Yapay Zeka ve Makine Öğrenmesi

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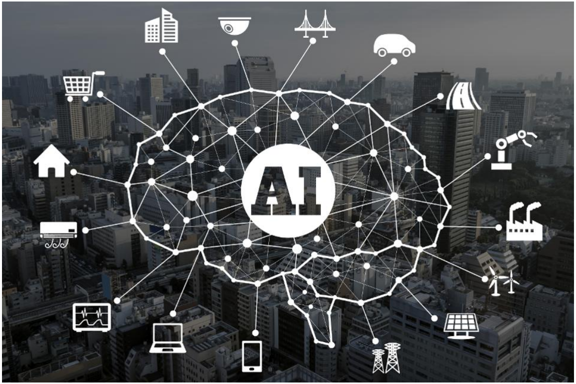
ARTIFICIAL INTELLIGENCE IN MEDICINE RESEARCH CENTER
ISTINYE UNIVERSITY

MEMORY

Yapay Zeka (Artificial Intelligence – AI)[2][3]

İnsan gibi düşünebilen veya davranabilen / mantıklı düşünebilen veya davranabilen sistemlerin genel adıdır[1].



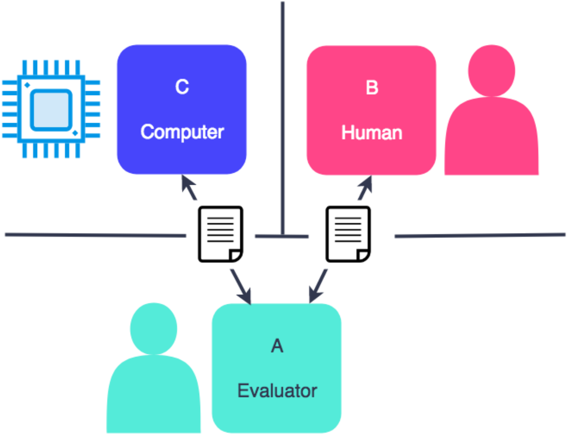
1 Artificial Intelligence: A Modern Approach, 3. Baskı, 2010.

2 https://en.wikipedi0.org/wiki/Timeline_of_artificial_intelligence

3 MIT 6.S099: Artificial General Intelligence: https://agi.mit.edu/

İnsan gibi Davranmak

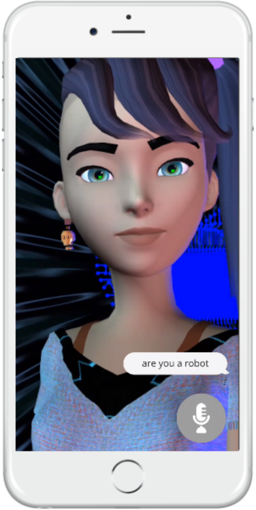
Turing Testi[4], 1950 yılında Alan Turing tarafından, bilgisayar düzeyinde zekayı tanımlamak icin kullanılmıştır.



[4] A. M. Turing (1950) Computing Machinery and Intelligence. Mind 49: 433-460 – http://cogprints.org/499/1/turing.html — Turing testinin geçilebilmesi için 5 dakikalık bir konuşma sırasında zamanın %30'undan fazlasında sistemin insan ile karıştırılması gerekmektedir. Makinelerin düşünüp düşünmeyeceğini sormak yerine, makinelerin davranışsal bir zeka testini geçip geçemeyeceğini sorgulanması hedeflenmektedir.

www.pandorabots.com Mitsuku

POWERED BY PANDORABOTS



Meet Mitsuku

Mitsuku, a four-time winner of the Loebner Prize Tu
is the world's best conversational chatbot. As featu
the New York Times, Wall Street Journal, BBC, Guar
Wired, and more.

Mitsuku

World's best conversational AI

Hi. I'm the world's most humanlike conversational AI.

Type a message...

by pandorabots

A Proposal for the

DARTMOUTH SUMMER RESEARCH PROJECT ON ARTIFICIAL INTELLIGENCE

June 17 - Aug. 16

We propose that a 2 month, 10 man study of artificial intelligence be carried out during the summer of 1956 at Dartmouth College in Hanover, New Hampshire. The study is to proceed on the basis of the conjecture that every aspect of learning or any other feature of intelligence can in principle be so precisely described that a machine can be made to simulate it. An attempt will be made to find how to make machines use language, form abstractions and concepts, solve kinds of problems now reserved for humans, and improve themselves. We think that a significant advance can be made in one or more of these problems if a carefully selected group of scientists work on it together for a summer.

The following are some aspects of the artificial intelligence problem:

1) Automatic Computers

If a machine can do a job, then an automatic calculator can be programmed to simulate the machine. The speeds and memory capacities of present computers may be insufficient to simulate many of the higher functions of the human brain, but the major obstacle is not lack of machine capacity, but our inability to write programs taking full advantage of what we have.

2) How Can a Computer be Programmed to Use a Language

[5] Moor, J. (2006). The Dartmouth College artificial intelligence conference: The next fifty years. Ai Magazine, 27(4), 87 – https://www.aaai.org/ojs/index.php/aimagazine/article/view/1911/1809; McCarthy, J., Minsky, M. L., Rochester, N., Shannon, C. E. (2006). A proposal for the dartmouth summer research project on artificial intelligence, august 31, 1955. AI magazine, 27(4), 12 – http://jmc.stanford.edu/articles/dartmouth/dartmouth.pdf ++ https://wvvw.aaai.org/ojs/index.php/aimagazine/article/view/1904/1802

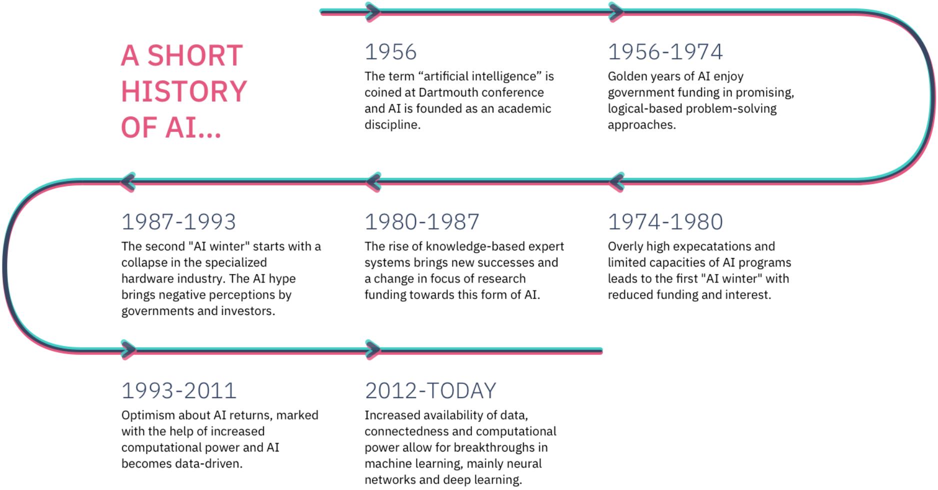
5

Dartmouth Yapay Zeka Yaz Araştırma Projesi (1955/1956)[6]

Konu: Makinelerin dili nasıl kullanacaklarını, soyutlamaları ve kavramları nasıl oluşturacaklarını, şuan insanlarca çözülmesi hedeflenen problemleri nasıl çözebileceklerini ve makinelerin kendilerini nasıl geliştirecekleri çalışılacaktır.

