ARTIFICIAL INTELLIGENCE

Google's Artificial Intelligence Built an AI That Outperforms Any Made by Humans

It's more accurate and more efficient than any other system.

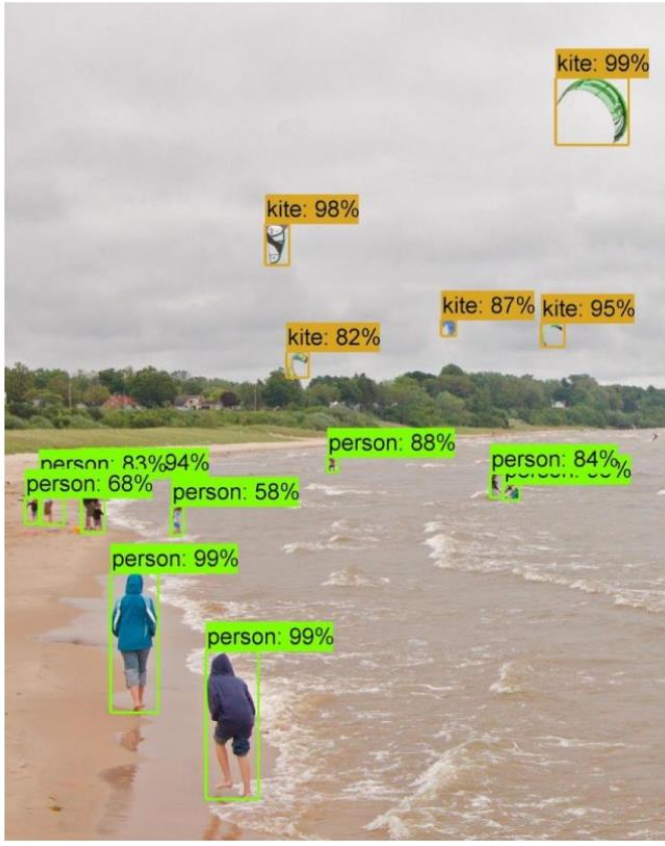
DOM GALEON | DECEMBER 1ST 2017

An AI That Can Build AI

In May 2017, researchers at Google Brain announced the creation of AutoML, an artificial intelligence (AI) that's capable of generating its own AIs. More recently, they decided to present AutoML with its biggest challenge to date, and the AI that can build AI created a "child" that outperformed all of its human-made counterparts.

The Google researchers automated the design of machine learning models using an approach called reinforcement learning. AutoML acts as a controller neural network that develops a child AI network for a specific task. For this particular child AI, which the researchers called NASNet, the task was recognizing objects — people, cars, traffic lights, handbags, backpacks, etc. — in a video in real-time.

According to the researchers, NASNet was 82.7 percent accurate at predicting images on ImageNet's validation set. This is 1.2 percent better than any previously published results, and the system is also 4 percent more efficient, with a 43.1 percent mean Average Precision (mAP). Additionally, a less computationally demanding version of NASNet outperformed the best similarly sized models for mobile platforms by 3.1 percent.



Google fires Timnit Gebru, 12.2020

The withering email that got an ethical AI researcher fired at Google

"Stop writing your documents because it doesn't make a difference": Timnit Gebru's final message to her peers

Casey Newton
Dec 3, 2020 19 6

Google, 1.2021

Home | Internet | Internet News | Google Suspends Second AI Ethics Researcher, Union Says

Google Suspends Second AI Ethics Researcher, Union Says

Researcher Margaret Mitchell's suspension came in response to her downloading and sharing of company documents.

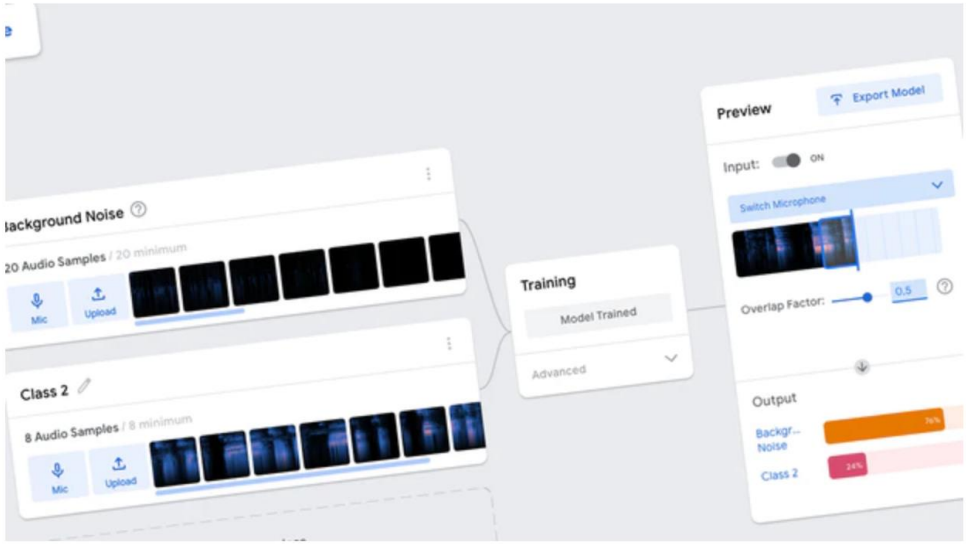
By Agence France-Presse | Updated: 22 January 2021 12:09 IST

