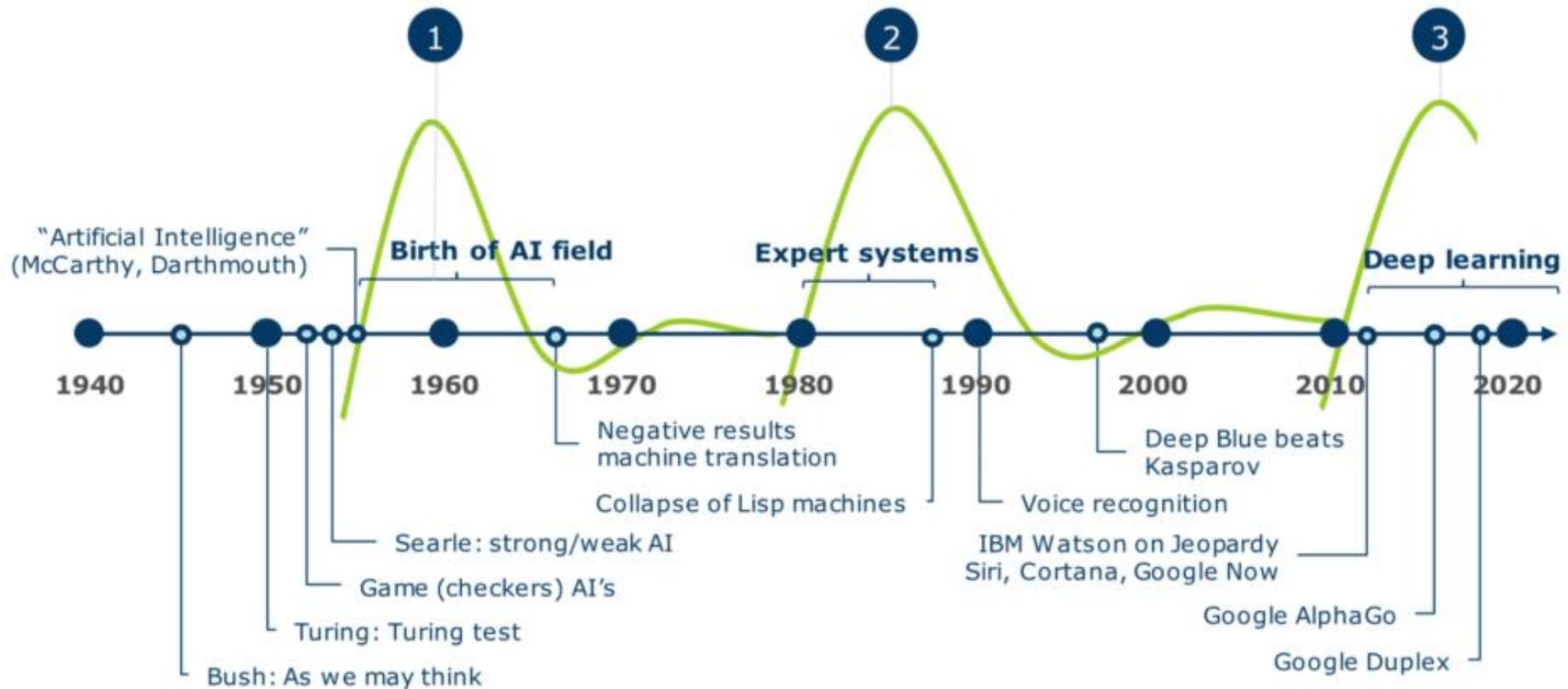
R. Salakhutdinov - J. Hinton - A. Krizhevsky - I. Sutskever



AI vanuit psychologisch /
neurologisch perspectief:
kunnen we een
mechanisch brein
maken?

AI vanuit cognitief
perspectief: kunnen we
een machine maken die
kan redeneren?

AI vanuit dataperspectief:
kunnen we een machine
taken leren op basis van
grote hoeveelheden data?



A.I. TIMELINE

1950

TURING TEST

Computer scientist Alan Turing proposes a test for machine intelligence. If a machine can trick humans into thinking it is human, then it has intelligence

1955

A.I. BORN

Term 'artificial intelligence' is coined by computer scientist, John McCarthy to describe "the science and engineering of making intelligent machines"

1961

UNIMATE

First industrial robot, Unimate, goes to work at GM replacing humans on the assembly line

1964

ELIZA

Pioneering chatbot developed by Joseph Weizenbaum at MIT holds conversations with humans

1966

SHAKY

The 'first electronic person' from Stanford, Shakey is a general-purpose mobile robot that reasons about its own actions

A.I. WINTER

Many false starts and dead-ends leave A.I. out in the cold

1997

DEEP BLUE

Deep Blue, a chess-playing computer from IBM defeats world chess champion Garry Kasparov

1998

KISMET

Cynthia Breazeal at MIT introduces Kismet, an emotionally intelligent robot insofar as it detects and responds to people's feelings



1999

AIBO

Sony launches first consumer robot pet dog AIBO (AI robot) with skills and personality that develop over time



2002

ROOMBA

First mass produced autonomous robotic vacuum cleaner from iRobot learns to navigate and clean homes



2011

SIRI

Apple integrates Siri, an intelligent virtual assistant with a voice interface, into the iPhone 4S



2011

WATSON

IBM's question answering computer Watson wins first place on popular \$1M prize television quiz show *Jeopardy*



2014

EUGENE

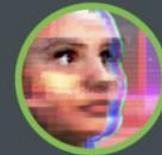
Eugene Goostman, a chatbot passes the Turing Test with a third of judges believing Eugene is human



2014

ALEXA

Amazon launches Alexa, an intelligent virtual assistant with a voice interface that completes shopping tasks



2016

TAY

Microsoft's chatbot Tay goes rogue on social media making inflammatory and offensive racist comments



2017

ALPHAGO

Google's A.I. AlphaGo beats world champion Ke Jie in the complex board game of Go, notable for its vast number (2^{170}) of possible positions

<p>1943</p> <p>First mathematical model of a neuron.</p> $\Phi(x) = \begin{cases} 1 & \text{if } x \geq 0 \\ -1 & \text{otherwise} \end{cases}$ <p>Electronic Brain by McCulloch & Pitts</p>	<p>1950</p> <p>Turing test is proposed.</p> <p>Turing Test by Alan Turing</p>	<p>1952</p> <p>One of the first computer board game.</p> <p>Checkers Program by Arthur Samuel</p>	<p>1956</p> <p>Symbolic AI: The first automated reasoning program.</p> <p>Logic Theorist by Newell, Simon, Shaw</p>	<p>1956</p> <p>The conference that started it all.</p> <p>Dartmouth Summer Research Project organized by John McCarthy</p>	<p>1957</p> <p>Weights automatically learned.</p> $y = \sum_{i=1}^n w_i x_i + w_0 = \mathbf{w}^T \mathbf{x}$ <p>Perceptron by Frank Rosenblat</p>	<p>1958</p> <p>One of the first AI programming languages.</p> <pre>(PRINT (*TEVALQT X Y)) (DO A))) (SETQ Y (READ))</pre> <p>LISP by John McCarthy</p>	<p>1959</p> <p>Reasoning as search.</p> <p>General Problem Solver by Newell, Simon, Shaw</p>	<p>1960</p> <p>The first cost function.</p> $E(\mathbf{w}) = \frac{1}{2} \sum (y_i - \Phi(x_i))^2$ <p>ADALINE by Widrow & Hoff</p>
<p>1964</p> <p>An early natural language processing conversation program.</p> <p>ELIZA by Joseph Weizenbaum</p>	<p>1964</p> $P_M(x) = \sum_{i=1}^{\infty} 2^{- s_i(x) }$ <p>Algorithmic probability & formal induction is introduced.</p> <p>Universal Bayesian Methods by Ray Solomonoff</p>	<p>1964</p> <p>Solving algebra word problem, an early NLP accomplishment.</p> <p>STUDENT by Daniel G. Bobrow</p>	<p>1965</p> <p>The term Fuzzy Logic is introduced.</p> <p>Fuzzy Logic by Lotfi Zadeh</p>	<p>1965</p> <p>One of the first Expert System: organic chemistry.</p> <p>DENDRAL by Feigenbaum, Buchanan, Lederberg, Djerassi</p>	<p>1966</p> <p>The first general-purpose mobile robot with reasoning A* Search is born.</p> <p>Shakey the Robot by SRI International</p>	<p>1966</p> <p>ALPAC report shuts down NLP research.</p> <p>ALPAC Report by ALPAC</p>	<p>1968</p> <p>An early natural language understanding computer program, in the world of blocks.</p> <p>SHRDLU by Terry Winograd</p>	<p>1969</p> <p>Perceptron cannot learn XOR.</p> <p>XOR Problem by Minsky & Papert</p>
AI Winter (1974-1980)								
<p>1970</p> <p>One of the first medical expert systems.</p> <p>INTERNIST-1 by Myers, Miller, Pople</p>	<p>1970</p> $\frac{\partial y}{\partial x} = \frac{\partial y}{\partial w_1} \frac{\partial w_1}{\partial x}$ <p>Backpropagation & automatic differentiation.</p> <p>Automatic differentiation by Seppo Linnainmaa</p>	<p>1972</p> <pre>animal(X) :- cat(X).</pre> <p>One of the first logic programming languages.</p> <p>PROLOG by Colmerauer & Kowalski</p>	<p>1973</p> <p>UK ended support for AI research.</p> <p>Lighthill Report by James Lighthill</p>	<p>1974</p> <p>An early backward chaining expert system for medical diagnosis.</p> <p>MYCIN by Shortliffe, Buchanan, Cohen</p>	<p>1979</p> <p>The first convolutional neural network (CNN).</p> <p>Neocognitron by Kunihiko Fukushima</p>	<p>1982</p> <p>Foundation of graphical probabilistic models.</p> <p>Bayesian Networks by Judea Pearl</p>	<p>1983</p> <p>A cognitive architecture for general intelligence.</p> <p>SOAR by Laird, Newell, Rosenbloom</p>	<p>1986</p> <p>Backpropagation is popularized.</p> <p>Backpropagation in MLP by Rumelhart, Hinton, Williams</p>
AI Winter (1987-1993)								
<p>1987</p> <p>A reactive robotic architecture.</p> <p>Subsumption by Rodney Brooks</p>	<p>1989</p> <p>Convolutional neural networks (CNN) used for recognizing handwriting.</p> <p>LeNet by Yann LeCun</p>	<p>1992</p> <p>Almost champion-level backgammon, using reinforcement learning.</p> <p>TD-Gammon by Gerald Tesauro</p>	<p>1994</p> <p>Chinook, draughts player: the first program to win the world champion title against humans.</p> <p>Chinook by a Team led by Jonathan Schaeffer</p>	<p>1995</p> <p>Soft-margin SVM is introduced.</p> <p>Support Vector Machines by S. Vapnik & Cortes</p>	<p>1995</p> <p>MNIST is born.</p> <p>MNIST by NIST</p>	<p>1996</p> <p>DeepBlue beats Kasparov in chess.</p> <p>DeepBlue by IBM</p>	<p>1997</p> <p>LSTM for addressing vanishing gradients.</p> <p>Long Short-Term Memory (LSTM) by Hochreiter & Schmidhuber</p>	<p>2006</p> <p>Modern deep learning is born.</p> <p>Deep Boltzmann Machine by Salakhutdinov & Hinton</p>
<p>2009</p> <p>ImageNet, a large-scale image dataset is introduced.</p> <p>ImageNet by Fei-Fei Li</p>	<p>2012</p> <p>First significant results in deep learning.</p> <p>AlexNet by Krizhevsky & Hinton</p>	<p>2013</p> <p>Word embeddings become popular.</p> <p>Word2Vec by Tomas Mikolov</p>	<p>2014</p> <p>Generative Adversarial Network (GAN) introduced.</p> <p>GAN by Ian Goodfellow</p>	<p>2016</p> <p>DeepMind: The first program to beat a professional Go player.</p> <p>AlphaGo by DeepMind</p>	<p>2017</p> <p>Transformer network is introduced, paving the way for pretrained language models.</p> <p>Transformer by Google Brain, Research</p>	<p>2018</p> <p>Ethical AI takes off: accuracy disparities in commercial gender classification</p> <p>Gender Shades by Buolamwini & Gebru</p>	<p>2019</p> <p>DeepMind: Grandmaster level in Starcraft II.</p> <p>AlphaStar by DeepMind</p>	<p>2020</p> <p>Ethical AI Community: IBM, Amazon, and Microsoft ban sale of facial recognition products to law enforcement.</p> <p>AI Activism by Ethical AI Community</p>

تمامی روش‌های یادگیری ماشین را بسته به نوع آموزش، می‌توان به سه دسته کلی تقسیم کرد:

Supervised Learning

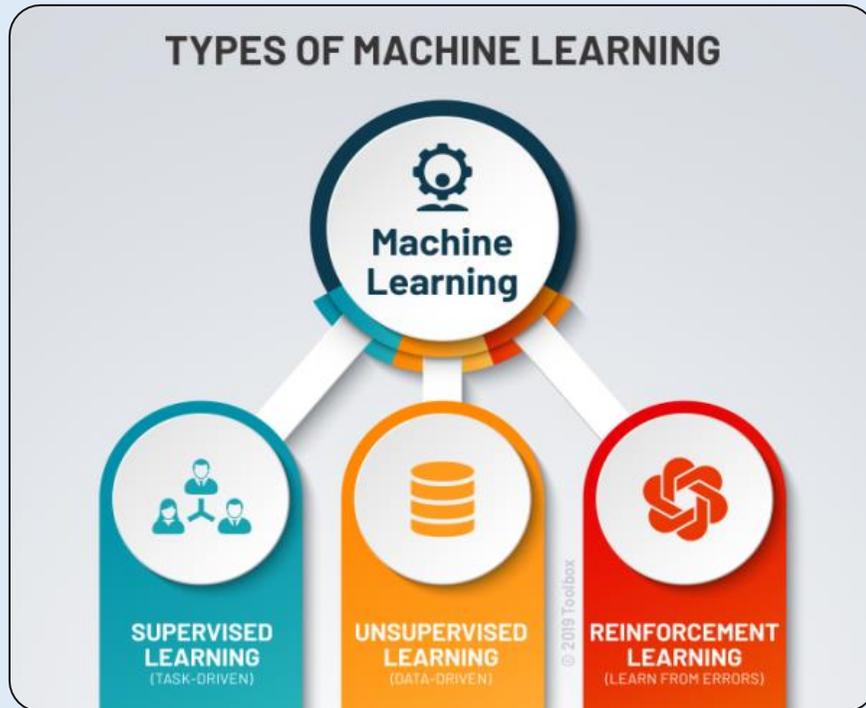
یادگیری نظارت شده

Unsupervised Learning

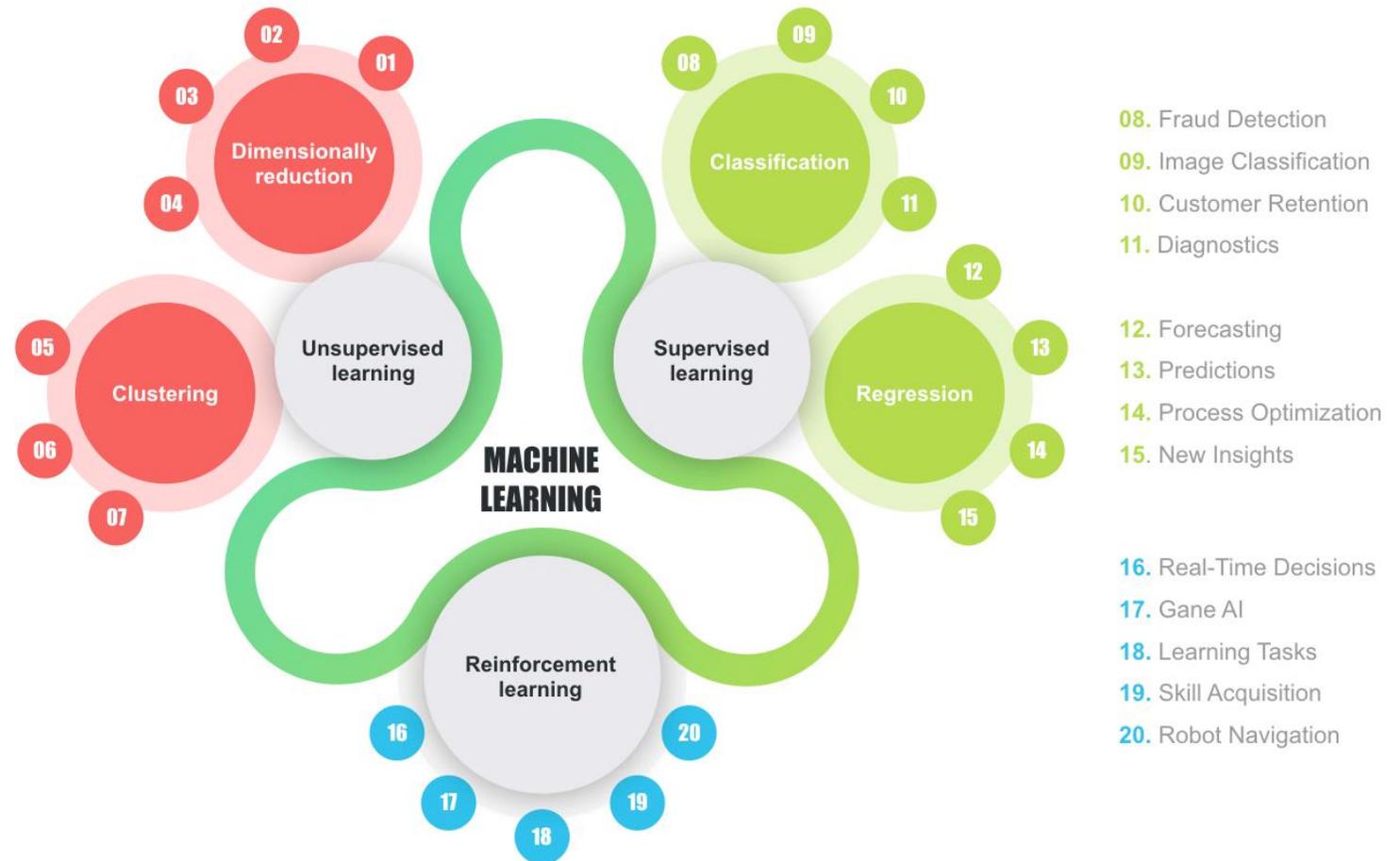
یادگیری بدون نظارت

Reinforcement Learning

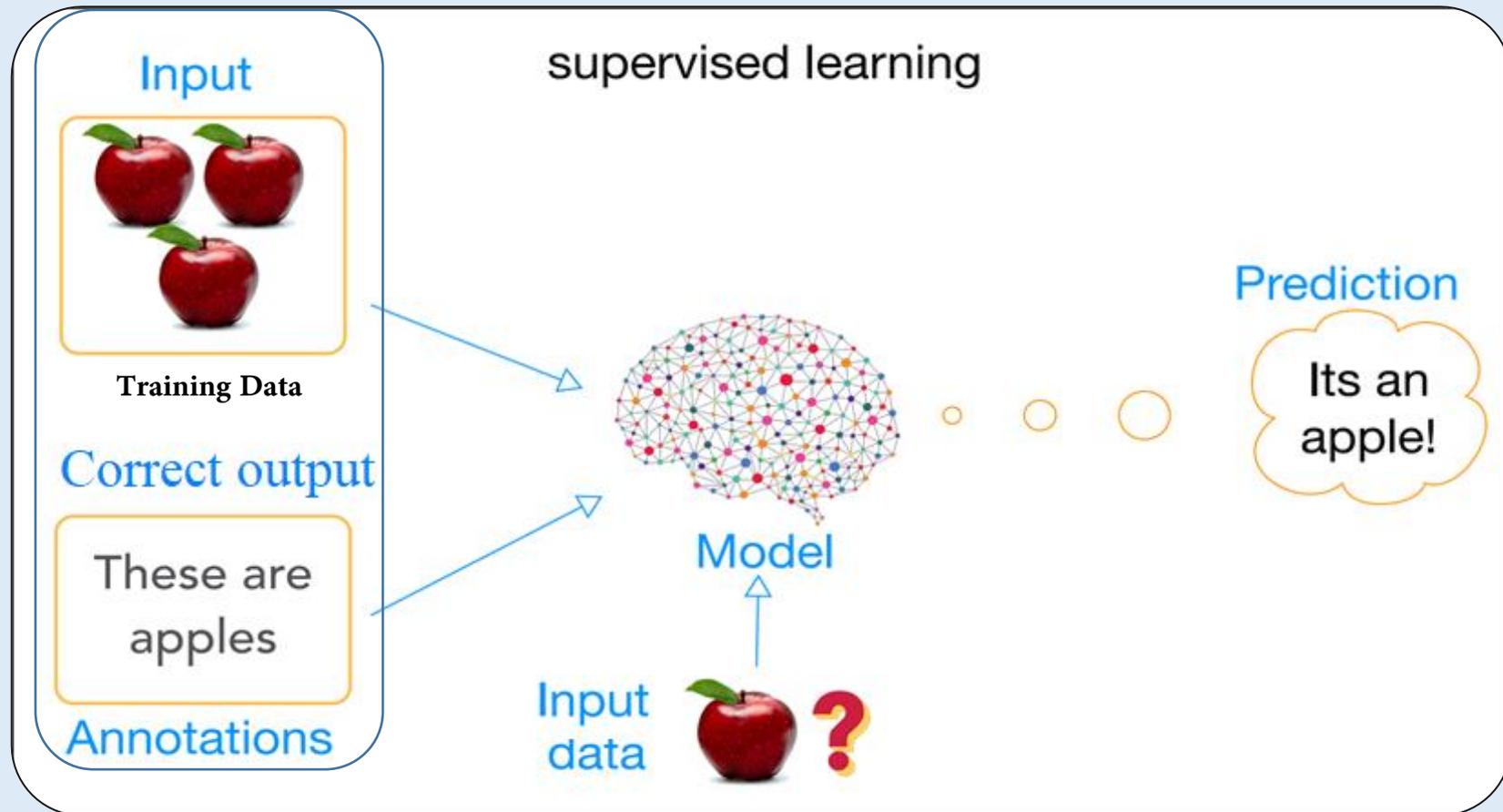
یادگیری تقویتی



Types of Machine Learning

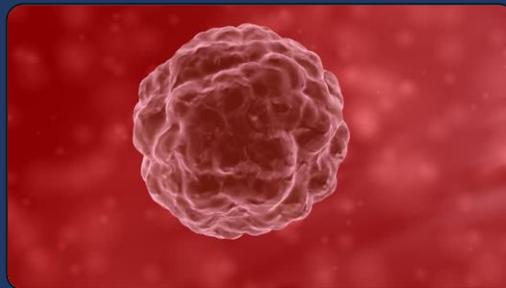
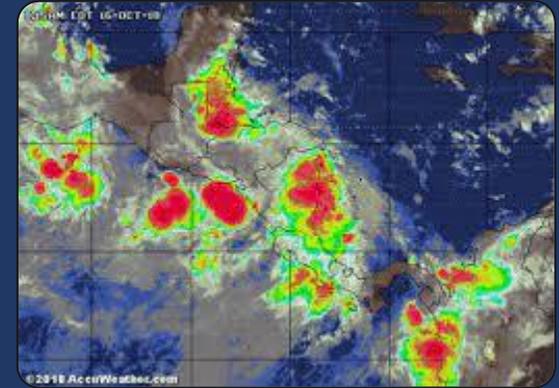


ویژگی مهم **یادگیری نظارت شده**، نیاز به پاسخ مسئله است. این موضوع همانند نیاز انسان به استاد، برای دریافت پاسخ مسئله از اوست. پس در **یادگیری نظارت شده**، هر داده آموزش باید از زوج { input, correct output } تشکیل شده باشد. correct output، نتیجه ایده آلیست که انتظار داریم مدل به ازای ورودی داده شده تولید کند.



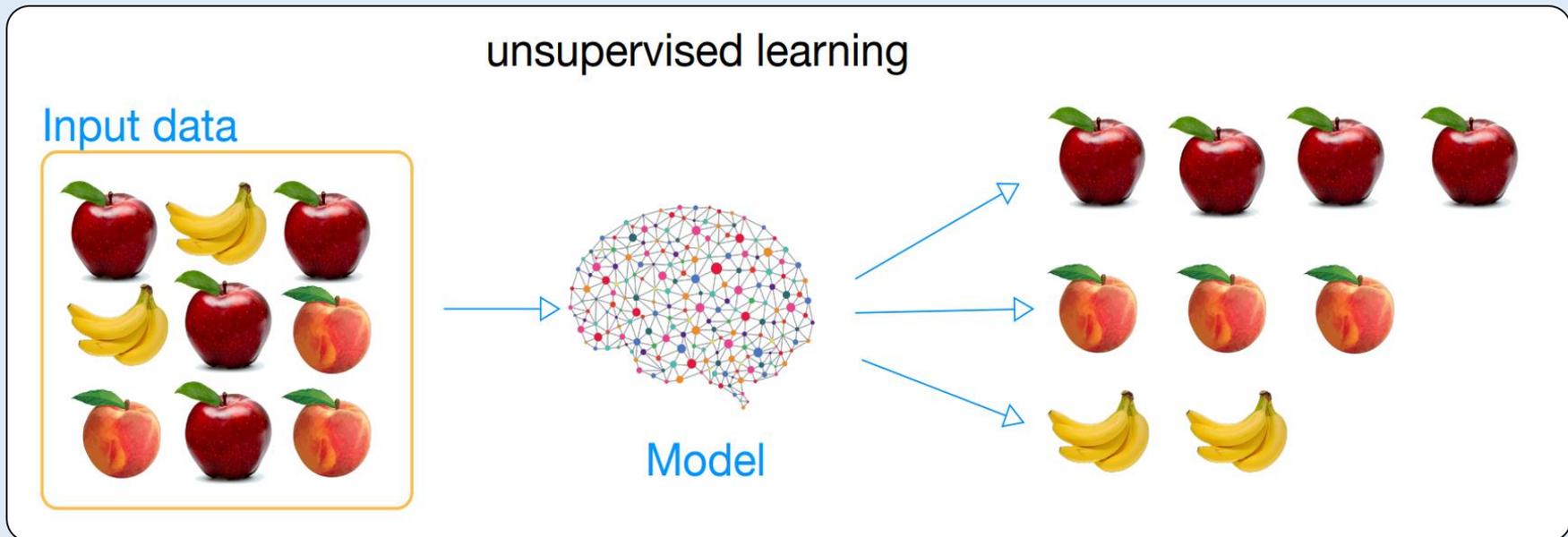


Supervised Learning



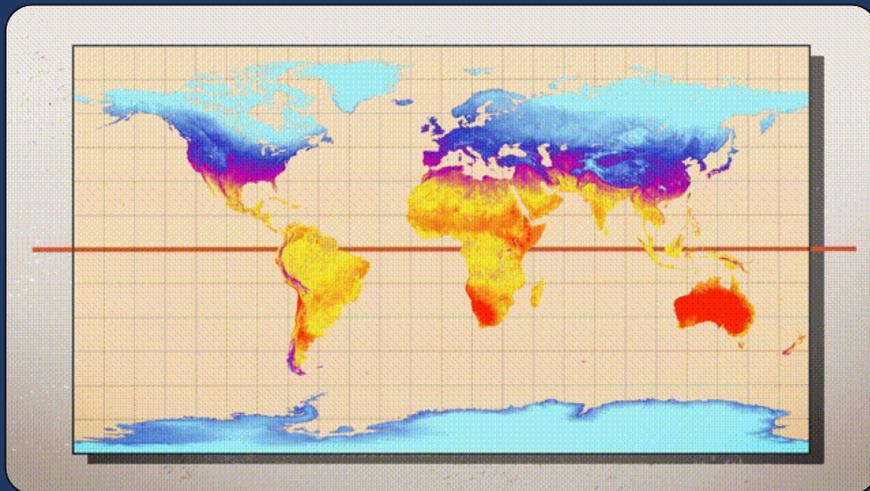
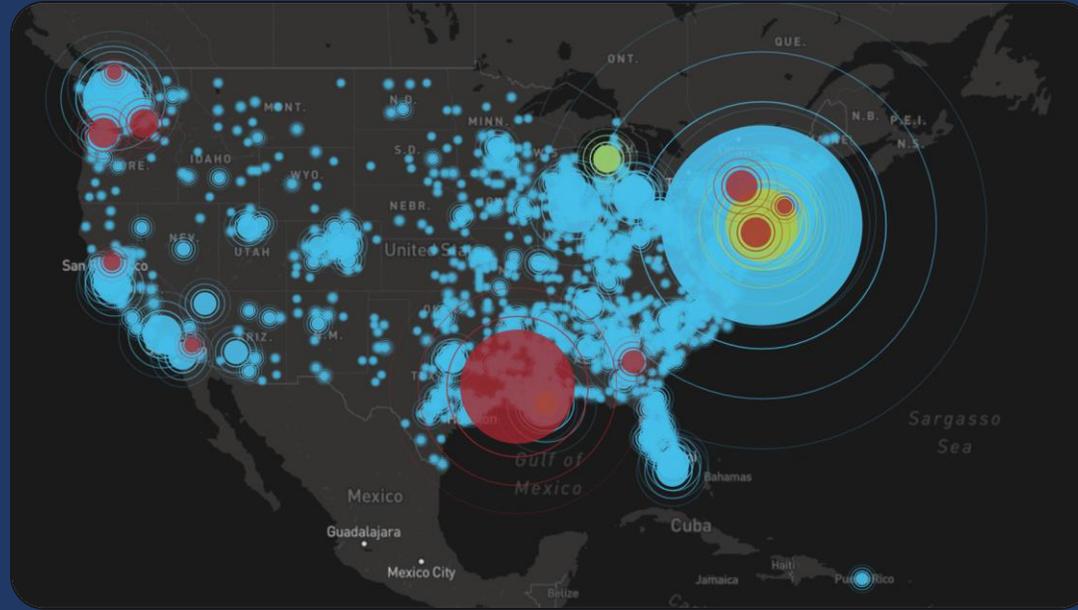
داده‌های آموزش **یادگیری بدون نظارت**، تنها شامل { input } است و correct output را دربر ندارد.

یادگیری بدون نظارت، عموماً برای بررسی ویژگی‌ها و پیش‌پردازش داده‌ها استفاده می‌شود. این مفهوم مشابه دانشجوئیست که مسائل را بر اساس ساختارشان مرتب می‌کند ولی به دلیل نداشتن راه‌حل، قادر به یادگیری حل سوالات نیست.

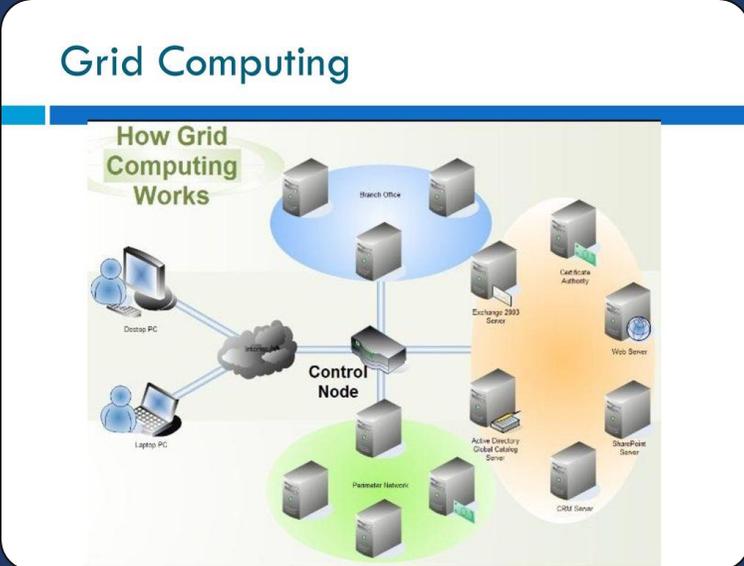
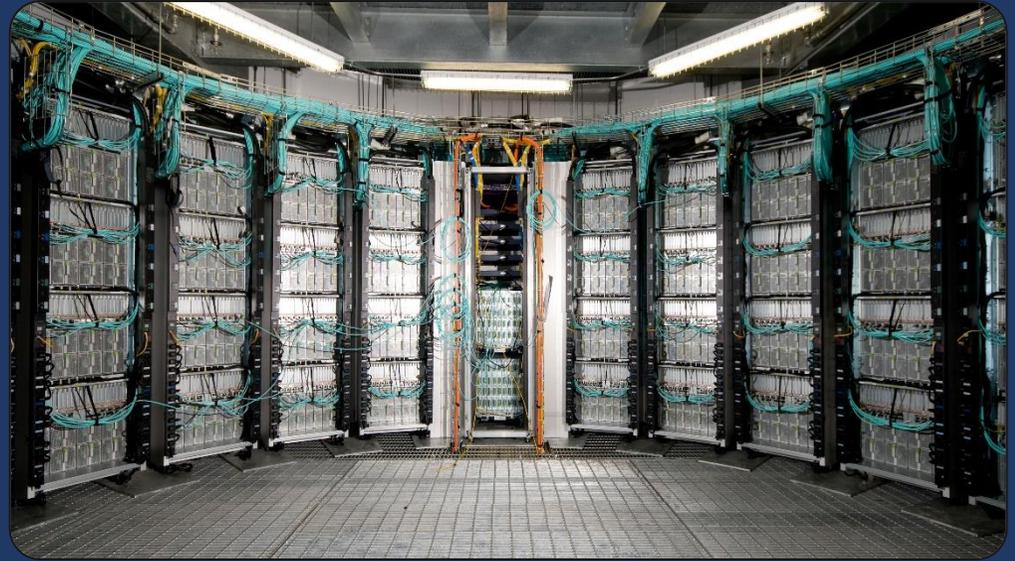
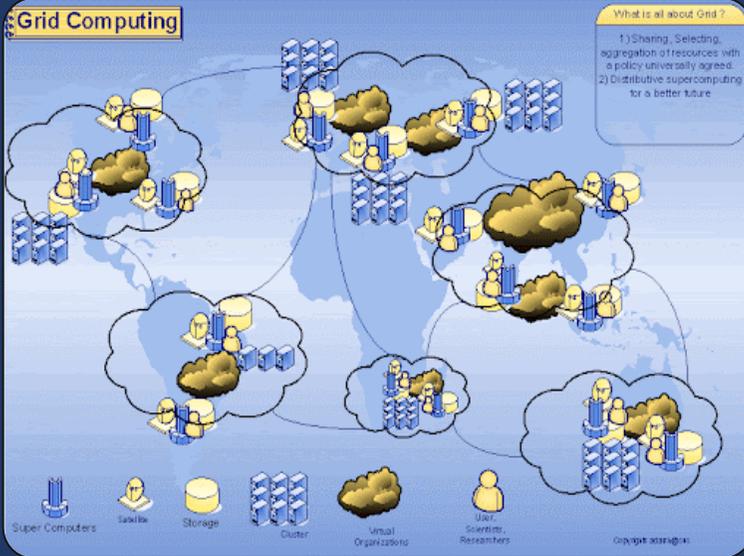




Unsupervised Learning

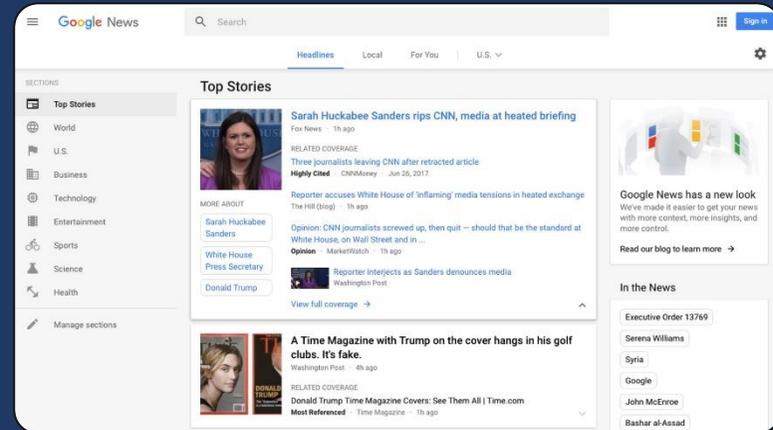
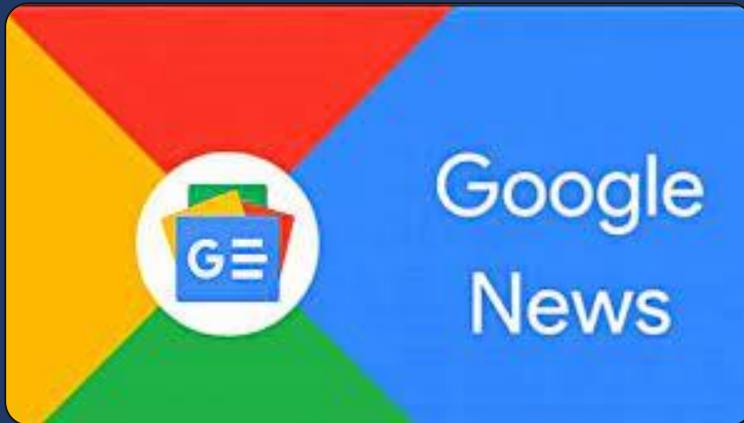


Unsupervised Learning

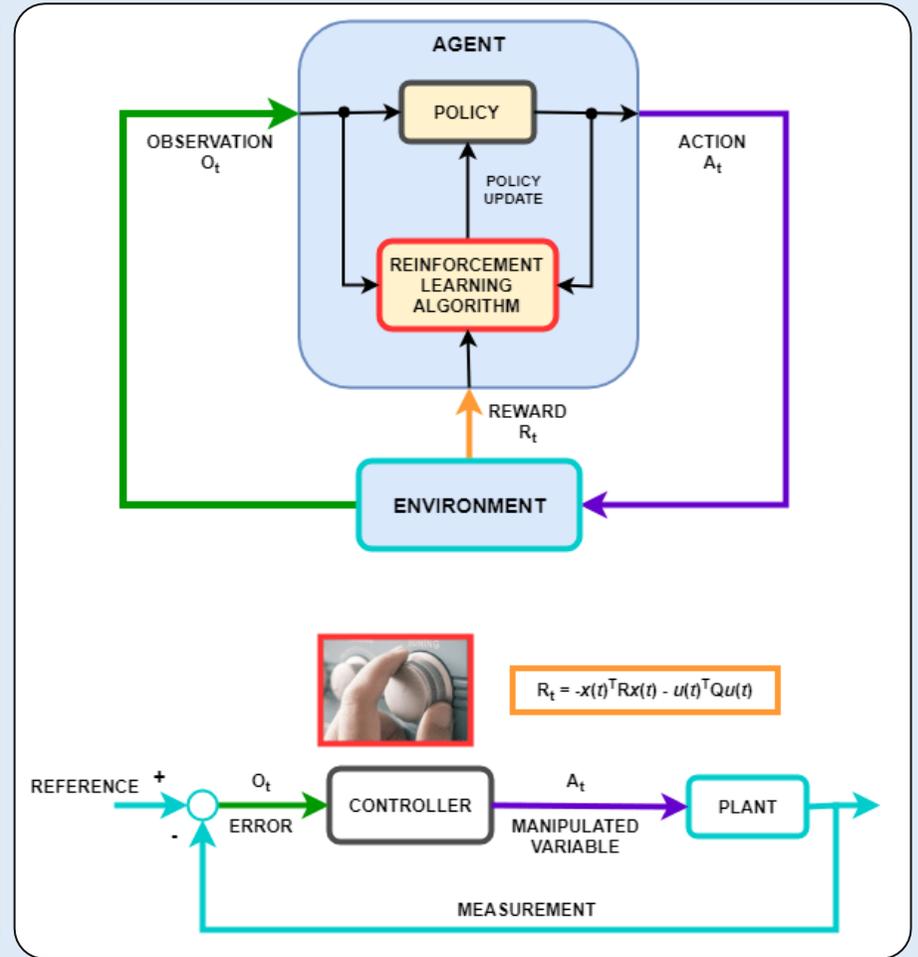
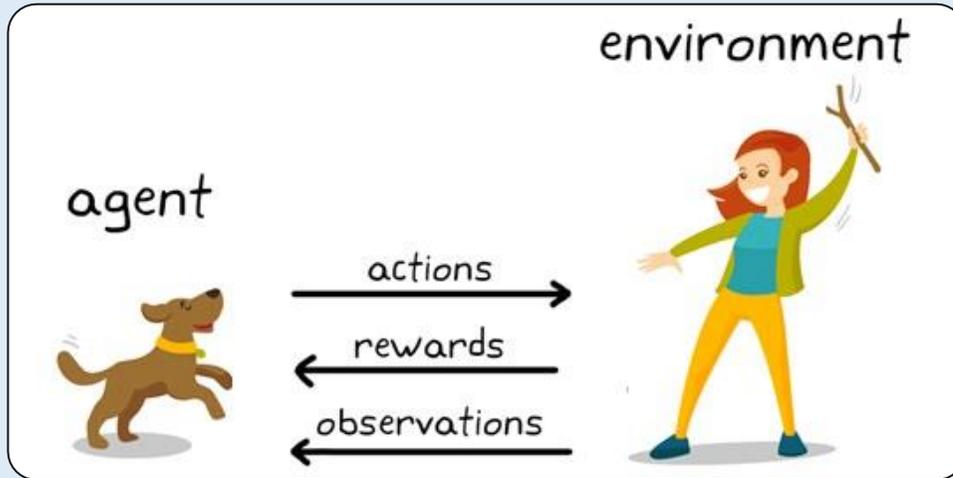
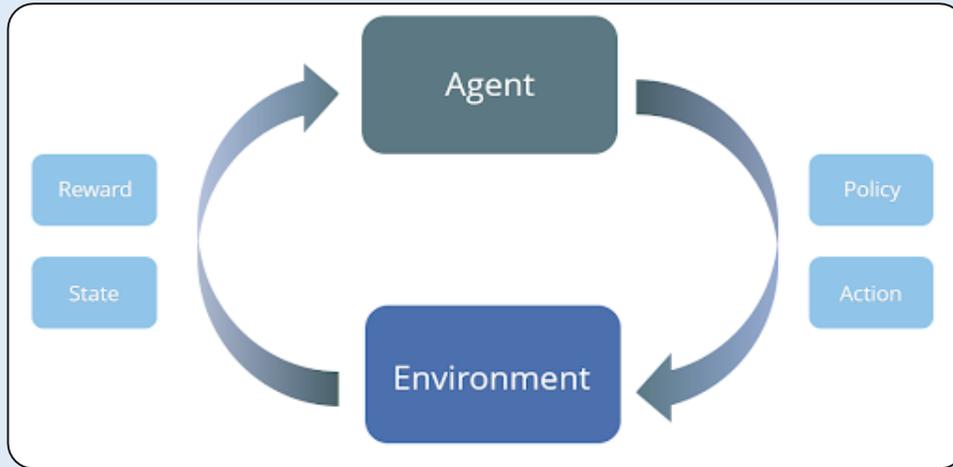