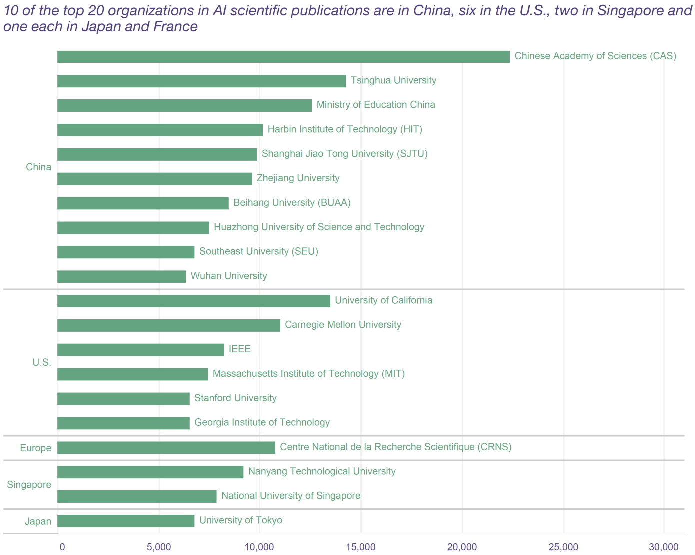
- Otomatik Bilgisayarlar
- Bir Bilgisayar bir dili kullanmak için nasıl programlanabilir?
- Nöron Ağları
- Hesaplama Büyüklüğü Teorisi
- Öz-gelişim
- Soyutlamalar
- Rastgelelik ve Yaratıcılık

[6] Moor, J. (2006). The Dartmouth College artificial intelligence conference: The next fifty years. AI Magazine, 27(4), 87 – https://www.aaai.org/ojs/index.php/aimagazine/article/view/1911/1809; McCarthy, J., Minsky, M. L., Rochester, N., Shannon, C. E. (2006). A proposal for the dartmouth summer research project on artificial intelligence, august 31, 1955. AI magazine, 27(4), 12 – http://jmc.stanford.edu/articles/dartmouth/dartmouth.pdf ++ https://wvvw.aaai.org/ojs/index.php/aimagazine/article/view/1904/1802



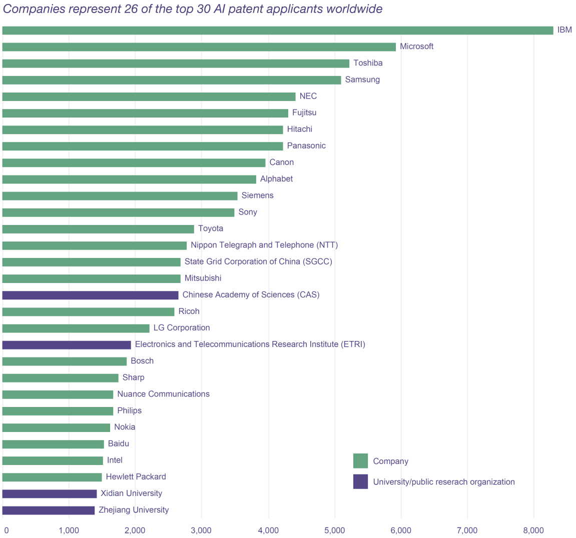
[7] WIPO Technology Trends 2019 – Artificial Intelligence – https://www.wipo.int/publications/en/details.jsp?id=4386

AI'da Akademi Ne Yapıyor?[8]



[8] WIPO Technology Trends 2019 – Artificial Intelligence – https://www.wipo.int/publications/en/details.jsp?id=4386

AI'da Endüstri Ne Yapıyor?[9]

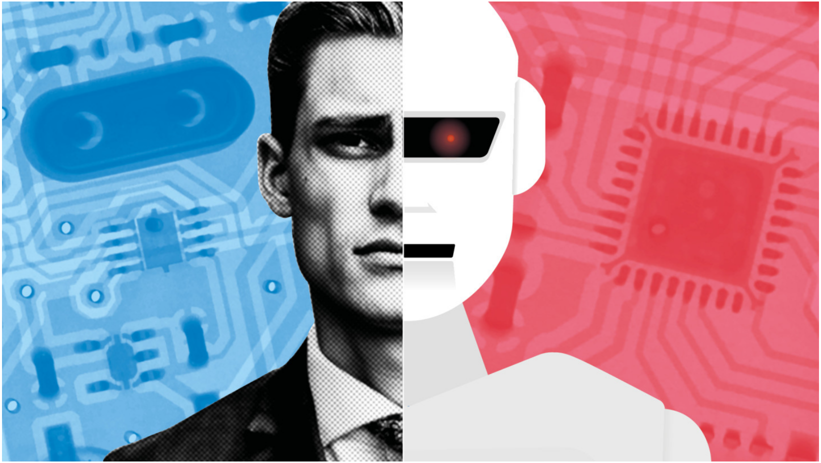


Note: Fujitsu includes PFU; Panasonic includes Sanyo; Alphabet includes Google, Deepmind Technologies, Waymo and X Development; Toyota includes Denso; and Nokia includes Alcatel

[9] WIPO Technology Trends 2019 – Artificial Intelligence – https://www.wipo.int/publications/en/details.jsp?id=4386

Robot = Yapay Zeka?

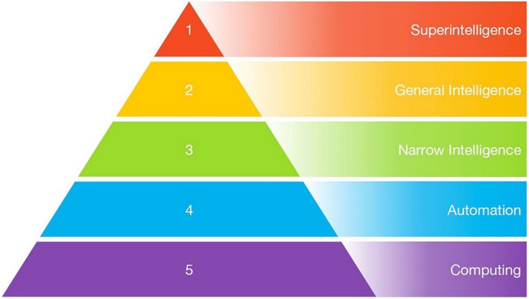
Her (fiziksel) robot yapay zeka değildir !![10]



10 resim kaynağı: https://www.ft.com/content/bcd81a88-cadb-11e8-b276-b9069bde0956

ANI vs. AGI vs. ASI[11]

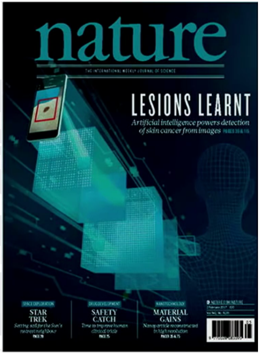
- **Dar YZ** (Narrow/Weak AI - ANI): tekil görevlere yönelik zeka
- **Genel YZ** (General/Strong/Full AI - AGI): insan seviyesi (çoklu görev) zeka
- **Süper YZ** (Super AI - ASI): insan ötesi zeka



[11] resim kaynağı: https://blog.produvia.com/curated-news-1-93527fda6808

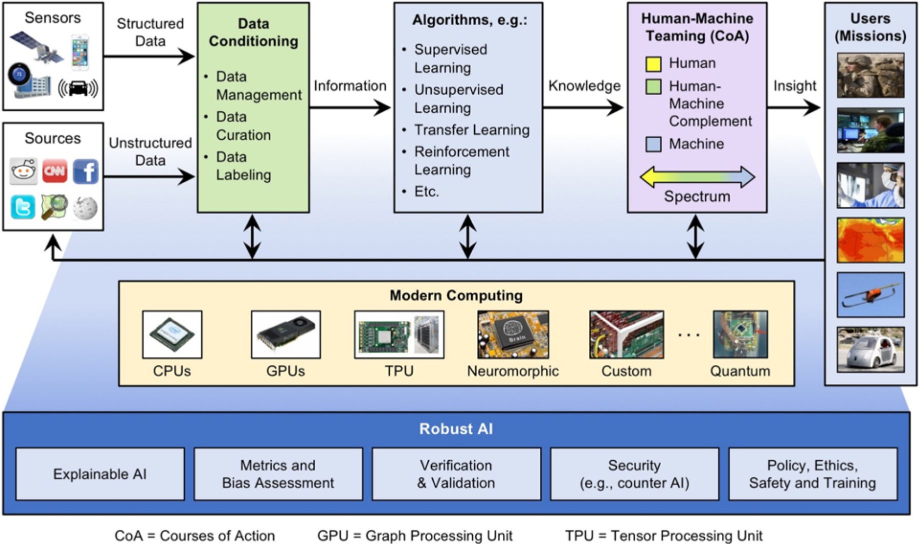
Dar YZ (Narrow/Weak AI - ANI)

Günümüz AI teknolojileri ANI kategorisindedir, tek göreve yöneliktir[12].