Share on Facebook | Tweet | Snapchat | Share | Reddit | Email | Comment

Google Teachable Machine 2.0

Maschinelles Lernen für alle: Google stellt Teachable Machine 2.0 vor

Pocket Facebook Twitter WhatsApp E-M



Teachable Machine 2.0. (Screenshot: Teachable Machine / t3n)

11.11.2019, 13:28 Uhr • Lesezeit: 1 Min. Gerade keine Zeit? Jetzt speichern und später lesen

Teachable Machine erlaubt es auch absoluten Anfängern, maschinelles Lernen einzusetzen. Jetzt hat Google Version 2.0 des kostenlosen Tools vorgestellt.

Schon 2017 hat Google mit der Teachable Machine eine Web-App vorgestellt, mit der sich ganz ohne Programmierkenntnisse einfache Machine-Learning-Modelle erstellen lassen. Jetzt hat der Internet-Konzern Version 2.0 des Tools vorgestellt.

Kim Rixecker

News-Redakteur

Verwandte Themen

Google

Künstliche Intelligenz

Machine Learning

Apps

Arduino

NIX MEHR VERPASSEN
UNSERE NEWSLETTE

E-Mail-Adresse

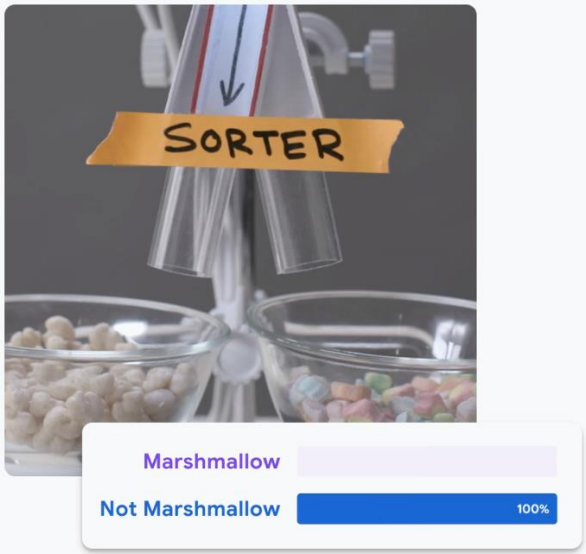
Google Teachable Machine (Homepage)

Teachable Machine

Bring einem Computer bei, deine eigenen Bilder, Töne und Posen zu erkennen.

Du kannst schnell und einfach Modelle für maschinelles Lernen für deine Websites und Apps erstellen – ganz ohne Fachwissen oder Programmierkenntnisse.

Erste Schritte



teachablemachine.withgoogle.com

Google Teachable Machine (Homepage)

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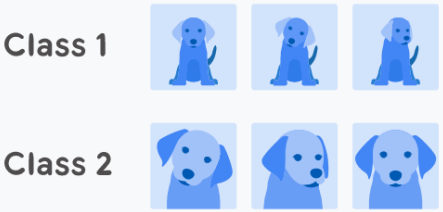
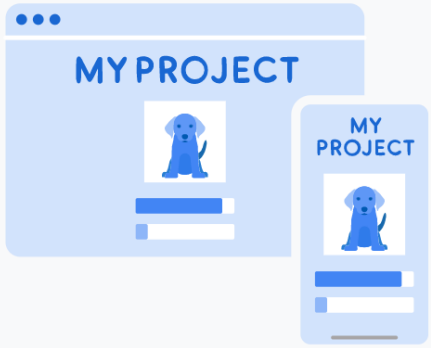




1 Zusammentragen

Du kannst Beispiele zusammentragen und sie in Klassen oder Kategorien gruppieren, die der Computer lernen soll.

Video: Beispiele zusammentragen

2 Trainieren

Trainiere dein Modell und teste es danach sofort, um herauszufinden, ob es neue Beispiele korrekt klassifiziert.