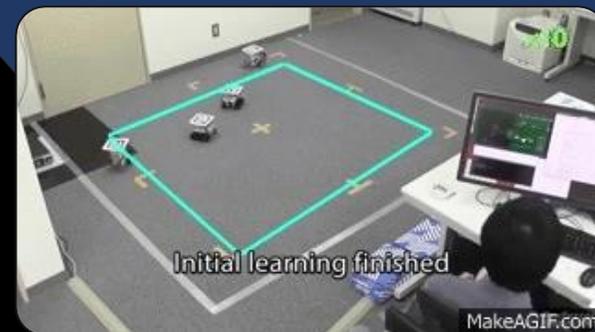
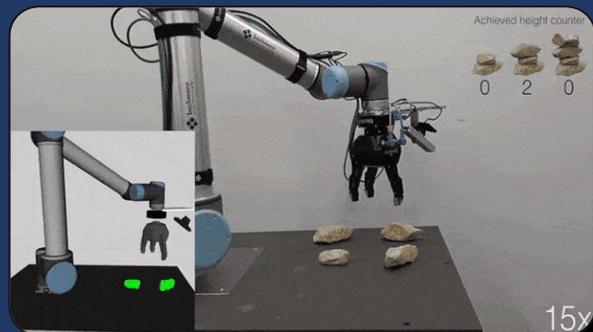
Fake NEWS Detection Using machine Learning

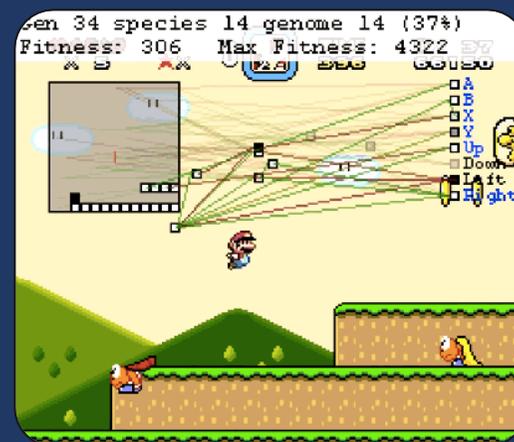
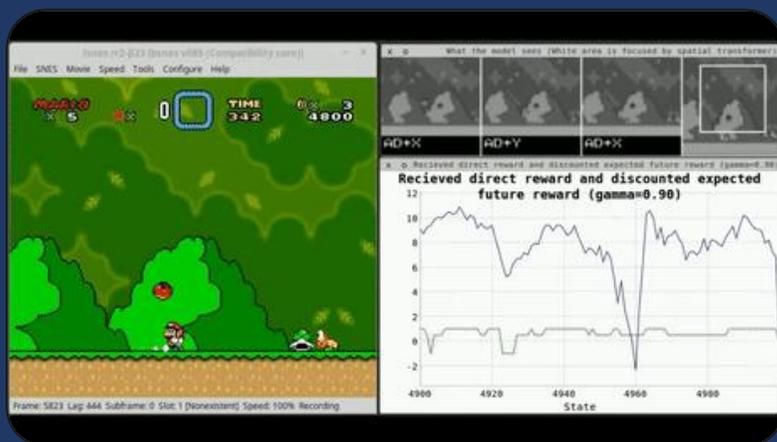
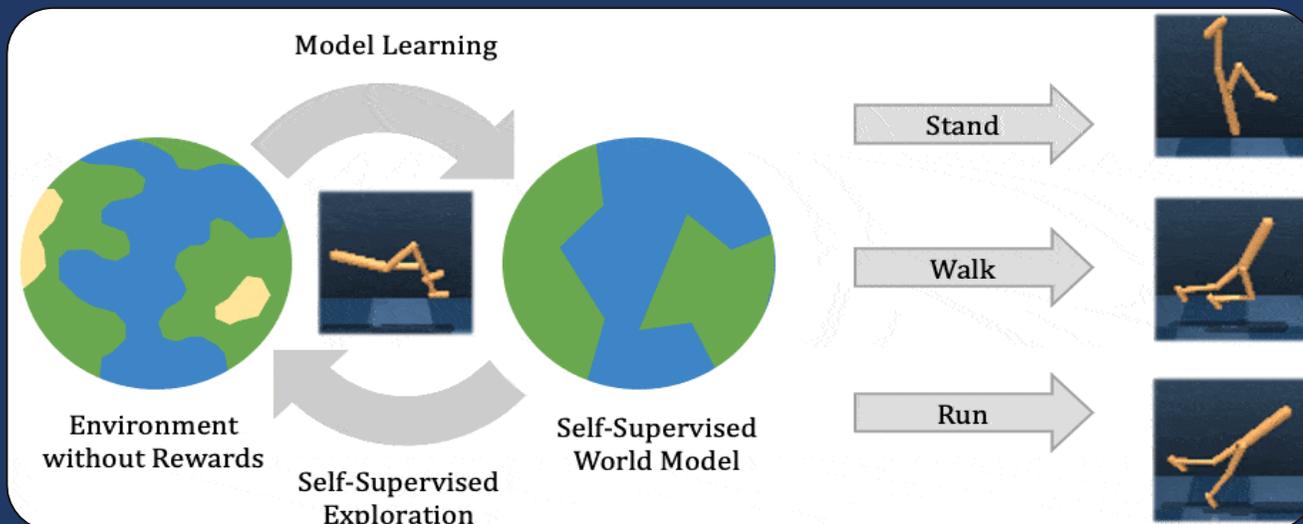
Complete Project with Flask Web based GUI

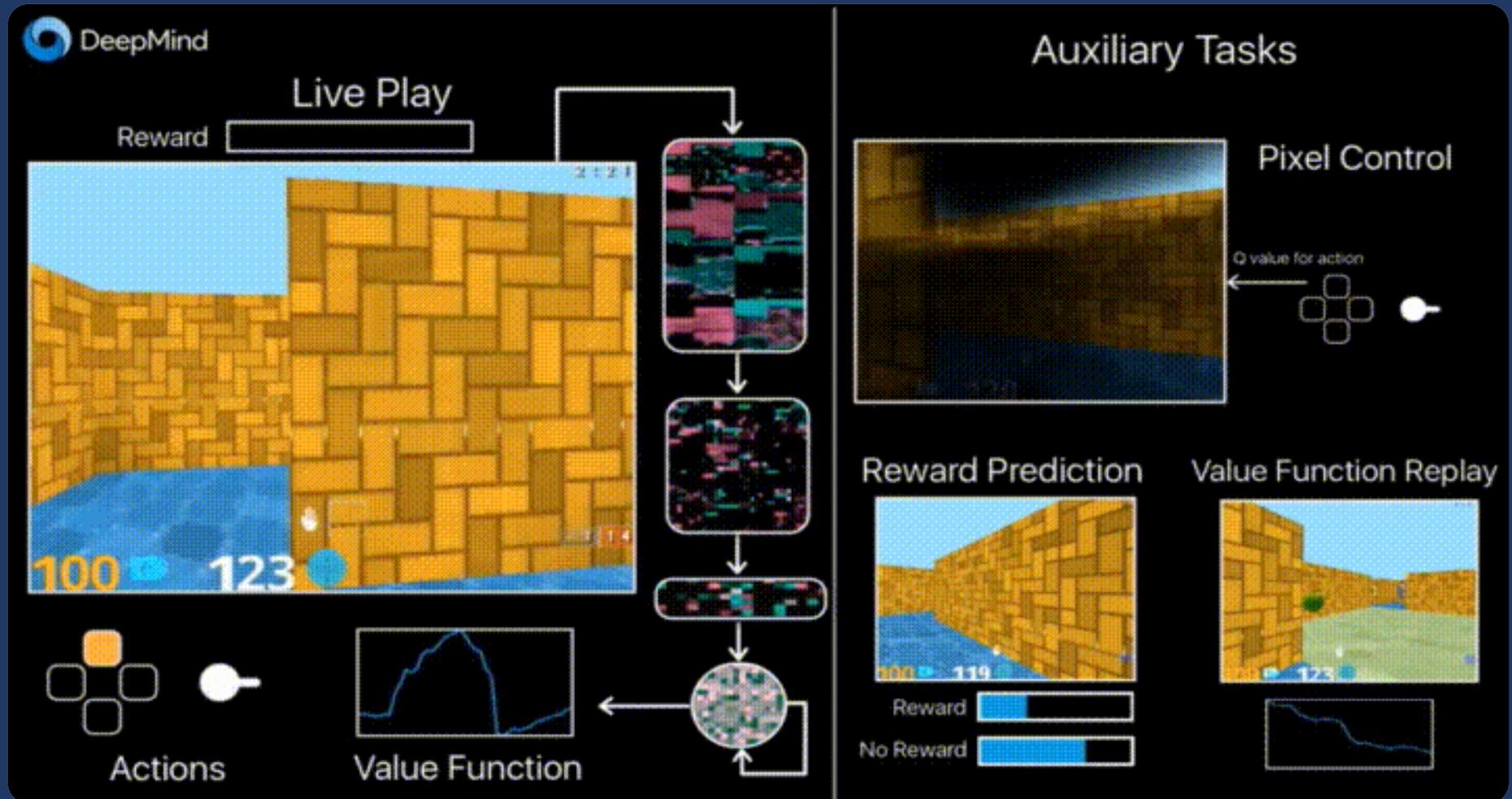


یادگیری تقویتی، مجموعه { input, some output, grade for this output } را به عنوان داده آموزش به کار می گیرد. این روش به طور کلی در حوزه هایی مانند کنترل و بازی های کامپیوتری که نیاز به تعاملات بهینه دارند، استفاده می شود.









طبقه‌بندی و رگرسیون (Classification and Regression)

دو مورد از مهم‌ترین کاربردهای یادگیری نظارت‌شده، **طبقه‌بندی** (classification) و **رگرسیون** (regression) هستند.

طبقه‌بندی، کاربردی‌ترین بخش یادگیری ماشین است. هر دو روش، بخشی از یادگیری نظارت‌شده هستند. بنابراین ساختار داده‌های آموزش آن‌ها به صورت $\{ \text{input}, \text{correct output} \}$ است. **طبقه‌بندی** در `class` و در **رگرسیون**، `value` است.

مثال‌هایی از طبقه‌بندی:

Spam mail filtering service

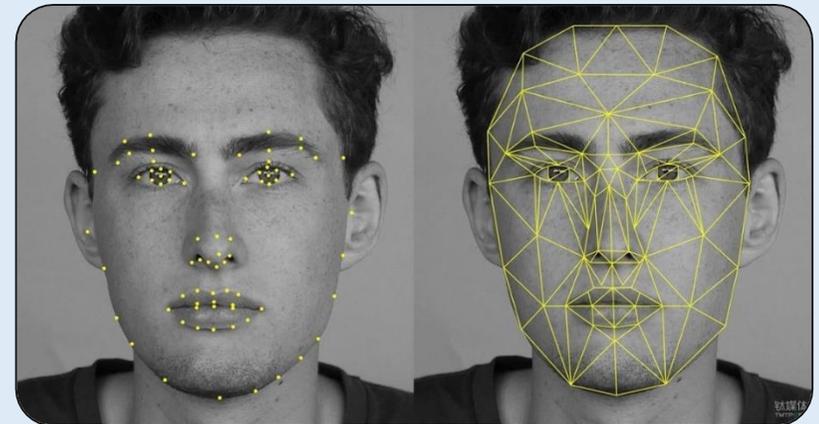
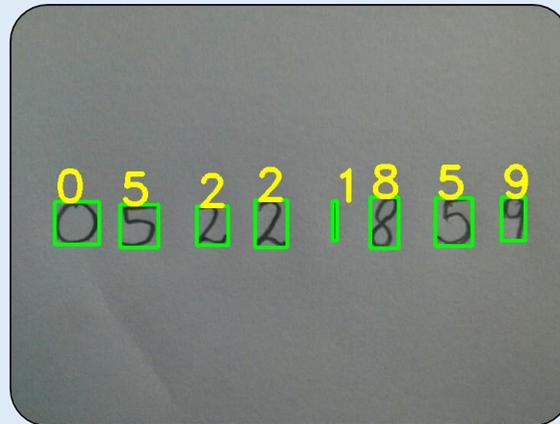
Digit recognition service

Face recognition service

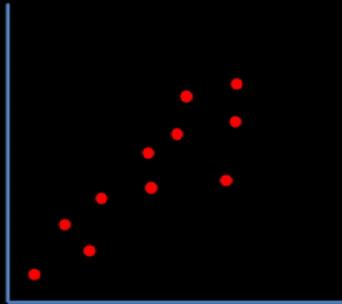
سیستم فیلترینگ ایمیل‌های اسپم

سیستم تشخیص ارقام

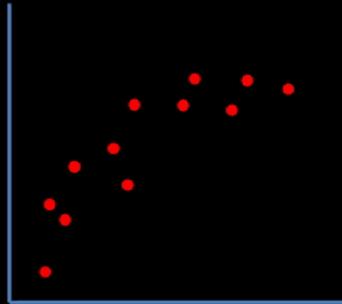
سیستم تشخیص چهره



Regression - Examples

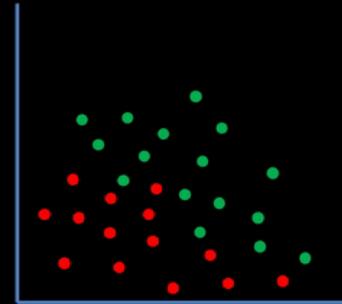


Example - 1

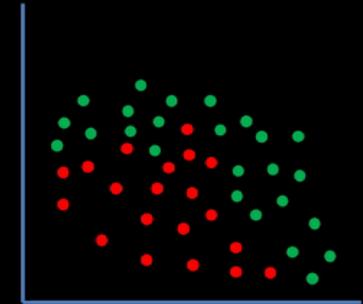


Example - 2

Classification - Examples



Example - 1



Example - 2



برخلاف طبقه‌بندی، **رگرسیون** دسته داده‌ها را تعیین نمی‌کند؛ بلکه خروجی، تخمین یک مقدار است.

به‌طور خلاصه، اگر بخواهیم کلاسی را که داده به آن تعلق دارد تعیین کنیم، از **طبقه‌بندی** و زمانی که به مدلی برای پیش‌بینی روند داده‌ها نیازمندیم، از **رگرسیون** بهره می‌گیریم.



Regression

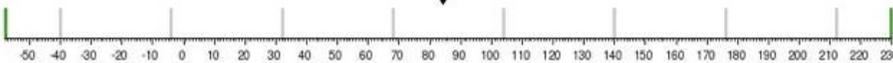
What is the temperature going to be tomorrow?

PREDICTION

84°

Fahrenheit

°F



Classification

Will it be Cold or Hot tomorrow?

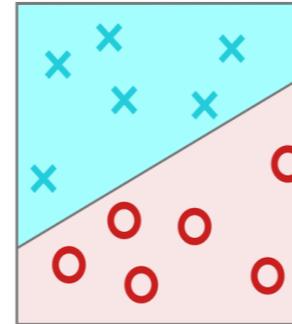
COLD

PREDICTION

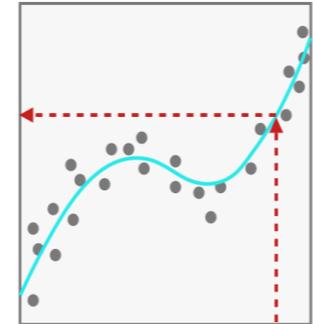
HOT

Fahrenheit

°F



Classification



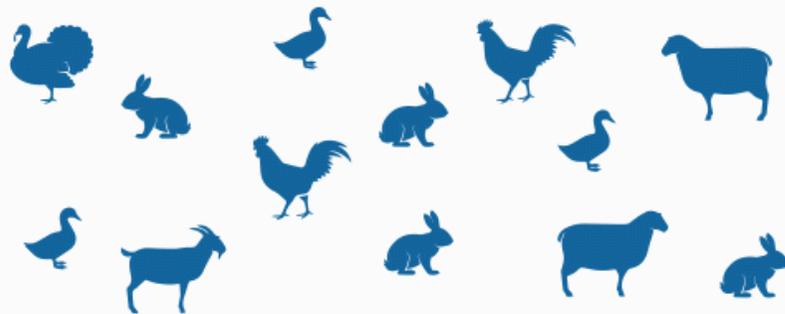
Regression

Supervised Learning

- Classification
- Regression

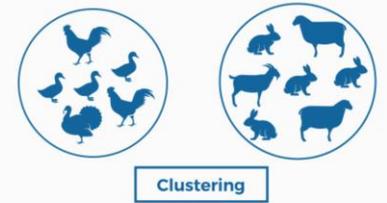
Unsupervised Learning

- Clustering
- Dimensionality reduction
- Pattern recognition

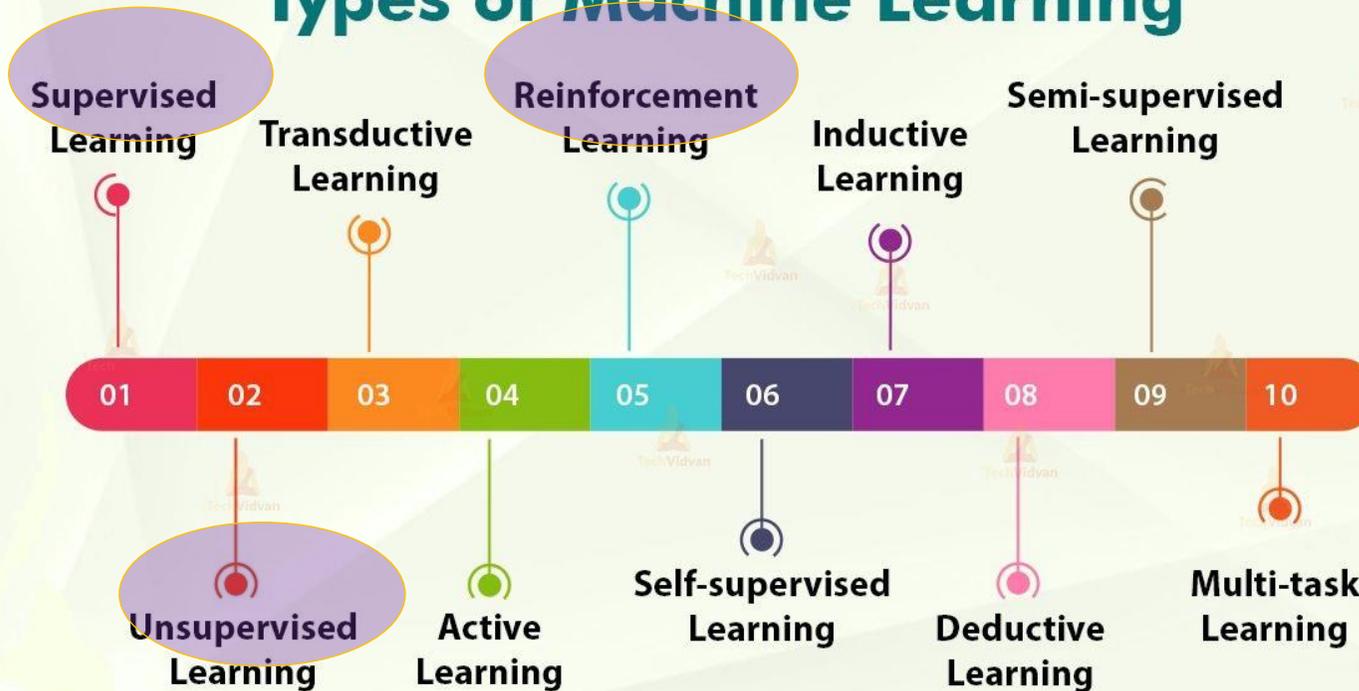


Classification

Clustering

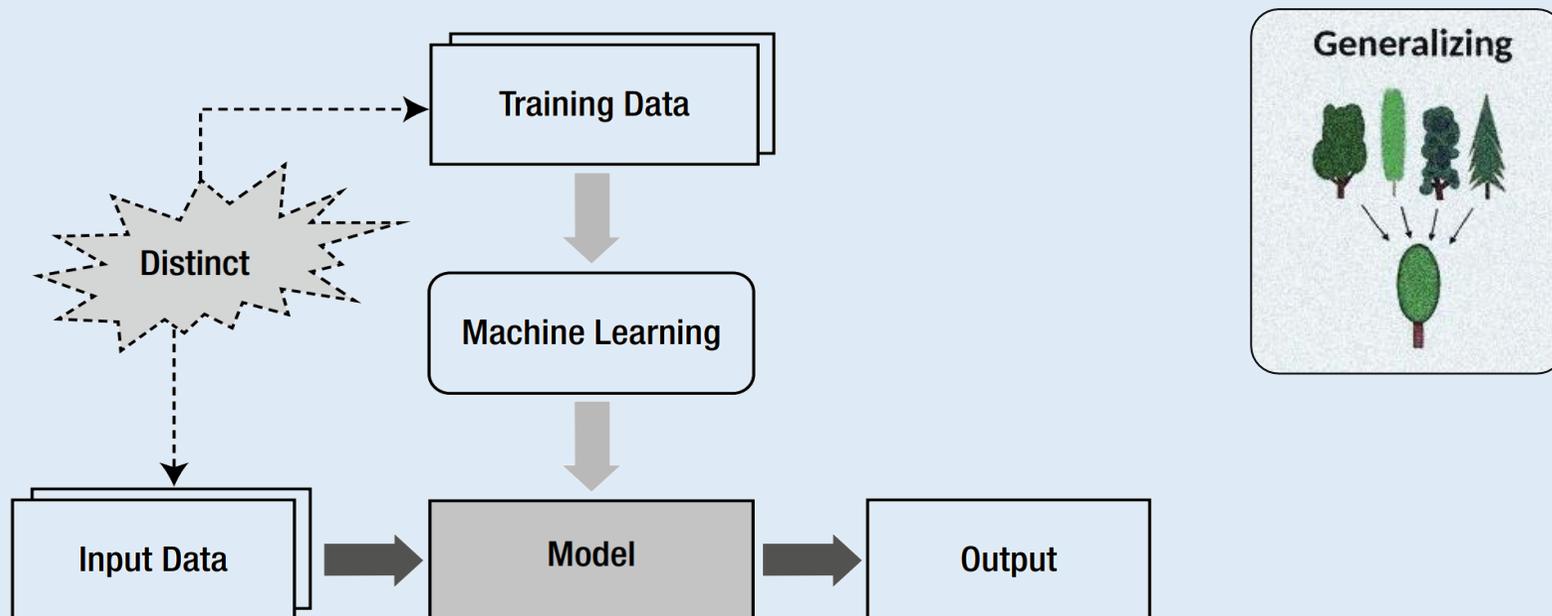


Types of Machine Learning



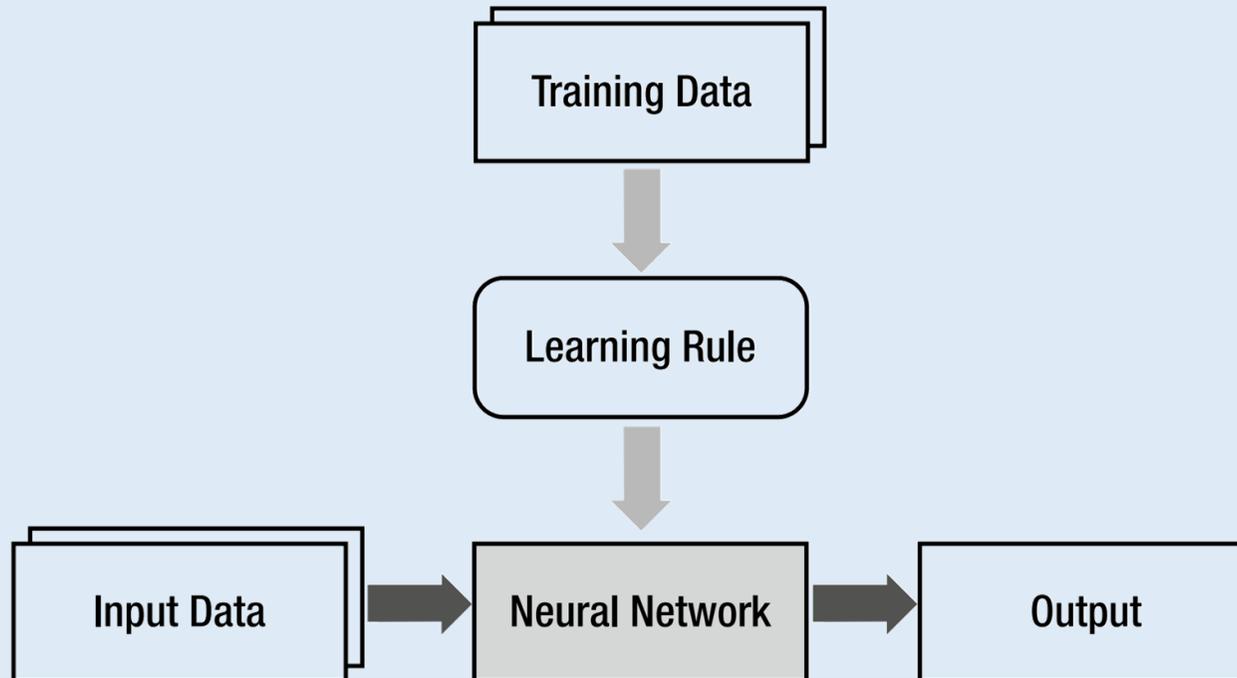
اساسی‌ترین مشکلی که یادگیری ماشین با آن مواجه است، تفاوت داده‌های آموزش و داده‌های ورودی واقعی است. بسیار مهم است از داده‌های آموزشی‌ای استفاده کنیم که به بهترین نحو، بیان‌گر ویژگی‌های داده‌های واقعی باشند.

فرآیندی که بازدهی مدل را مستقل از داده‌های ورودی یا داده‌های آموزش بهبود می‌بخشد، **تعمیم** (Generalization) نامیده می‌شود. موفقیت فرآیند یادگیری ماشین، عمیقا وابسته به کیفیت **تعمیم** انجام شده است.

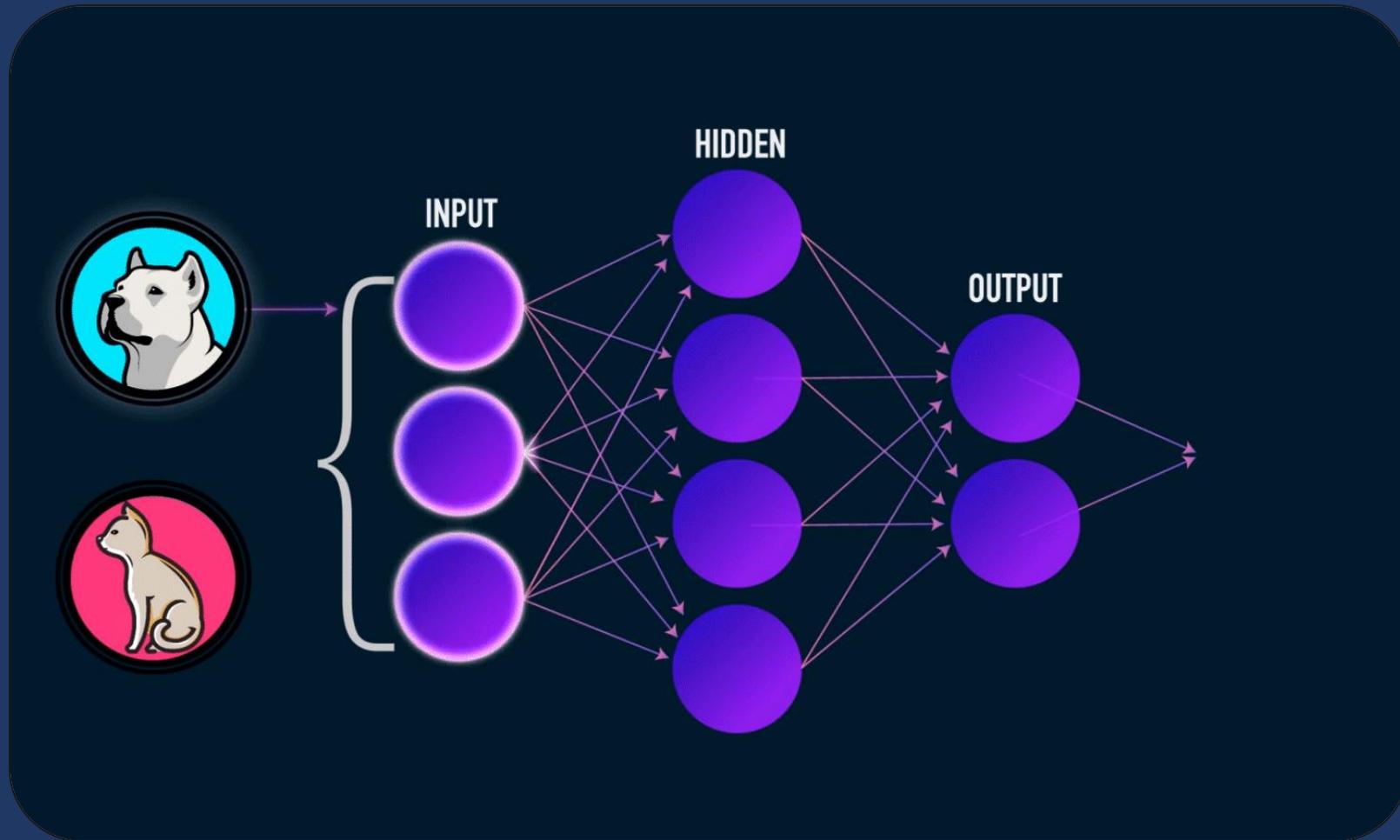


برای درک بهتر یادگیری عمیق، به طور اجمالی مفاهیم و کاربردهای شبکه‌های عصبی را مطالعه می‌کنیم.
شبکه‌های عصبی (Neural Networks) یکی از روش‌های پیاده‌سازی مدل‌های یادگیری ماشین است.

در این فصل به توضیح قوانین یادگیری برای شبکه‌های عصبی تک‌لایه (Single-layer Neural Network) می‌پردازیم. در فصل آینده، قوانین یادگیری برای شبکه‌های عصبی چندلایه (Multi-layer Neural Network) را بررسی خواهیم کرد.



An Application of Neural Network



Aspect	Human Brain	Artificial Neural Network (ANN)
Size	86 Billion Neuron in Them	10-1000 Neurons in Them
Learning	They Can Tolerate Ambiguity	Very Precise & Structured Data Is Required to Practice Ambiguity
Topology	Complex Topology with Asynchronous Connections	Topology Has Tree Patterns with Layers
Power Consumption	Consumer Less Power. Approx. 20 Watts	Consumes More Power

Biological Neuron

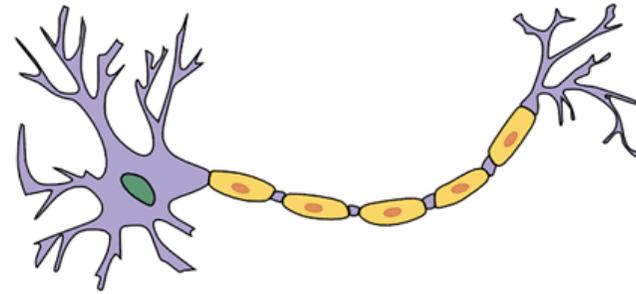


Fig: Biological Neuron

Artificial Neuron

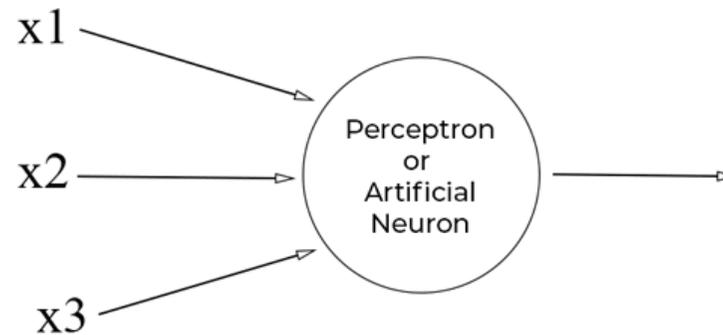
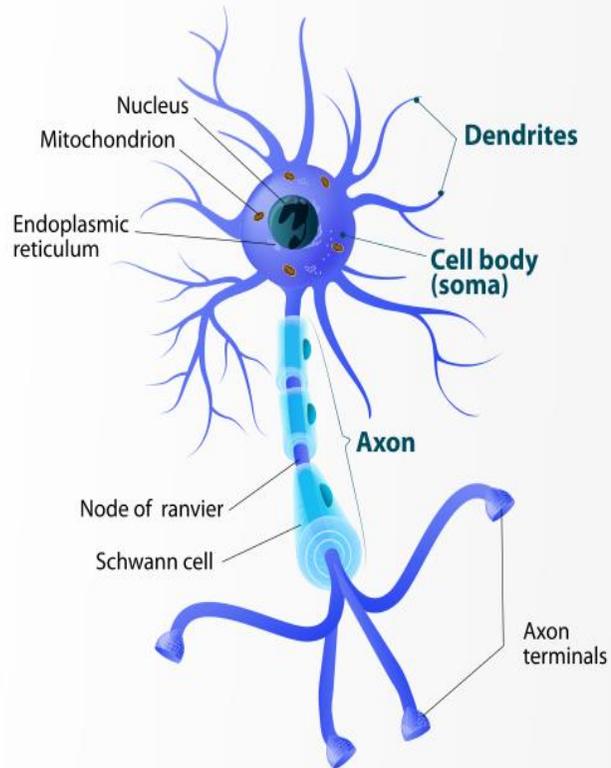
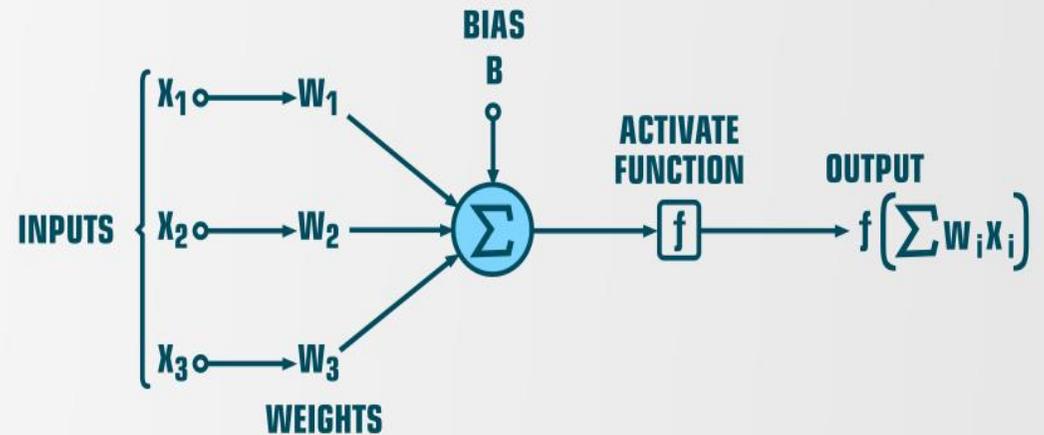


Fig: Artificial Neuron

Structure of Typical Neuron



Structure of Artificial Neuron

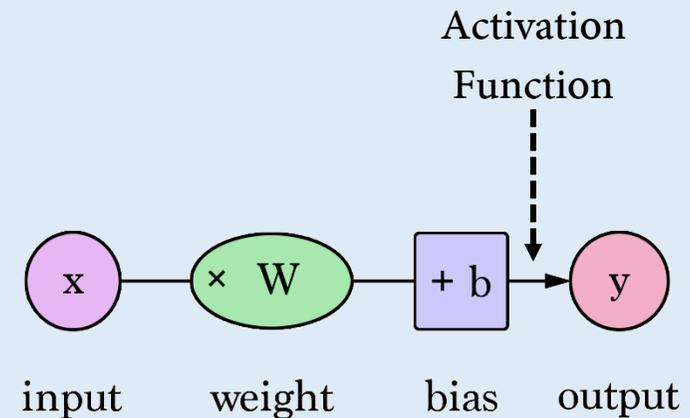
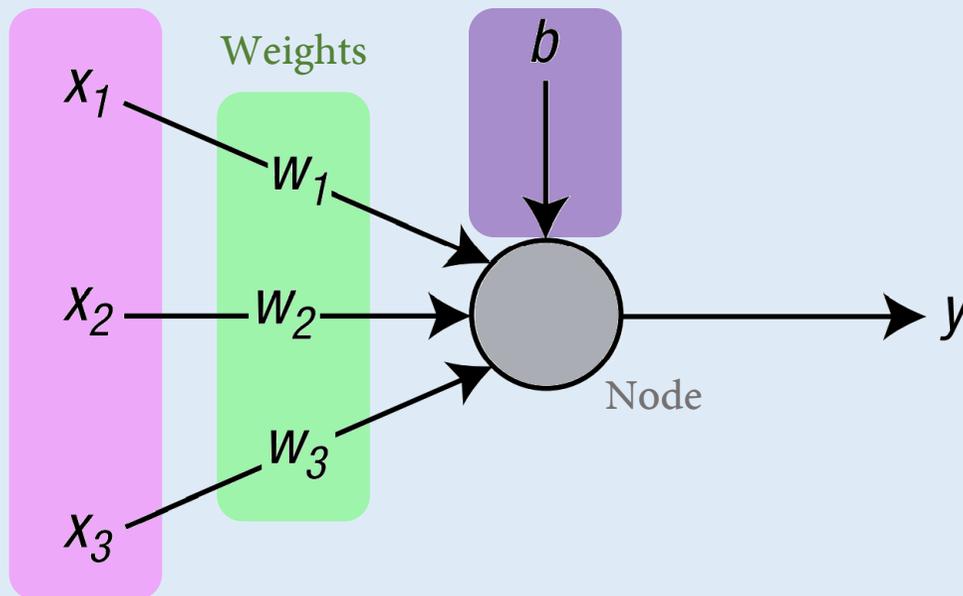


شبکه عصبی با استفاده از **مقدار وزنی (Weight Value)** از ارتباطات نورون‌ها که مهم‌ترین سازوکار مغز هستند، تقلید می‌کند.