12 resim kaynağı: https://towardsdatascience.com/what-happened-at-the-tensorflow-dev-summit-2017-part-1-3-community-applications-77fb5ce03c52

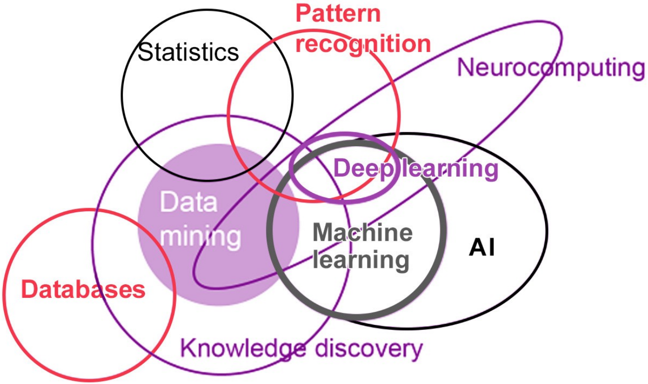
Genel AI Mimarisi[13]



13 Reuther, A., Michaleas, P., Jones, M., Gadepally, V., Samsi, S. and Kepner, J., 2019. Survey and Benchmarking of Machine Learning Accelerators. arXiv preprint arXiv:1908.11348 – https://arxiv.org/abs/1908.11348

Konu Sınıflandırmaları / Benzerlikler - Farklılıklar

Fazla dikkate almayın[14] ...



[14] https://medium.com/enabled-innovation/artificial-general-intelligence-too-much-or-too-little-too-soon-9c0dd7bd1c2d

Konu Sınıflandırmaları / Benzerlikler - Farklılıklar[15]

POINTS OF SIGNIFICANCE

Statistics versus machine learning

Statistics draws population inferences from a sample, and machine learning finds generalizable predictive patterns.

Two major goals in the study of biological systems are inference and prediction. Inference creates a mathematical model of the data-generation process to formalize understanding or test a hypothesis about how the system behaves. Prediction aims at forecasting unobserved outcomes or future behavior, such as whether a mouse with a given gene expression pattern has a disease. Prediction makes it possible to identify best courses of action (e.g., treatment choice) without requiring understanding of the underlying mechanisms. In a typical research project, both inference and prediction can be of value—we want to know how biological processes work and what will happen next. For example, we might want to infer which biological processes are associated with the dysregulation of a gene in a disease, as well as detect whether a subject has the disease and predict the best therapy.

Many methods from statistics and machine learning (ML) may, in principle, be used for both prediction and inference. However, statistical methods have a long-standing focus on inference, which is achieved through the creation and fitting of a project-specific probability model. The model allows us to compute a quantitative measure of confidence that a discovered relationship describes a 'true' effect that is unlikely to result from noise. Furthermore, if enough data are available, we can explicitly verify assumptions (e.g., equal variance) and refine the specified model, if needed.

By contrast, ML concentrates on prediction by using general-purpose learning algorithms to find patterns in often rich and unwieldy data[1,2]. ML methods are particularly helpful when one is dealing with 'wide data', where the number of input variables exceeds the number of subjects, in contrast to 'long data', where the number of subjects is greater than that of input variables. ML makes minimal assumptions about the data-generating systems; they can be effective even when the data are gathered without a carefully controlled experimental design and in the presence of complicated nonlinear interactions. However, despite convincing prediction results, the lack of an explicit model can make ML solutions difficult to directly relate to existing biological knowledge.

Figure 1 | Simulated expression and RNA-seq read counts for 40 genes in which the last 10 genes (A–J) are differentially expressed across two phenotypes (–/+). Simulated quantities and heat maps are log-scaled. (**a**) Simulated log mean expression levels for the genes generated by sampling from the normal distribution with mean 4 and s.d. 2. In the + phenotype the differential expression of genes A–J was created by the addition of a standard normal to each mean expression in the – phenotype. (**b**) The simulated RNA-seq read counts for ten subjects in each phenotype generated from an overdispersed Poisson distribution based on mean expression in **a** with biological variation. The heat map shows z-scores of the read counts normalized across all 20 subjects for a given gene.

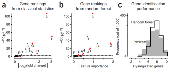


Figure 2 | Analysis of gene ranking by classical inference and ML. (**a**) Unadjusted log-scaled P values from statistical differential expression analysis as a function of effect size, measured by fold change in expression. (**b**) Log-scaled P values from **a** as a function of gene importance from random forest classification. In **a** and **b**, red circles identify the ten differentially expressed genes from **Figure 1**; the remaining genes are indicated by open circles. (**c**) Distribution of the number of dysregulated genes correctly identified in 1,000 simulations by inference (gray fill) and random forest (black line).

Classical statistics and ML vary in computational tractability as the number of variables per subject increases. Classical statistical modeling was designed for data with a few dozen input variables and sample sizes that would be considered small to moderate today. In this scenario, the model fills in the unobserved aspects of the system. However, as the numbers of input variables and possible associations among them increase, the model that captures these relationships becomes more complex. Consequently, statistical inferences become less precise and the boundary between statistical and ML approaches becomes hazier.

To compare traditional statistics to ML approaches, we'll use a simulation of the expression of 40 genes in two phenotypes (–/+). Mean gene expression will differ between phenotypes, but we'll set up the simulation so that the mean difference for the first 30 genes is not related to phenotype. The last ten genes will be dysregulated, with systematic differences in mean expression between phenotypes. To achieve this, we assign each gene an average log expression that is the same for both phenotypes. The dysregulated genes (31–40, labeled A–J) have their mean expression perturbed in the + phenotype (**Fig. 1a**). Using these average expression values, we simulate an RNA-seq experiment in which the observed counts for each gene are sampled from a Poisson distribution with mean $\exp(x + \varepsilon)$, where x is the mean log expression, unique to the gene and phenotype, and $\varepsilon \sim N(0, 0.15)$ acts as biological variability that varies from subject to subject (**Fig. 1b**). For genes 1–30, which do not have differential expression, the z-scores are approximately $N(0, 1)$. For the dysregulated genes, which do have differential expression, the z-scores in one phenotype tend to be positive, and the z-scores in the other tend to be negative.

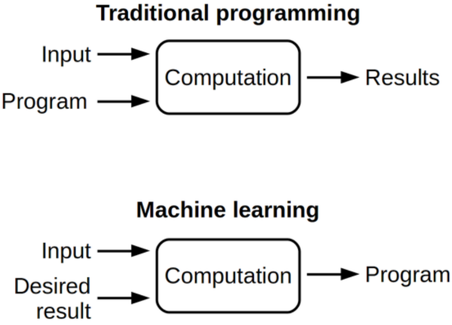
Our goal in the simulation is to identify which genes are associated with the abnormal phenotype. We'll formally test the null hypothesis that the mean expression differs by phenotype with a

İstatistik vs. Makine Öğrenmesi

15 Bzdok, D., Altman, N. and Krzywinski, M., 2018. Statistics versus machine learning. Points of significance, Nature Methods 15, Nature – https://www.nature.com/articles/nmeth.4642

Makine Öğrenimi (Machine Learning – ML)

ML[16]: bilgisayarlara, **programlanmadan** öğrenme olanağı sağlamak[17].

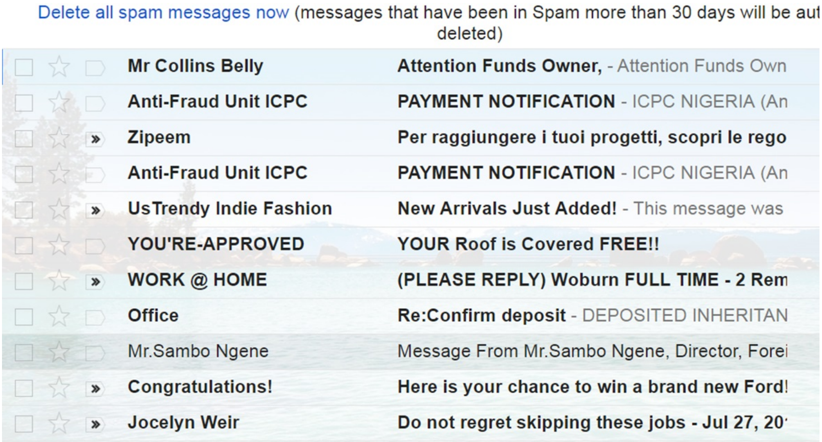


16 https://en.wikipedi0.org/wiki/Machine_learning

17 resim kaynağı: ,https://www.futurice.com/blog/differences-between-machine-learning-and-software-engineering/

ML: Spam Filtreleme

ML, gelen e-posta kutunuzun spam içermemesine yardımcı olur[18]



[18] https://blogs.nvidia.com/blog/2016/07/29/whats-difference-artificial-intelligence-machine-learning-deep-learning-ai/

ML: Öneri Sistemleri

Arama, reklam, film, şarkı[19], ürün, haber...