Video: Trainiere dein Modell

3 Exportieren

Exportiere dein Modell für deine Projekte, Websites, Apps und mehr. Du kannst es herunterladen oder kostenlos online hosten.

Video: Exportiere dein Modell

teachablemachine.withgoogle.com

Google Teachable Machine (Homepage)

Teachabl
Machine

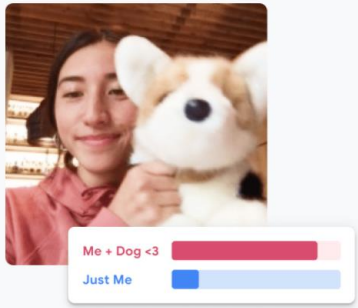
**Bring einem Comput
eigenen Bilder, Töne
erkennen.**

Du kannst schnell und einfach M
maschinelles Lernen für deine W
erstellen – ganz ohne Fachwiss
Programmierkenntnisse.

Erste Schritte

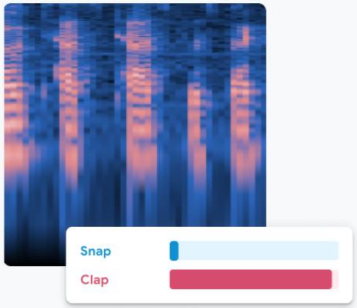
Was kann ich zum Trainieren des Modells verwenden?

Teachable Machine ist flexibel – du kannst Dateien verwenden oder Beispiele live erfassen. Das Tool respektiert deine Arbeitsweise. Und du kannst es sogar komplett auf dem Gerät verwenden, ohne dass Webcam- oder Mikrofondaten deinen Computer verlassen.



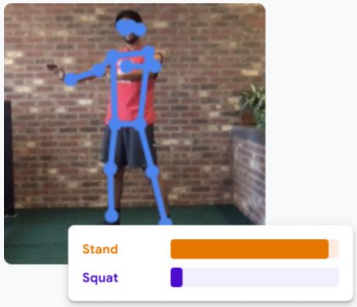
Bilder

Trainiere ein Modell zur Klassifizierung von Bildern, mit Dateien oder deiner Webcam.



Töne

Ein Modell durch Aufnahme kurzer Audiobeispiele dazu trainieren, Audio zu klassifizieren. (Unterstützung von WAV/MP3/-Dateien und anderen kommt demnächst.)