Brain	Neural Network
Neuron	Node
Connection of Neurons	Connection Weight

بایاس (Bias)، عاملی برای ذخیره اطلاعات است. اطلاعات شبکه عصبی، با مقادیر وزن‌ها و بایاس ذخیره می‌شوند.

Input Signals



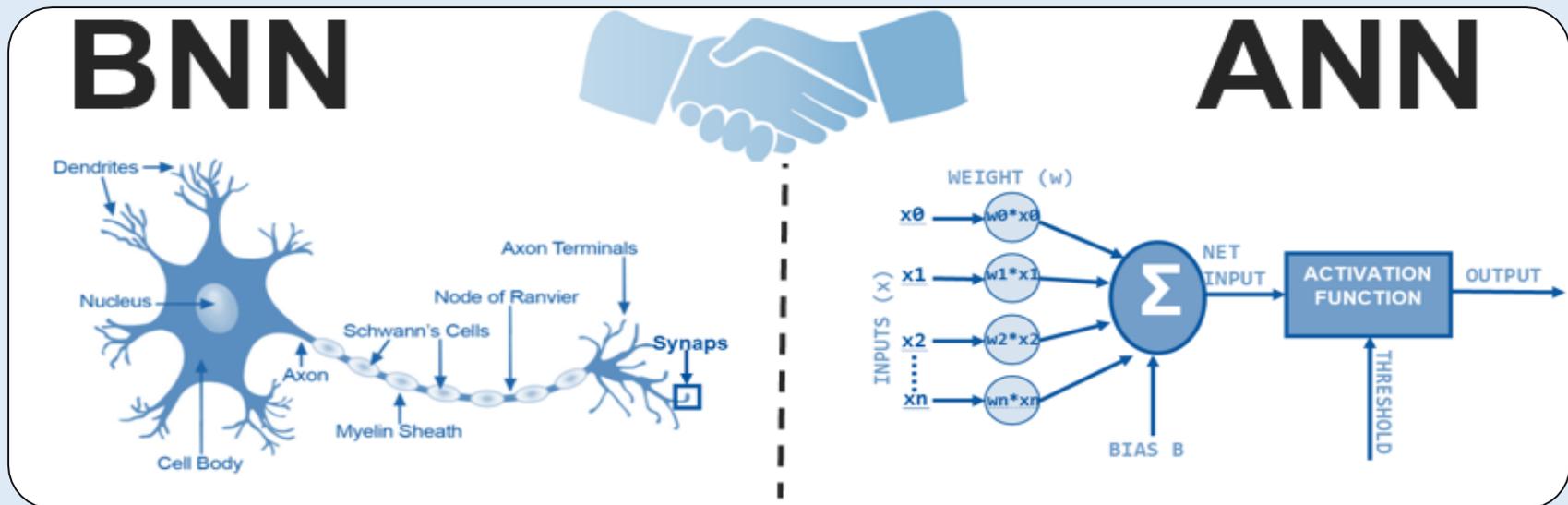
جمع وزنی (Weighted Sum)، به صورت زیر محاسبه می‌شود:

$$v = (w_1 \times x_1) + (w_2 \times x_2) + (w_3 \times x_3) + b = [w_1 \quad w_2 \quad w_3] \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + b = W\mathbf{x} + b$$

در نهایت، Node مقدار جمع وزنی را به تابع فعال‌سازی (Activation Function) داده و خروجی را تولید می‌کند. تابع فعال‌سازی φ ، عملکرد Node را مشخص می‌کند.

$$y = \varphi(v) = \varphi(W\mathbf{x} + b)$$

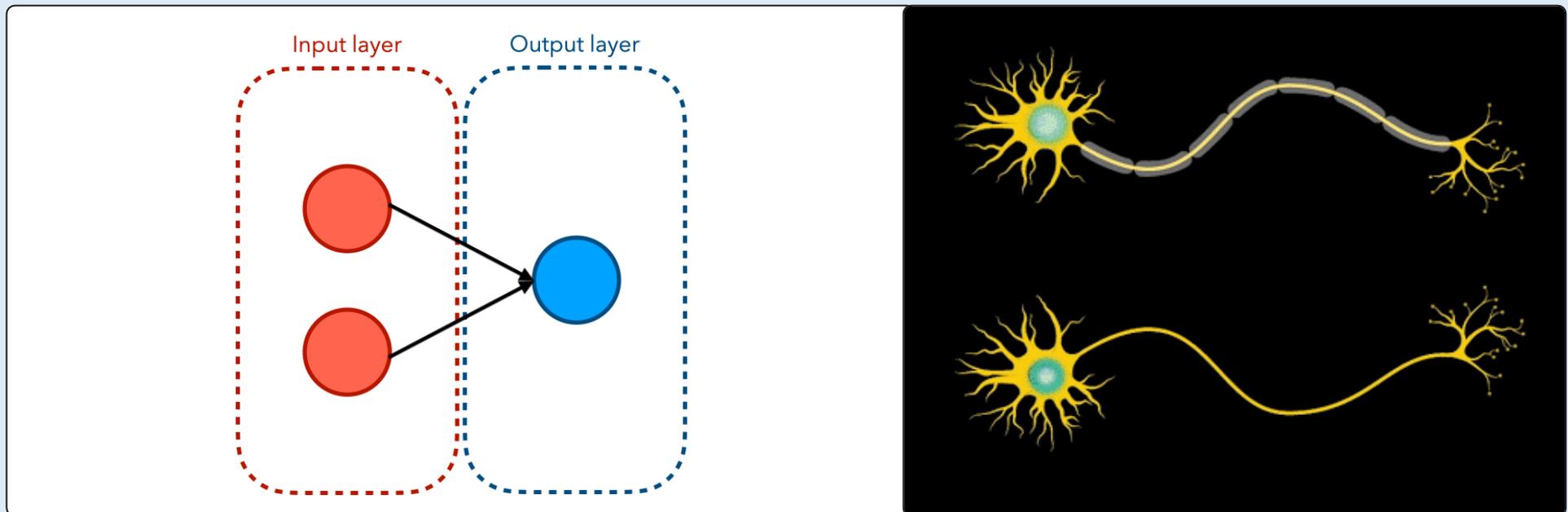
در شبکه‌های عصبی، انواع مختلفی از توابع فعال‌سازی را در اختیار داریم. (مثلا Sigmoid، Softmax و ...)



تلاش برای غلبه بر محدودیت‌های عملی شبکه عصبی تک‌لایه، منجر به خلق معماری شبکه عصبی چندلایه شد؛ ولی روند آن که مبتنی بر اضافه شدن لایه نهان به شبکه عصبی تک‌لایه بود، حدود ۳۰ سال طول کشید.

مشکل اصلی در شبکه عصبی چندلایه، تعریف خطا برای Node های نهانست.

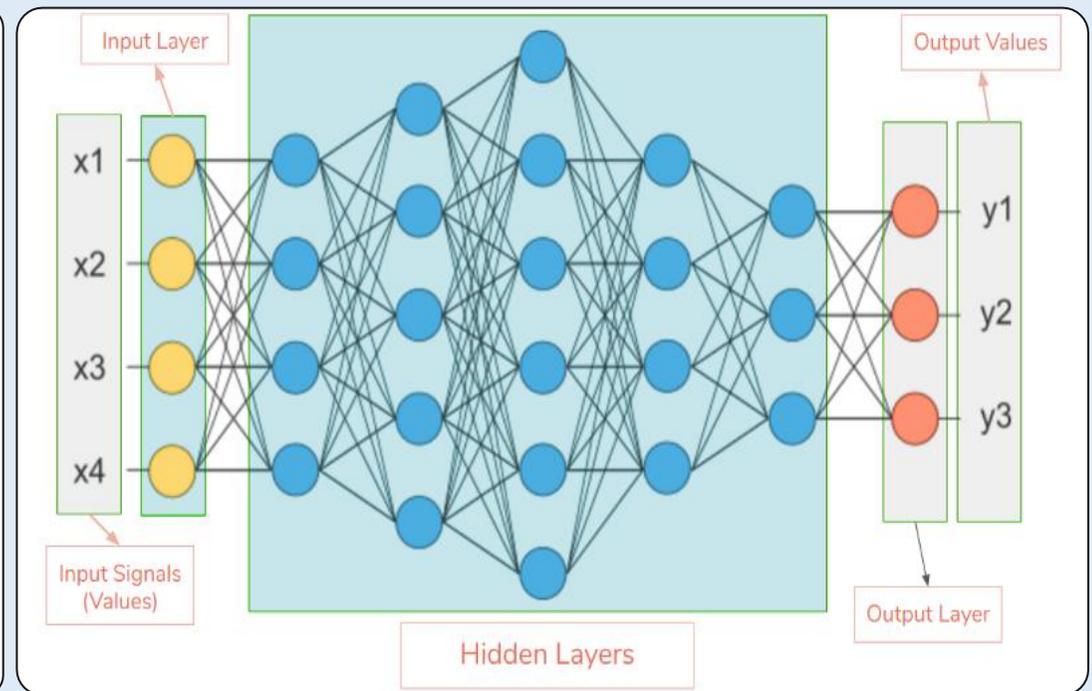
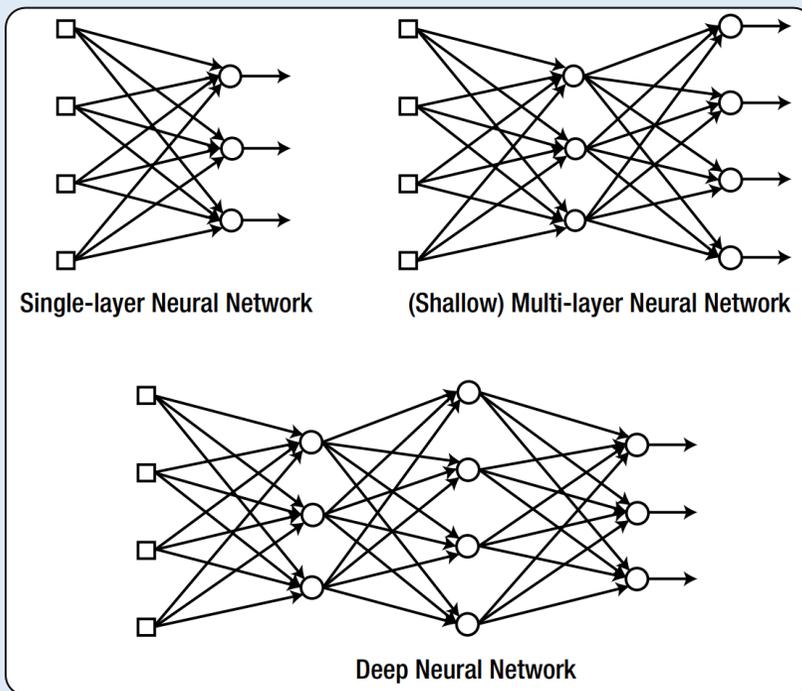
در ۱۹۸۶، معرفی الگوریتم پس انتشار (Back-propagation Algorithm) مشکل آموزش شبکه‌های عصبی چندلایه را حل کرد.



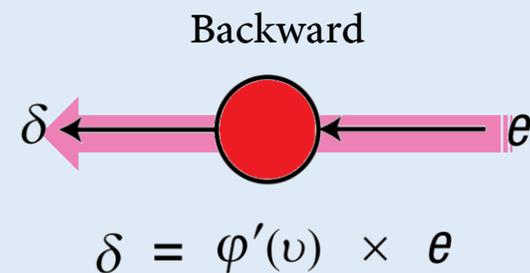
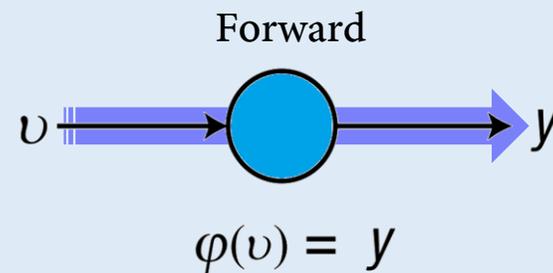
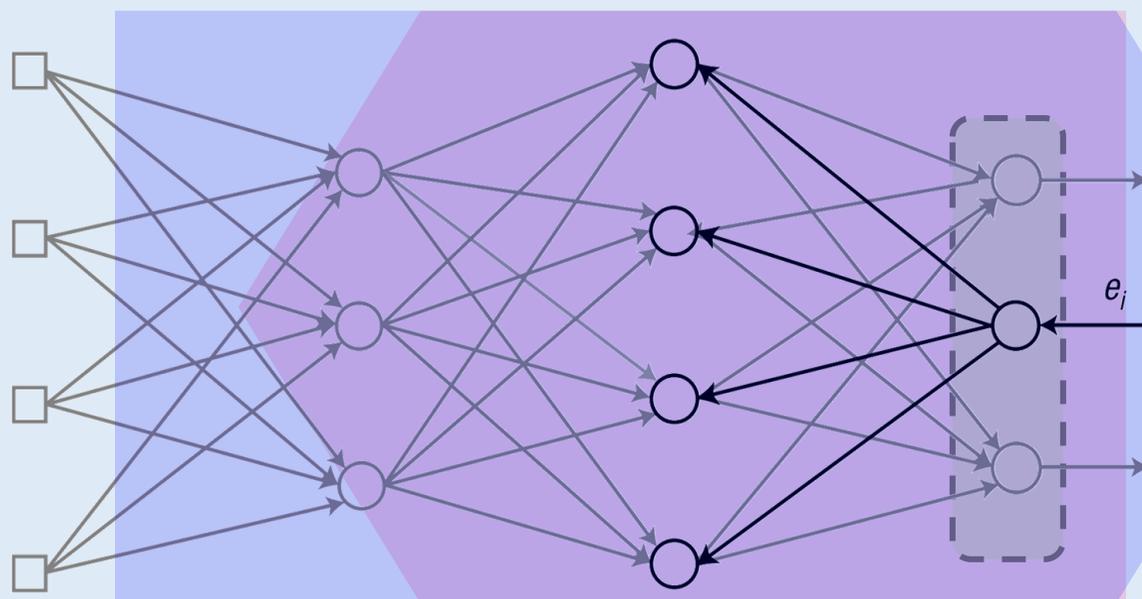
Single-Layer Neural Network		Input Layer - Output Layer
Multi-Layer Neural Network	Shallow Neural Network	Input Layer - Hidden Layer - Output Layer
	Deep Neural Network	Input Layer - Hidden Layers - Output Layers

شبکه عصبی عمیق

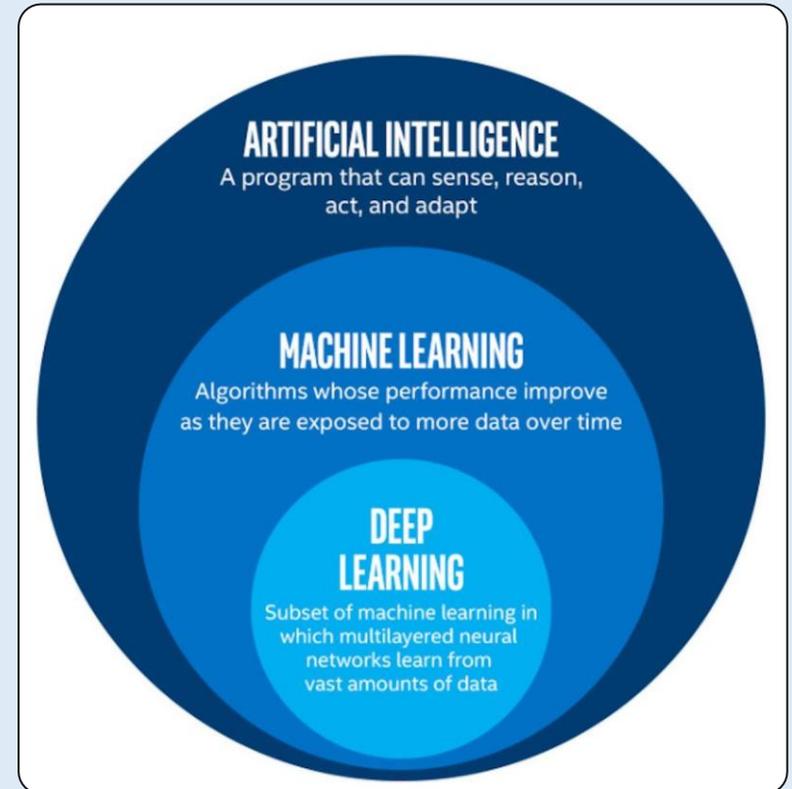
(Deep Neural Network) هستند.



در این الگوریتم، خطای خروجی از لایه خروجی به سمت عقب حرکت می کند تا به ابتدای لایه نهان برسد. این فرآیند که با انتشار خطای خروجی به سمت عقب شبکه عصبی اتفاق می افتد، پس انتشار نامیده می شود.



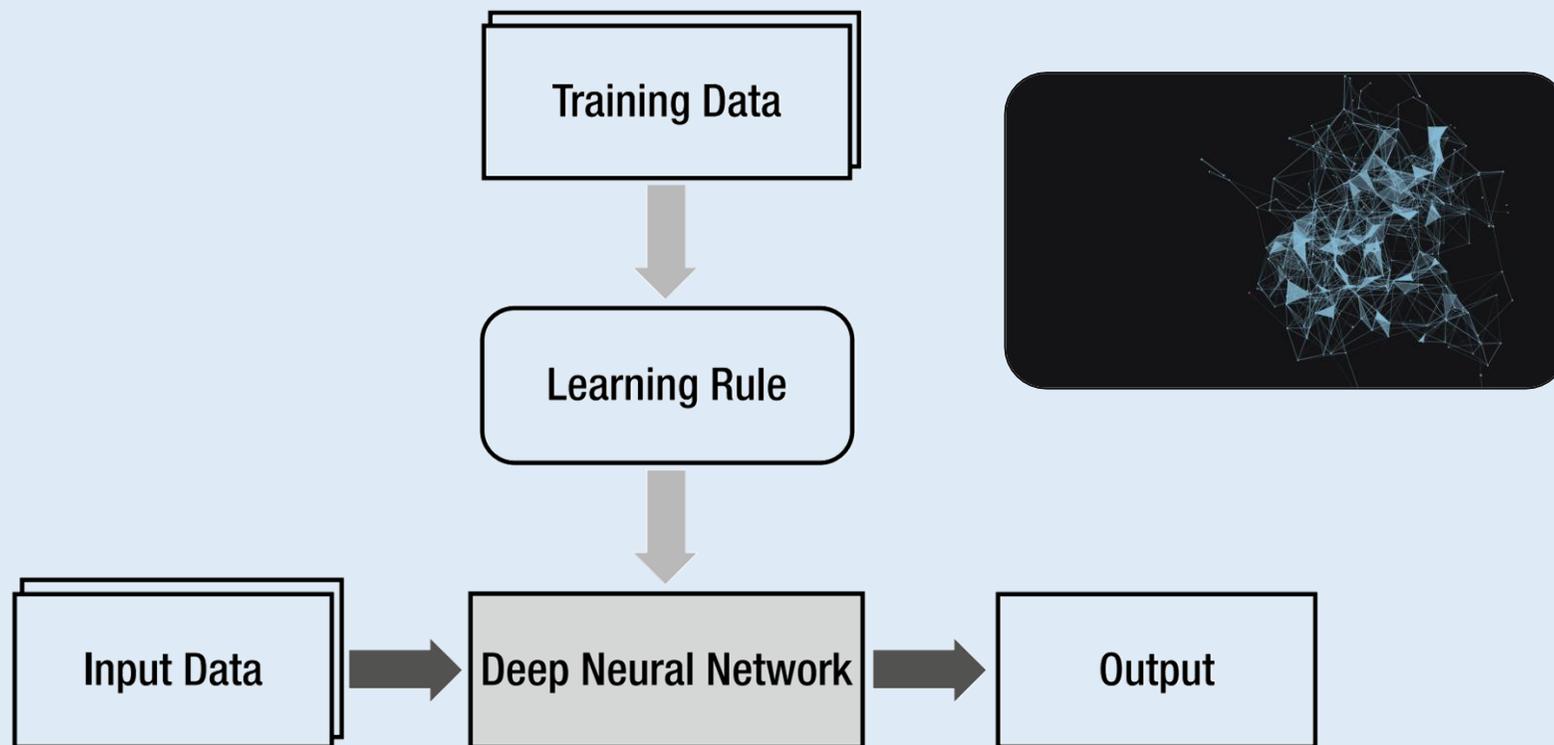
پس انتشار



Deep Neural Network

یادگیری عمیق، تعمیمی از شبکه عصبی و به طور خلاصه، یک روش یادگیری ماشینست که از شبکه‌های عصبی عمیق استفاده می‌کند.

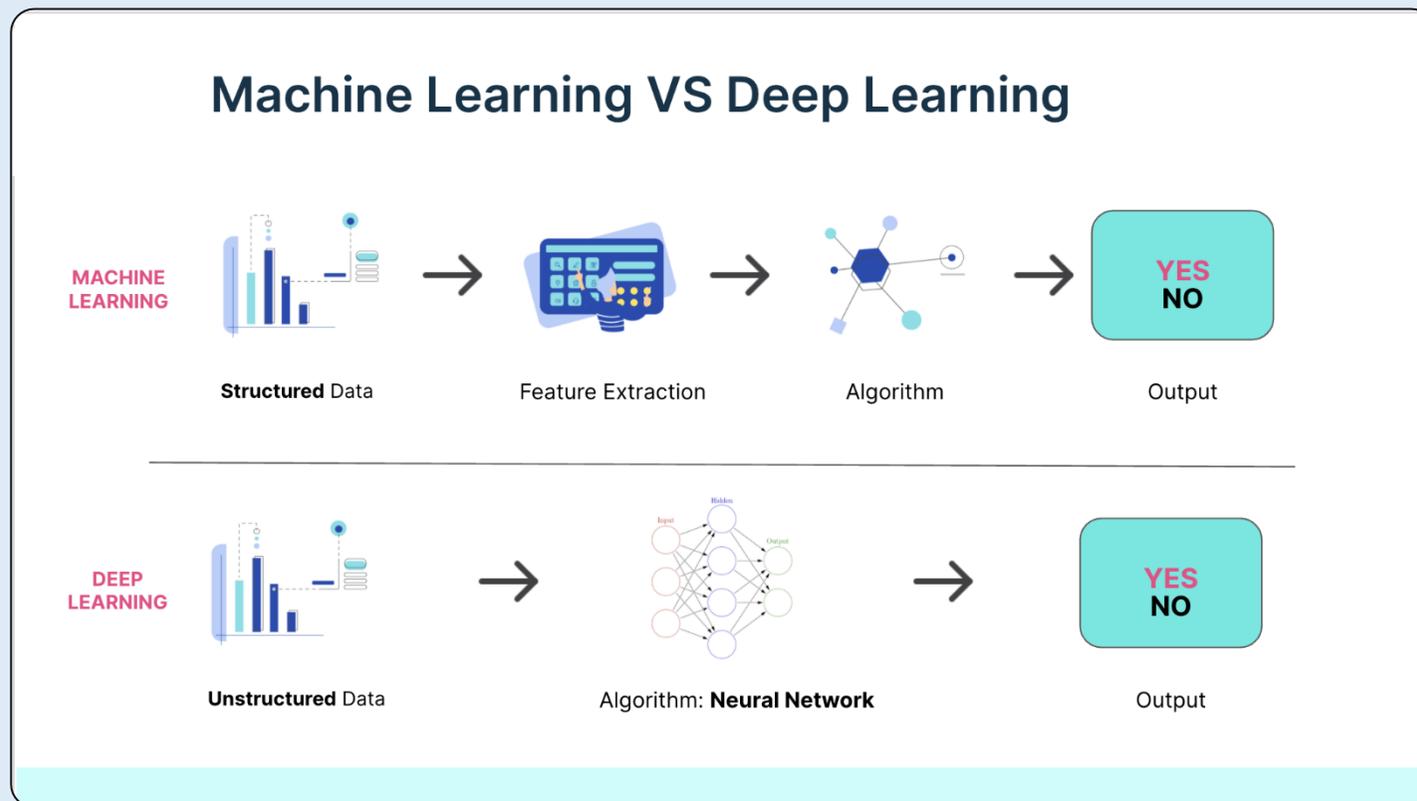
شبکه عصبی عمیق (Deep Neural Network)، شبکه عصبی چندلایه‌ایست که شامل دو یا چند لایه نهان می‌شود.



Deep Neural Network

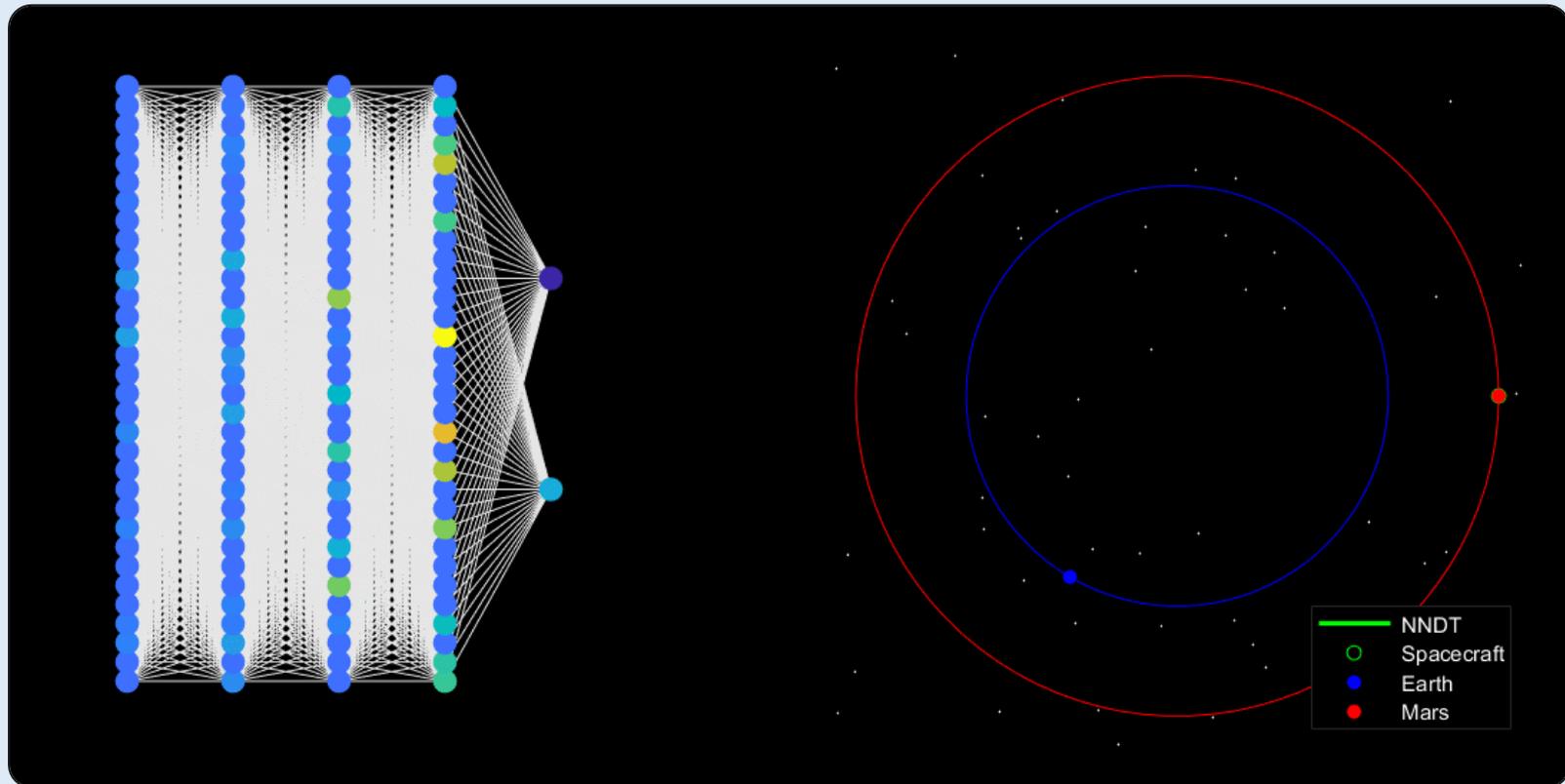
یادگیری عمیق، تعمیمی از شبکه عصبی و به طور خلاصه، یک روش یادگیری ماشینست که از شبکه‌های عصبی عمیق استفاده می‌کند.

شبکه عصبی عمیق (Deep Neural Network)، شبکه عصبی چندلایه‌ایست که شامل دو یا چند لایه نهان می‌شود.



حدود ۳۰ سال طول کشید تا مسائلی که توسط شبکه عصبی تک‌لایه قابل حل نبودند، با شبکه عصبی چندلایه حل شوند. علت این ۳۰ سال زمان، نبود قانون یادگیری مناسب بود. این مشکل با معرفی الگوریتم پس‌انتشار رفع شد.

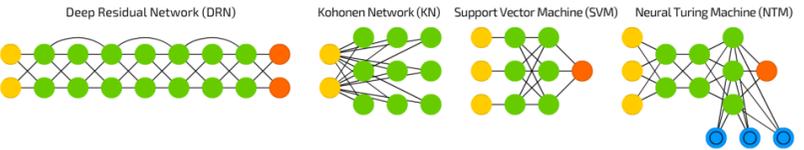
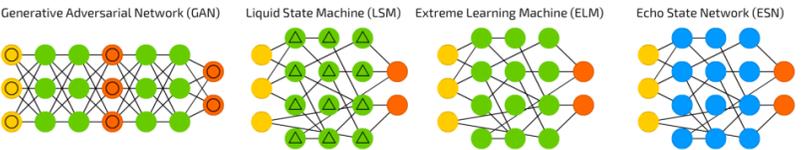
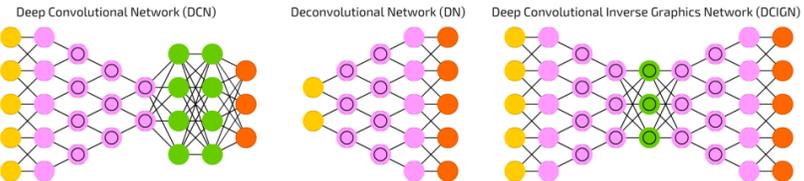
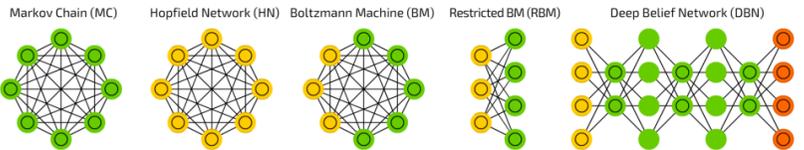
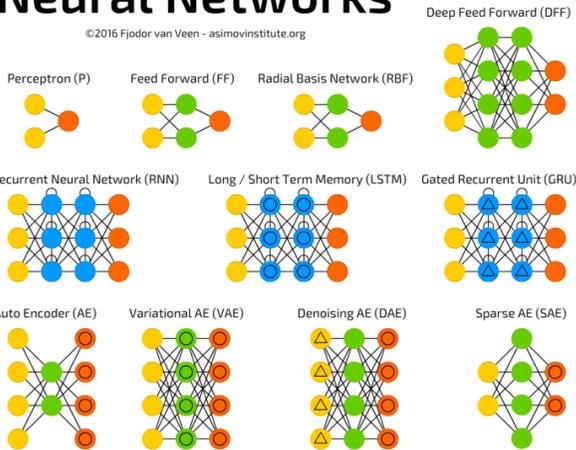
۲۰ سال دیگر هم گذشت تا یادگیری عمیق مبتنی بر شبکه‌های عصبی عمیق ظهور کند. مشکل این ۲۰ سال زمان، کارایی پایین الگوریتم پس‌انتشار بود. یادگیری عمیق، راه حلی برای این مشکل ارائه کرد.



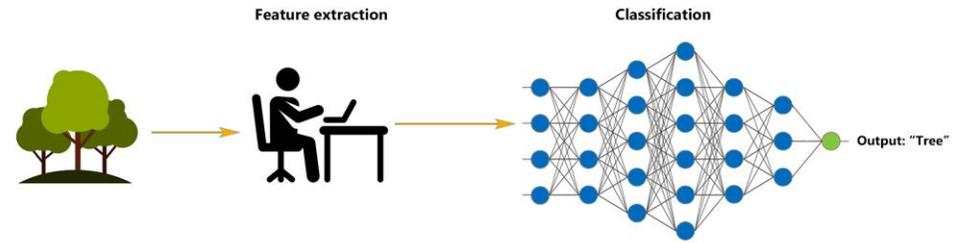
A mostly complete chart of Neural Networks

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- Backfed Input Cell
- Input Cell
- △ Noisy Input Cell
- Hidden Cell
- Probablistic Hidden Cell
- △ Spiking Hidden Cell
- Output Cell
- Match Input Output Cell
- Recurrent Cell
- Memory Cell
- △ Different Memory Cell
- Kernel
- Convolution or Pool

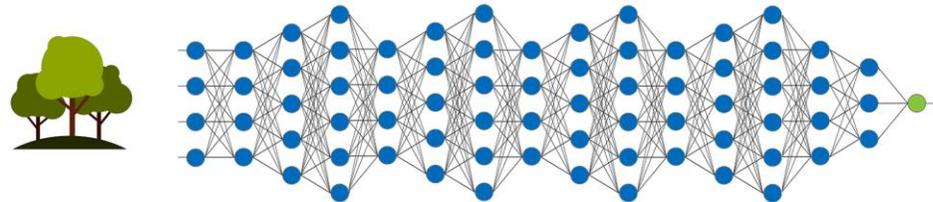


Machine Learning



Deep Learning

Feature extraction + Classification



دلیل کارایی پایین شبکه عصبی با لایه‌های عمیق، عدم امکان آموزش مناسب شبکه عصبیست و الگوریتم پس‌انتشار، با سه مشکل اساسی در فرایند آموزش شبکه عصبی عمیق مواجه است:

Vanishing Gradient

راه حل‌ها: استفاده از قانون یادگیری مبتنی بر Cross Entropy - استفاده از تابع ReLu برای فعال‌سازی - استفاده از Advanced Gradient Descent

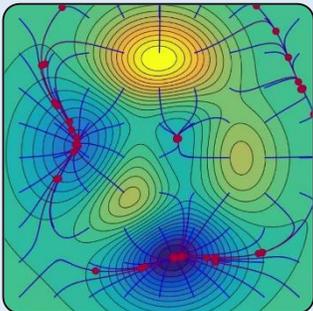
Overfitting

راه حل‌ها: اضافه کردن ترم‌های منظم‌سازی به Cost Function - استفاده از متود Dropout - استفاده از Massive Training Data

Computational Load

راه حل‌ها: استفاده از GPUهای قوی‌تر - استفاده از الگوریتم Batch Normalization

در ادامه به بررسی اجمالی هر مورد خواهیم پرداخت.



علاوه بر این، قوانین یادگیری مبتنی بر انتروپی متقاطع (Cross Entropy)، کارایی را بهبود می دهند. همچنین استفاده از روش گرادینان کاهش پیشرفته (Advanced Gradient Descent) که روشی عددی برای دستیابی بهتر به مقدار بهینه است، برای آموزش شبکه عصبی عمیق مفید خواهد بود.

Gradient Descent Variants

Stochastic Gradient Descent

Mini-batch Gradient Descent

Batch Gradient Descent

...

Gradient Descent Optimization Algorithms

Momentum

Adagrad

RMSprop

AdaMax

AMSGrad

Nesterov
Accelerated Gradient

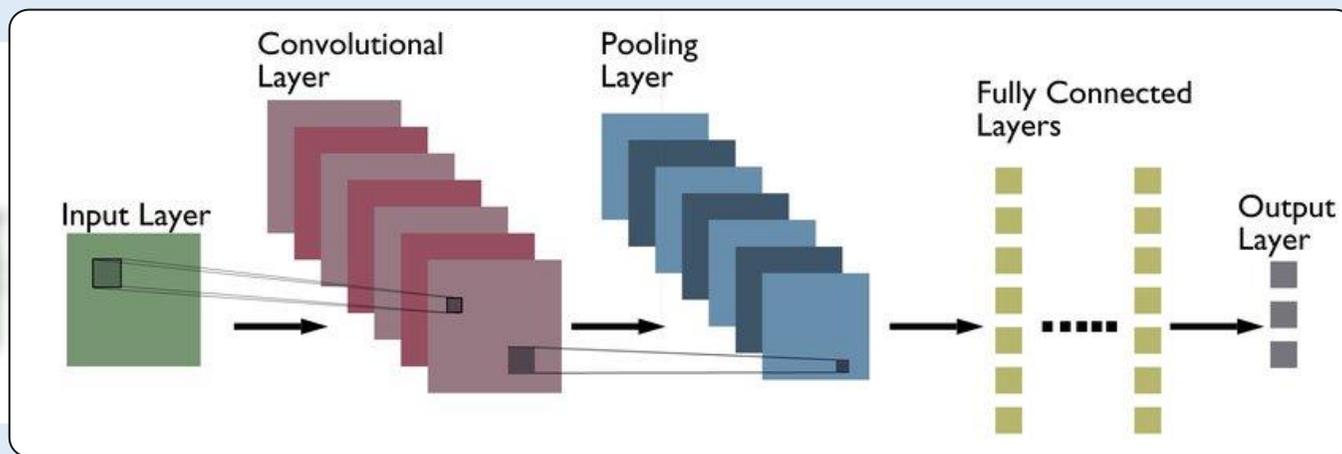
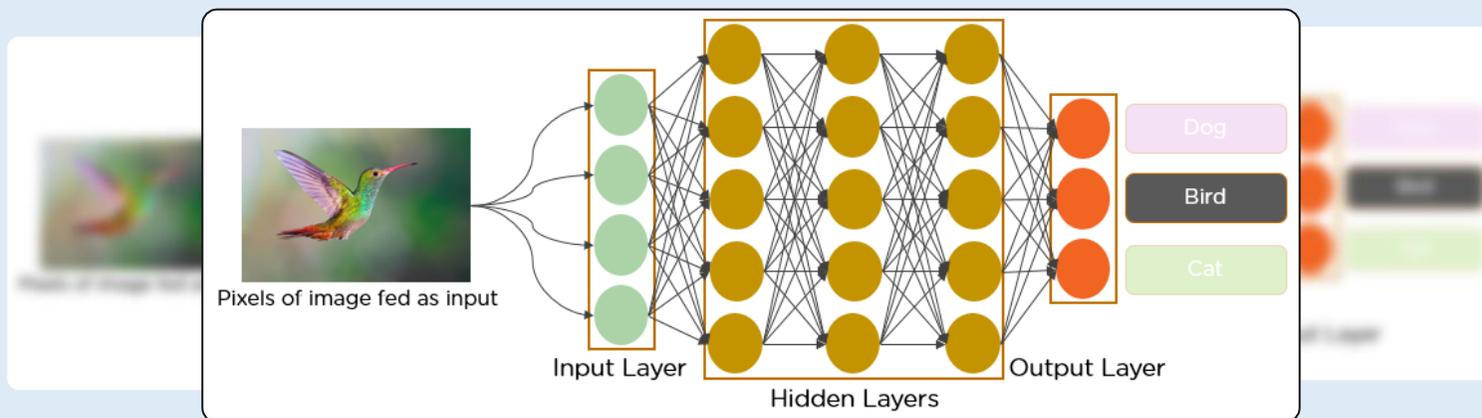
Adadelta

Adam

Nadam

...

اهمیت شبکه های عصبی عمیق در باز کردن راه برای مدل های پیچیده غیرخطی است.
ConvNet، شبکه عصبی عمیق، با کاربرد ویژه در تشخیص تصاویر است.



ConvNet، روشی قدیمیست که در دهه‌های ۱۹۸۰ و ۱۹۹۰ به رهبری Yann LeCun توسعه یافت؛ اما به دلیل غیرعملی بودن برای کاربردهای واقعی در تصاویر پیچیده، مدتی نسبتاً طولانی به فراموشی سپرده شد. از سال ۲۰۱۲ که این روش مجدداً به طور چشم‌گیر مورد توجه قرار گرفت، در بیشتر حوزه‌های مطالعاتی بینایی ماشین به کار رفته و با سرعت زیادی در حال رشد است.