[19] https://towardsdatascience.com/how-spotify-recommends-your-new-favorite-artist-8c1850512af0

ML: Ses tanıma + doğal dil işleme + çeviri

Google Pixel Kulaklıklar

Skype Çevirici

Google Hoparlörler

Google Duplex:
https://www.youtube.com/watch?v=bh84hWukDdQ

ML: Yüz Tanıma

Alipay ile Çin'deki KFC'de yüzünüzle ödeme yapın[20]

[20] http://money.cnn.com/2017/09/01/technology/china-alipay-kfc-facial-recognition/index.html

ML: Otonom Araçlar[25]

Kendi kendine giden araçlar: NVIDIA[21][22]

- **Temmuz 2019**: Baidu'dan 2 milyon km otonom araç sürüşü[23]; Waymo'dan 16 milyar km simulasyon sürüşü[24]

[21] https://www.nvidia.com/en-us/self-driving-cars/

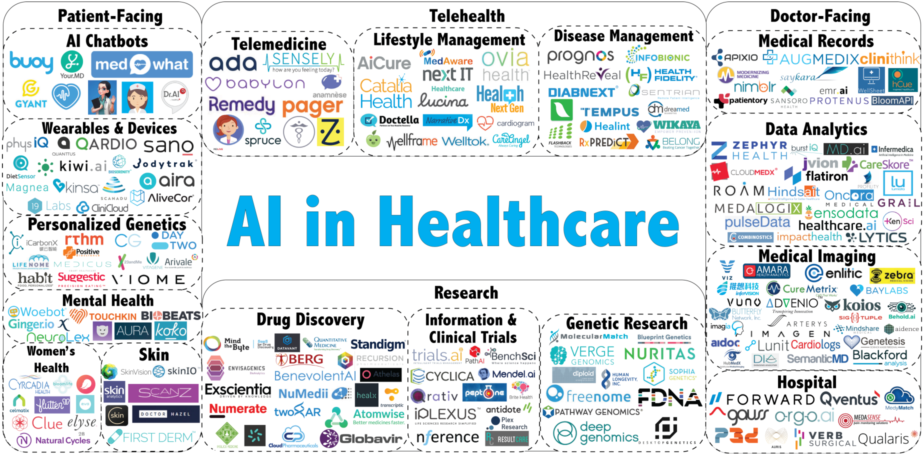
[22] Ride in NVIDIA's Self-Driving Car: https://www.youtube.com/watch?v=1W9q5SjaJTc

[23] https://venturebeat.com/2019/07/02/baidus-autonomous-cars-have-driven-more-than-1-million-miles-across-13-cities-in-china/

[24] https://techcrunch.com/2019/07/10/waymo-has-now-driven-10-billion-autonomous-miles-in-simulation/

[25] MIT Self-Driving Cars: State of the Art (2019): https://www.youtube.com/watch?v=sRxaMDDMWQQ – MIT 6.S094: Deep Learning for Self-Driving Cars: https://selfdrivingcars.mit.edu/

ML: Sağlık[26,27]



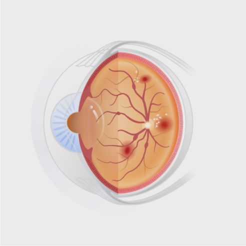
[26] https://techburst.io/ai-in-healthcare-industry-landscape-c433829b320c

[27] Chen, P.H.C., Liu, Y. and Peng, L., 2019. How to develop machine learning models for healthcare. Nature materials, 18(5), p.410 – https://www.nature.com/articles/s41563-019-0345-0

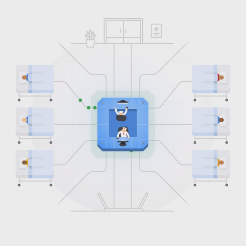
28

Using AI to give doctors a 48-hour head start on life-threatening illness

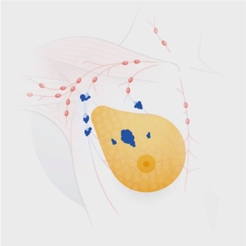
A promising step forward for predicting lung cancer



Using AI to help doctors address eye disease



Deep Learning for Electronic Health Records

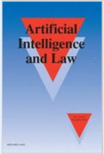


Applying Deep Learning to Metastatic Breast Cancer Detection

Highly Accurate Genomes With Deep Neural Networks

28 Google Health: https://health.google/ – https://www.youtube.com/watch?v=Q2UeoWow8yA ++ https://www.youtube.com/watch?v=P3SYqcPXqNk

ML: Hukuk[29][30]



Artificial Intelligence and Law

This journal seeks papers that address the development of formal or computational models of legal knowledge, reasoning, and decision making. It also includes in-depth studies of innovative artificial intelligence systems that are being used in the legal domain, and gives space to studies addressing the legal, ethical and social implications of the use of artificial intelligence in law. It welcomes interdisciplinary approaches including not only artificial intelligence and jurisprudence, but also logic, machine learning, cognitive psychology, linguistics, or philosophy.

[29] https://www.springer.com/journal/10506

[30] https://www.thelawyerportal.com/blog/artificial-intelligence-law/

ML: Gazetecilik[33]

- Yeni haber yazımı, sahte haberlerin belirlenmesi[31]
- %20 iş gücü zamanı kazanımı, haber doğruluğu ve kalite artışı[32]

[31] https://emerj.com/ai-sector-overviews/automated-journalism-applications/

[32] https://www.forbes.com/sites/nicolemartin1/2019/02/08/did-a-robot-write-this-how-ai-is-impacting-journalism/#709f48d47795

[33] https://www.tandfonline.com/doi/full/10.1080/21670811.2014.976412?journalCode=rdij20

ML: Finans / Sigortacılık

Risk değerlendirmesi, dolandırıcılık tespiti, finansal danışmanlık[34 35]

34 https://marutitech.com/ways-ai-transforming-finance/

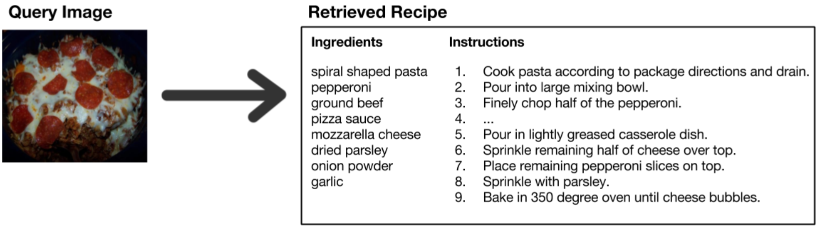
35 resim kaynağı: https://medium.com/activewizards-machine-learning-company/top-7-data-science-use-cases-in-finance-303c05a3cb58

ML: Gastronomi

Şef Watson[36]: Hangi ürünlerle bir ülke mutfağına ait en iyi yemek yapılabilir...

Pic2Recipe[37]: Yemek fotoğrafından tarif çıkarımı[38]

- Recipe1M+[39]: 1 milyondan fazla yemek tarifi ve ilgili 13 milyon yemek resmi



[36] https://www.ibm.com/blogs/watson/2016/01/chef-watson-has-arrived-and-is-ready-to-help-you-cook/

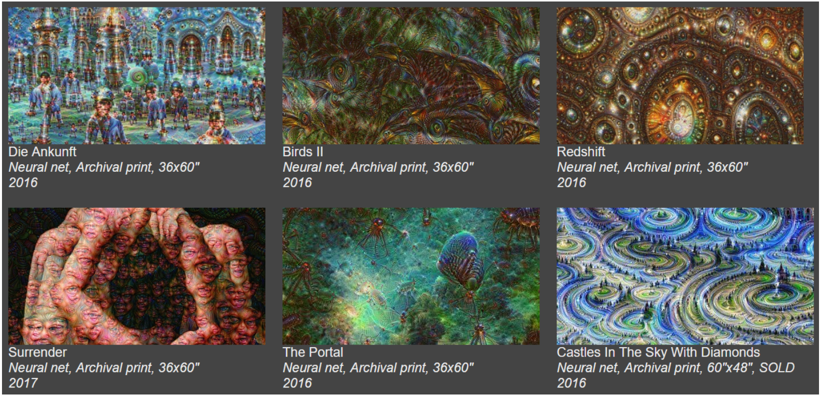
[37] https://www.digitaltrends.com/photography/pics2recipe-mit-research/

[38] https://www.youtube.com/watch?v=qp5y0fcBXq0

[39] http://pic2recipe.csail.mit.edu/

ML: Hatta sanat[41]

AI tarafından üretilen resim açık artırmada 432.500$'a satıldı[40]



[40] https://www.theverge.com/2018/10/25/18023266/ai-art-portrait-christies-obvious-sold

[41] http://www.miketyka.com/?s=deepdream

Ancak, fazla işlem gücüne ihtiyaç duyulabilir ... ...

Kişisel bilgisayarlar belirli ML görevlerini yerine getirmek için yeterli değildi – **süper bilgisayarlar** dönemi

Daha fazla işlem gücü...

En İyi 500 @ Kasım 2019:

https://www.top500.org/lists/2019/11/

Rank	System	Cores	Rmax (TFlop/s)	Rpeak (TFlop/s)	Power (kW)
1	**Summit** - IBM Power System AC922, IBM POWER9 22C 3.07GHz, NVIDIA Volta GV100, Dual-rail Mellanox EDR Infiniband , IBM DOE/SC/Oak Ridge National Laboratory United States	2,414,592	148,600.0	200,794.9	10,096
2	**Sierra** - IBM Power System AC922, IBM POWER9 22C 3.1GHz, NVIDIA Volta GV100, Dual-rail Mellanox EDR Infiniband , IBM / NVIDIA / Mellanox DOE/NNSA/LLNL United States	1,572,480	94,640.0	125,712.0	7,438
3	**Sunway TaihuLight** - Sunway MPP, Sunway SW26010 260C 1.45GHz, Sunway , NRCPC National Supercomputing Center in Wuxi China	10,649,600	93,014.6	125,435.9	15,371
4	**Tianhe-2A** - TH-IVB-FEP Cluster, Intel Xeon E5-2692v2 12C 2.2GHz, TH Express-2, Matrix-2000 , NUDT National Super Computer Center in Guangzhou China	4,981,760	61,444.5	100,678.7	18,482
5	**Frontera** - Dell C6420, Xeon Platinum 8280 28C 2.7GHz, Mellanox InfiniBand HDR , Dell EMC Texas Advanced Computing Center/Univ. of Texas United States	448,448	23,516.4	38,745.9	
6	**Piz Daint** - Cray XC50, Xeon E5-2690v3 12C 2.6GHz, Aries interconnect , NVIDIA Tesla P100 , Cray/HPE	387,872	21,230.0	27,154.3	2,384

Daha fazla işlem gücü...

IBM Power System AC922: 2.41 milyon işlemci çekirdeğine sahip[42]

[42] https://www.top500.org/system/179397

Süper bilgisayarlar: Makine insanı yener – 1997[44]

Garry Kasparov vs. **IBM Deep Blue**[43]

43 Deep Blue vs Kasparov: How a computer beat best chess player in the world – https://www.youtube.com/watch?v=KF6sLCeBj0s

44 Korf, R.E., 1997, January. Does Deep Blue use AI?. In Deep Blue Versus Kasparov: The Significance for Artificial Intelligence (pp. 1-2) – https://www.aaai.org/Papers/Workshops/1997/WS-97-04/WS97-04-001.pdf [Uzman sistemler + MinMax arama + hesaplama gücü (1996: saniyede 100 milyon satranç pozisyonunu değerlendirebilme; 1997: saniyede 200 milyon satranç pozisyonunu değerlendirebilme)] – 1996 (6 games): Kasparov = 3, Deep Blue = 1, Draw = 2; 1997 (6 games): Kasparov = 1, Deep Blue = 2, Draw = 3

Süper bilgisayarlar: Makine insanı yener – 2011

IBM Watson[45] **saniyede** bir milyon kitabın eşdeğeri olan **500 gigabayt** işleyebilir – Riziko (Jeopardy)![46] 2011

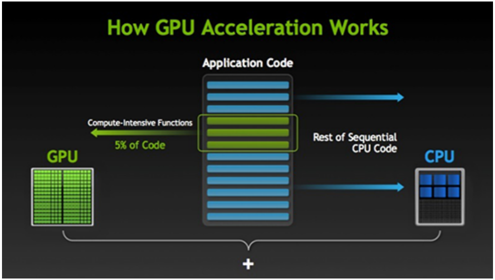
[45] https://en.wikipedi0.org/wiki/Watson_(computer)

[46] https://en.wikipedi0.org/wiki/Jeopardy!

Daha fazla işlem gücü ... CPU ve GPU

Gerçekten büyük süper bilgisayarlara ihtiyacımız var mı?[47]

- **GPU**-hızlandırmalı hesaplama, bir CPU ile birlikte bir ya da daha fazla grafik işlem biriminin (GPU) kullanılmasıdır.
- Bir **CPU**, **sıralı seri işleme** için optimize edilmiş birkaç çekirdekten oluşurken, **GPU**, aynı anda birden fazla görevi yürütebilen yüzlerce / binlerce daha küçük, daha verimli çekirdekten oluşan büyük ölçüde **paralel** bir mimariye sahiptir.



47 http://www.nvidia.com/object/what-is-gpu-computing.html

CPU vs. GPU

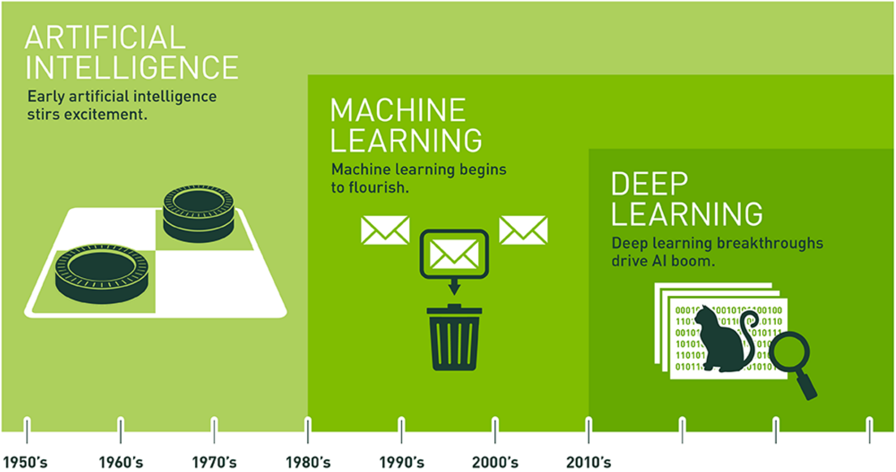
Son kullanıcı düzeyi GPU'lu bir kişisel bilgisayar, karmaşık hesaplamalarda süper bilgisayardan daha iyi performans gösterebilmektedir[48]

[48] http://newatlas.com/nvidia-gpu-outperforms-supercomputer/44112/

CPU vs. GPU: Satın Alacak Param Yok

Bulut hizmetleri satın alın ya da Google Colab[49] gibi ücretsiz servislere yönelin ...