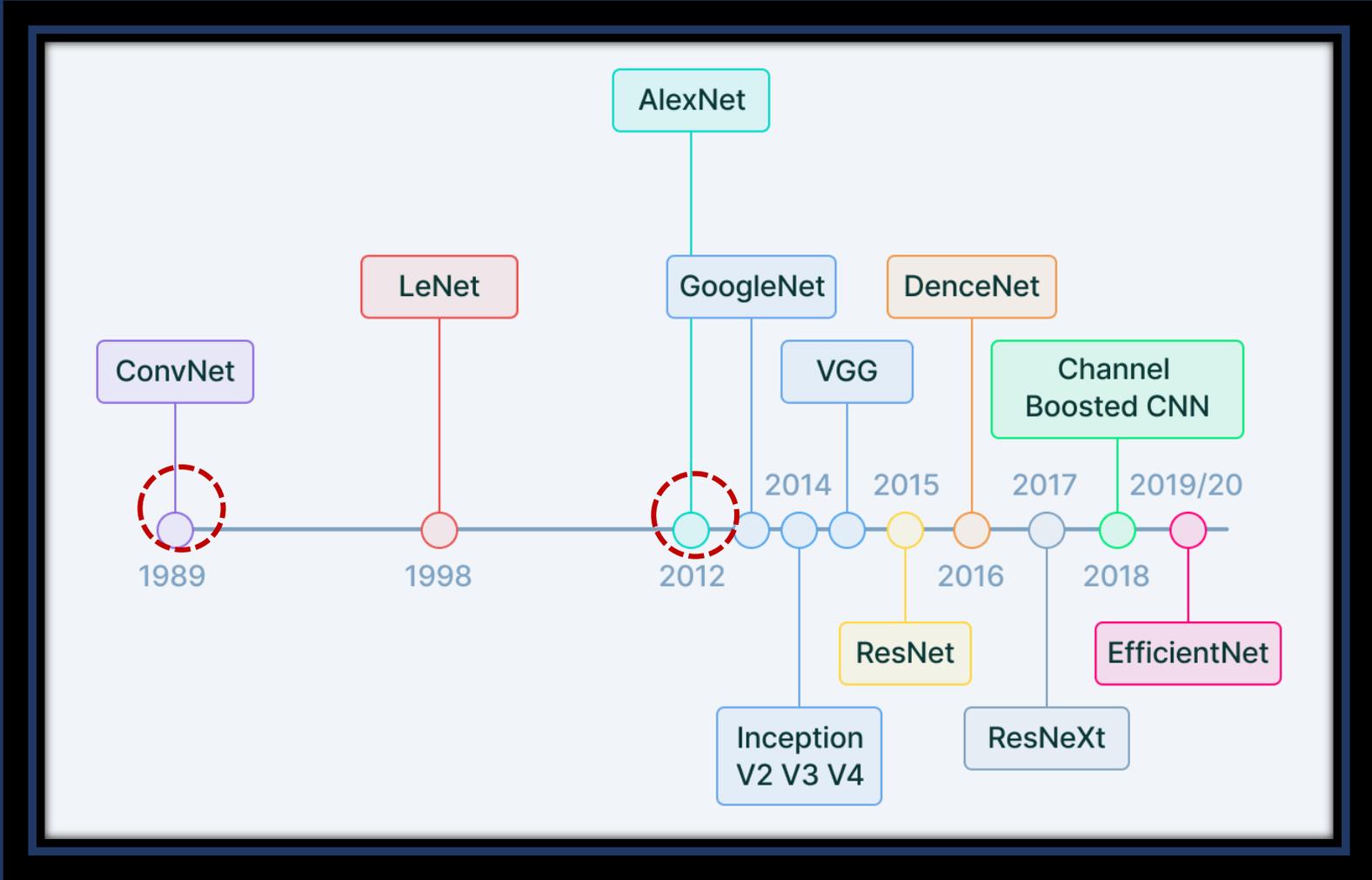
UDACITY TALKS

Yann LeCun

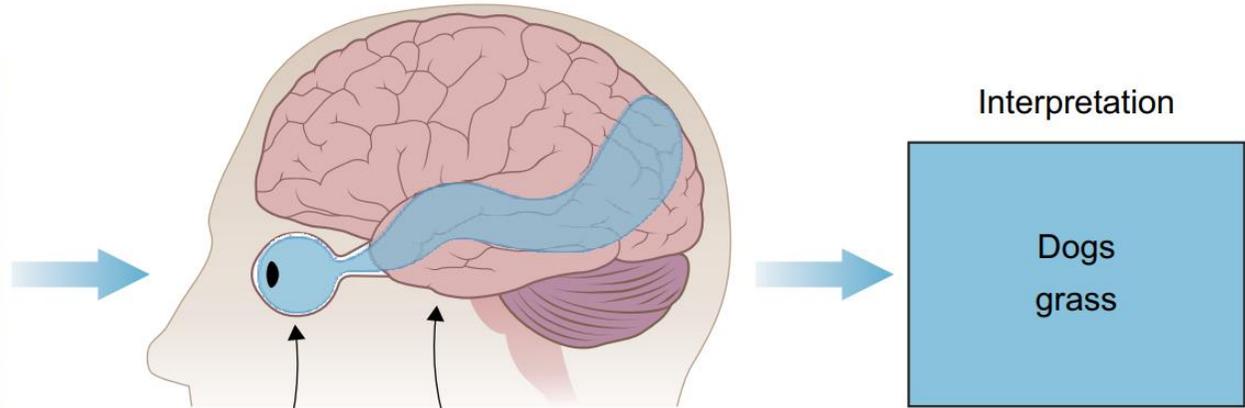
Director of AI Research

facebook





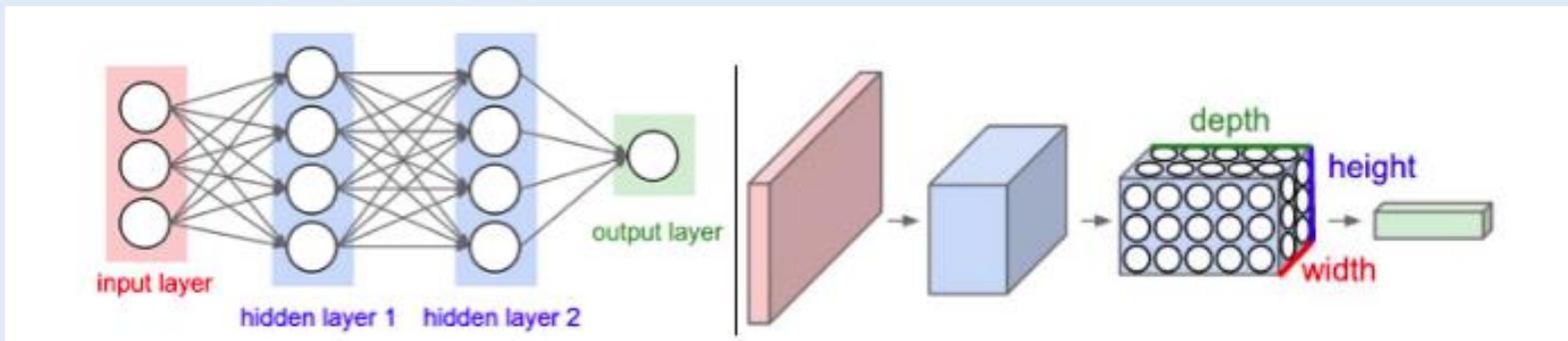
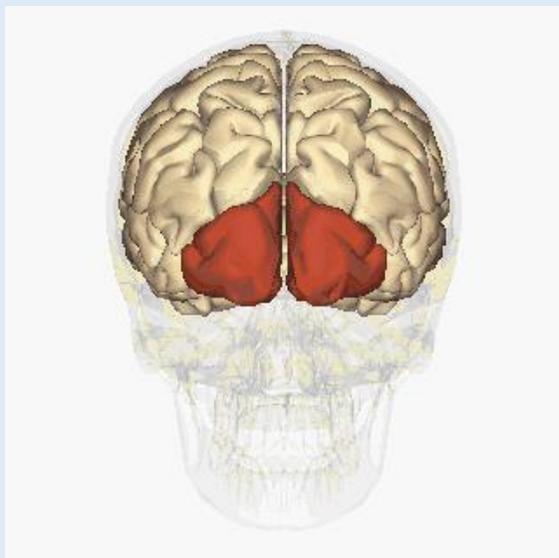
Human vision system



Eye (sensing device responsible for capturing images of the environment)

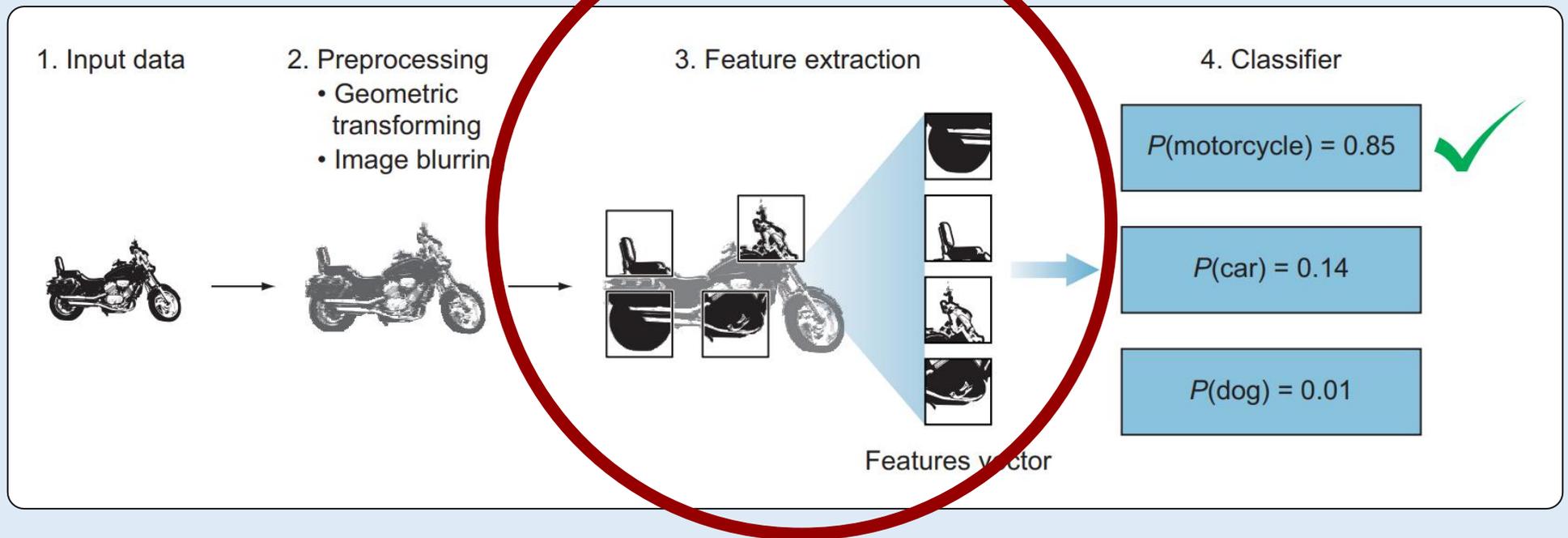
Brain (interpreting device responsible for understanding the image content)

ConvNet، شبکه عصبی عمیقیست که چگونگی پردازش و تشخیص تصاویر توسط Visual Cortex مغز را تقلید می‌کند. درک این مفهوم در اولین برخورد، اغلب حتی برای افراد متخصص Neural Networks هم دشوار است. (به دلیل تفاوت مفاهیم و عملکرد ConvNet با شبکه‌ها عصبی قبلی)



تشخیص تصاویر، در واقع همان طبقه‌بندیست (معمولا طبقه‌بندی چنددسته‌ای)؛ منتهی صرفا استفاده از تصاویر اصلی برای تشخیص تصاویر جدید، بدون توجه به روش کار، منجر به نتایج ضعیفی می‌شود. بنابراین پیش از این کار، باید تصاویر را برای استخراج ویژگی‌ها پردازش کنیم.

روش‌های متعددی برای Image Feature Extraction توسعه داده شده‌است. (از جمله GLOH, RIFT, Spin Image, HoG, SIFT, Textons).



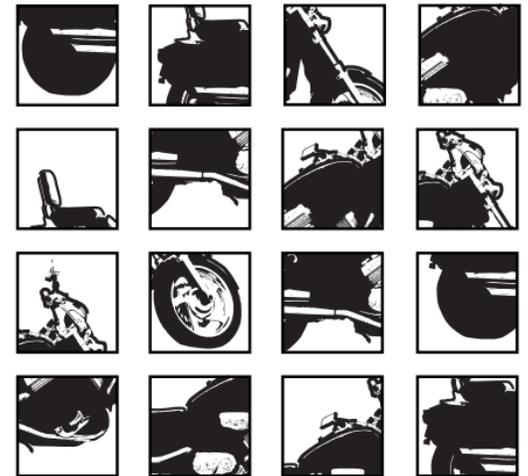
Input data



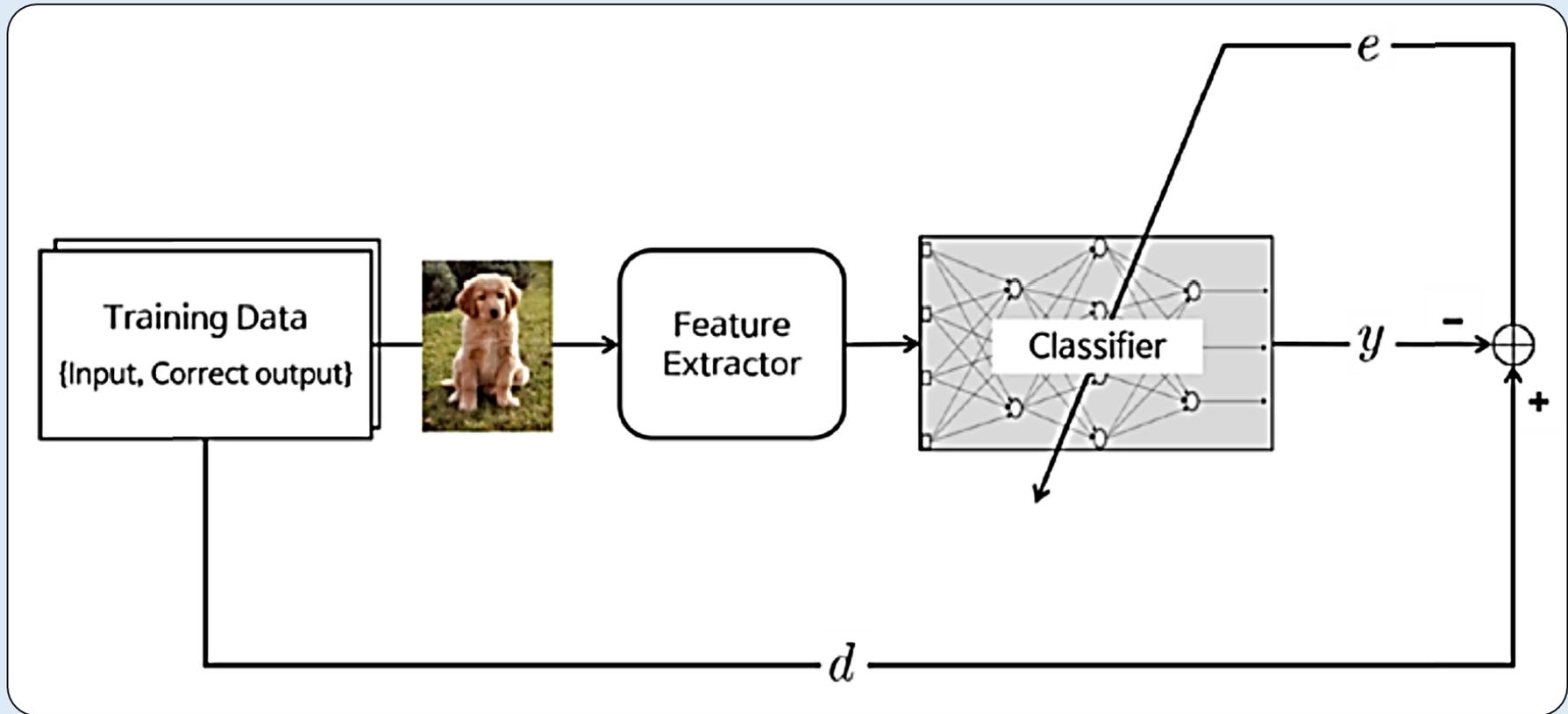
Feature extraction
algorithm



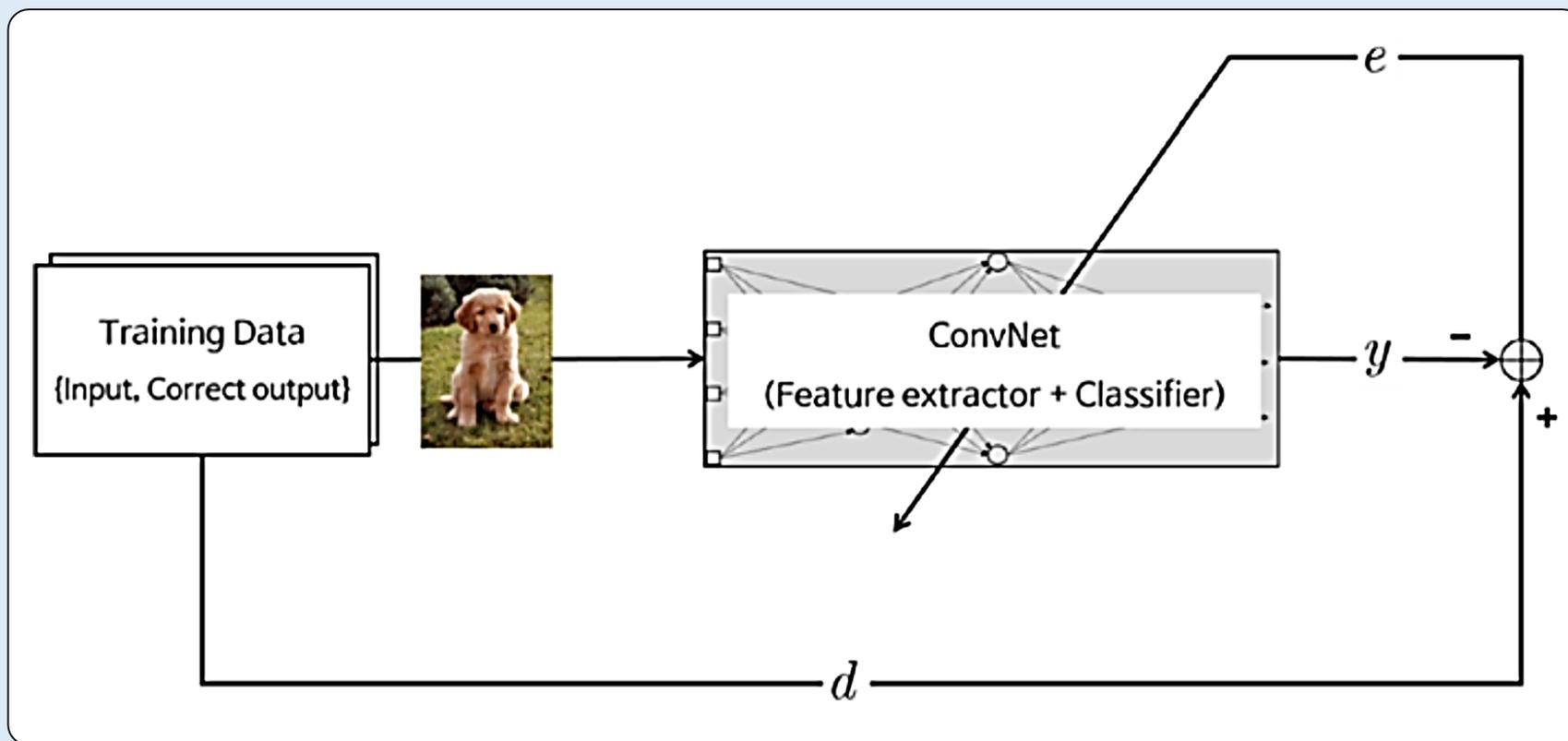
Features



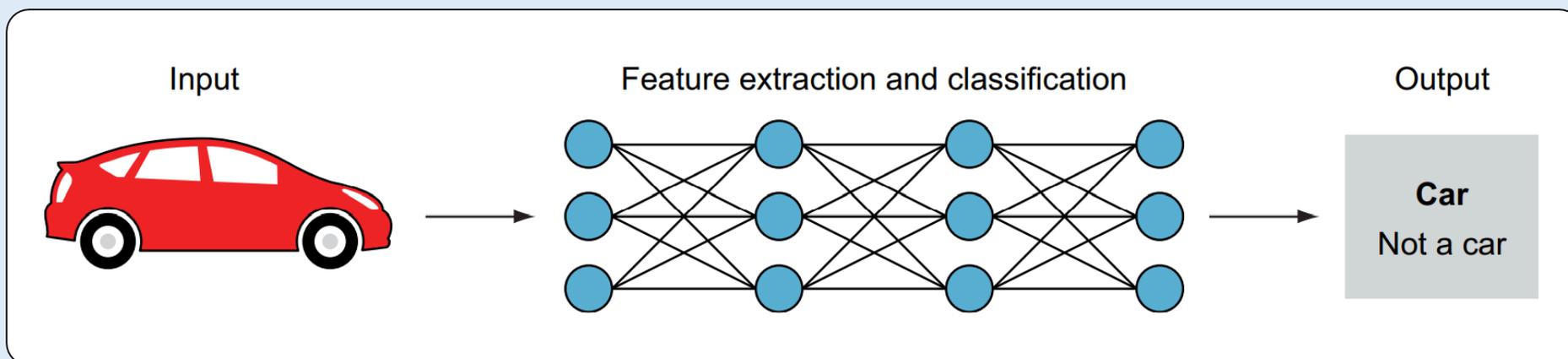
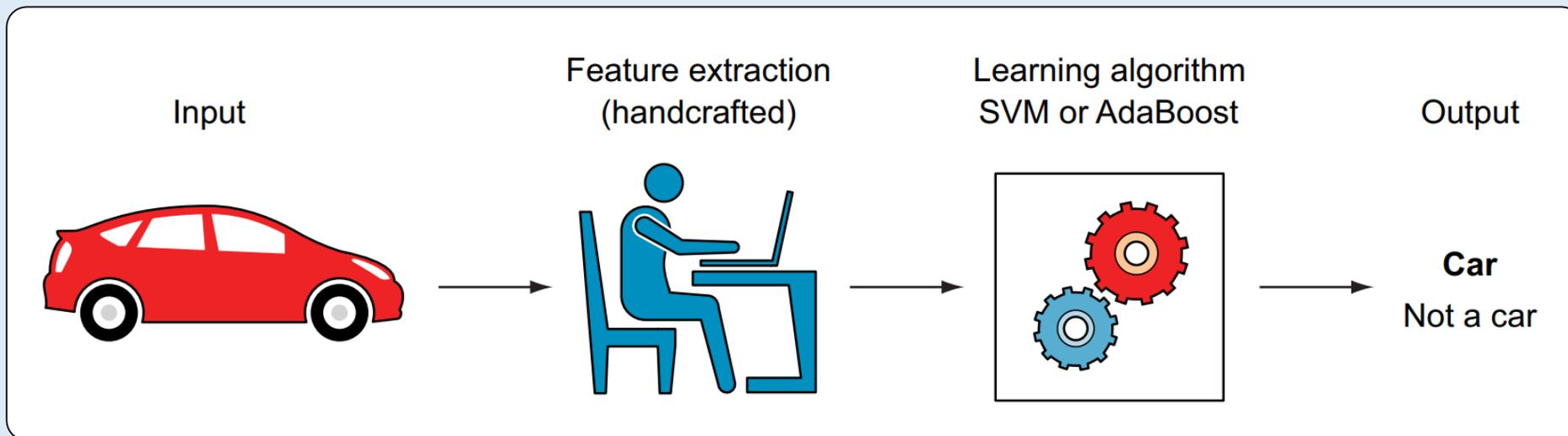
پیش از ConvNet، استخراج کننده‌های ویژگی در حوزه‌های مختلف، توسط متخصصان هر حوزه طراحی می‌شد. بنابراین در صورت نرسیدن به کارایی مورد نظر، متحمل هزینه و اتلاف زمان زیادی می‌شدیم. این استخراج کننده‌های ویژگی، بدون استفاده از یادگیری ماشین عمل می‌کردند.



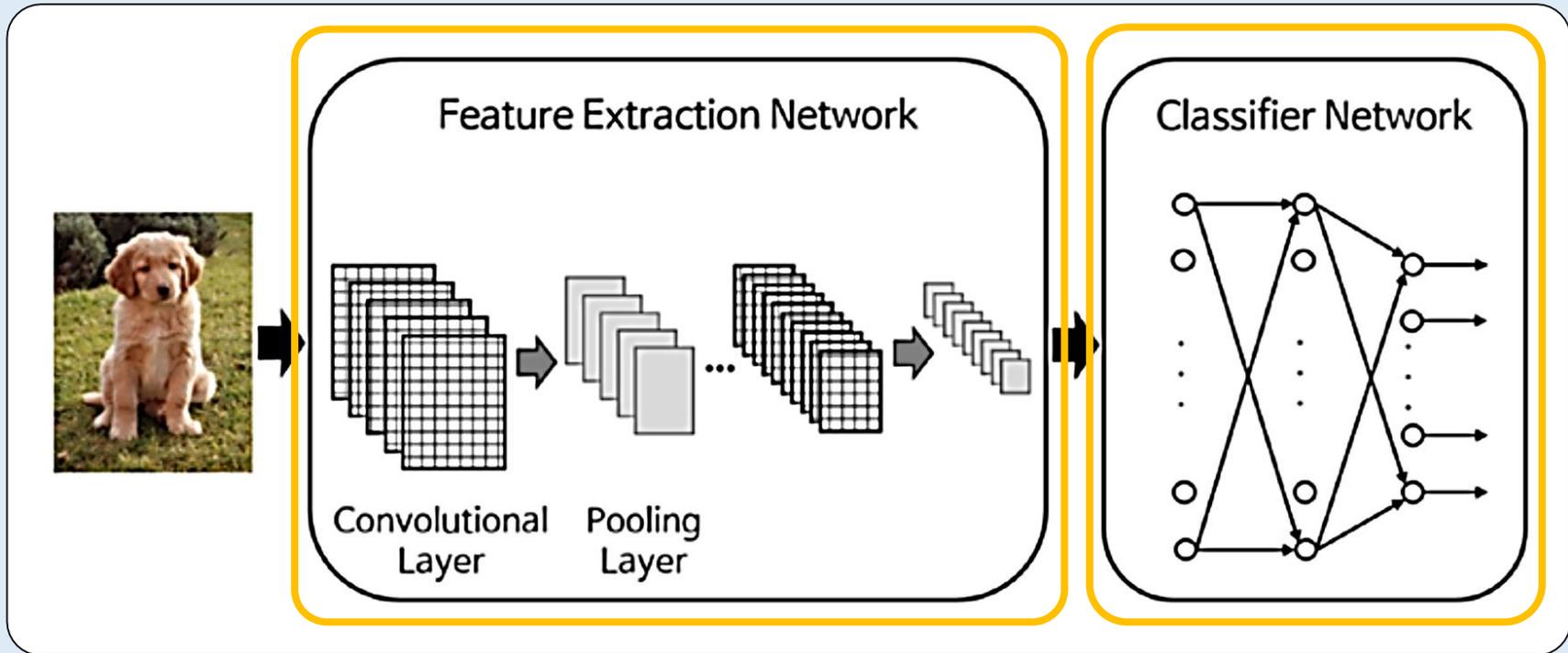
ConvNet، بدون نیاز به طراحی استخراج‌کننده‌های ویژگی به صورت مجزا، این استخراج‌کننده را در فرآیند آموزش جای داده است. استخراج‌کننده ویژگی ConvNet، از نوع خاصی از شبکه عصبی ساخته شده است که اوزان آن در طول فرآیند آموزش تعیین می‌شوند.



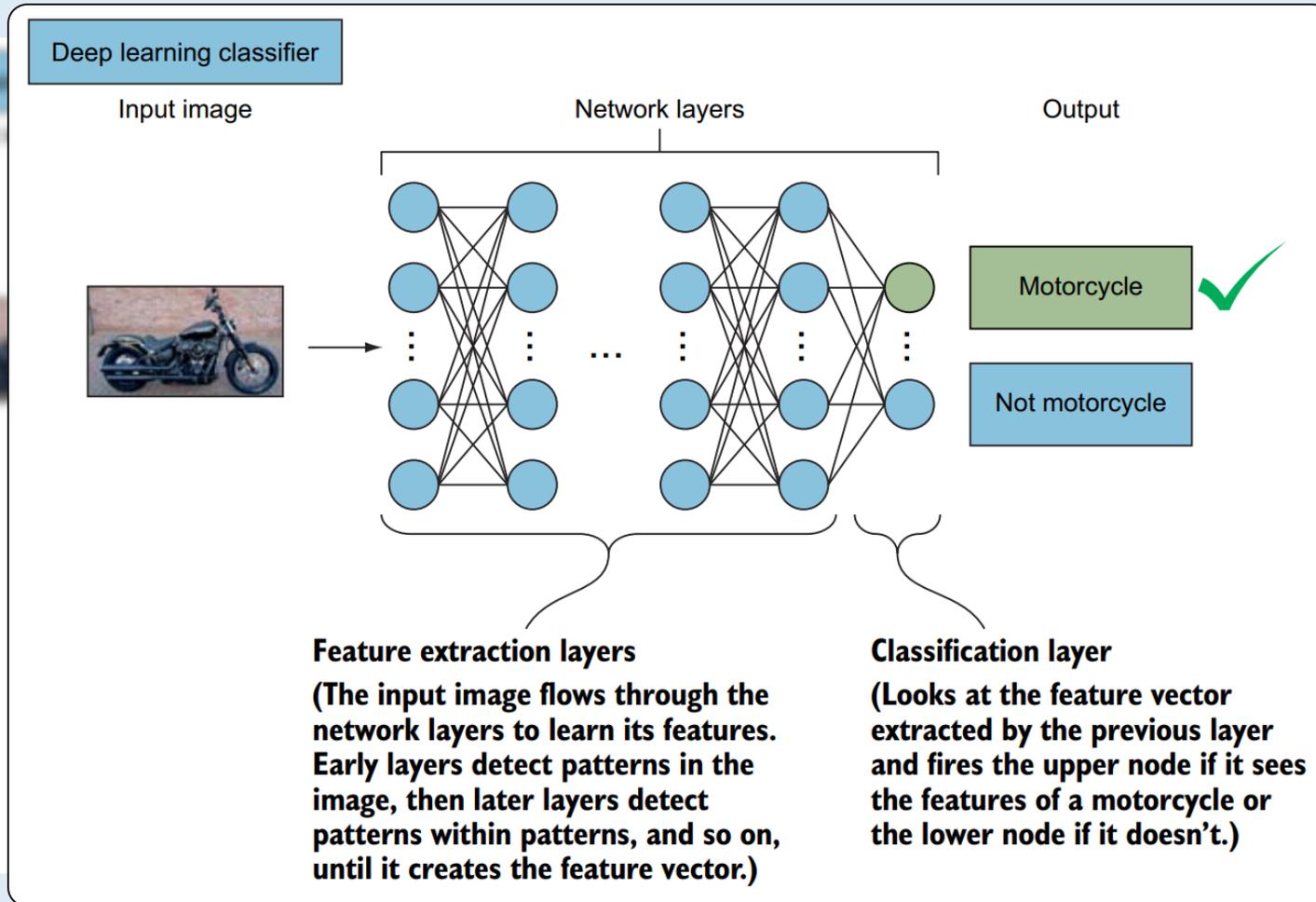
تبدیل طراحی **Manually** استخراج‌کننده ویژگی **به Automated**، ویژگی و مزیت اصلی ConvNet است.



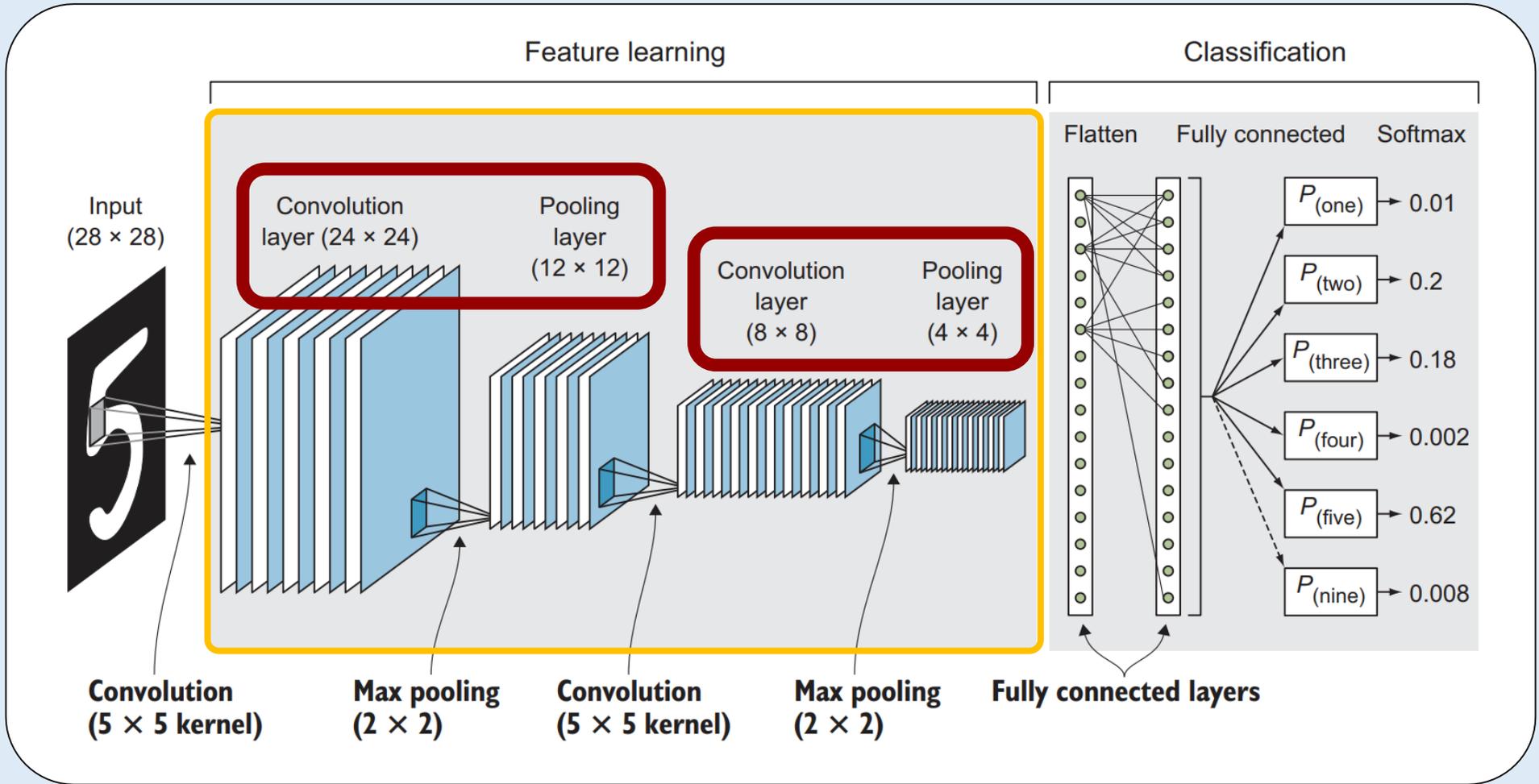
ConvNet از دو شبکه عصبی تشکیل شده است که اولی ویژگی‌های تصویر ورودی را استخراج می‌کند و دومی، تصاویری که ویژگی آن‌ها استخراج شده است را طبقه‌بندی می‌کند.



هر قدر که شبکه عصبی استخراج کننده ویژگی ConvNet عمیق تر (با لایه های بیشتر) باشد، تشخیص تصاویر را بهتر انجام می دهد و هزینه این بهبود، به صورت دشواری فرایند آموزش نمایان می شود.

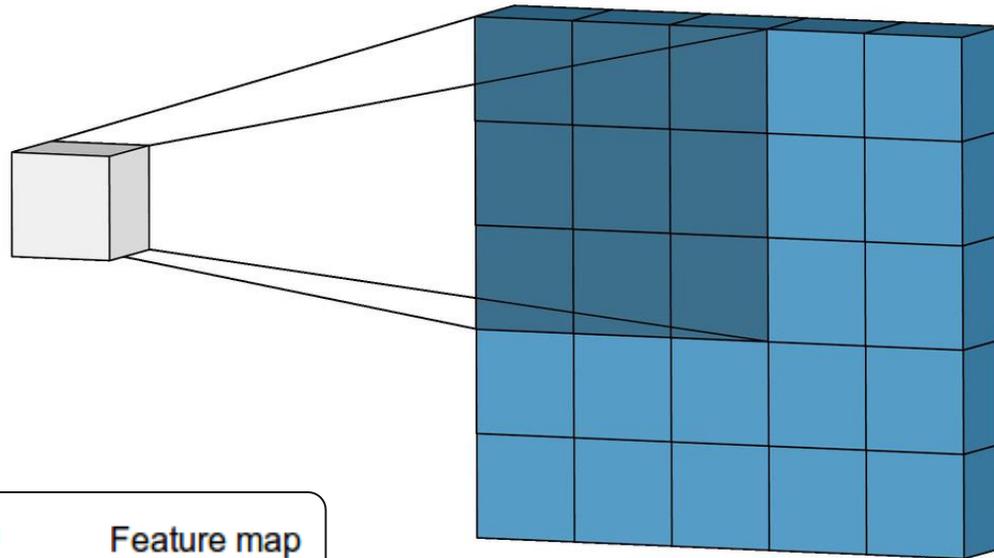


شبکه عصبی استخراج ویژگی، متشکل از Pile های Pair از لایه های Convolution و لایه Pooling.



لایه Convolution، با استفاده از عمل Convolution، تصاویر را Convert می کند.

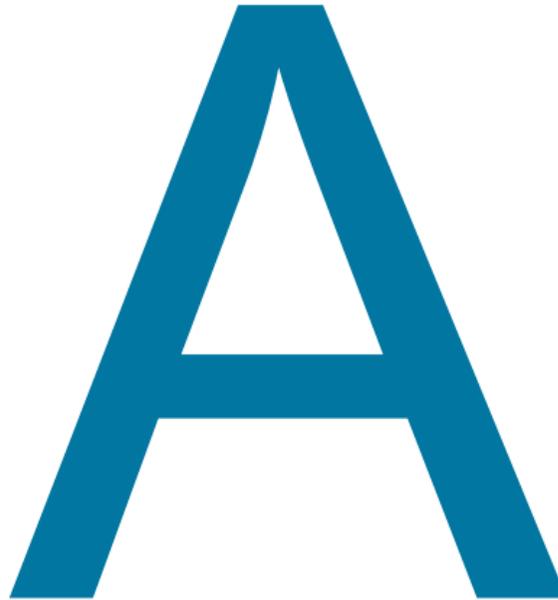
این بخش را می توان مجموعه ای از فیلترها (یا کرنلها)ی دیجیتال در نظر گرفت.



Input image	Convolution Kernel	Feature map
	$\begin{bmatrix} -1 & -1 & -1 \\ -1 & 8 & -1 \\ -1 & -1 & -1 \end{bmatrix}$	

لایه Pooling، با ترکیب پیکسل‌های همسایه، آن‌ها را به یک پیکسل تبدیل می‌کند و بنابراین Dimension عکس را ضمن حفظ خصوصیات اصلی‌اش کاهش می‌دهد.

Pooling layers reduce image resolution and keep the image's important features.

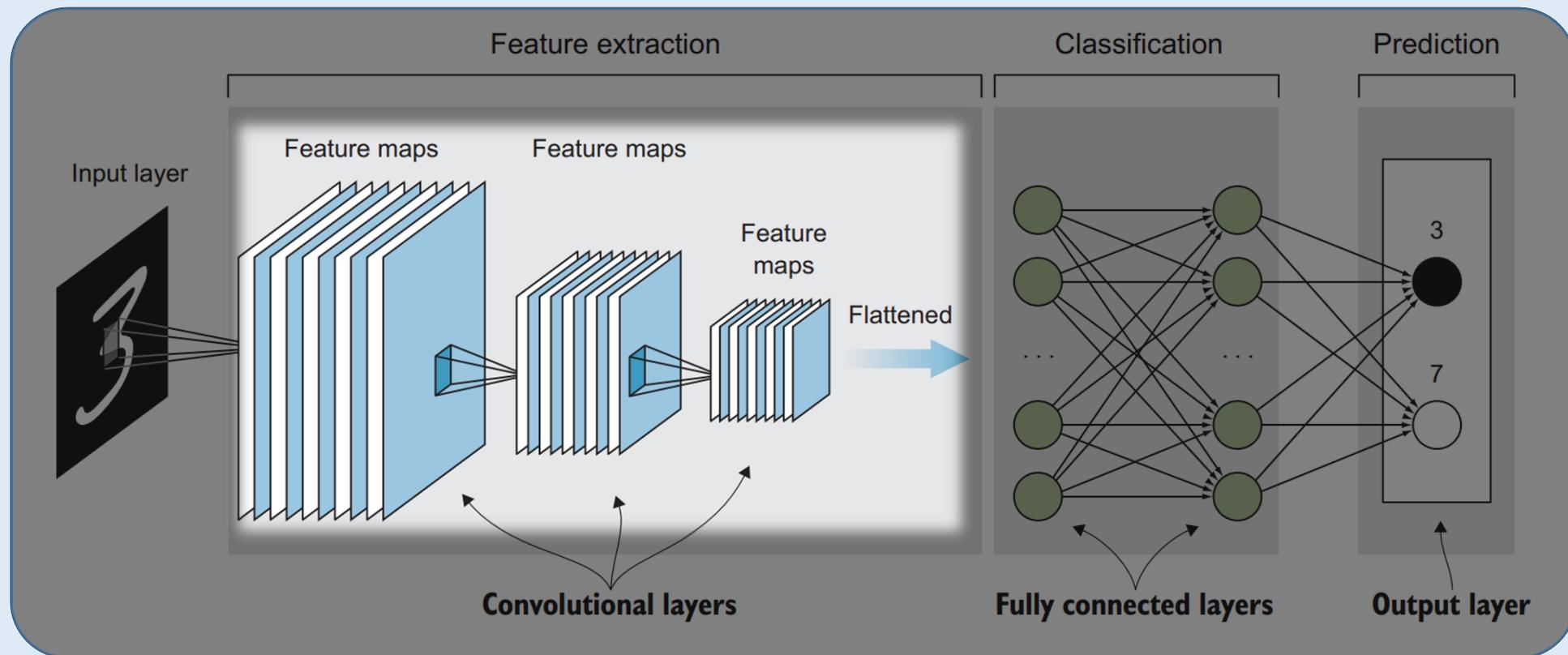


Original



Downsampled

چون هدف اصلی ConvNet تصاویرند، عملکرد لایه‌های Convolution و Pooling، در صفحه‌ی دوبعدی انجام می‌شود. این یکی از تفاوت‌های ConvNet با دیگر شبکه‌های عصبیست.



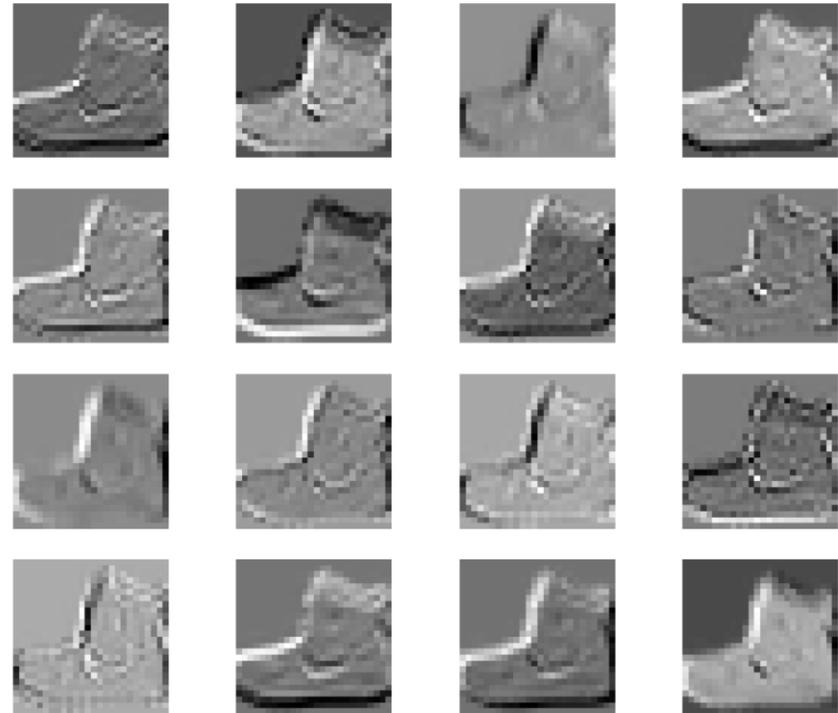
لایه Convolution، تصاویر جدیدی را که **Feature Maps** نامیده می‌شوند تولید می‌کند.

Feature Maps، ویژگی‌های منحصر به فرد تصویر اصلی را برجسته می‌کند.

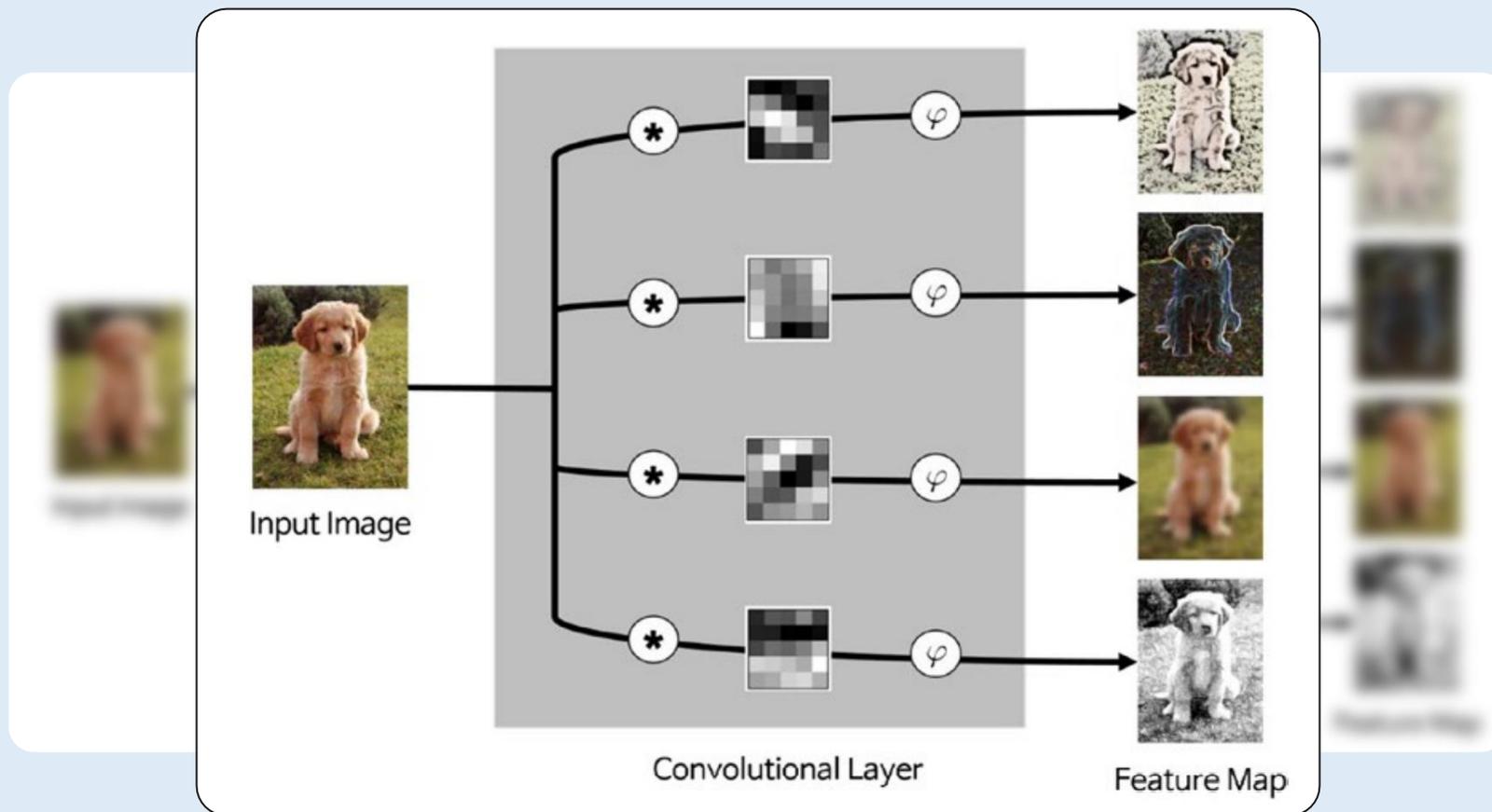
Original Image



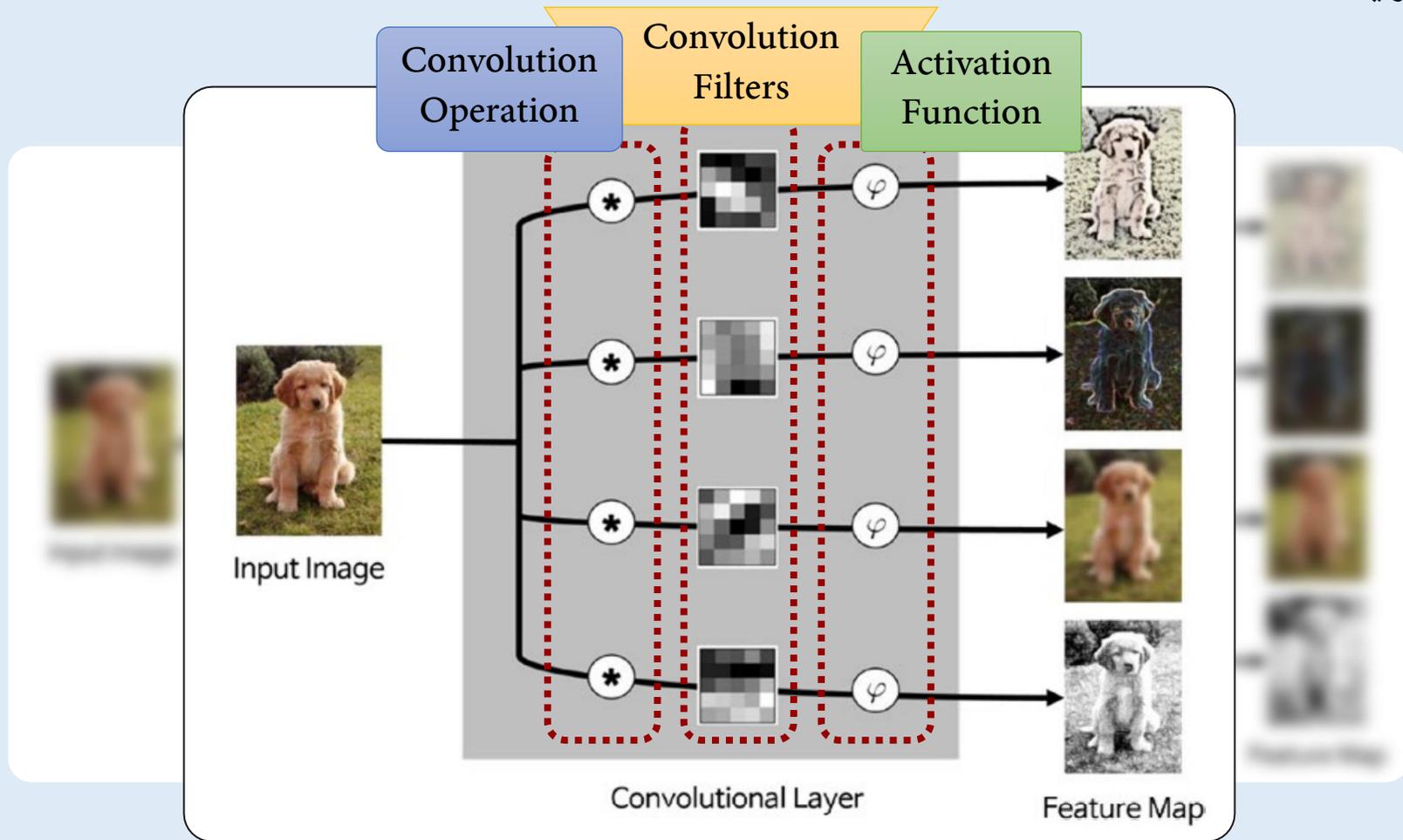
Example Feature Maps

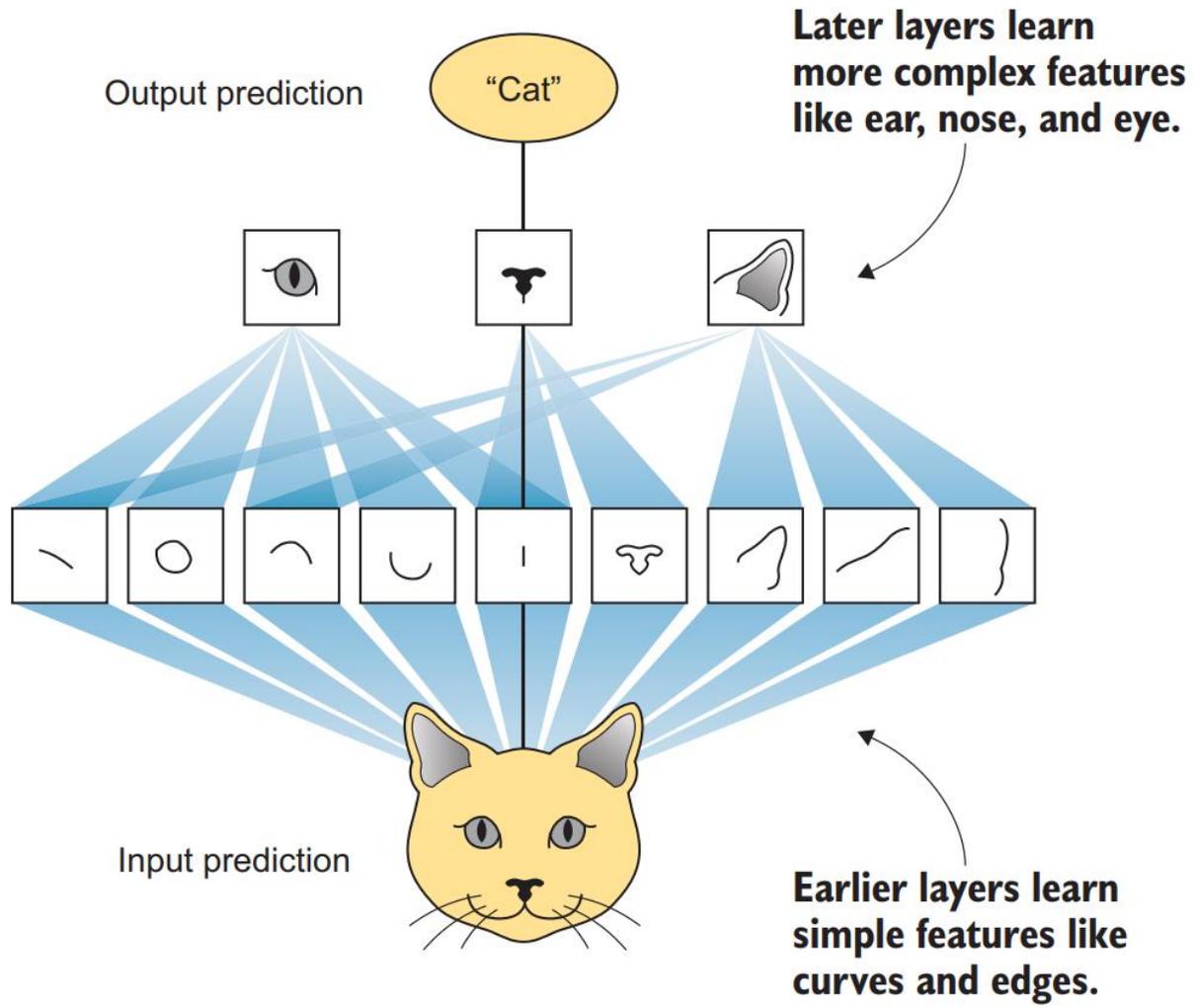


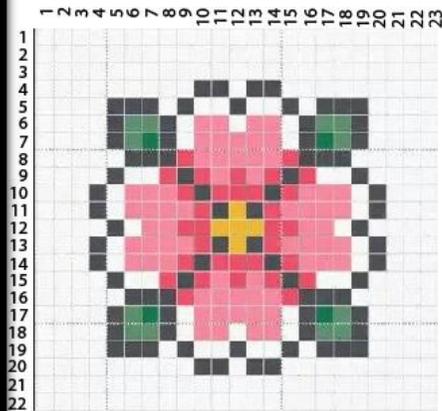
لایه Convolution، از وزن‌های اتصال و جمع وزنی استفاده نمی‌کند و به جای آن شامل **فیلترها** (یا کرنل‌ها) بیست که تصاویر را Convert می‌کند. این لایه به تعداد فیلترهای Convolution، Feature Map تولید می‌کند. مثلاً اگر لایه Convolution دارای چهار فیلتر باشد، چهار نقشه ویژگی تولید خواهد کرد.



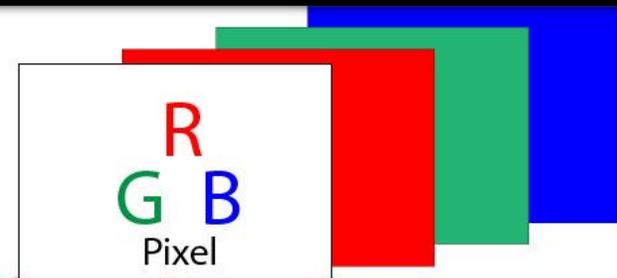
فیلترهای لایه Convolution، ماتریس‌های دوبعدی‌اند که مقادیرشان در طول فرآیند آموزش تعیین می‌شود؛ بنابراین این مقادیر در طول فرآیند آموزش به طور پیوسته تغییر می‌کنند. این جنبه از لایه Convolution، مانند تغییر وزن اتصالات در شبکه‌های عصبی معمولیست.







One Pixel Consist With 3 Channels / Layers



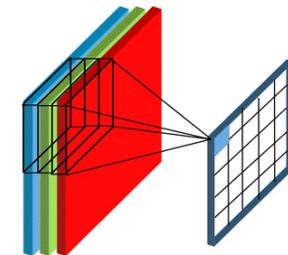
R channel
Range: 0 ~255



G channel
Range: 0 ~255



B channel
Range: 0 ~255



What we see



What computers see

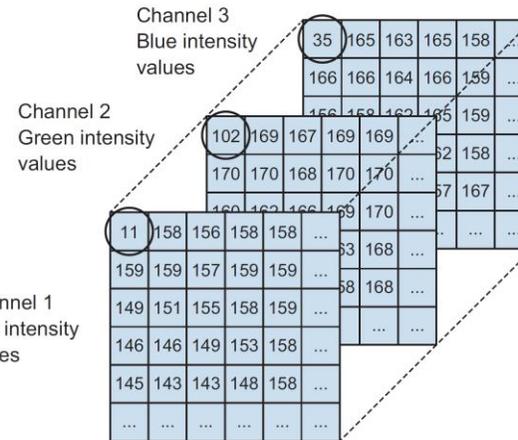
08	02	22	97	38	15	00	40	00	75	04	05	07	78	52	12	50	77	91	08
49	49	99	40	17	81	18	57	60	87	17	40	98	43	69	46	04	56	62	00
81	49	31	73	55	79	14	29	93	71	40	67	53	99	30	03	49	13	36	65
52	90	95	23	04	60	11	42	69	24	48	56	01	32	54	71	37	02	34	91
22	31	14	71	51	67	43	59	41	92	34	54	22	40	40	28	44	33	13	80
24	47	32	60	99	03	45	02	44	75	33	53	78	36	64	20	35	09	12	80
32	98	81	28	64	23	67	10	26	38	40	67	59	54	70	66	18	38	64	70
47	24	20	68	02	62	12	20	95	63	94	39	63	04	49	91	44	49	94	21
24	55	58	05	66	73	99	26	97	17	78	78	94	83	14	88	34	89	63	72
21	36	23	09	75	00	74	44	20	45	35	14	00	41	33	97	34	31	33	95
78	17	53	28	22	75	31	67	15	94	03	80	04	42	16	14	09	53	56	92
16	39	05	42	96	35	31	47	55	58	88	24	00	17	54	24	34	29	85	57
84	56	00	48	35	71	89	07	05	44	44	37	44	40	21	58	51	54	17	58
19	80	61	68	05	94	47	49	28	73	92	13	86	52	17	77	04	09	55	40
04	52	08	83	97	35	99	14	07	97	57	32	16	26	26	79	33	27	98	44
04	36	68	81	57	62	20	72	03	16	33	67	46	55	12	32	43	93	53	69
04	42	14	73	38	25	39	11	24	94	72	18	06	46	29	32	40	62	74	36
20	49	34	41	72	30	23	88	34	62	99	69	82	47	59	85	74	04	34	24
20	23	35	29	78	31	90	01	74	31	49	71	48	86	81	14	23	57	05	54
01	70	54	71	83	51	54	49	16	92	33	48	61	43	51	01	89	19	67	48

Color image

$$F(0, 0) = [11, 102, 35]$$



RGB channels



0	0	0	0	0	0	...
0	156	155	156	158	158	...
0	153	154	157	159	159	...
0	149	151	155	158	159	...
0	146	146	149	153	158	...
0	145	143	143	148	158	...
...

Input Channel #1 (Red)

0	0	0	0	0	0	...
0	167	166	167	169	169	...
0	164	165	168	170	170	...
0	160	162	166	169	170	...
0	156	156	159	163	168	...
0	155	153	153	158	168	...
...

Input Channel #2 (Green)

0	0	0	0	0	0	...
0	163	162	163	165	165	...
0	160	161	164	166	166	...
0	156	158	162	165	166	...
0	155	155	158	162	167	...
0	154	152	152	157	167	...
...

Input Channel #3 (Blue)

-1	-1	1
0	1	-1
0	1	1

Kernel Channel #1

↓
308

1	0	0
1	-1	-1
1	0	-1

Kernel Channel #2

↓
-498

0	1	1
0	1	0
1	-1	1

Kernel Channel #3

↓
164 + 1 = -25
↑
Bias = 1

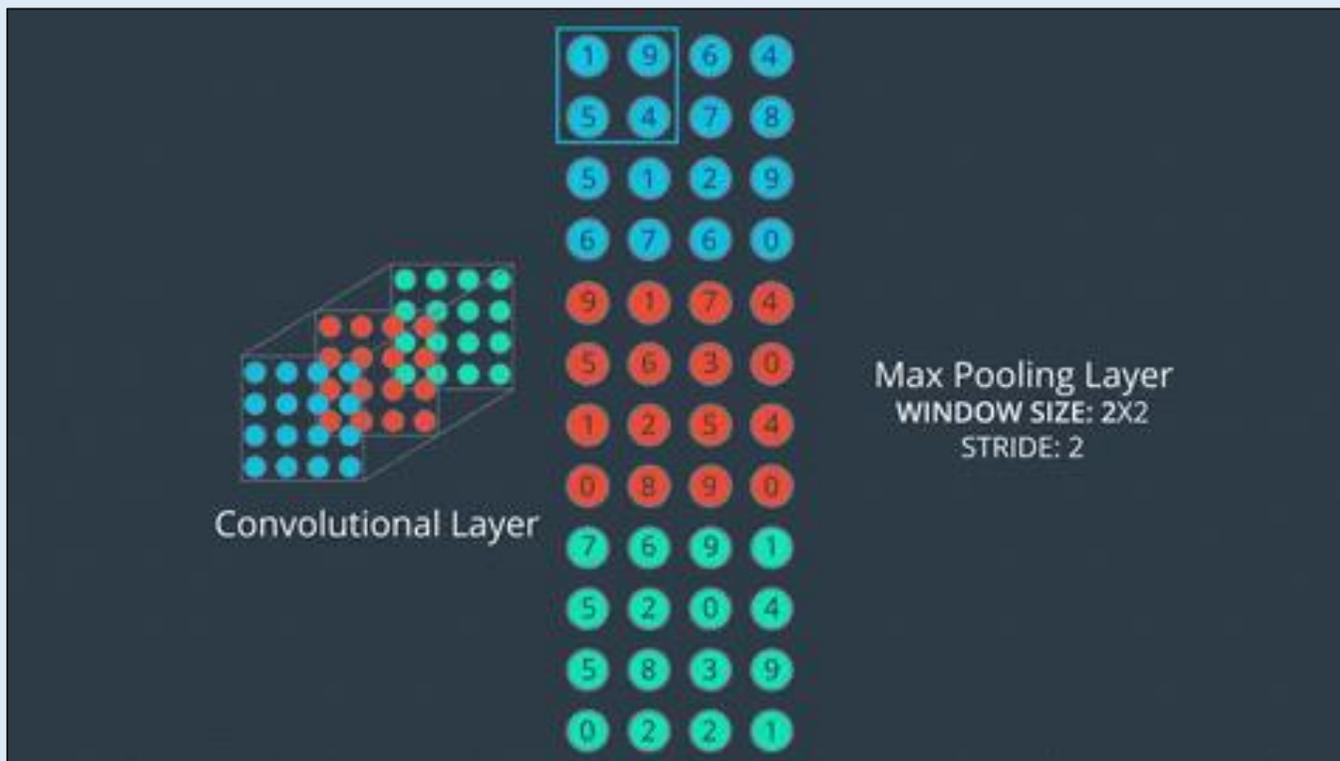
+

+

Output

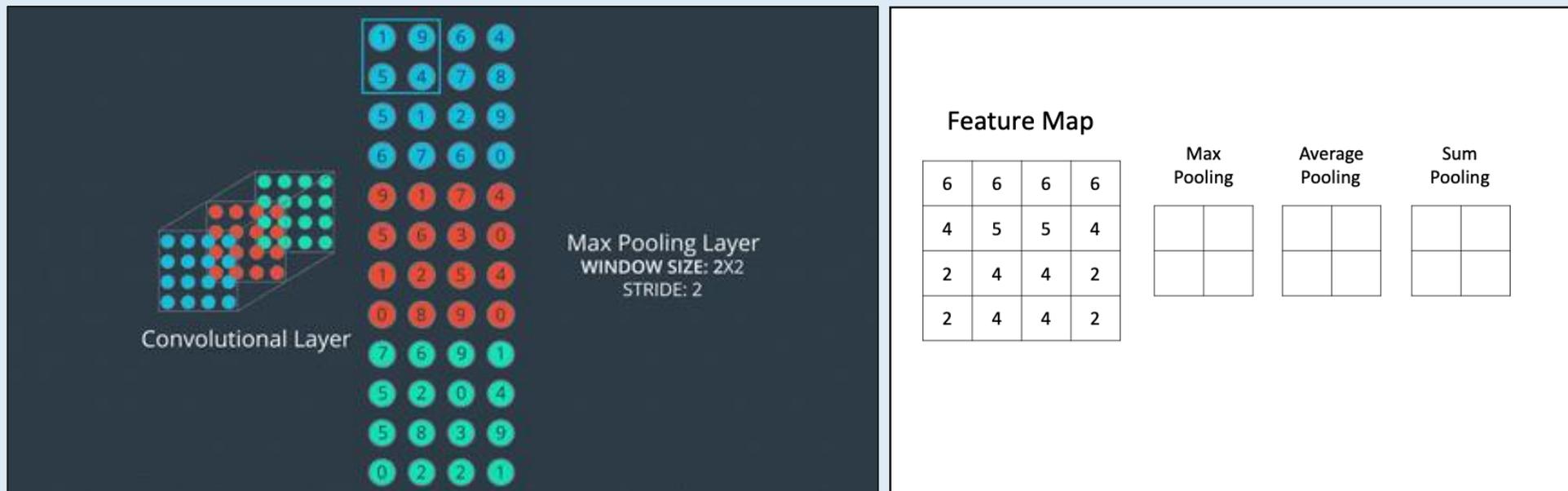
-25				...
				...
				...
				...
...

لایه Pooling با ترکیب پیکسل‌های همسایه در یک ناحیه و دادن یک مقدار به آن‌ها، اندازه تصویر را کاهش می‌دهد. Pooling روشی مرسوم است که بسیاری از روش‌های پردازش تصویر قبلاً هم از آن استفاده می‌کردند.



پیکسل‌های همسایه معمولاً به صورت ماتریس‌های مربعی انتخاب می‌شوند و تعداد پیکسل‌هایی که ترکیب می‌شوند از مسئله‌ای به مسئله دیگر تغییر می‌کند.

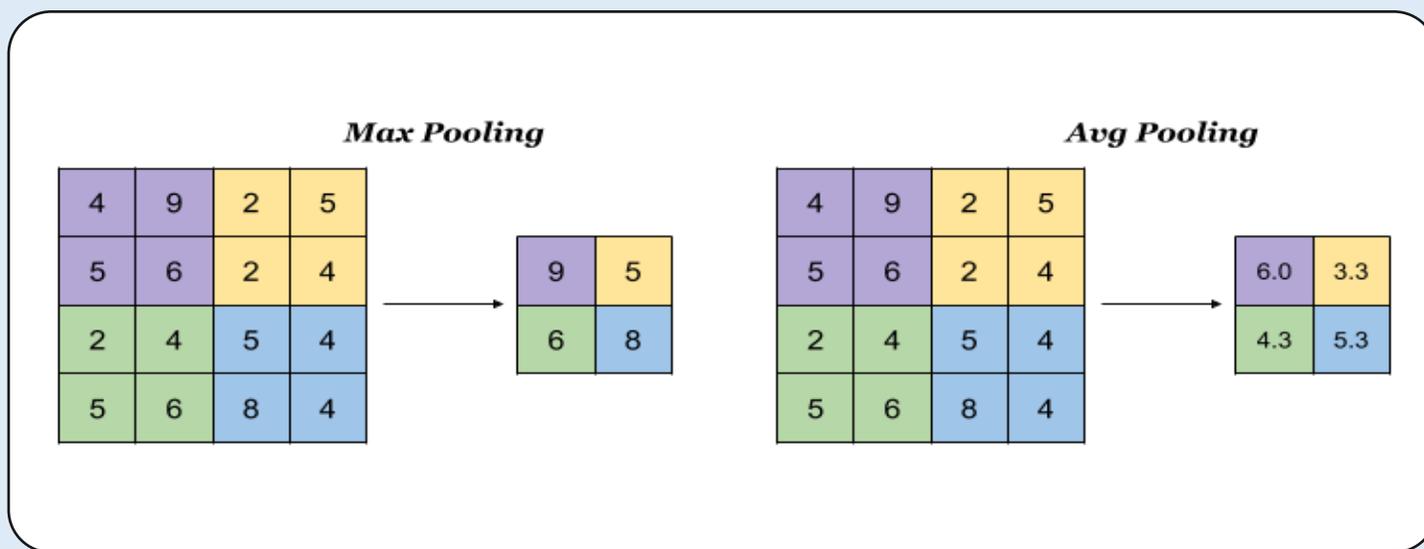
لایه Pooling با ترکیب پیکسل‌های همسایه در یک ناحیه و دادن یک مقدار به آن‌ها، اندازه تصویر را کاهش می‌دهد. Pooling روشی مرسوم است که بسیاری از روش‌های پردازش تصویر قبلاً هم از آن استفاده می‌کردند.



فرایند Pooling با کاهش اندازه تصویر، موجب کاهش بار محاسباتی و جلوگیری از Overfitting می‌شود.

مقداری که به پیکسل‌های Pooling شده داده می‌شود، معمولاً Mean یا Maximum پیکسل‌های انتخاب شده است. برای آشنایی با عملکرد لایه Pooling، مثالی را بررسی می‌کنیم.

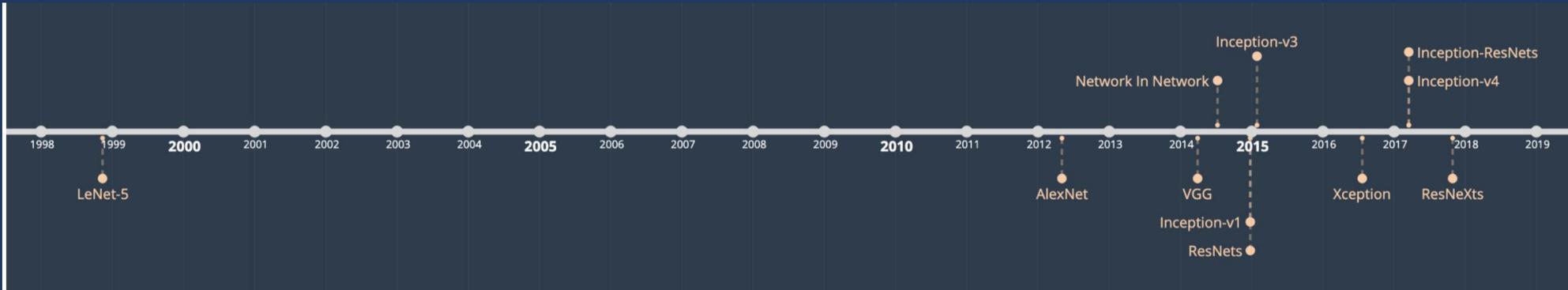
تصویر پیکسلی ۴ در ۴ زیر که به صورت ماتریس نمایش داده شده است را بدون هم‌پوشانی مولفه‌ها به دو طریق به ماتریس‌های ۲ در ۲ تبدیل خواهیم کرد:



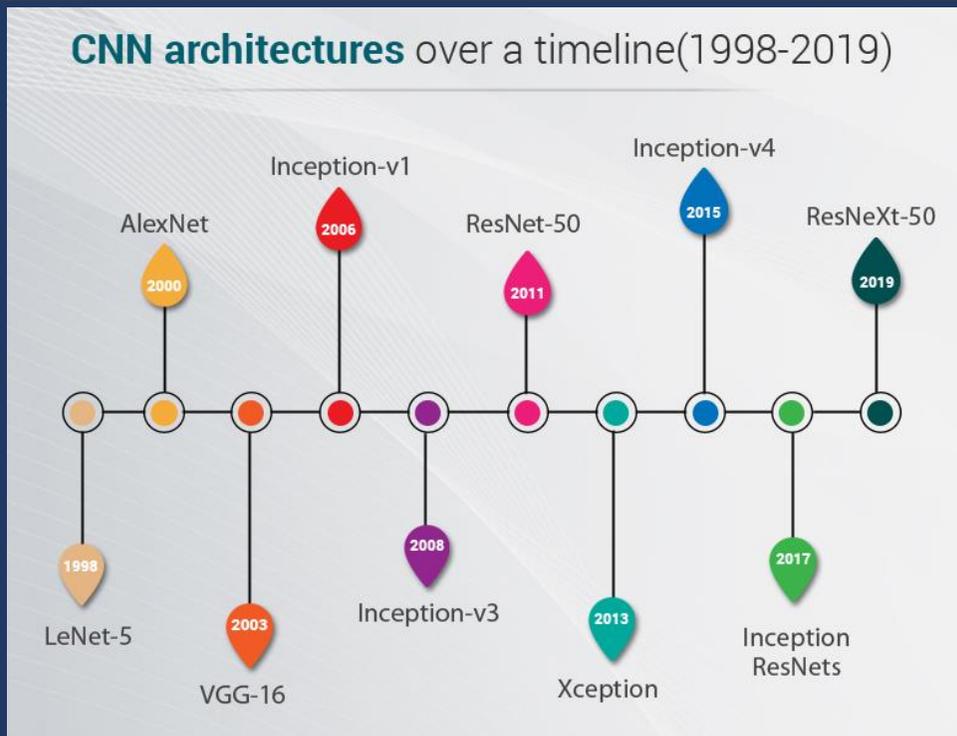
از نظر ریاضی، فرایند Pooling نوعی از عملیات Convolutional است.

تفاوت این لایه با لایه Convolutional، در ثابت بودن فیلتر و عدم هم‌پوشانی نواحی Convolutional است.

10 Common CNN Architectures



CNN architectures over a timeline(1998-2019)



Natural Language Processing (NLP) is the discipline of building machines that can manipulate human language — or data that resembles human language — in the way that it is written, spoken, and organized.

پردازش زبان طبیعی حوزه‌ای است که در آن ماشین‌هایی ساخته می‌شوند که می‌توانند زبان طبیعی (انسانی) — یا داده‌هایی که شبیه زبان طبیعی (انسانی) هستند — را به روشی که نوشته، صحبت شده و سازماندهی شده‌اند، تغییر دهند و کنترل کنند.



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

پردازش زبان طبیعی (NLP) برای چه مواردی استفاده می شود؟

پردازش زبان طبیعی برای طیف گسترده‌ای از وظایف مرتبط با زبان، از جمله پاسخگویی به سؤالات، طبقه‌بندی متن به روش‌های مختلف و گفتگو با کاربران استفاده می‌شود.

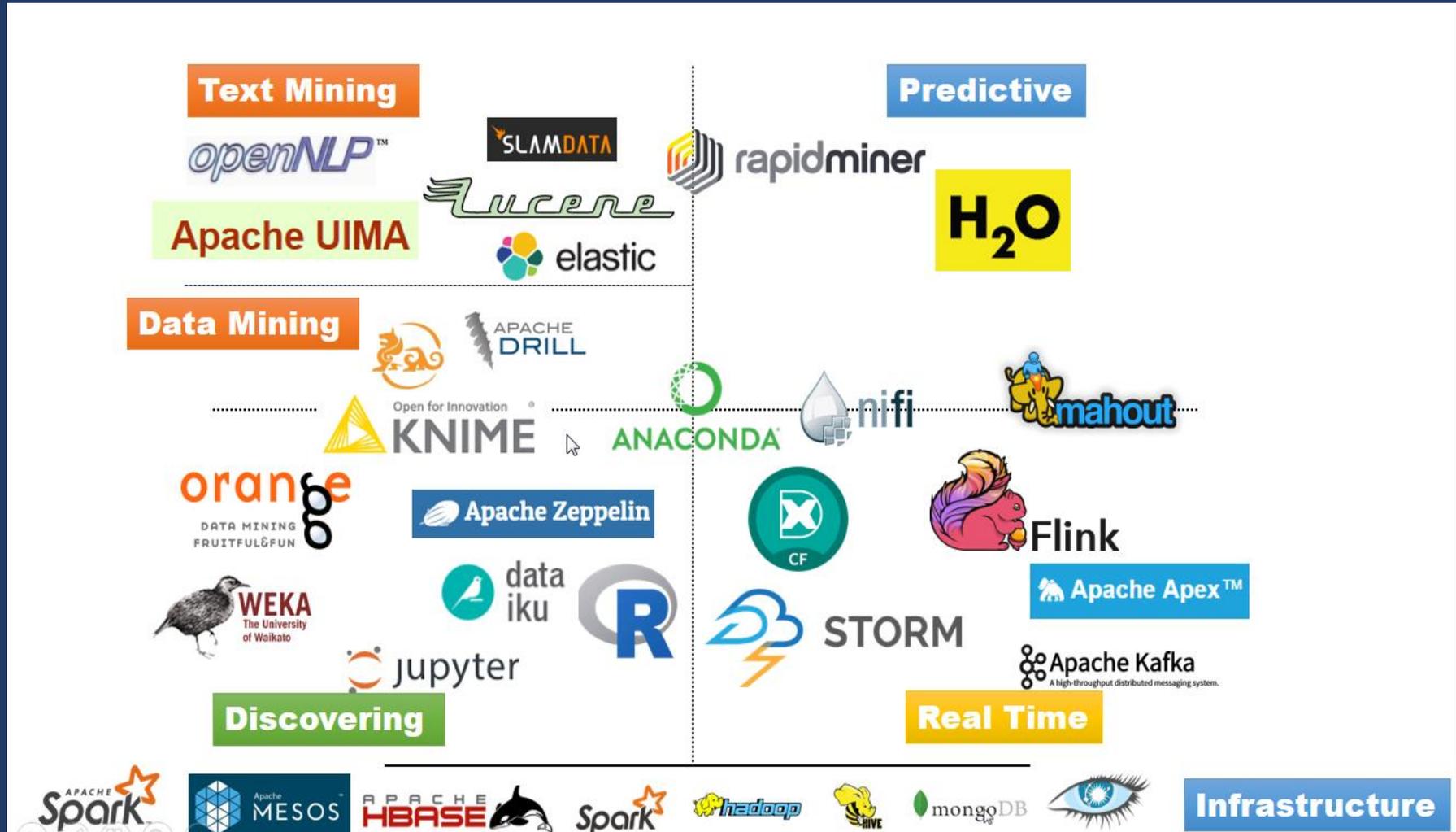
- Sentiment analysis
- Machine translation
- Spam detection
- Grammatical error correction
- Text generation
 - Autocomplete
 - Chatbots
- Summarization
 - Extractive summarization
 - Abstractive summarization
- Question answering
 - Multiple choice
 - Open domain



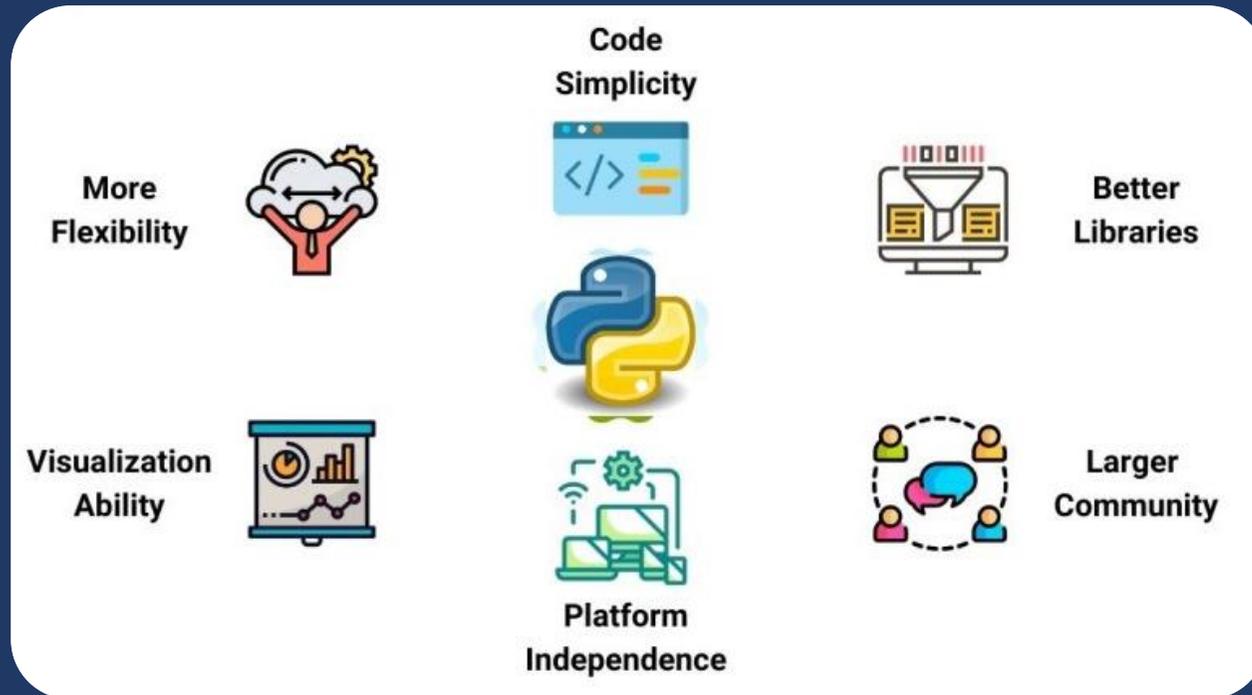
AI Tools



AI programming/coding Tools



Why Python for ML?