[49] https://colab.research.google.com/



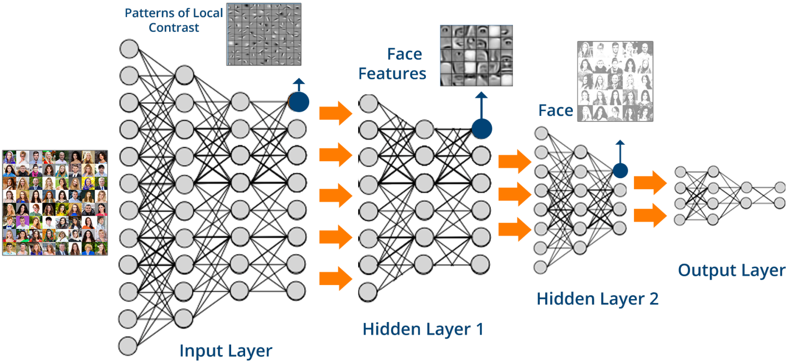
Since an early flush of optimism in the 1950s, smaller subsets of artificial intelligence – first machine learning, then deep learning, a subset of machine learning – have created ever larger disruptions.

50

[50] resim kaynağı: What's the Difference Between Artificial Intelligence, Machine Learning and Deep Learning? – https://blogs.nvidia.com/blog/2016/07/29/whats-difference-artificial-intelligence-machine-learning-deep-learning-ai/

Derin Öğrenme (Deep Learning[51] – DL)[52]

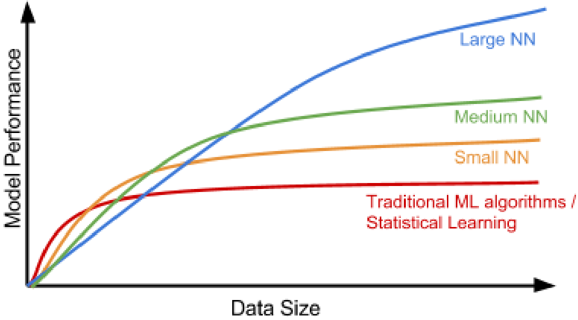
GPU'da çok verimli...



51 http://deeplearning.net/

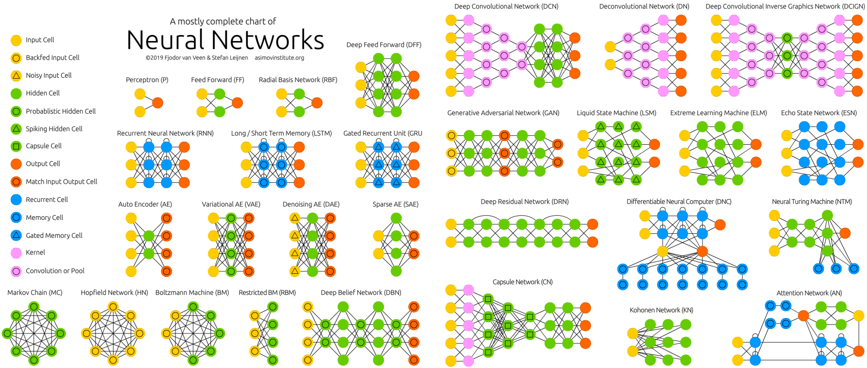
52 Goodfellow, I., Bengio, Y. and Courville, A., 2016. Deep learning. MIT press: http://www.deeplearningbook.org/

DL[53]



[53] Nuts and Bolts of Applying Deep Learning (Andrew Ng): https://www.youtube.com/watch?v=F1ka6a13S9I – https://lilianweng.github.io/lil-log/2017/06/21/an-overview-of-deep-learning.html

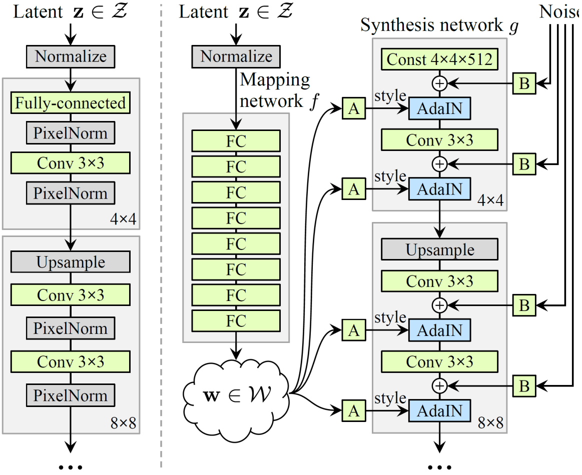
DL Mimarileri



54

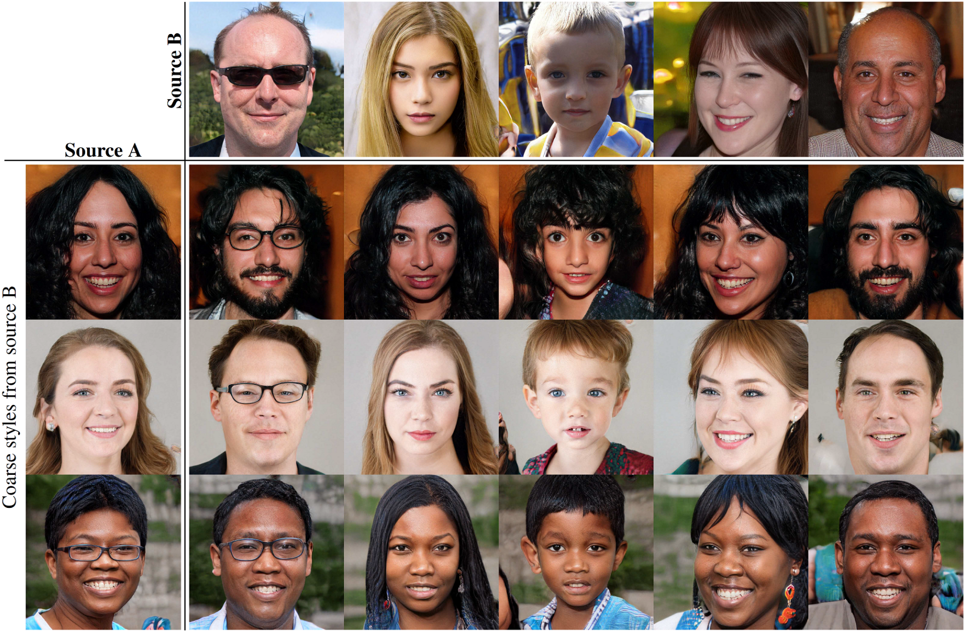
[54] https://www.asimovinstitute.org/neural-network-zoo/

DL Mimarileri – örn. Tarza Dayalı GAN



(a) Traditional (b) Style-based generator

[55] Karras, T., Laine, S. and Aila, T., 2019. A style-based generator architecture for generative adversarial networks. In Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (pp. 4401-4410) – http://openaccess.thecvf.com/content_CVPR_2019/papers/Karras_A_Style-Based_Generator_Architecture_for_Generative_Adversarial_Networks_CVPR_2019_paper.pdf – https://www.youtube.com/watch?v=o46fcRl2yxE


Source B
Source A
Coarse styles from source B

DL – Yapar Sinir Ağları (Neural Networks)

François Chollet
@fchollet

Follow

"Neural networks" are a sad misnomer. They're neither neural nor even networks. They're chains of differentiable, parameterized geometric functions, trained with gradient descent (with gradients obtained via the chain rule). A small set of highschool-level ideas put together

11:58 AM - 12 Jan 2018

1,271 Retweets **3,314** Likes

119 1.3K 3.3K [56]

[56] Francois Chollet who made Keras: https://fchollet.com/ – Deep Learning with Python - 2018 Manning

DL için Hangi GPU?[57]

Yeni başlayanlar için GPU kartı – GTX 1050 Ti

- 768 CUDA çekirdeği (1354 MHz Çekirdek Saat)

[57] http://timdettmers.com/2017/04/09/which-gpu-for-deep-learning/

NVIDIA DGX-1: Derin Öğrenme Süper Bilgisayarı

- 28672 / 40960 CUDA cores

AlexNet[58] ağ eğitimi 250 Xeon CPU sunucusu ile 150 saat sürerken DGX-1 ile 2 saat sürmektedir

[58] https://en.wikipedi0.org/wiki/AlexNet

Atlas 900: Derin Öğrenme Süper Bilgisayarı[60]

Dünyanın en hızlı AI eğitim bilgisayarı kümesi[59]

- 500.000 kişisel bilgisayarın işlem gücüne sahiptir.