Tools

The Dataflop Open Source Landscape 2.0



Created by: www.Dataflop.com



Tools

Infrastructure

Hadoop On-Premise cloudera MAPR Hortonworks Pivotal IBM bluedata splice jethro	Hadoop in the Cloud amazon IBM Microsoft Azure Google Cloud Platform CAZENA treasure data altiscale bule xplenty	Spark databricks GridGain TACHYON NEXUS	Cluster Services amazon kubernetes docker MESOSPHERE Core OS pepperdata StackIQ
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Analytics

Analyst Platforms Palantir AYASDI Quid/enigma Digital Reasoning ORBITALINSIGHTS	Analytics Platforms Microsoft GUAVUS Datameer interlana	Data Science Platforms context relevant CONTINUUM DataRobot Alpine MODE plotly ADATAD dataiku Plotianian DOMINO sense yhat ALGORITHMIA	Visualization tableau Roambi QOMDATA Qlik CHARTIO
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Applications

Sales & Marketing RADIUS bloomreach livefyre kahuna persado AVISO Gainsight Zeta blueyonder Lattice SAILTHRU infer ACTIONIQ QUANTIFIND ENAGGIO	Customer Service MEDALLIA ATTENITY STELLA Service NGDATA DigitalGenius fuse/machines	Human Capital gild Connectifier textic entelo hiQ	Legal RAVEL JUDICATA Everlaw Brevia PRE-MONITOR
Ad Optimization MediaMath OpenX Adgorithms LiveIntent DataXu Integral theTradeDesk dstillery UPPIER TAPAD	Security TANIUM CounterTack AREA1 Recorded Future FORTSCALE Keybase cyberreason CYLANE SentinelOne Guardian Analytics sift science feedzai SIGNIFYD	Vertical AI Applications facebook Clara KASIST lumia	

NoSQL Databases HBASE cassandra MarkLogic KERO SPIKE SequoiaDB accumulo Microsoft Azure mongoDB Couchbase DATASTAX redislabs influxdata	NewSQL Databases SAP Clustrix Pivotal paradigm4 nuODB memsql MariaDB VOLTDB citusdata cleopdb Trifolium Cockroach LABS
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BI Platforms Power BI Domo GoodData platform looker atScale amazon Wave Analytics birst kyvos insights ARCADIA SINENSE	Statistical Computing sas SPSS MATLAB	Log Analytics splunk sumologic hibana CLOUD PHYSICS loggly	Social Analytics NETBASE DATASIFT tracx bitly synthesio bottlenose simplereach
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Graph Databases neo4j GIAPH OrientDB InfiniteGraph	MPP Databases TERADATA VERTICA NETEZZA kognitio dremio	Cloud EDW amazon Microsoft Azure Pivotal snowflake WATERLINE Infoworks	Data Transformation alteryx TRIFACTA tamr Paxata StreamSets Alation	Data Integration informatica MuleSoft snapLogic BedrockData
---	--	---	--	--

Real-Time amazon METAMARKETS confluent DATACURRENT dataArtisans	Machine Learning Azure Machine Learning amazon H2O.ai SKYTREE rapidsminer DATA RPM deepgenio PredictionIO glowFlash	Speech & NLP NarrativeScience api.ai semanticreadines coontalio moluho MindMeid IBIBON vscope	Horizontal AI IBM Watson Cortana sentient vicarious nervana nara HyperScience MetaMind clarifai Geometric Intelligence
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Publisher Tools outbrain mixpanel Chartbeat yieldbot Yieldmo	Govt/ Regulation Socrata OPENGOV enigma FiscalNote mark43 PREDPOL OpenDataSoft	Finance affirm LendingClub OnDeck Kreditech zest finance Kabbage tidemark LendUp INSIKT Lendio Zuora KENSHC Dataminr Quantopian ISENTIUM
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Management / Monitoring New Relic APPDYNAMICS amazon occtifio Numerify splunk DATADOG Trocano Anodot	Security TANIUM illumio CODE42 DataGravity panasas VECTRA sqrrl BlueTalon	Storage amazon Microsoft Azure Panasas nimblestorage Qumulo	App Dev apigee CASK Typesafe CONCURRENT	Crowd-sourcing amazon mechanicalturk CrowdFlower WorkFusion
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Search hp Autonomy ORACLE EXALEAD Lucidworks elastic ThoughtSpot MAANA swiftype Algolia SINEQUA	Data Services Opera Mu Sigma DATA SCIENCE kaggle datascope DataKind	For Business Analysts OrigamiLogic ClearStory CIRRO import io	SMB / Commerce Google Analytics AMPLITUDE RJMetrics BLUECORE sumAll granify Airtable retention science custora
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Education/ Learning NEWTON Clever eclara PANORAMA knowte	Life Sciences 23andMe Counsyl Recombine xyrus FLATIRON zymergen HealthTap METABIOTA ZEPHYR HEALTH Gingerio transcriptic Glow enlithic AiCure Atomwise	Industries OPower RetailNext STITCH FIX WorkFusion TACHYUS Seq FarmLogs duetto BLUE RIVER SwiftKey select RIGHT MACHINE HowGood statmuse
--	--	---

Cross-Infrastructure/Analytics

amazon web services | Google | Microsoft | IBM | SAP | SAS | hp | Autonomy | vmware | talend | TIBCO | TERADATA | ORACLE | NetApp

Open Source

Framework hadoop YARN Spark MESOS TEZ Flink CDAP	Query / Data Flow SLAMDATA APACHE DRILL Google Cloud Dataflow	Data Access cassandra HBASE mongoDB SciDB kafka CouchDB riak OPENTSOB nifi	Coordination talend Apache Zookeeper Apache Ambari	Real-Time STORM Spark APEX Flink TACHYON druid	Stat Tools Scala Numpy SciPy	Machine Learning mlilb Aerosolve Caffe learn WEKA DIMSUM mahout MADlib CNTK TensorFlow jupyter DL4J	Search elasticsearch Solr Lucene	Security Apache Ranger Zeppelin
--	---	--	--	---	--	--	--	--

Data Sources & APIs

Health Apple JAWBONE GARMIN practice fusion fitbit Withings VALIDIC netatmo kinsa Human API	IOT UPTAKE helium ThingWorx samsara AUGURY estimates	Financial & Economic Data Bloomberg DOW JONES YDLEE PREMISE S&P CAPITAL IQ quandl xignite CBINSIGHTS mattermark estimote PLAID	Air / Space / Sea PLANET LABS WINDWARD spire CRUISE SKYCATCH Airware DroneDeploy	Location/People/Entities GARMIN foursquare InsideView esri STREETLINE CARTODB factual PlaceIQ Crimson Hexagon placemeter BASIS Sense	Other qualtrics panjiva DATA.GOV	Incubators & Schools GA DataCamp INSIGHT DataElite The Data Incubator
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DATA & AI LANDSCAPE 2019

INFRASTRUCTURE

HADOOP ON-PREMISE
 cloudera Hortonworks
 MAPR Pivotal
 IBM InfoSphere
 jethro

HADOOP IN THE CLOUD
 AWS Microsoft Azure
 Google Cloud
 SAP Cloud Platform
 IBM InfoSphere BigInsights
 Duoble CAZENA

STREAMING / IN-MEMORY
 Amazon Kinesis
 SAP Cloud Platform
 Confluent
 strimio hazelcast
 GIGASPACEs Wallaroo Labs FASTDATA Ix

NoSQL DATABASES
 Google Cloud AWS
 ORACLE
 mongoDB MarkLogic
 Couchbase DATASTAX
 redislabs REDSPARKS
 ArangoDB SCYLLA

NewSQL DATABASES
 SAP Clustrix Pivotal
 Microsoft Azure
 IBM InfoSphere
 Oracle
 VoltDB splice
 param42

GRAPH DBs
 Amazon Neptune
 IBM InfoSphere
 Oracle
 HINTECH
 GraphDB

MPP DBs
 TERADATA
 IBM Data Warehouse Systems
 Oracle
 Exasol
 dremio
 Yellowbrick

CLOUD EDW
 AWS
 Google Cloud
 Microsoft Azure
 Pivotal
 Snowflake
 Pulsar
 Nuclio
 Pucio Function Server

SERVERLESS
 AWS
 Google Cloud
 Microsoft Azure
 Pivotal
 Snowflake
 Pulsar
 Nuclio
 Pucio Function Server

DATA TRANSFORMATION
 talend pentaho
 alteryx TRIFACTA
 tamr
 StreamSets
 UNIFI

DATA INTEGRATION
 SAP Data Services Informatica
 Microsoft TRALEUM
 Alteryx
 Segment ATTUNITY
 ZALONI import.io
 Infoworks Finestra
 SNOWFLOW NATILLION

DATA GOVERNANCE
 Informatica
 IBM
 Alation
 OKERA
 MANTA data.world

MGMT / MONITORING
 AWS New Relic acrtio
 rubrik
 Dynatrace
 SignalFX druva
 Splunk
 Microsoft paperduty
 univention Numentry
 zenoss CosmoMAGNITUDE

STORAGE
 AWS
 Microsoft Azure
 Pure Storage
 Alluxio wasabi
 Cloudinary
 Cohesity

CLUSTER SVCS
 Amazon EMR
 Microsoft Azure
 Google Cloud
 SAP Cloud Platform
 IBM InfoSphere
 Oracle
 SAP HANA

DATA GENERATION & LABELLING
 Amazon Mechanical Turk
 Upwork
 HIVE Labelbox
 Magnitude

AI OPS
 ALGORITHMIA
 Vertica datmo
 HIVE Labelbox
 Magnitude

GPU DBs & CLOUD
 Kinetica
 SAP HANA
 Oracle
 SAP HANA

HARDWARE
 Google TPU GTC
 Intel AI
 NVIDIA
 Graphcore
 Mythic
 Habana
 Logz.io

CROSS-INFRASTRUCTURE/ANALYTICS

aws Google Cloud Microsoft IBM SAP Oracle NetApp synsort MAPR cloudera

ANALYTICS & MACHINE INTELLIGENCE

DATA ANALYST PLATFORMS
 Microsoft pentaho alteryx
 Digital Reasoning GUAVUS AYASDI
 ATTIVO Datameer Incorta
 interana MODE ENDOR
 sisu switchboard Starburst

DATA SCIENCE PLATFORMS
 IBM databricks dataiku
 Domino rapidminer TIBCO
 SAS
 ANACONDA
 KNIME MathWorks

BI PLATFORMS
 Looker
 SAP
 Google Cloud
 ATSCALE Qlik
 DataRobot gamalan
 MicroStrategy Keen IQ

VISUALIZATION
 Tableau Power BI
 SAP
 Google Cloud
 Qlik
 SAP
 SAP

MACHINE LEARNING
 AWS
 Google Cloud
 H2O
 DataRobot gamalan
 ViSENZE ELEMENT
 deepsense

COMPUTER VISION
 Microsoft Azure
 Amazon Rekognition
 Clarifai
 EverAI deepomatic
 Yitu
 Synthesis

HORIZONTAL AI
 IBM Watson Cortana
 Affective
 Numenta
 Petuum
 OSARO

SPEECH & NLP
 Google Cloud
 Amazon Translate
 Narrative Science
 IBM Watson
 Microsoft Azure
 SAP
 SAP

SEARCH
 Oracle
 Algolia
 Elasticsearch
 Coveo
 Swiftype
 Omnisu

LOG ANALYTICS
 Splunk
 Sumologic
 Solarwinds
 Logz.io

SOCIAL ANALYTICS
 Hootsuite
 Netbase
 Synthesio
 SimilarWeb

WEB / MOBILE / COMMERCE ANALYTICS
 Google Analytics
 Mixpanel Amplitude
 Airtable RESCI
 Sigopt granify
 Custora

APPLICATIONS - ENTERPRISE

SALES
 CHORUS
 INSIDESALES.COM peopleai
 conversica
 clarai
 fuselmachines

MARKETING - B2B
 RADIUS
 EVERSTING
 HINTIGO
 tubular
 EN GAGGIO
 KNOTCH mpr

MARKETING - B2C
 ZETA
 bloomreach
 SendGrid
 braze ACTIONIQ BLUECORE
 Contrecoeur TRALEUM mpartice
 Amperio
 Simon
 Liffia PERSADO
 remesh

CUSTOMER EXPERIENCE / SERVICE
 Qualtrics MEDALLIA SurveyMonkey
 CLARABridge Zendesk Customer Freshdesk
 Resco
 HEAR Amplifire
 DigitalGenius ASAPP
 bda automata ahniti

ENTERPRISE PRODUCTIVITY
 slack
 ORACLE
 GURU lumina
 DIFFBOT clara
 tallia Kasisto

HUMAN CAPITAL
 Workday
 ADP
 SAP
 SAP
 SAP

LEGAL
 RAVEL
 JUDICATA
 JUDICATA
 JUDICATA

REGTECH & COMPLIANCE
 RegTech
 RegTech
 RegTech

FINANCE
 Anaplan
 ZUORA
 SAP
 SAP
 SAP

BACK OFFICE AUTOMATION & RPA
 UiPath
 Blue Prism
 Workfusion
 Workfusion
 Workfusion

SECURITY
 Tanium
 Cylance
 Zscaler
 StackPath
 Illumio
 Coda42
 CipherCloud
 Darktrace
 Anomali
 Trend Micro
 Vectra
 Palo Alto
 Palo Alto
 Palo Alto

APPLICATIONS - INDUSTRY

ADVERTISING
 AppNexus
 Rubicon
 Oracle
 Oracle
 Oracle

EDUCATION
 Edmentum
 Blackboard
 FutureLearn
 FutureLearn
 FutureLearn

REAL ESTATE
 Redfin
 Opendoor
 VTS
 Credifi
 Compass
 Compass

GOVT
 OpenGov
 Mark43
 Passport
 SmartProcure
 Streetlight
 Streetlight

INTELLIGENCE
 Palantir
 Quid
 Quid
 Quid
 Quid

FINANCE - INVESTING
 Kenshuc
 Quantopian
 ADEPAR
 Jumbia
 iSentium
 Logoz
 TrueAccord
 Pagaya

FINANCE - LENDING
 OnDeck
 Affirm
 Jiantu
 Jiantu
 Jiantu

INSURANCE
 Lemonade
 Cylene
 Hippo
 Shift Technology
 Root
 Zesty.ai
 Tractable
 CAPE

OPEN SOURCE

FRAMEWORKS
 Spark
 Flink
 YARN
 Tez
 Mesos
 DCCDP
 HELIX

QUERY / DATA FLOW
 Spark SQL
 Presto
 SLAMDATA
 GraphQL
 Flink

DATA ACCESS & DATABASES
 Cassandra
 MongoDB
 Redis
 Cockroach Labs
 Druid
 ScioDB
 Riak
 HBase
 HBase

ORCHESTRATION & MGMT
 Talend
 Apache Airflow
 Mesos
 Etcd
 Kong

STREAMING & MESSAGING
 Spark
 NiFi
 Flink
 Beam
 Kafka
 Storm
 Apache RocketMQ

STAT TOOLS & LANGUAGES
 Julia
 Scala
 Studio
 SciPy
 Julia

AI OPS & INFRA
 MLflow
 Kubeflow
 Mxnet
 DVC
 SELDOL
 PyTorch

AI / MACHINE LEARNING / DEEP LEARNING
 TensorFlow
 Keras
 PyTorch
 OpenAI
 Theano
 Apache NNGA
 DIMSUM
 FeatureFu
 Veles
 ONNX
 PyTorch

SEARCH
 Elasticsearch
 Solr
 Elasticsearch

LOGGING & MONITORING
 Kibana
 Sentry
 Logstash
 Prometheus
 Fluentbit
 Fluentd
 Grafana

VISUALIZATION
 Matplotlib
 TensorBoard
 Seaborn
 Bokeh

COLLABORATION
 BeakerX
 Jupyter
 Anaconda

SECURITY
 Apache Ranger
 Knox
 Sentry
 Accurion

DATA SOURCES & APIs

HEALTH
 Apple
 Validic
 Practice Fusion
 Fitbit
 Garmin
 Kinisa

IOT
 GE Digital
 Uptake
 ThingWorx
 Helium
 Samsara

FINANCIAL & ECONOMIC DATA
 Bloomberg
 Thomson Reuters
 Dow Jones
 SAP Capital IQ
 CB Insights
 Plaid
 Envestnet
 Estimize
 Premise
 Quandl
 Engage Alpha
 Stocktwits
 Xignite
 Thinkium
 Earnest Research
 Predata

AIR / SPACE / SEA
 Orbital Insight
 Planet
 Airobotics
 Spire
 Inmarsat
 Kespry
 Inmarsat
 Tellus Labs
 Windward
 DroneDeploy
 MarineTraffic

PEOPLE / ENTITIES
 Acxiom
 Experian
 Epsilon
 InsideView
 Crism Hexagon
 Basis
 Quantcast
 SafeGraph

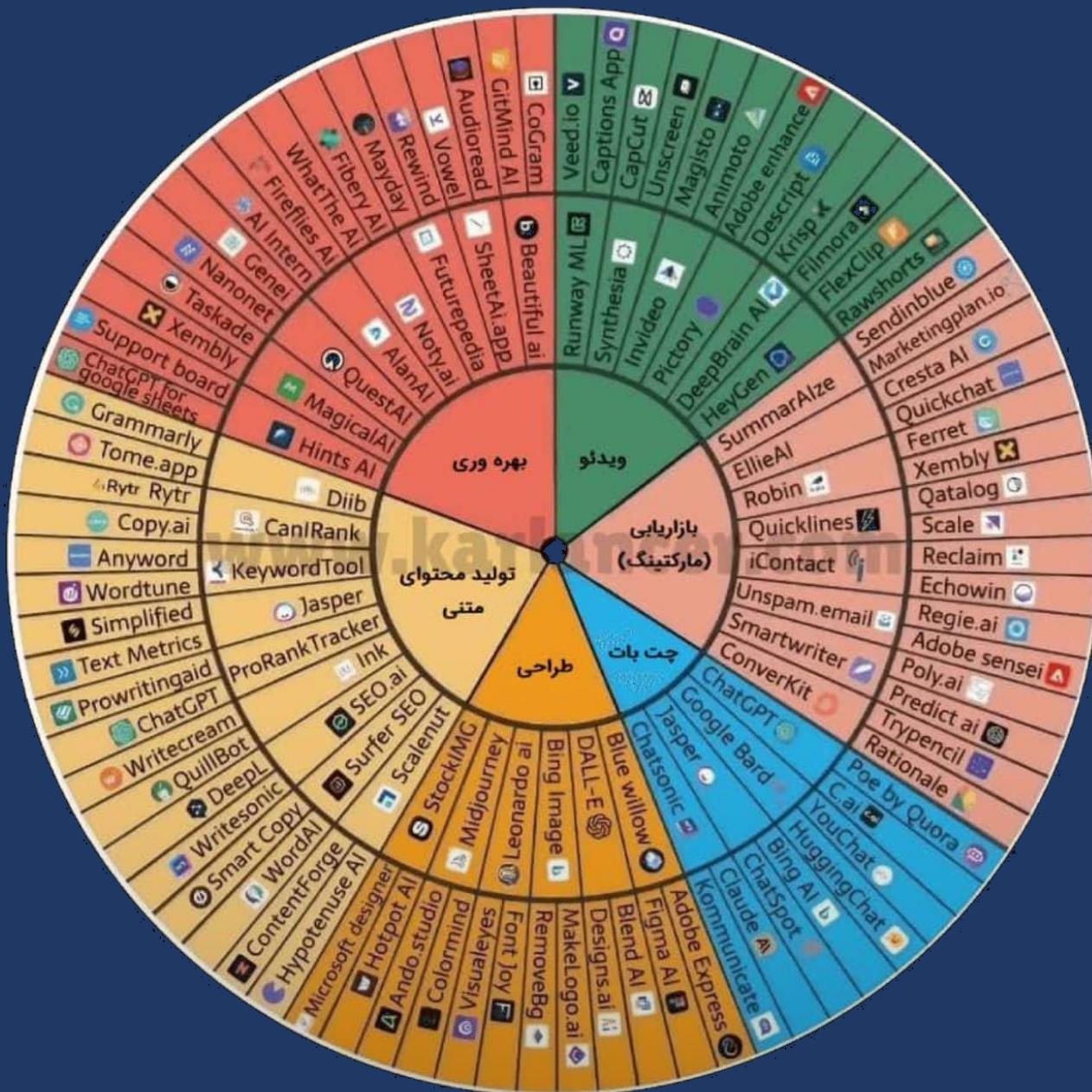
LOCATION INTELLIGENCE
 Foursquare
 Mapbox
 Sense360
 Hexagon
 PlaceIQ
 Esri
 Factual
 Carty
 Mapillary
 Streetline
 Cuebic
 Radar
 OpenStreetMap

OTHER
 Data.gov
 Imagenet
 CRUX
 Loggraffito

DATA SERVICES
 Opera
 Data Science
 Fractal
 Kaggle
 Exel
 DataKind
 InnoPluxus

INCUBATORS & SCHOOLS
 Pluralsight
 DataCamp
 Data Elite
 The Data Incubator
 Metis

RESEARCH
 Facebook Research
 OpenAI
 MIRI
 Vector Institute
 Allen Institute for AI



<https://openai.com/>



OpenAI

<https://www.zoomit.ir/tech/384025-openai-first-company-reach-agi/>

openai/gym

A toolkit for developing and comparing reinforcement learning algorithms.



Next-token-prediction

The model is given a sequence of words with the goal of predicting the next word.

Example:
Hannah is a ____

Hannah is a *sister*
Hannah is a *friend*
Hannah is a *marketer*
Hannah is a *comedian*

Masked-language-modeling

The model is given a sequence of words with the goal of predicting a 'masked' word in the middle.

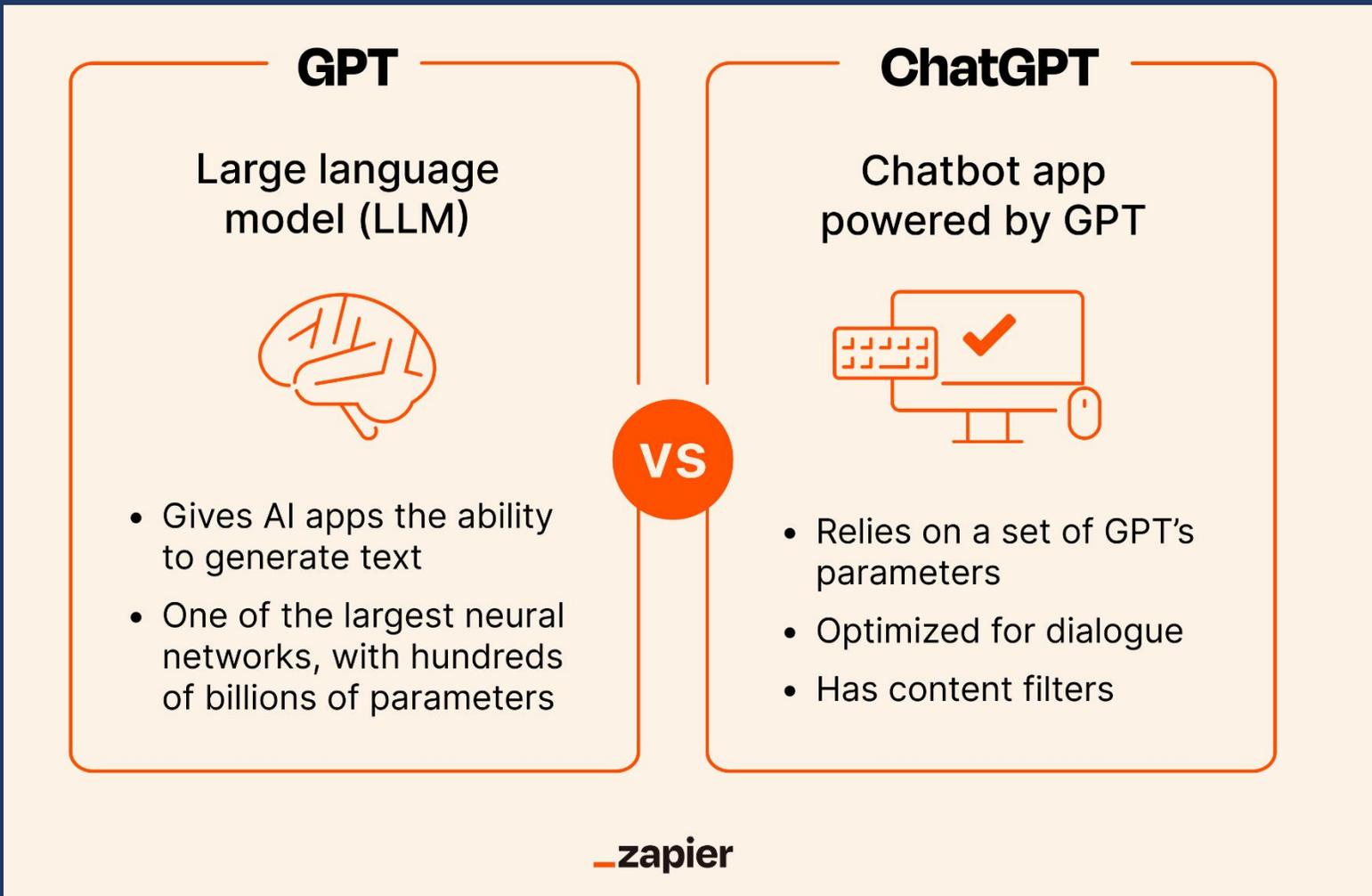
Example
Jacob [mask] reading

Jacob *fears* reading
Jacob *loves* reading
Jacob *enjoys* reading
Jacob *hates* reading

Large Language Models



ChatGPT (Chat Generative Pre-trained Transformer)



ChatGPT is designed to generate human-like responses in natural language conversations.

ChatGPT (Chat Generative Pre-trained Transformer)

M Tell me how ChatGPT works.

 ChatGPT is a large language model that uses deep learning techniques to generate human-like text. It is based on the GPT (Generative Pre-trained Transformer) architecture, which uses a transformer neural network to process and generate text. The model is pre-trained on a massive dataset of text, such as books, articles, and websites, so it can understand the patterns and structure of natural language. When given a prompt or a starting point, the model uses this pre-trained knowledge to generate text that continues the given input in a coherent and natural way.



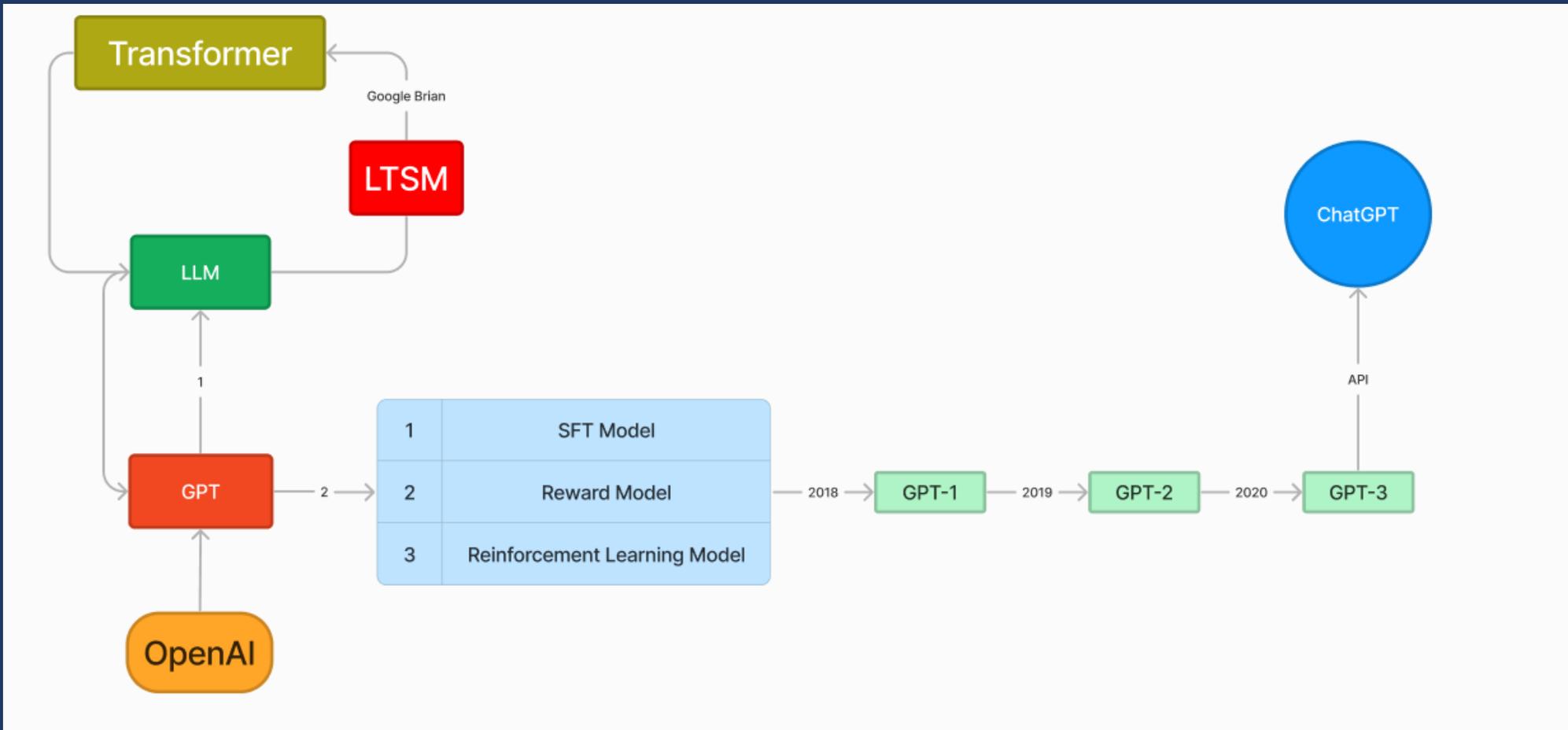




Table 2. OpenAI GPTs

Model	Launched	Amount of training data	Number of parameters	Characteristics
GPT-1	2018	40 GB	117 million	Capable of natural-language-processing tasks such as completing texts and answering questions.
GPT-2	2019	40 GB	1,500 million	Capable of more complex natural-language-processing tasks such as machine translation and summarizing.
GPT-3	2020	17,000 GB	175,000 million	Capable of advanced natural-language-processing tasks such as writing coherent paragraphs and generating entire articles. Also capable of adapting to new tasks with just a few examples.
GPT-4 ⁶	2023	1,000,000 GB (reported but not confirmed)	170,000,000 million (reported but not confirmed)	Enhanced reliability and is capable of processing more complex instructions.

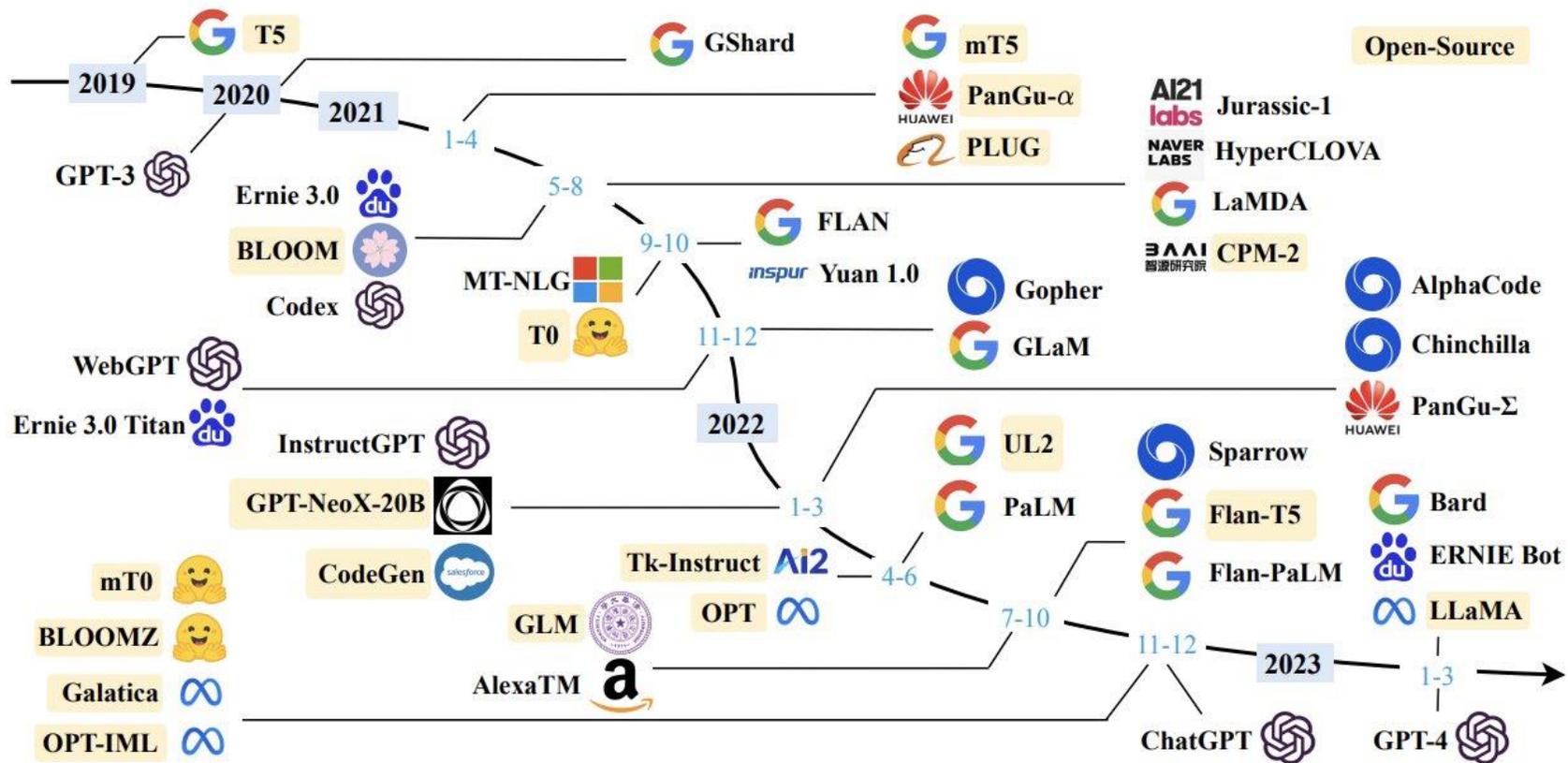


Fig. 1. A timeline of existing large language models (having a size larger than 10B) in recent years. We mark the open-source LLMs in yellow color.

AI Apps in Healthcare



Top Startups Revolutionizing Healthcare with AI in 2023

<https://omdena.com/blog/top-ai-startups-in-healthcare/>



From Drug R&D To Diagnostics: 90+ Artificial Intelligence Startups In Healthcare

<https://www.cbinsights.com/research/artificial-intelligence-startups-healthcare/>



90+ Healthcare AI Startups To Watch

Imaging & Diagnostics



Drug Discovery



Predictive Analytics & Risk Scoring



Genomics



Fitness



Hospital Decision Support



Remote Monitoring



Virtual Assistant



Clinical Trials



Nutrition



Compliance



Mental Health



Created by You. Powered by **CBINSIGHTS**





106 STARTUPS TRANSFORMING HEALTHCARE WITH AI

PATIENT DATA & RISK ANALYTICS



RESEARCH



MEDICAL IMAGING & DIAGNOSTICS



LIFESTYLE MANAGEMENT & MONITORING



NUTRITION



EMERGENCY ROOM & SURGERY



IN-PATIENT CARE & HOSPITAL MANAGEMENT



MISCELLANEOUS



MENTAL HEALTH



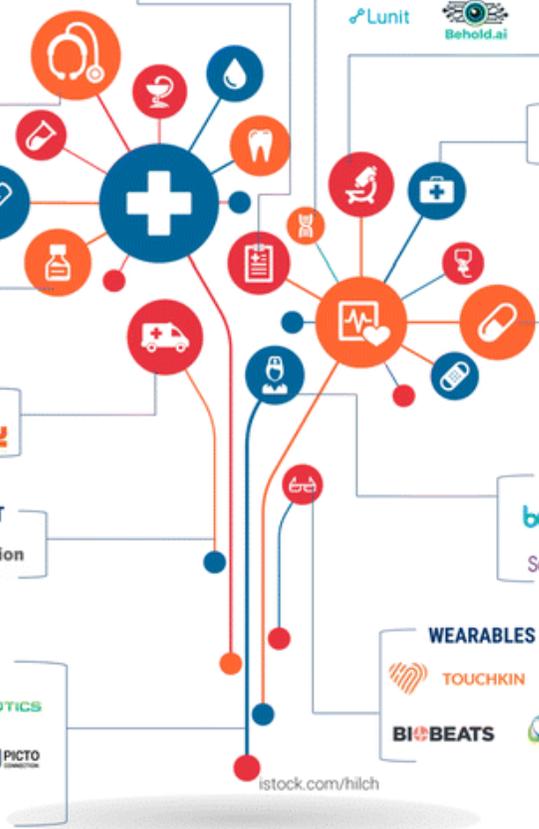
DRUG DISCOVERY



VIRTUAL ASSISTANTS



WEARABLES



istock.com/hilch



AI DIGITAL HEALTHCARE AI MARKET MAP

SAPPHIRE

Data & Analytics



Clinical Interactions

Note-taking



Diagnosis Support



Care Management



Administrative Workflows

Revenue Cycle Operations



Medical Coding



Contact Center Support



Other Admin Workflows





Global Artificial Intelligence (AI) in Healthcare Market Overview

Growth Rate



Key Players in the Market

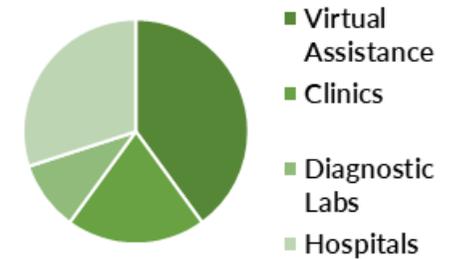
- NVIDIA Corporation
- Philips International B.V.
- Micron Technology, Inc.
- Siemens Healthcare GmbH
- Crunchbase Inc.
- Genger.io, Inc.
- Welltok, Inc.
- Google LLC
- Medtronic plc
- General Electric Company

Global Market Analysis, By Region, 2033



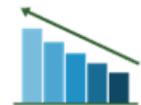
North America region to display significant opportunities for the market growth over 2023-2033 owing to the growing geriatric population in the region

Global Market Analysis, By End-User, 2033



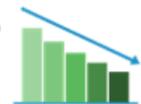
Growth Drivers

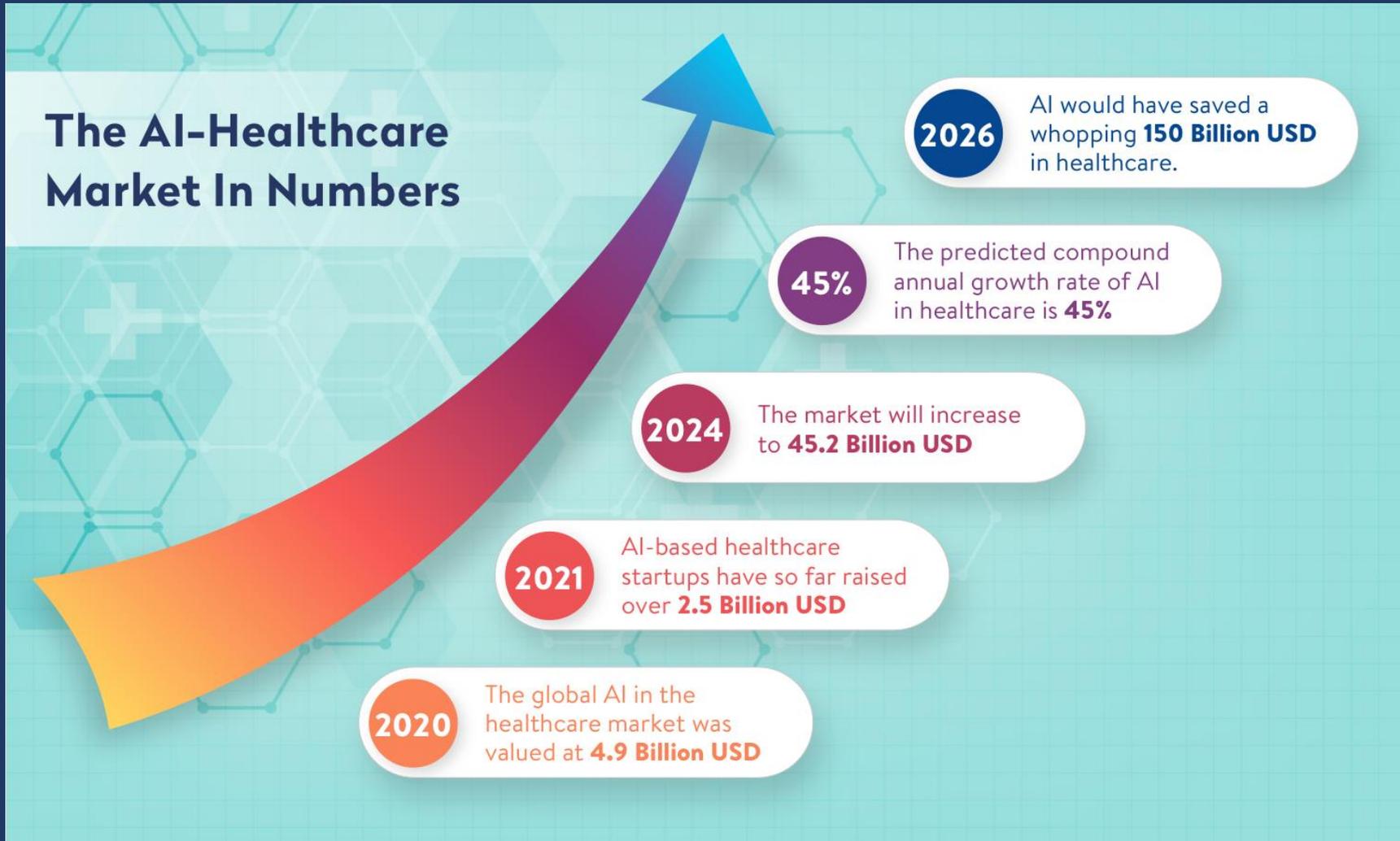
- Significant Decrement in the Number of Physicians
- Rising Prevalence of Neurological Disorders



Challenges

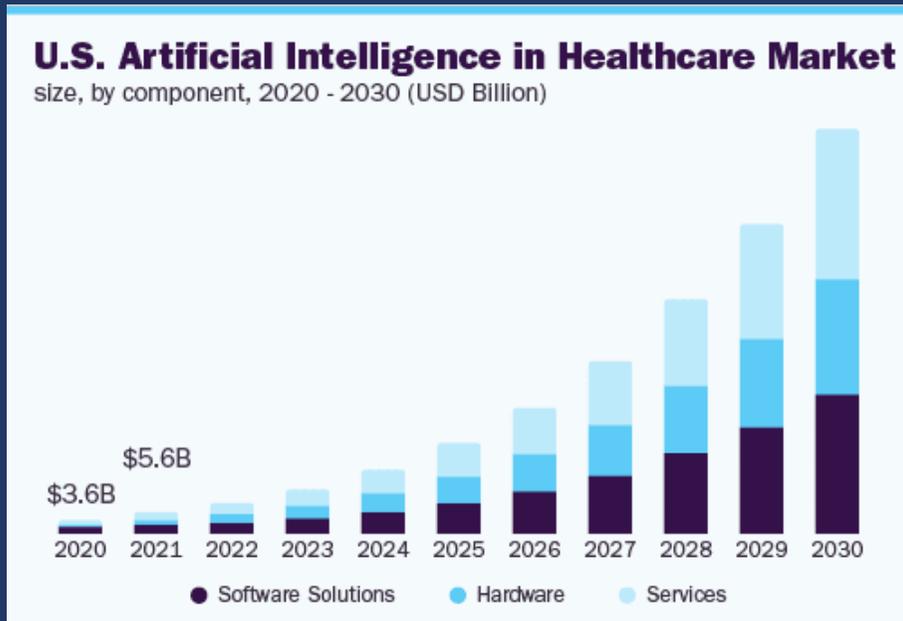
- Lack of Skilled Workforce to Develop AI



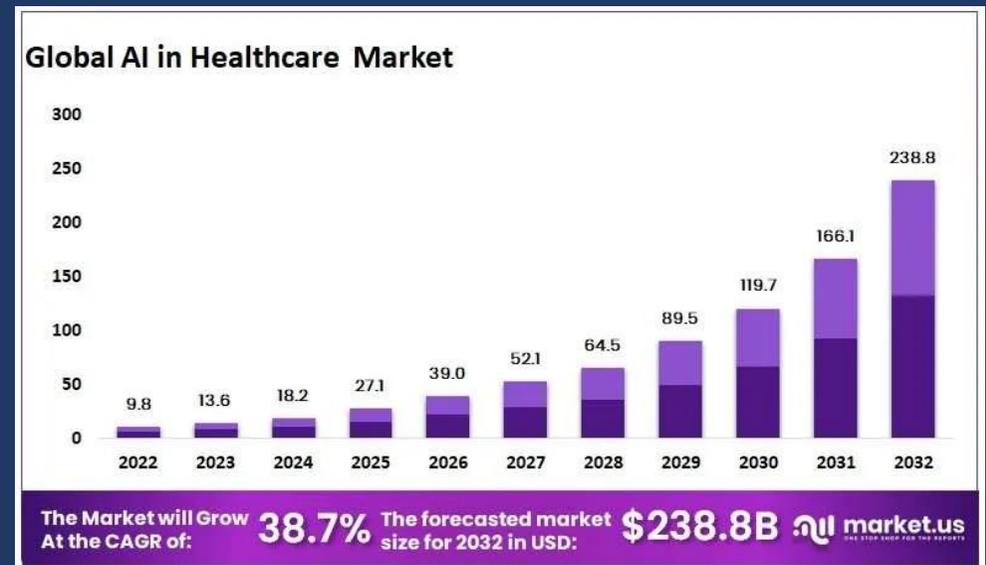


Healthcare Artificial Intelligence Market size

Know Why AI is Beneficial for Growth of Healthcare Venture



<https://www.xongolab.com/blog/ai-benefits-in-healthcare-sector/>



<https://www.openpr.com/news/1490555/ai-in-healthcare-global-market-analysis-and-future-growth-trends.html>

Healthcare Artificial Intelligence Market size

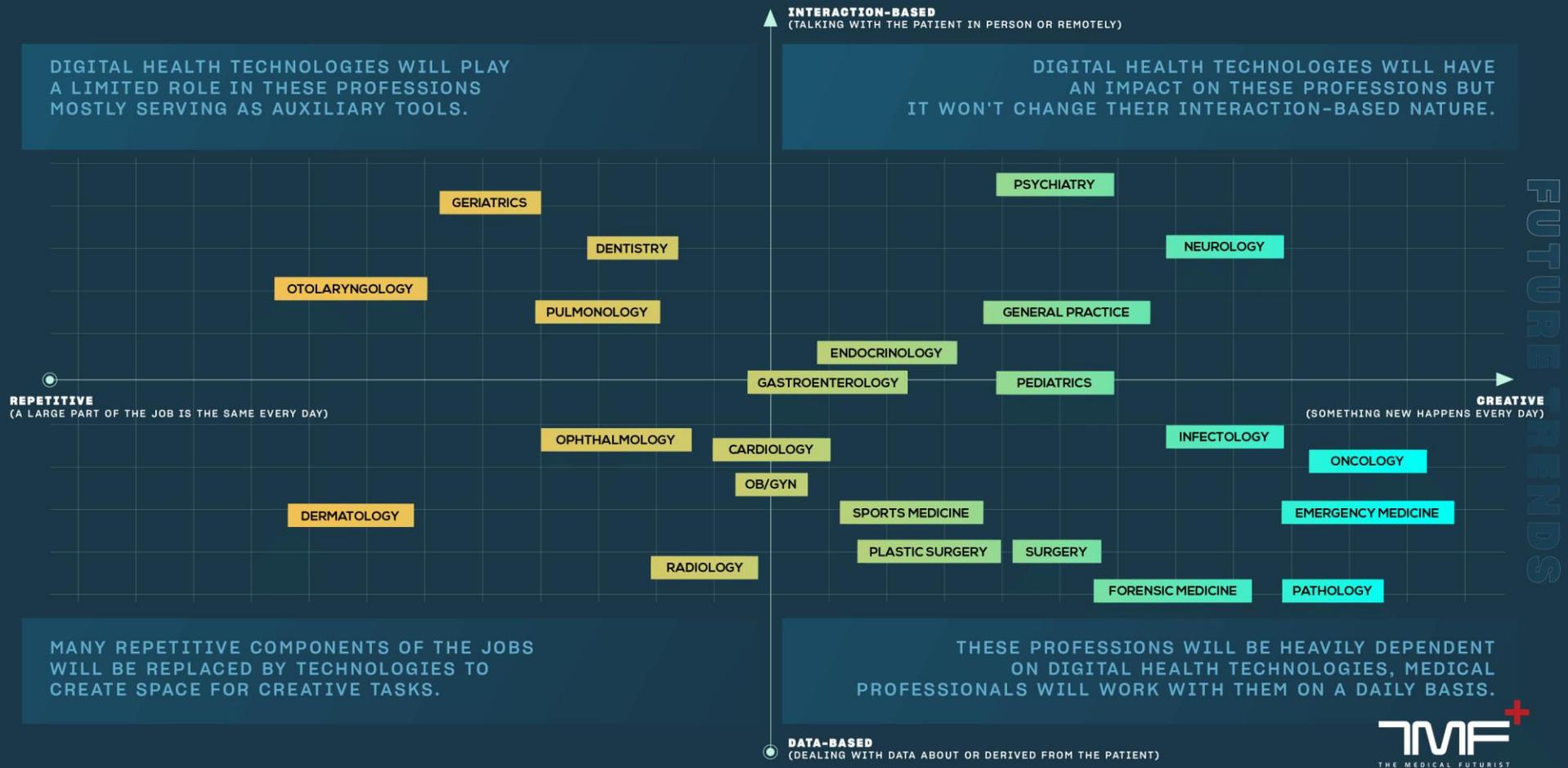
<https://www.prnewswire.com/news-releases/artificial-intelligence-ai-market-in-healthcare-sector-to-observe-usd-13-bn-growth-north-america-to-emerge-as-key-growth-region--technavio-301648896.html>



The Impact Of Digital Health Technologies On The Future Of Medical Specialties

<https://medicalfuturist.com/towards-creativity-in-healthcare-the-impact-of-digital-technologies-on-medical-specialties-in-an-infographic/>

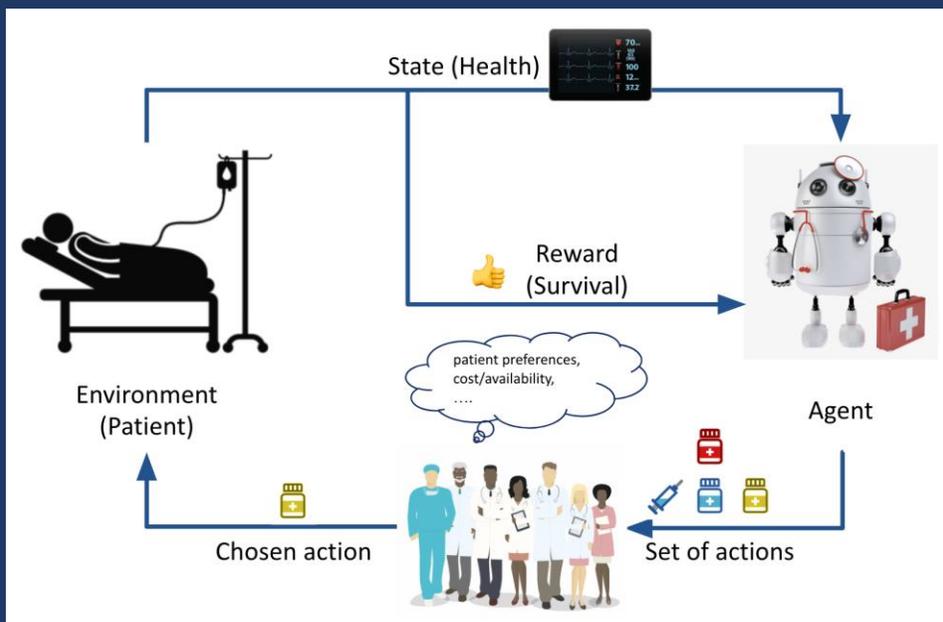
WILL DIGITAL HEALTH TECHNOLOGY REPLACE PHYSICIANS?



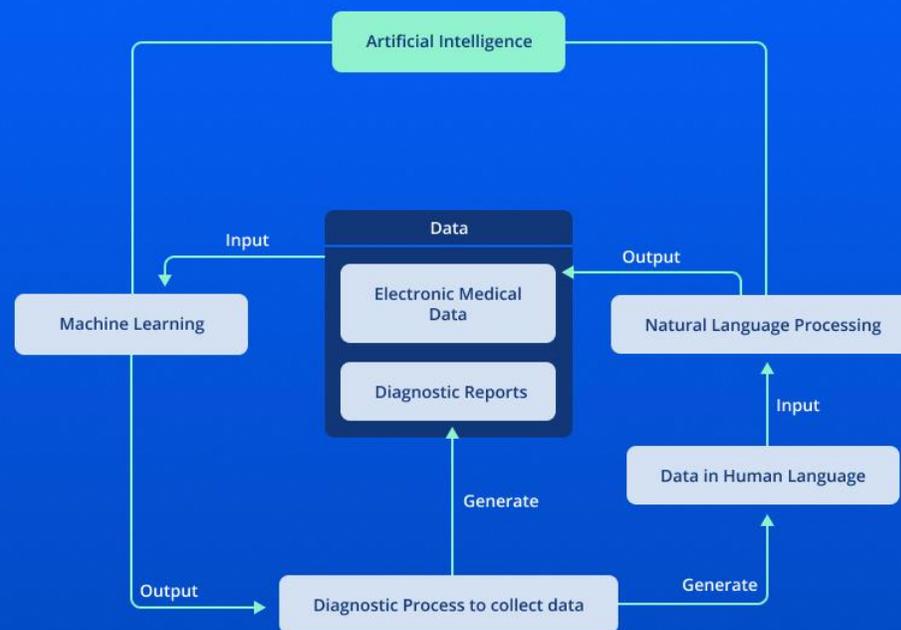
FUTURE TRENDS



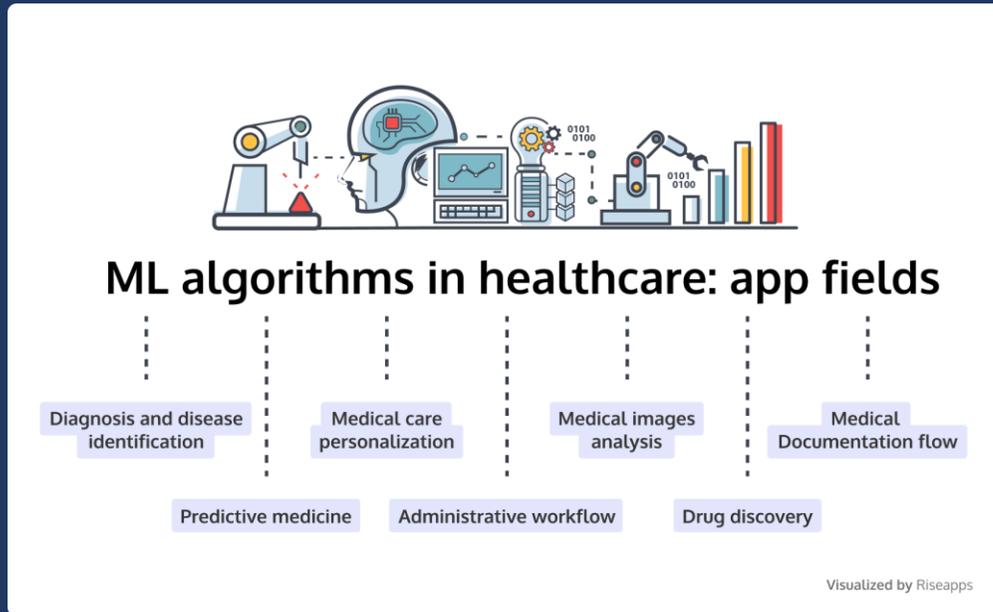
Artificial Intelligence in Healthcare: Applicable Uses



THE WORK PROCESS OF AI SYSTEMS IN MEDICINE



Artificial Intelligence in Healthcare: Applicable Uses



1. Robot Assisted Surgery
2. Clinical Trials Participation
3. Research and Development
4. Medical Imaging and Diagnostics
5. Digital Consultations
6. Personal Medical Experience
7. Precision medicine
8. Healthcare Management
9. Health Predictions and Forecasts
10. Clinical Decision Support
11. Automating Administrative Tasks
12. Wearable Health Devices
13. Drug Design and Discovery
14. Enables Remote Patient Monitoring
15. Patient Privacy
16. Clinical pathway design



Benefits of Artificial Intelligence in Healthcare



Higher Operational Efficiency



Improved Patient Care



Reduced Costs



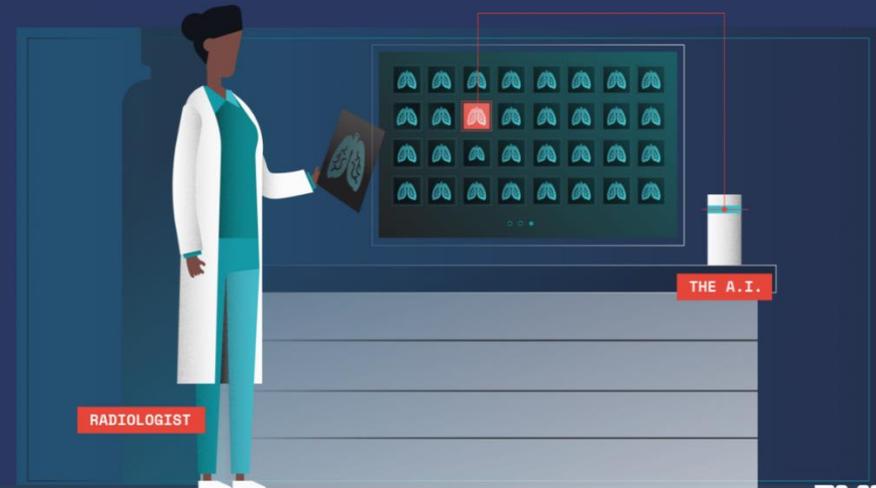
Challenges of AI in Healthcare



Privacy and Security Measures



Regulatory Compliance

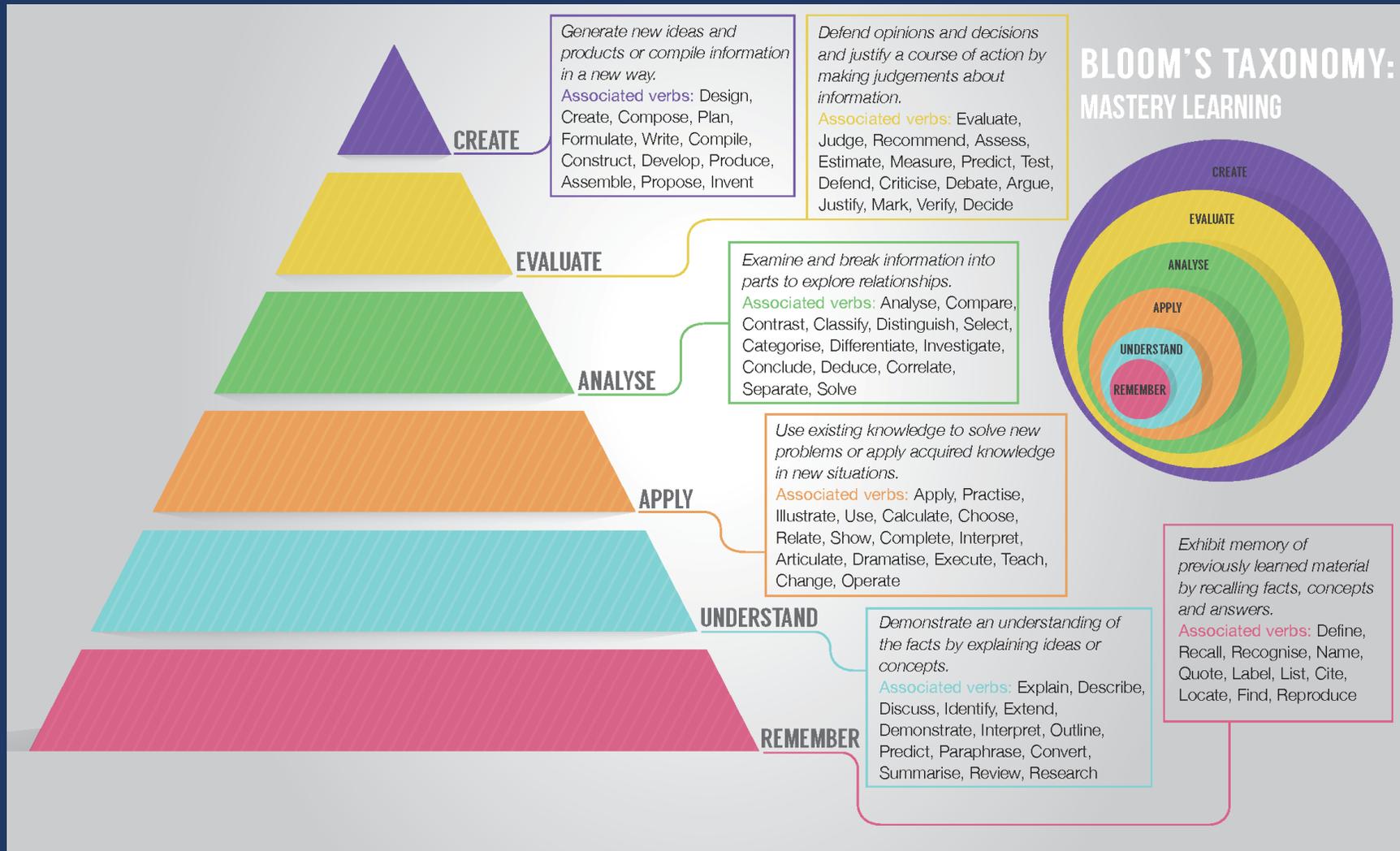


TMF⁺
THE MEDICAL FUTURIST



ARTIFICIAL INTELLIGENCE IN EDUCATION





Digital learning and transformation of education

Artificial intelligence in education

metamorworks/Shutterstock.com

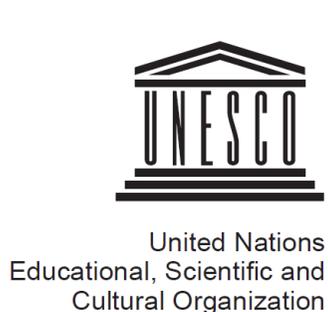
Artificial Intelligence (AI) has the potential to address some of the biggest challenges in education today, innovate teaching and learning practices, and accelerate progress towards SDG 4. However, rapid technological developments inevitably bring multiple risks and challenges, which have so far outpaced policy debates and regulatory frameworks. UNESCO is committed to supporting Member States to harness the potential of AI technologies for achieving the Education 2030 Agenda, while ensuring that its application in educational contexts is guided by the core principles of inclusion and equity.

[Artificial Intelligence promises to transform 500 million white collar jobs in the next five years!](https://www.unesco.org/en/digital-education/artificial-intelligence)

<https://www.unesco.org/en/digital-education/artificial-intelligence>

UNESCO Education Sector

Education is UNESCO's top priority because it is a basic human right and the foundation on which to build peace and drive sustainable development. UNESCO is the United Nations' specialized agency for education and the Education Sector provides global and regional leadership in education, strengthens national education systems and responds to contemporary global challenges through education with a special focus on gender equality and Africa.



Education
Sector

The Global Education 2030 Agenda

UNESCO, as the United Nations' specialized agency for education, is entrusted to lead and coordinate the Education 2030 Agenda, which is part of a global movement to eradicate poverty through 17 Sustainable Development Goals by 2030. Education, essential to achieve all of these goals, has its own dedicated Goal 4, which aims to *“ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.”* The Education 2030 Framework for Action provides guidance for the implementation of this ambitious goal and commitments.



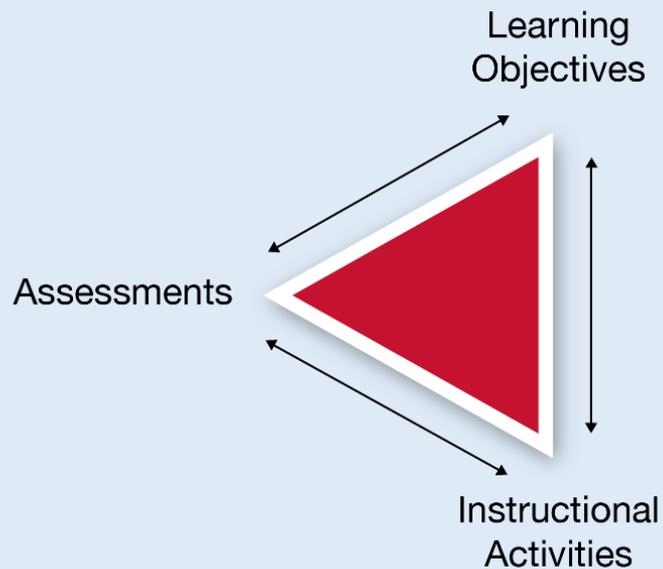
<https://www.unesco.org/en/digital-education/artificial-intelligence>

AI Is Changing Education Forever



Applications of Artificial Intelligence in Education

1. Adaptive Learning:

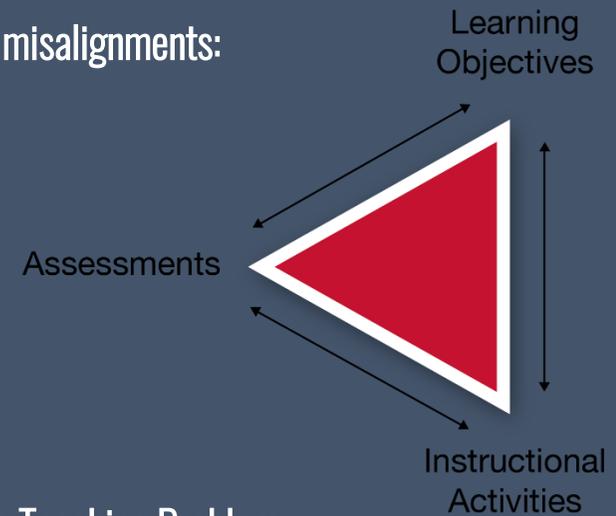


- Timing and Logistics
- Technology for Education
- Organize knowledge
- Prioritizing the knowledge
- Aligning major components of instruction:
Learning objectives, Assessments, and Instructional activities.
- Respond to cultural differences in our classes
- Create a productive and **inclusive learning environment**

1. Adaptive Learning:

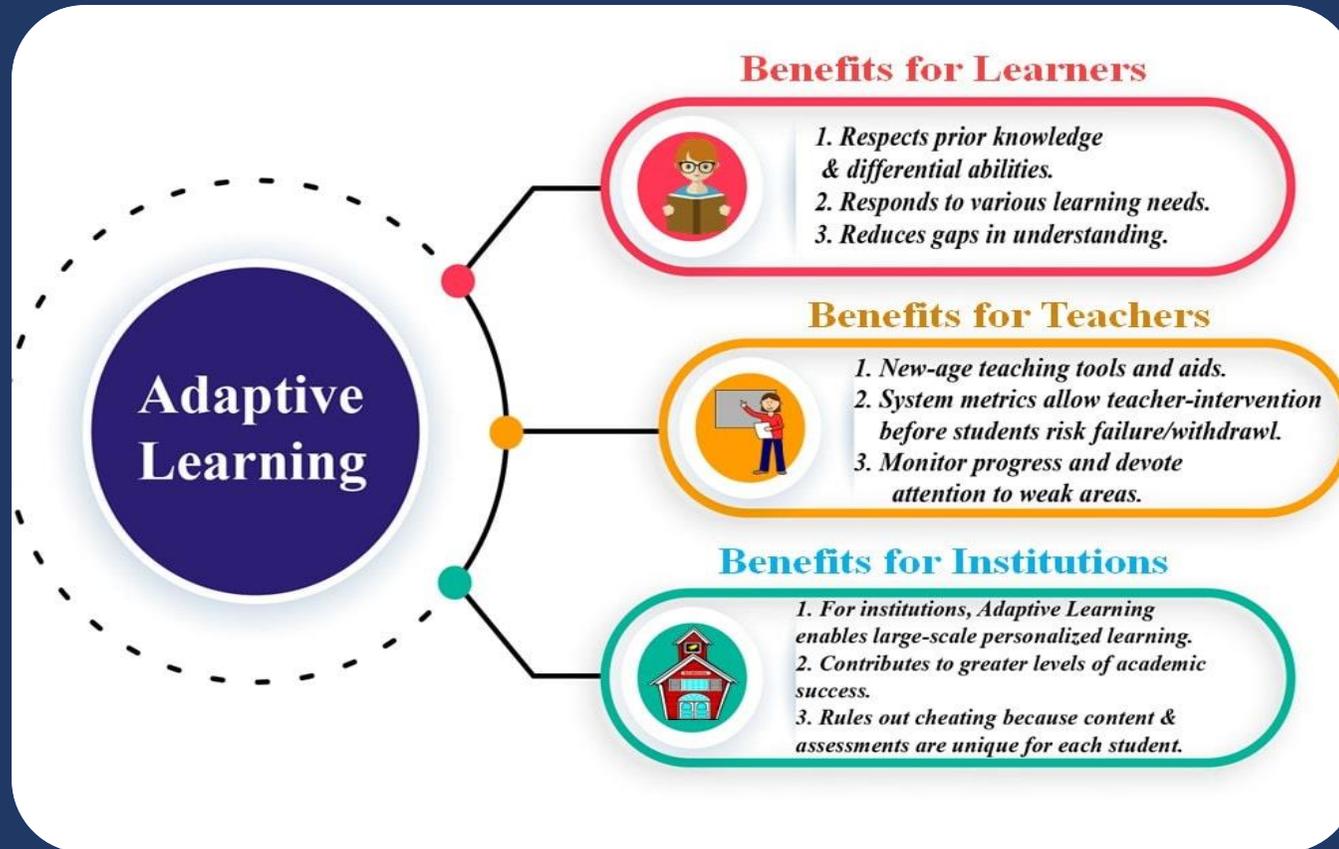
Hyperparameter Tuning

- **Detect misalignments:**



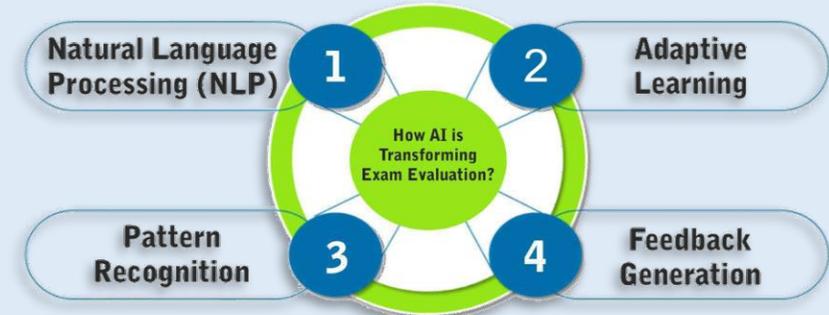
- Solve a Teaching Problem
- Detect reasons of eroding Attitudes & Motivation
- Grabbing and holding students' attention
- Encourage to demonstrate Critical Thinking

Applications of Artificial Intelligence in Education



Applications of Artificial Intelligence in Education

2. Automated Grading:



How Automated Grading Systems Improve Exam Assessment

- 1 Consistent and accurate evaluation
- 2 Instant feedback
- 3 Enhanced efficiency
- 4 Reduces burnout
- 5 Ensures fairness

Applications of Artificial Intelligence in Education

3. Concept Map

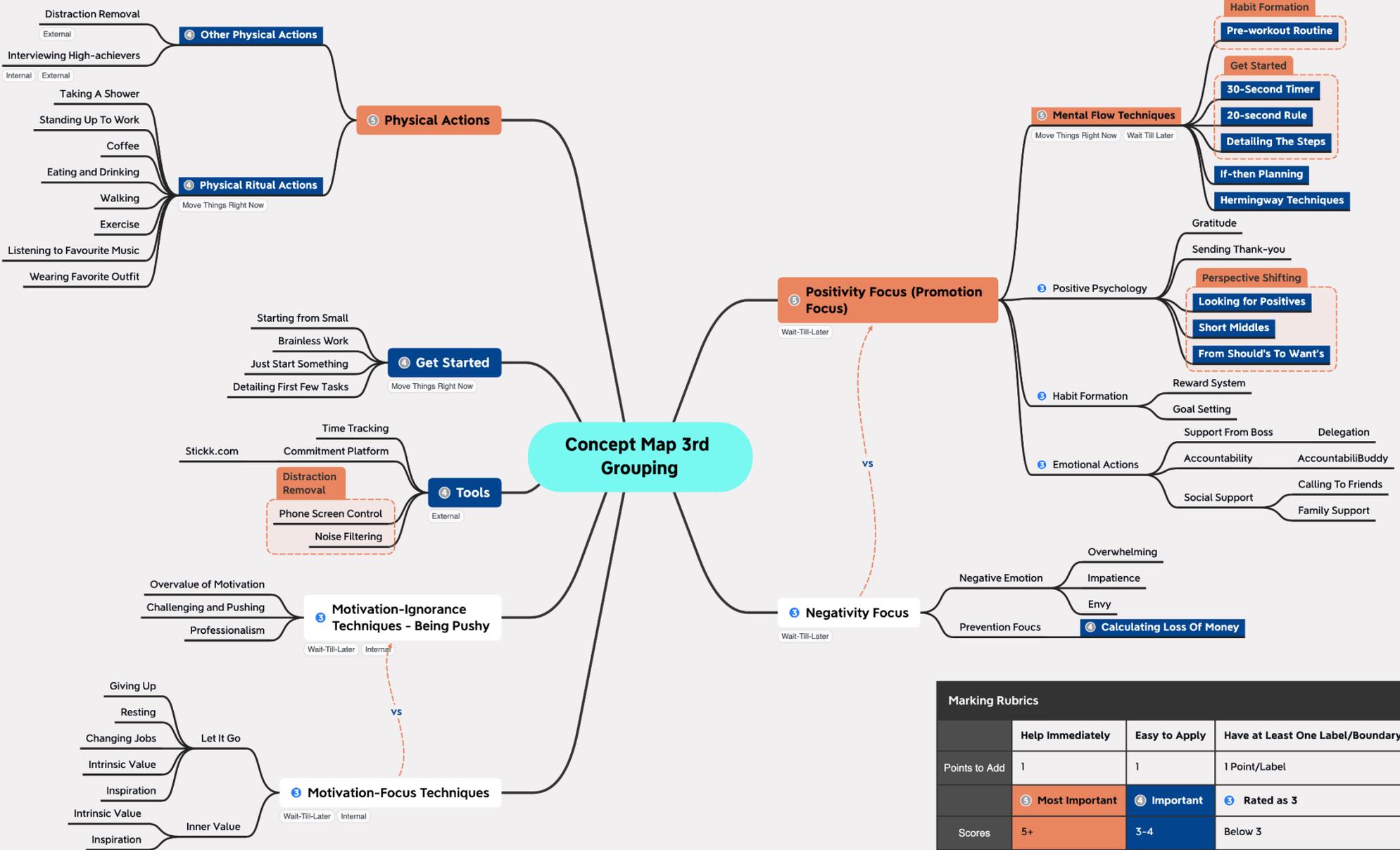
The screenshot displays a concept map application interface. The main map is titled "cm persona Content writer - Beginner" and features a central node "Wannabe content writer". This central node is connected to several other nodes: "Personal blogger" (with sub-nodes "Food blogging" and "Travel blogging"), "Age: 20 - 30", "Persona (user experience)", "Student", "Freelancer", "India", "Asia", and "Africa". A "want to be" relationship is shown between "Student" and "Freelancer". A "is a" relationship is shown between "Wannabe content writer" and "Personal blogger". A "is from" relationship is shown between "Wannabe content writer" and "India".

Below the main map, there is a "Related concepts" section with various tags such as "Artificial intelligence", "Autocomplete", "Natural-language generation", "Explanation", "ai image generator from text", "ai art generator from text", "ai generated text", "how to make an ai text generator", "Black box", "Explainable artificial intelligence", "Website", "Alan Turing", "open ai text generator", "text to image generator ai", "ai generated text adventure", "Artificial general intelligence", "Donald Michie", "Bertrand Russell", "Thought", "conversion.ai", "copy.ai", and a "Load more" button.