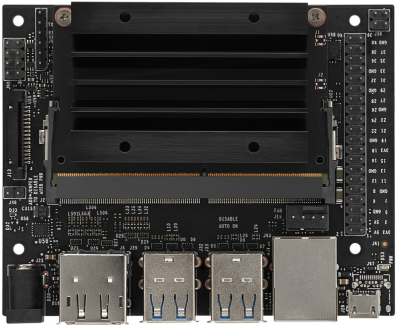
[59] https://e.huawei.com/en/products/cloud-computing-dc/atlas/atlas-900-ai

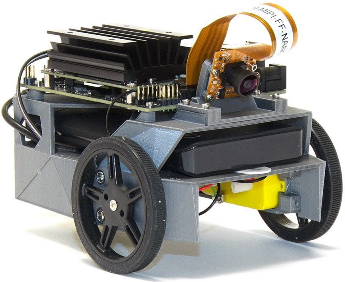
[60] https://www.huawei.com/en/press-events/news/2019/9/huawei-computing-strategy-atlas-900-ai-training-cluster

Küçük AI Sistemleri – Jetson Nano Geliştirici Kiti[61]

Görüntü sınıflandırma, nesne algılama, segmentasyon ve konuşma işleme gibi uygulamalar için birden fazla sinir ağını paralel olarak çalıştırmanıza izin veren küçük, 5 watt güçle çalışan bir bilgisayar.

- 128 CUDA çekirdeği

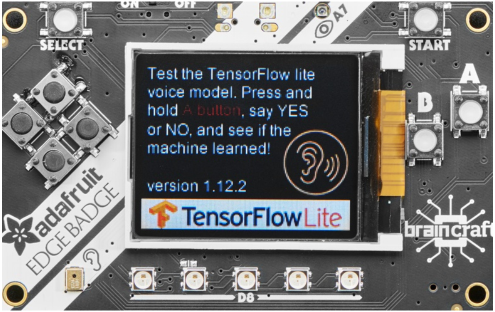




[61] https://developer.nvidia.com/embedded/jetson-nano-developer-kit – https://devblogs.nvidia.com/jetson-nano-ai-computing/ – kullanma kılavuzu: https://developer.nvidia.com/embedded/learn/get-started-jetson-nano-devkit – NVIDIA JetBot - Jetson Nano Vision-Controlled AI Robot: https://www.youtube.com/watch?v=wKMWjIKaU68 – jetbot github: https://github.com/NVIDIA-AI-IOT/jetbot/wiki/examples – resim kaynağı: https://www.siliconhighwaydirect.co.uk/product-p/945-13450-0000-000.htm

Küçük AI Sistemleri – TensorFlow Lite[62]

Makine öğrenimi modellerini mobil ve IoT cihazlarında kullanmak için TensorFlow derin öğrenme kütüphanesi

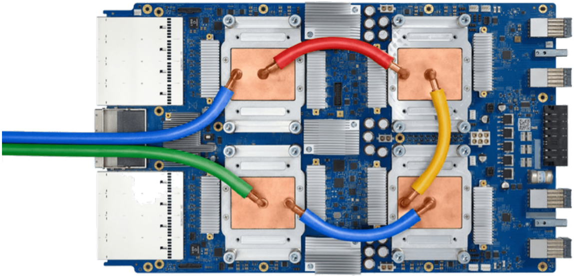


62 https://www.tensorflow.org/lite – Introduction to TensorFlow Lite: https://www.udacity.com/course/intro-to-tensorflow-lite--ud190 – TinyML kitabı: https://www.oreilly.com/library/view/tinyml/9781492052036/ – resim kaynağı: https://shop.pimoroni.com/products/adafruit-edgebadge-tensorflow-lite-for-microcontrollers

Uygulamaya Özgü Devreler (ASICs) – Tensör İşleme Ünitesi (TPU)[64]

Sinir ağlarına yönelik işlemci birimleri (Google[63])

- Makine öğrenimime yönelik ekran kartlarında da bulunmakta...



[63] https://cloud.google.com/tpu

[64] https://en.wikipedia.org/wiki/Tensor_processing_unit – resim kaynağı: https://techcrunch.com/2019/05/07/googles-newest-cloud-tpu-pods-feature-over-1000-tpus/

AI Odaklı Özelleşmiş Yongalar – Nöromorfik Hesaplama[66]

Tianjic[65]: Tek yonga ile insansız bisiklet sisteminde eşzamanlı olarak, gerçek zamanlı nesne algılama, izleme, ses kontrolü, engellerden kaçınma ve denge kontrolü

65 Pei, J., Deng, L., Song, S., Zhao, M., Zhang, Y., Wu, S., Wang, G., Zou, Z., Wu, Z., He, W. and Chen, F., 2019. Towards artificial general intelligence with hybrid Tianjic chip architecture. Nature, 572(7767), pp.106-111 – https://www.nature.com/articles/s41586-019-1424-8, https://www.youtube.com/watch?v=VjSs6KCLTC0

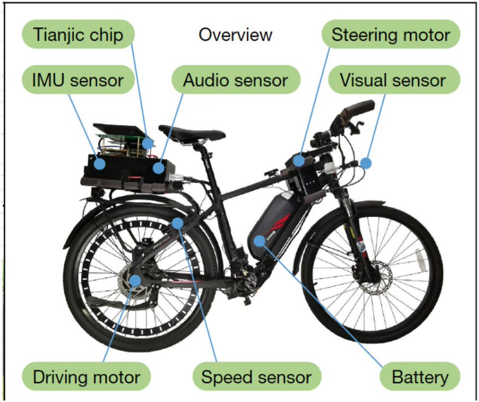
66 https://bdtechtalks.com/2019/10/28/neuromorphic-chips-artificial-intelligence/ – https://www.frontiersin.org/articles/10.3389/fnins.2019.00260/full

AI Odaklı Özelleşmiş Yongalar – Nöromorfik Hesaplama[67]

Towards artificial general intelligence with hybrid Tianjic chip architecture

Jing Pei[1,2,13], Lei Deng[1,13], Sen Song[3,4,13], Mingguo Zhao[5,13], Youhui Zhang[6,13], Shuang Wu[1,2,13], Guanrui Wang[1,2,13], Zhe Zou[1,2], Zhenzhi Wu[7], Wei He[1,2], Feng Chen[5], Ning Deng[8], Si Wu[9], Yu Wang[10], Yujie Wu[1,2], Zheyu Yang[1,2], Cheng Ma[1,2], Guoqi Li[1,2], Wentao Han[6], Huanglong Li[1,2], Huaqiang Wu[8], Rong Zhao[11], Yuan Xie[12] & Luping Shi[1,2]*

There are two general approaches to developing artificial general intelligence (AGI)[1]: computer-science-oriented and neuroscience-oriented. Because of the fundamental differences in their formulations and coding schemes, these two approaches rely on distinct and incompatible platforms[2–8], retarding the development of AGI. A general platform that could support the prevailing computer-science-based artificial neural networks as well as neuroscience-inspired models and algorithms is highly desirable. Here we present the Tianjic chip, which integrates the two approaches to provide a hybrid, synergistic platform. The Tianjic chip adopts a many-core architecture, reconfigurable building blocks and a streamlined dataflow with hybrid coding schemes, and can not only accommodate computer-science-based machine-learning algorithms, but also easily implement brain-inspired circuits and several coding schemes. Using just one chip, we demonstrate the simultaneous processing of versatile algorithms and models in an unmanned bicycle system, realizing real-time object detection, tracking, voice control, obstacle avoidance and balance control. Our study is expected to stimulate AGI development by paving the way to more generalized hardware platforms.