On the right side, there is a sidebar titled "ai text generator" with a search bar and a list of suggestions:

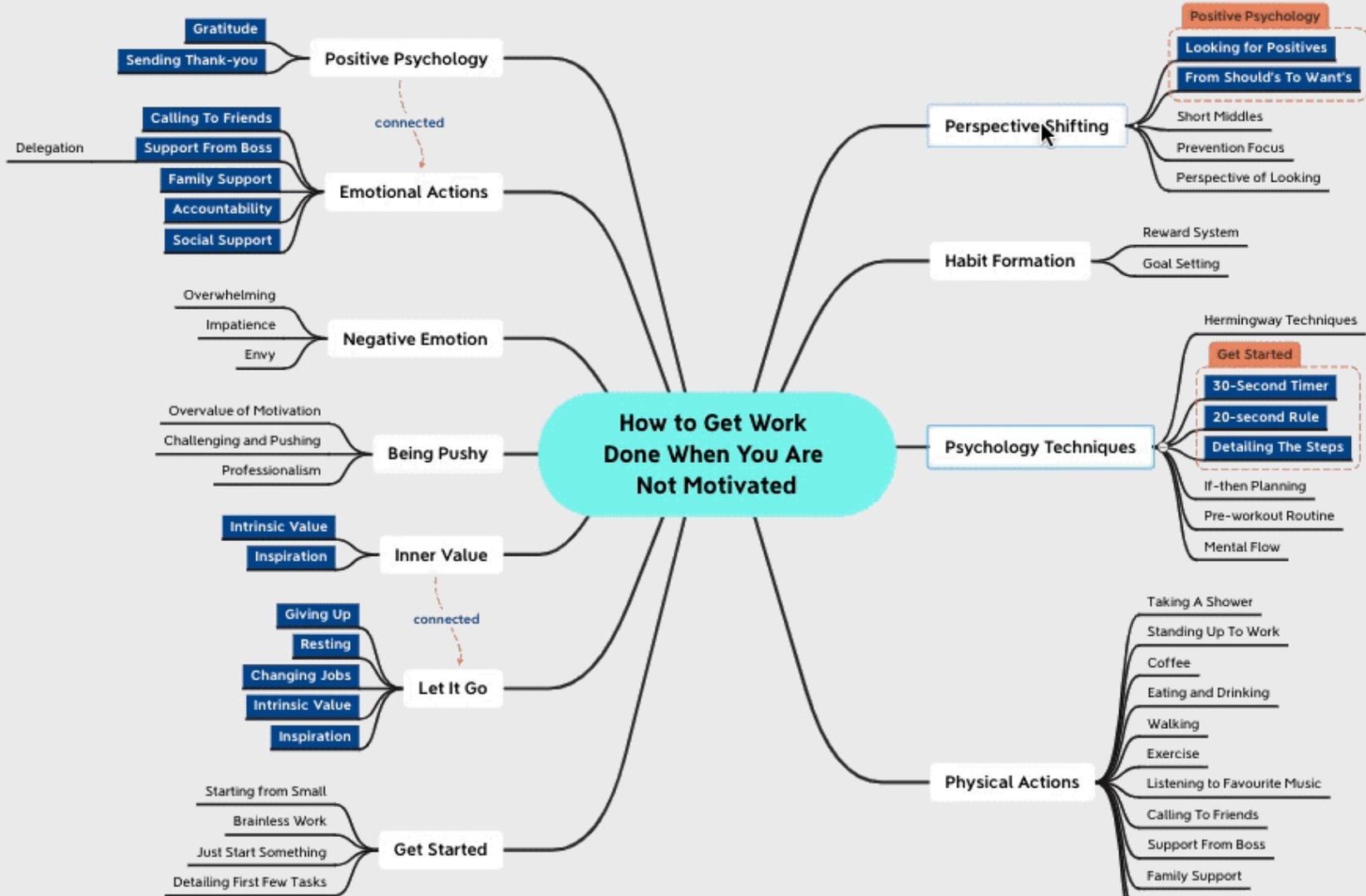
- Sassbook AI Writer | Versatile AI Text Generator: The AI text generator will not only speed up your content creation, but will also help generate articulate, original content often spurring new ideas driven by AI. Inspiring automatic text generator. AI writer powered by state-of-the-art natural language technologies. <https://sassbook.com/ai-writer>
- Automatically Write Articles with this AI Writer | English: AI-written text is ready in seconds, quick and easy, you can have access to our unlimited text generator, create your own free content with the most advanced online tool to generate text, by using our application you will be able to generate any type of text and in any language, like articles for your blogs, books, and much more. <https://smodin.io/writer>

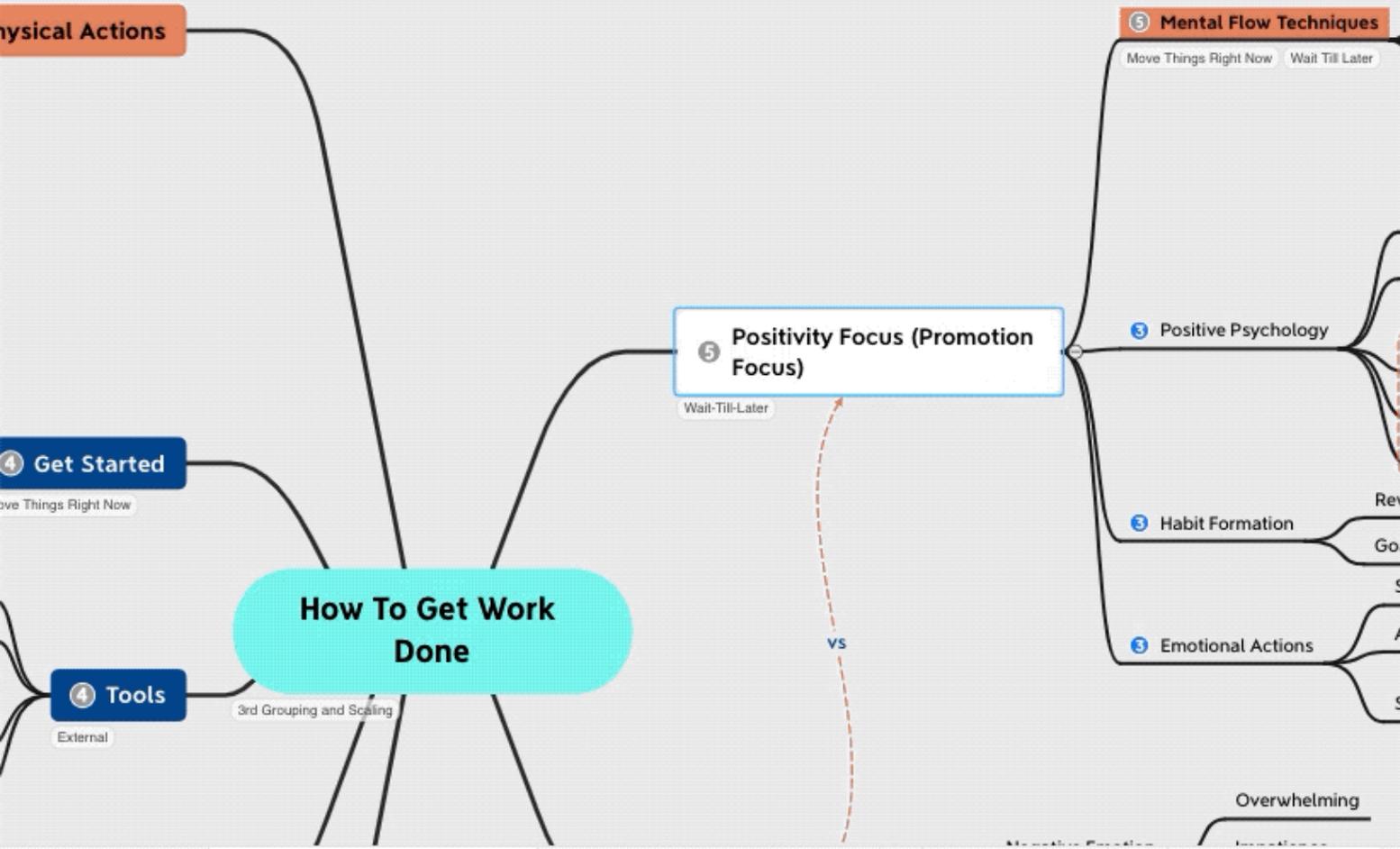
Additional suggestions in the sidebar include "create a portfolio", "Prepare outline first", "Struggling with keeping focus", "Have too many ideas, cycling around", "SEO optimization without SEO expert", and "Swipe file".



Marking Rubrics			
	Help Immediately	Easy to Apply	Have at Least One Label/Boundary
Points to Add	1	1	1 Point/Label
	5 Most important	4 Important	3 Rated as 3
Scores	5+	3-4	Below 3







Style | Map

Main ...

Structure [Icon]

Shape [Icon]

Fill

Border

Fixed Width 336

Text

NeverMind

DemiBold 20

B I ~~S~~ Tt

[Icons]

Branch [Icon]

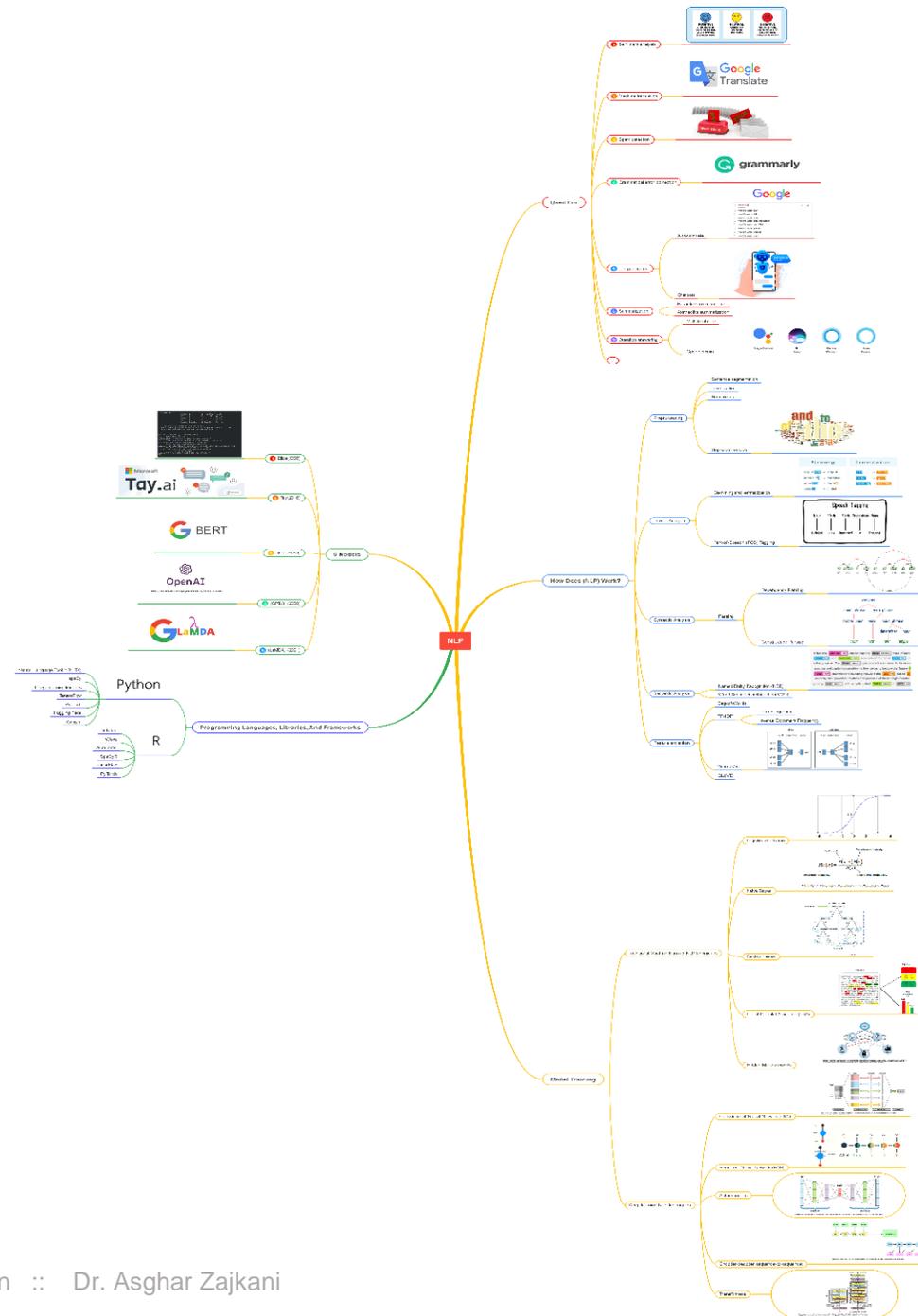


AI Assisted Concept Map



WONDERSHARE EDRAWMIND

- <https://whimsical.com/ai/ai-mind-maps>
- <https://www.enspired-trading.com/blog/mind-mapping-ai>
- <https://www.edrawmind.com/ai-features/ai-concept-map.html>
- <https://noduslabs.com/featured/generate-mind-maps-text-gpt3-ai/>
- <https://www.edrawmax.com/mind-map/concept-map-ai-maker.html>
- <https://www.edrawmind.com/ai-features/ai-concept-map.html>
- https://www.google.com/imgres?imgurl=https%3A%2F%2Fwww.biggerplate.com%2FmapImages%2Fxl%2FS9yZHBdN_AI-TOOLS-TO-USE-IN-THE-CLASSROOM-mind-map.png&tbid=XlfvhsUG1ejhM&vet=12ahUKEwi9tOCNylmDaxWm7bsIHyr0A2EQMygFegQIARBg..i&imgrefurl=https%3A%2F%2Fwww.biggerplate.com%2Fmindmaps%2FS9yZHBdN%2Fai-tools-to-use-in-the-classroom&docid=0MavxL43bR6tKM&w=750&h=547&q=mind%20map%20ai%20tool&ved=2ahUKEwi9tOCNylmDaxWm7bsIHyr0A2EQMygFegQIARBg





Write Essays

with AI & Mind Maps



Applications of Artificial Intelligence in Education

4. Chatbot:

- Sentiment analysis
- Machine translation
- Spam detection
- Grammatical error correction
- Text generation
 - Autocomplete
 - Chatbots
- Summarization
 - Extractive summarization
 - Abstractive summarization
- Question answering
 - Multiple choice
 - Open domain



5. Chat Campus:



Google Assistant



Siri
(Apple)



Cortana
(Microsoft)

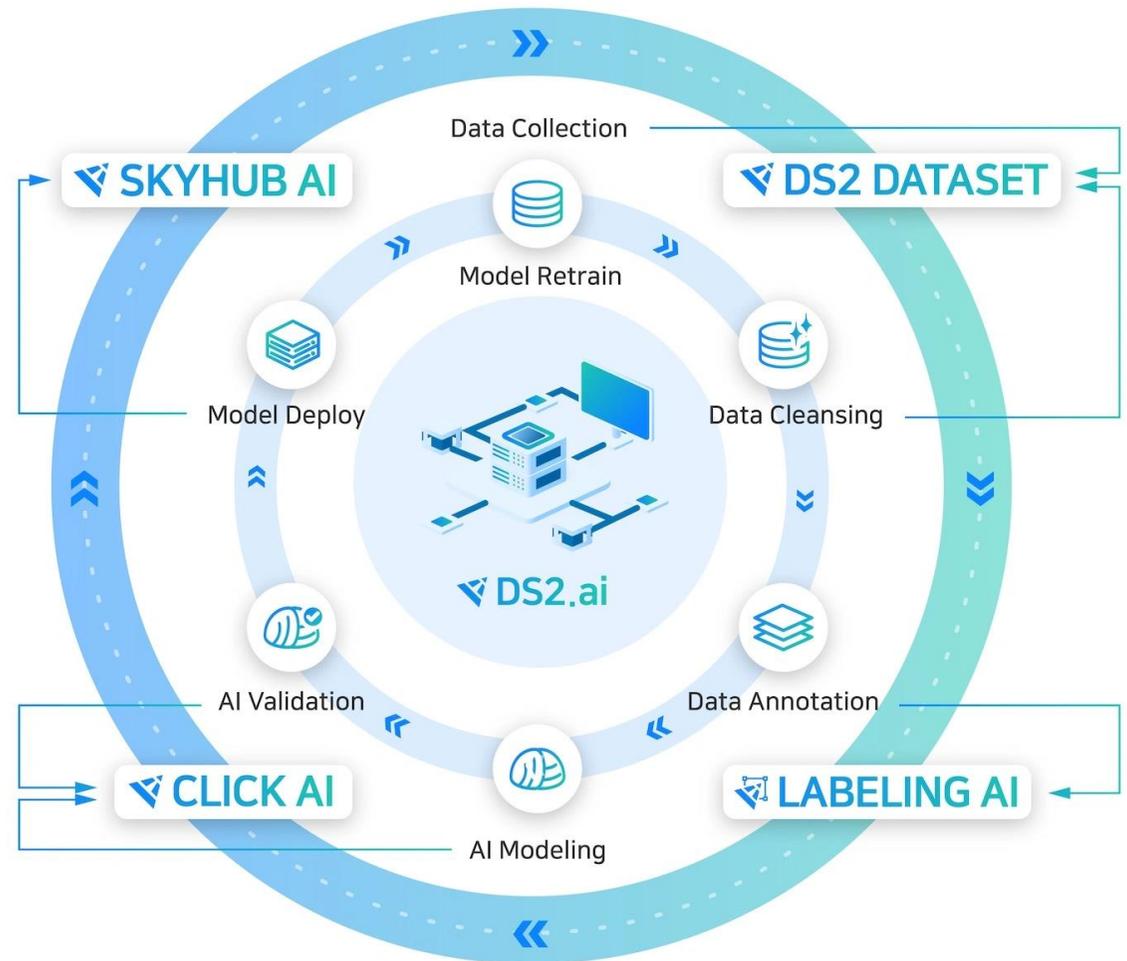


Alexa
(Amazon)



Applications of Artificial Intelligence in Education

6. Data Accumulation:



Applications of Artificial Intelligence in Education

7. Personalized Learning:

Personalized Learning with 3 Models

Project-Based Learning (PBL)

Blended Learning

Flipped Instruction



• **Duolingo**: a language learning app that uses AI to personalize lessons for each user

Coursera: which uses AI to recommend courses to students based on their interests and previous learning history.

The screenshot shows the Coursera website interface. At the top, there is a navigation bar with links for "For Individuals", "For Businesses", "For Universities", and "For Governments". Below this is the Coursera logo and an "Explore" dropdown menu. A search bar contains the text "What do you want to learn?". On the right side of the navigation bar, there are links for "Online Degrees", "Find your New Career", "Log In", and a "Join for Free" button. The main content area features the "coursera PLUS" logo. Below the logo, the text reads: "Unlimited access to 7,000+ world-class courses, hands-on projects, and job-ready certificate programs—all included in your subscription". The price is listed as "\$59/month, cancel anytime". A prominent blue button says "Start 7-day Free Trial". Below the button, there is a link: "or \$399/year with 14-day money-back guarantee". To the right of the text is a circular image of a woman with glasses working on a laptop. To the right of the image is a decorative grid of yellow dots.

Learn from **275+** leading universities and companies with Coursera Plus



The best way to learn to code

Courses designed by experts with real-world practice.
Join our global community. **It's free.**

[Start learning now!](#)

or

 Google

 Apple

 Facebook



Tailored to you

No matter your experience level, you'll be writing **real, functional code within minutes** of starting your first course.



Bite-sized

Go step-by-step through our unique courses. Assess what you've learned with in-lesson quizzes, and **gradually advance your skills with practice.**



Get proof

Earn a certificate to validate your newly acquired skills. Post it on social for others to see.

Discover New Courses



Introduction to C



Introduction to Python



Introduction to C#



C++



Java

[← Back to courses](#)



Python Core

Learn Python, one of today's most in-demand programming languages on-the-go! Practice writing Python code, collect points, & show off your skills now!

 **Basic Concepts** 7/7 

 **Strings & Variables** 10/10 

COURSE CERTIFICATE

This is to certify that

Alireza Mehrabi

has successfully completed the course by demonstrating
theoretical and practical understanding of

Introduction to Python



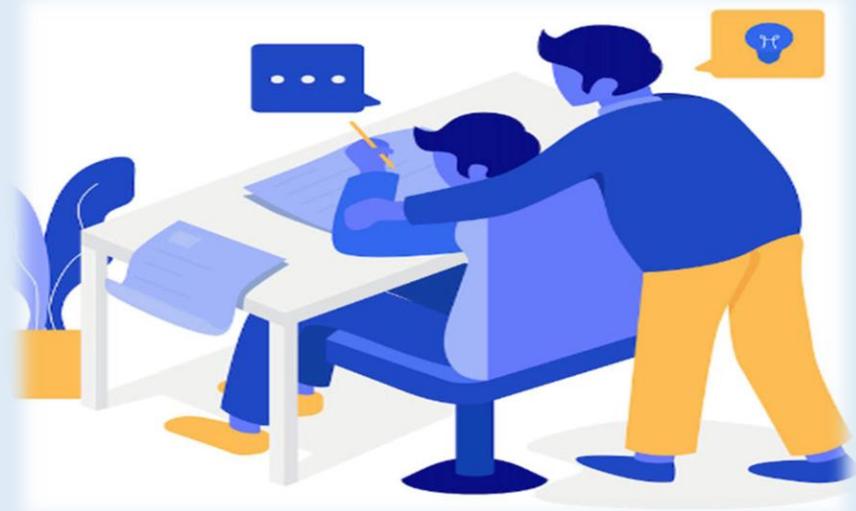
Certificate CC-C5WTIO1M
Issued 07 December, 2023

Yeva Hyusyan
Chief Executive Officer

Applications of Artificial Intelligence in Education

8. Proctoring:

E-learning, the future of learning needs supporting technologies. AI-powered systems ensure the authenticity of the student to take the exam and prevent from cheating. It can be used for attending competitive exams, school/college admission test, promotions, and, more.





Jasper AI can also recognize emotions and sentiments in language, which can be useful for crafting persuasive or emotionally resonant content.

Applications of Artificial Intelligence in Education

9. Virtual Facilitator, Virtual and Augmented Reality:

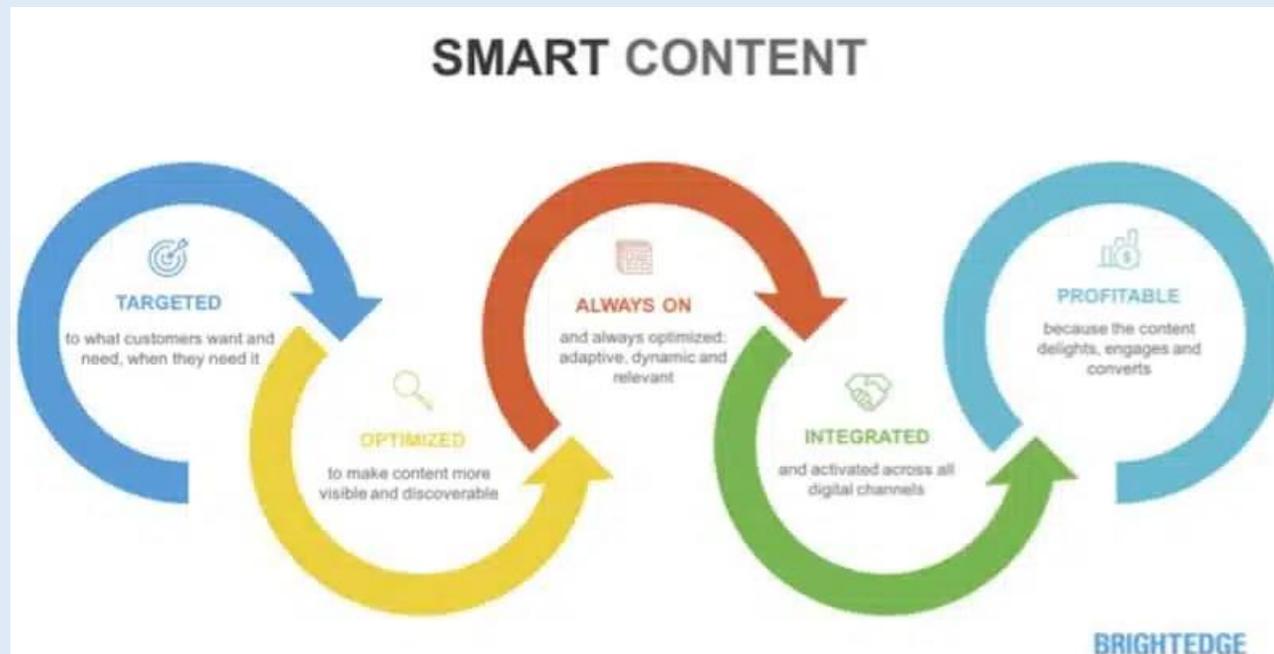


Though virtual humans are not welcomed in the place of a human instructor, virtual instructors could be used in the educational and therapeutic environment. It can think, act, and react to the students' queries and act as an **assistant** for the teacher. It could be used successfully in remote training programs.

Applications of Artificial Intelligence in Education

10. Smart Content:

Smart content creation is already introduced into the primary and secondary school, college, and corporate environment. With the help of AI, the textbooks could be split into **small chunks** of digestible guides, which is easy to read and understand.



The study guide includes flashcards, MCQs, fill in the blanks, pointers, true/false, chapter summary, and so forth. For instance: Cram 101, Netexlearning, and, etc.

Applications of Artificial Intelligence in Education

youtube.com/watch?v=RBo585Z6FSQ

Official U.S. Depart... AI for Papers ★ Bookmarks Imported From Fire... Imported From Fire... All Bookmarks

YouTube PL Search

Download this video

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168K views · 7 years ago

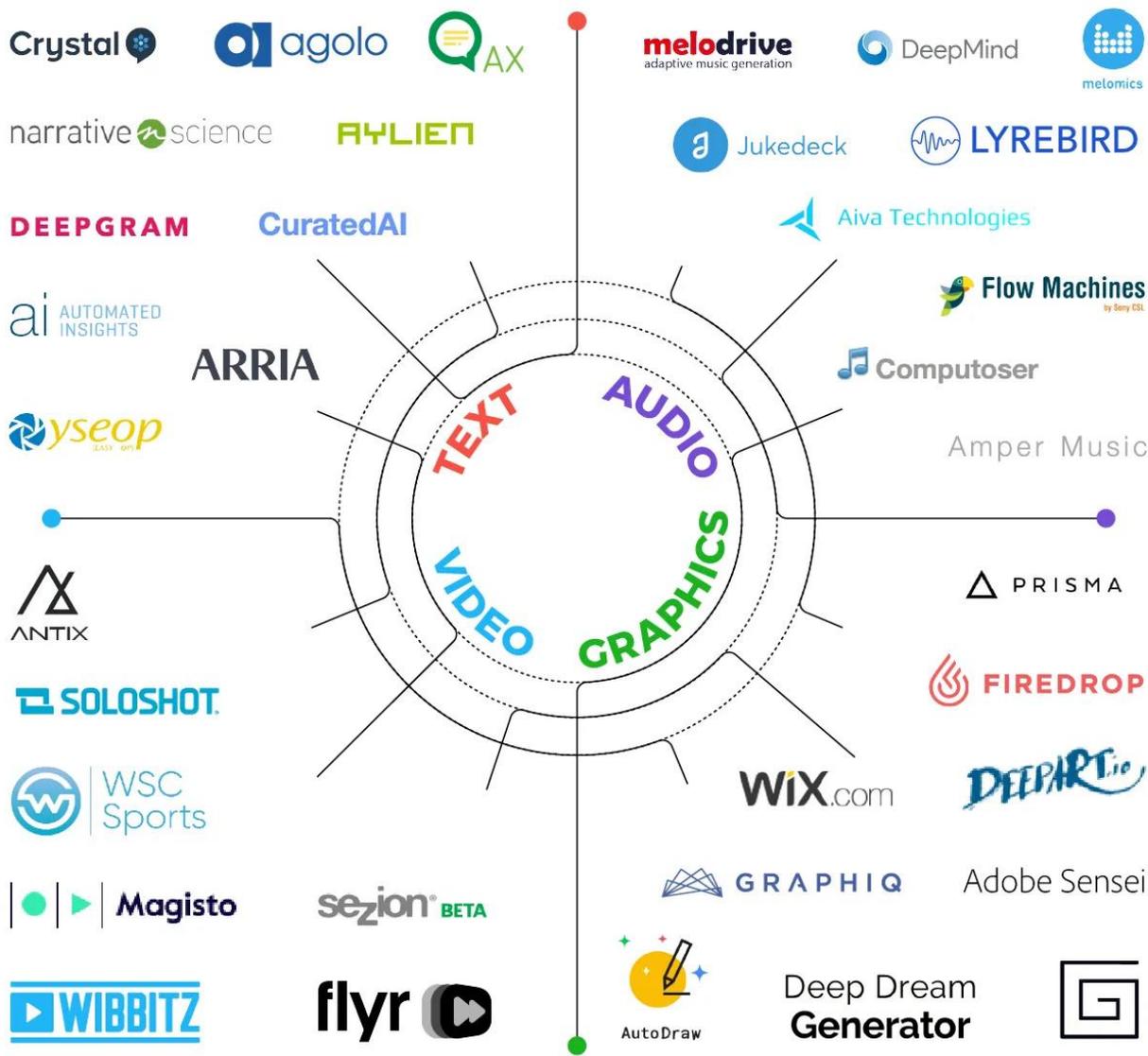
Why AI will never replace humans | Alexandr Wang | ...
TEDx Talks ✓
170K views · 1 year ago

Why AI is the Catalyst We Need



AI COMPANIES

FOR CONTENT CREATORS



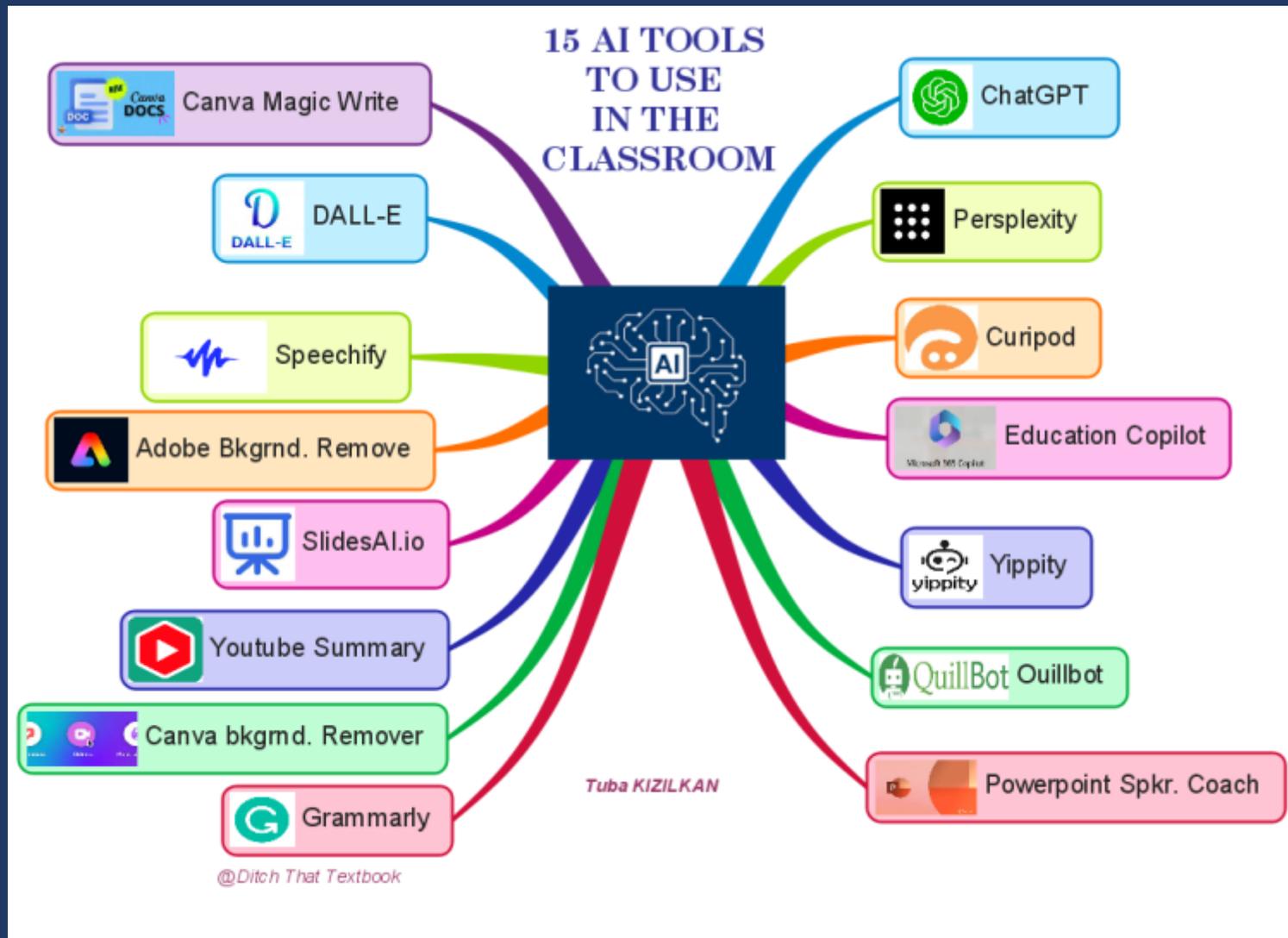
<https://addons.prestashop.com/en/additional-information-product-tab/90599-openai-integration-pro-ai-smart-content-generation.html>

<https://www.selligent.com/resources/guides/smart-content-powered-by-selligent-cortex-ai/>

<https://www.canva.com/design/DAF5UzYqKGE/2GwkIhJy9-aGZExe-bRbkQ/edit?ui=eyJEljpw7IkgiOnsiQSI6dHJ1ZX19fQ&referrer=magic-write-landing-page>

<https://topai.tools/s/smart-content-creator>

Ai Tools To Use In Educating



60 Top AI Smart Content Creator Tools

Explore some of the best AI tools for **smart content creator** and use our AI-powered search box to find the best tools for your task and more.

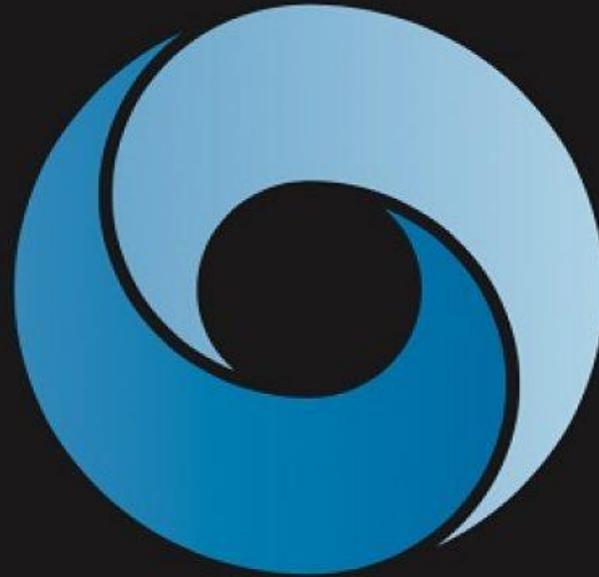
AI-Powered Search For AI Tools

- Explore all tools
- AI Use Cases New
- AI Detection
- Art
- Audio
- Avatars
- Business
- Chat
- Coaching
- Data Analysis
- Design
- Development
- Education
- Email
- Finance
- Gaming
- Images
- Legal
- Marketing
- Music
- Podcasting
- Productivity
- Prompt Guides
- Research
- SEO
- Social Media
- Speech
- Translation
- Video
- Writing
- Free AI tools
- Opensource AI tools
- GPTs List

AI Tools For: Smart Content Creator

Filters

Robo found 60 tools for you..



Google DeepMind

<https://deepmind.google/>

Gemini

<https://moneyaitech.com/what-is-google-gemini-ai-how-to-use-the-new-chatbot-model/>

AI

Introducing Gemini: our largest and most capable AI model

Dec 06, 2023

Making AI more helpful for everyone

12 min read



Sundar Pichai
CEO of Google and
Alphabet



Demis Hassabis
CEO and Co-Founder,
Google DeepMind

Share

The word "Gemini" above five separate threads, each a different color, converge from the left into a three-dimensional central helix before separating back out toward the right into five individual strands once more.

<https://deepmind.google/technologies/gemini/#capabilities>

89.8%

Human expert (MMLU)

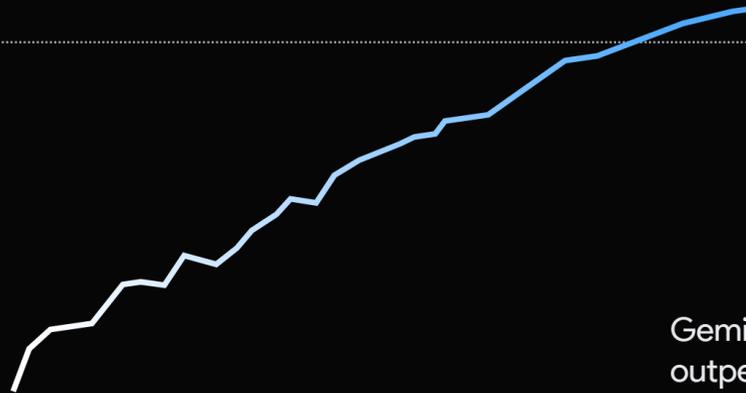
90.0%

CoT@32*

86.4%

5-shot* (reported)
Previous SOTA (GPT-4)

*Note that evaluations of previous SOTA models use different prompting techniques.



Gemini is the first model to outperform human experts on MMLU (Massive Multitask Language Understanding), one of the most popular methods to test the knowledge and problem solving abilities of AI models.

<https://paperswithcode.com/dataset/mmlu>

Gemini surpasses state-of-the-art performance on a range of benchmarks including text and coding.

TEXT

Capability	Benchmark Higher is better	Description	Gemini Ultra	GPT-4 API numbers calculated where reported numbers were missing
General	MMLU	Representation of questions in 57 subjects (incl. STEM, humanities, and others)	90.0% CoT@32*	86.4% 5-shot** (reported)
Reasoning	Big-Bench Hard	Diverse set of challenging tasks requiring multi-step reasoning	83.6% 3-shot	83.1% 3-shot (API)
	DROP	Reading comprehension (F1 Score)	82.4 Variable shots	80.9 3-shot (reported)
	HellaSwag	Commonsense reasoning for everyday tasks	87.8% 10-shot*	95.3% 10-shot* (reported)
Math	GSM8K	Basic arithmetic manipulations (incl. Grade School math problems)	94.4% maj1@32	92.0% 5-shot CoT (reported)
	MATH	Challenging math problems (incl. algebra, geometry, pre-calculus, and others)	53.2% 4-shot	52.9% 4-shot (API)
Code	HumanEval	Python code generation	74.4% 0-shot (IT)*	67.0% 0-shot* (reported)
	Natural2Code	Python code generation. New held out dataset HumanEval-like, not leaked on the web	74.9% 0-shot	73.9% 0-shot (API)

*See the technical report for details on performance with other methodologies

**GPT-4 scores 87.29% with CoT@32—see the technical report for full comparison

How China Is Using Artificial Intelligence in Classrooms





- How is Artificial Intelligence is Reshaping the College Experience.
- AI and associated technologies change the role of higher education.



Why Go for a Digital University

- 01 Unlimited Seats per Course
- 02 Minimal Eligibility Criteria
- 03 Affordable Education
- 04 Flexible Learning
- 05 Large Variety of Courses
- 06 Education in Mother Tongue

Challenges for Digital University

- Access to Resources for Online Education
- Lowered Attention Span in Online Mode
- Hesitance for Online/Distance Education
- Impact on Other Sectors of the Economy
- Poor Connectivity in Remote Areas
- Unfamiliarity with Online Education

Artificial Intelligence Will Transform Higher Education

1. Finding the right students and persuading them to enroll
2. Strengthening retention and helping students graduate
3. Personalizing teaching and learning
4. Adapting the curriculum to meet market demands
5. Streamlining operations to gain efficiencies and lower costs

AI TOOLS TO USE IN THE CLASSROOM

- <https://www.biggerplate.com/mindmaps/S9yZHBdN/ai-tools-to-use-in-the-classroom>
- <https://addons.prestashop.com/en/additional-information-product-tab/90599-openai-integration-pro-ai-smart-content-generation.html>
- <https://www.insidehighered.com/views/2023/03/22/how-ai-shaping-future-higher-ed-opinion#:~:text=AI%20is%20quietly%20disrupting%20higher,to%20assess%20productivity%20and%20performance.>
- <https://www.insidehighered.com/digital-learning/blogs/online-trending-now/how-ai-and-associated-technologies-change-role-higher-ed#>
- <https://www.labellerr.com/blog/top-12-examples-of-how-ai-can-help-in-education/>
- <https://www.linkedin.com/pulse/9-applications-artificial-intelligence-education-abhinav-bhutada>
- <https://dataflog.com/read/companies-education-influence-ai/>
- <https://www.questionpro.com/blog/educational-apps/>
- <https://gotteched.com/ai-tool-master-list-by-the-ai-teacher-podcast-gotteched-the-podcast/>
- <https://gotteched.com/ai-tool-master-list-by-the-ai-teacher-podcast-gotteched-the-podcast/>
- <https://www.matellio.com/blog/ai-grading-system-features-and-cost-of-development/>

Thank You

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AI In 2030 the future you didn t expect!



Table 1. Techniques used in generative AI

Machine learning (ML)		A type of AI that uses data to automatically improve its performance.
Artificial neural network (ANN)		A type of ML that is inspired by the structure and functioning of the human brain (e.g. the synaptic connections between neurons).
Text generative AI	General-purpose transformers	A type of ANN that is capable of focusing on different parts of data to determine how they relate to each other
	Large language models (LLM)	A type of general-purpose transformer that is trained on vast amounts of text data.
	Generative pre-trained transformer (GPT)⁴	A type of LLM that is pre-trained on even larger amounts of data, which allows the model to capture the nuances of language and generate coherent context-aware text.
Image generative AI	Generative adversarial networks (GANs)	Types of neural network used for image generation.
	Variational autoencoders (VAEs)	

<https://www.unesco.org/en/digital-education/artificial-intelligence>