[67] https://bdtechtalks.com/2019/10/28/neuromorphic-chips-artificial-intelligence/

Kuantum bilgisayarlar nerede?[71]

Google'ın kuantum bilgisayarı normal bir kişisel bilgisayardan 100 milyon kat daha hızlı[68]

- Kuantum bilgisayarların etkin kullanım girişimleri[69] [70]

68 http://www.wired.co.uk/article/google-quantum-computing-d-wave

69 https://ai.googleblog.com/2019/10/quantum-supremacy-using-programmable.html

70 https://www.nature.com/articles/s41586-019-1666-5

71 IBM kuantum bulut servisi: https://quantum-computing.ibm.com/

Derin Öğrenme - Başarı Hikayeleri

AlphaGO[72]: 19X19 boyutlu Go tahtasında profesyonel bir Go oyuncusunu yenen ilk bilgisayar programı (Google DeepMind, 2015)

[72] https://deepmind.com/research/alphago/

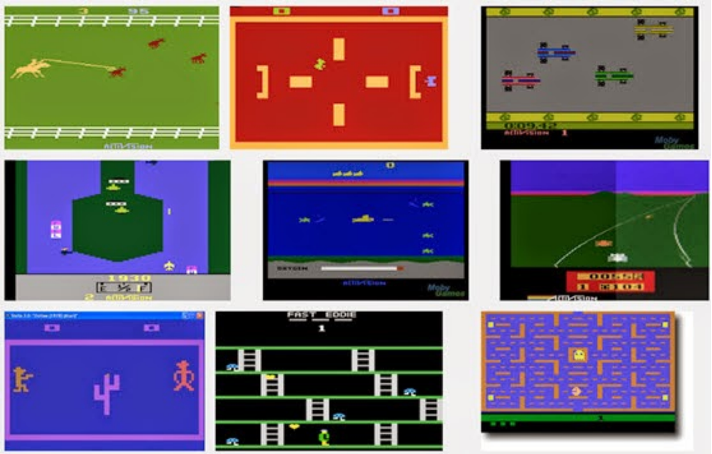
Derin Öğrenme - Başarı Hikayeleri

DeepMind tarafından yenilen eski GO şampiyonu AI'ı yenilmez ilan ettikten sonra emekli oldu[73]

[73] https://www.theverge.com/2019/11/27/20985260/ai-go-alphago-lee-se-dol-retired-deepmind-defeat

Derin Öğrenme - Başarı Hikayeleri

1980'lerin Atari oyunlarını herhangi bir talimat olmadan veya video oyunlarının nasıl oynanacağına dair önceden bilgi sahibi olmadan oynanması [74] (Google DeepMind)



74 http://www.businessinsider.com/artificial-intelligence-playing-video-games-2015-11

Derin Öğrenme - Başarı Hikayeleri

Baidu, İngilizce ve Çince (Mandarin) konuşmalarını insanlardan daha iyi tanıyan bir ses sistemi (**Deep Speech 2**) geliştirdi[75]

Deep Speech 2: End-to-End Speech Recognition in English and Mandarin

Baidu Research – Silicon Valley AI Lab*
Dario Amodei, Rishita Anubhai, Eric Battenberg, Carl Case, Jared Casper, Bryan Catanzaro, Jingdong Chen, Mike Chrzanowski, Adam Coates, Greg Diamos, Erich Elsen, Jesse Engel, Linxi Fan, Christopher Fougner, Tony Han, Awni Hannun, Billy Jun, Patrick LeGresley, Libby Lin, Sharan Narang, Andrew Ng, Sherjil Ozair, Ryan Prenger, Jonathan Raiman, Sanjeev Satheesh, David Seetapun, Shubho Sengupta, Yi Wang, Zhiqian Wang, Chong Wang, Bo Xiao, Dani Yogatama, Jun Zhan, Zhenyao Zhu

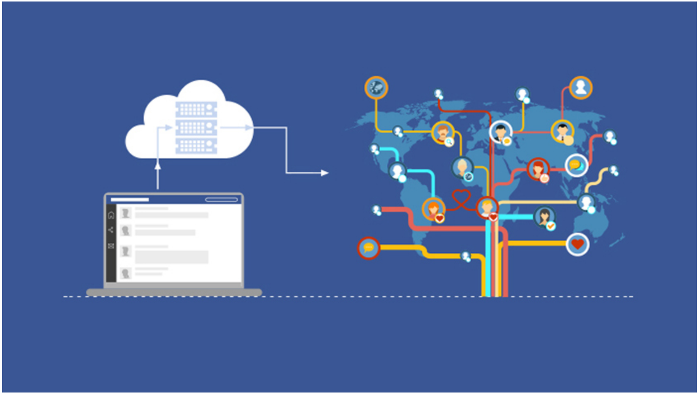
Abstract

We show that an end-to-end deep learning approach can be used to recognize either English or Mandarin Chinese speech—two vastly different languages. Because it replaces entire pipelines of hand-engineered components with neural net-

[75] https://www.technologyreview.com/s/544651/baidus-deep-learning-system-rivals-people-at-speech-recognition/

Ne Yapalım? – Veriye Odaklanın

- **Facebook**[76]: **Her dakika**, 510.000 yorum gönderilirken, 293.000 durum güncellenmesi ve 136.000 fotoğraf yüklenimi gerçekleştirilir



[76] https://zephoria.com/top-15-valuable-facebook-statistics/

Ne Yapalım? – Veriye Odaklanın

Facebook bizi terapistlerden daha iyi tanıyacak kadar veriye sahip![77]

- Mesajları ve tercihleri işleme
- Duygu analizi
- ...

[77] https://www.simplilearn.com/how-facebook-is-using-big-data-article

Nereden veri bulacağız? – Google Dataset Search[78]

[78] https://datasetsearch.research.google.com/

NEWS ·

Google health-data scandal spooks researchers

Scientists fear the controversy over the Nightingale project will undermine trust in research.

nature

Heidi Ledford

19 NOVEMBER 2019

[79] Google health-data scandal spooks researchers: https://www.nature.com/articles/d41586-019-03574-5

How home assistants ruined us, an explanation

Violet Blue, @violetblue
12.31.19 in Security

It's the rise -- and revenge -- of the machines.

engadget

[80] How home assistants ruined us, an explanation: https://www.engadget.com/2019/12/31/home-assistants-listening-ruined-us-an-explanation/

Sonuç... Yapay Zeka'nın Faydaları[81]

- Hızlı karar verebilme (+ veri işleme)
- Daha az hata (ya da uzman seviyesinde hata...)
- Standartlaşma ve objektiflik (/ veriye dayalı...)
- Yüksek kaliteye erişilebilirlik (örn. tıbbi hizmetler)
- 7/24 çalışabilme

[81] AI ADVANTAGE: How to Put the Artificial Intelligence Revolution to Work by Thomas H Davenport, MIT Press, 2018

Sonuç... Yapay Zeka'nın Eksiklikleri / Potansiyel Zararları[85]

- İşsizlik (aslında yeni iş alanları...)[82]
- Tembellik (tam otonomluk durumlarında...)
- Kara kutu yapısı (yeni hedef: açıklanabilir AI (XAI)[83] ...)
- Etik kaygılar (örn. otonom araç kazasında kim sorumlu?)[84]

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82 https://mitibmwatsonailab.mit.edu/research/publications/paper/?id=The-Future-of-Work-How-New-Technologies-Are-Transforming-Tasks

83 https://www.darpa.mil/program/explainable-artificial-intelligence

84 http://moralmachine.mit.edu/

85 AI ADVANTAGE: How to Put the Artificial Intelligence Revolution to Work by Thomas H Davenport, MIT Press, 2018