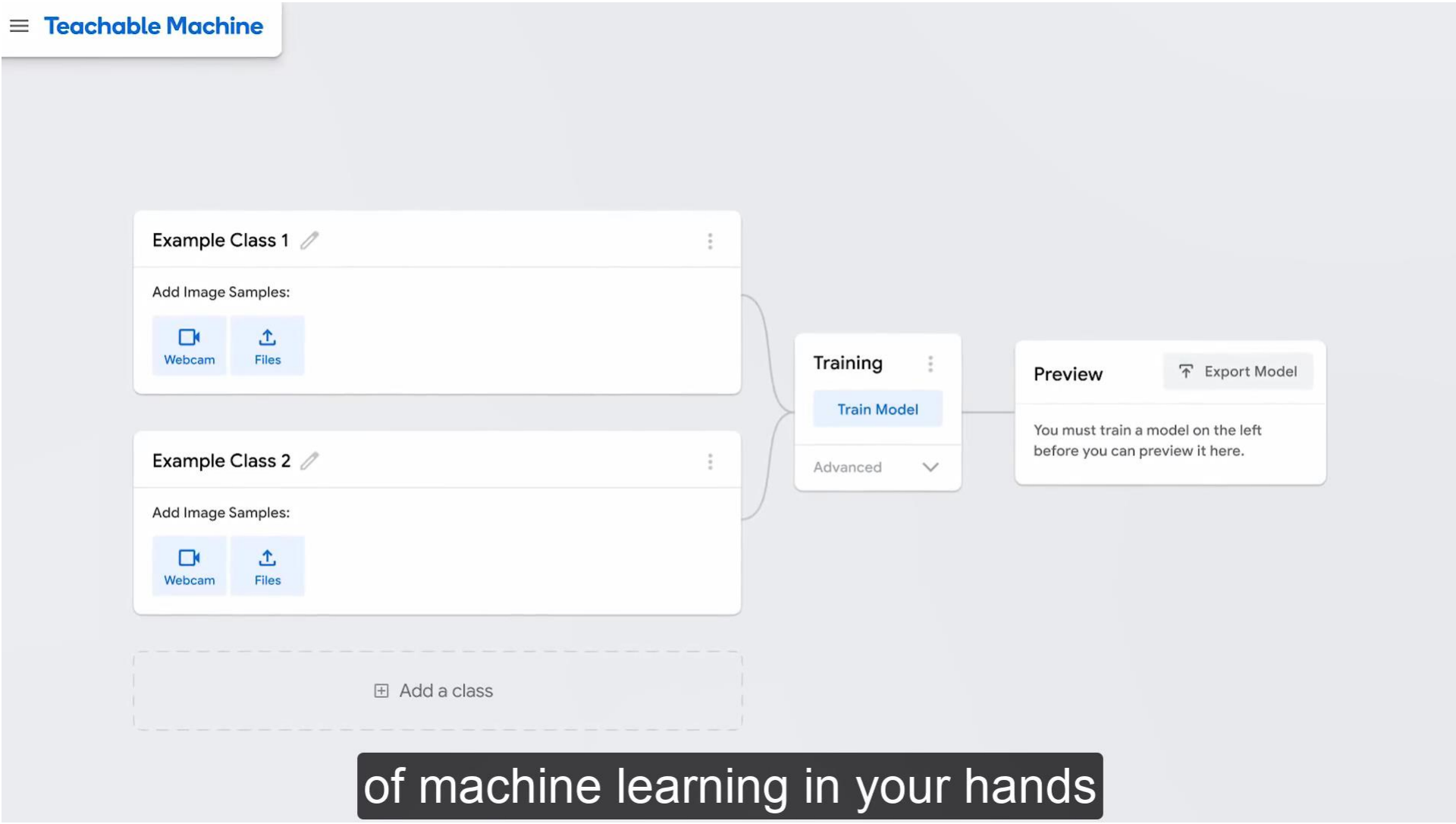


Posen

Bringe einem Modell mithilfe von Dateien oder auffälligen Posen in deiner Webcam bei, Körperhaltungen zu klassifizieren.

teachablemachine.withgoogle.com

Google Teachable Machine: An Intro



Teachable Machine 2.0: Making AI easier for everyone, 2019 2min
www.youtube.com/watch?v=T2qQGqZxkD0

Google Teachable Machine (Homepage)

Teachable Machine

Tutorials

Bilder: Bananameter

Erfahre, wie du ein Modell erstellst, das erkennt, ob eine Banane reif ist oder nicht.

Ton: Snap Clap Whistle

Erfahre, wie du ein Modell erstellst, das einfache Töne erkennt, die du von dir gibst.

Pose: Head Tilt

Erfahre, wie du ein Modell erstellst, das erkennt, in welche Richtung du den Kopf neigst.

teachablemachine.withgoogle.com

Google Teachable Machine (Homepage)

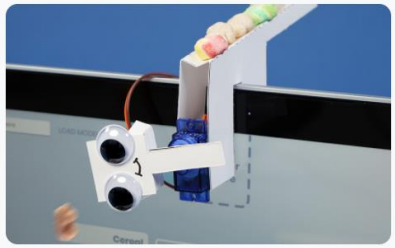
Teach
Mach

**Bring einem
eigenen Bild
erkennen.**

Du kannst schnell
maschinelles Lern
erstellen – ganz o
Programmierkenn

Erste Schri

Erstellt mit Teachable Machine



Tiny Sorter

Ein DIY-Experiment, das Arduino und Teachable Machine miteinander verbindet.

Weitere Informationen

Project Euphonia

Steve Saling nutzt Teachable Machine, um auf neue Art zu kommunizieren. Beispielsweise erzeugt er mit seiner Mimik verschiedene Klänge.

Video ansehen

Teachable Snake

Vince MingPu Shao hat mithilfe von Teachable Machine aus einer Webcam und einem Stück Papier einen Gamecontroller gemacht.

Weitere Informationen

Weitere Experimente, die mit Teachable Machine erstellt wurden, findest du hier. Wenn du deine Projekte mit uns teilen möchtest, kannst du sie hier einreichen oder eine E-Mail an teachablemachine—support@google.com senden.

teachablemachine.withgoogle.com

Google Teachable Machine (Homepage)

Teachable Ma

Bring e
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Du kannst
maschine
erstellen -
Programm

Erst

Zum Lernen

Du möchtest lernen, Teachable Machine zu verwenden?
Von Nutzern erstellte Unterrichtseinheiten und Aktivitäten:

AI + Ethics

von Blakeley H. Payne, Personal Robots Group, MIT Media Lab

Eine Lerneinheit für Schüler zu den Grundlagen der Verzerrung in algorithmischen Systemen.

Common Core, K-8, Technik

Dancing with AI

von MIT Media Lab

Du kannst Teachable Machine und PoseBlocks verwenden, um interaktive Systeme zu erstellen.

K-8, Technologie

Ready AI Lesson

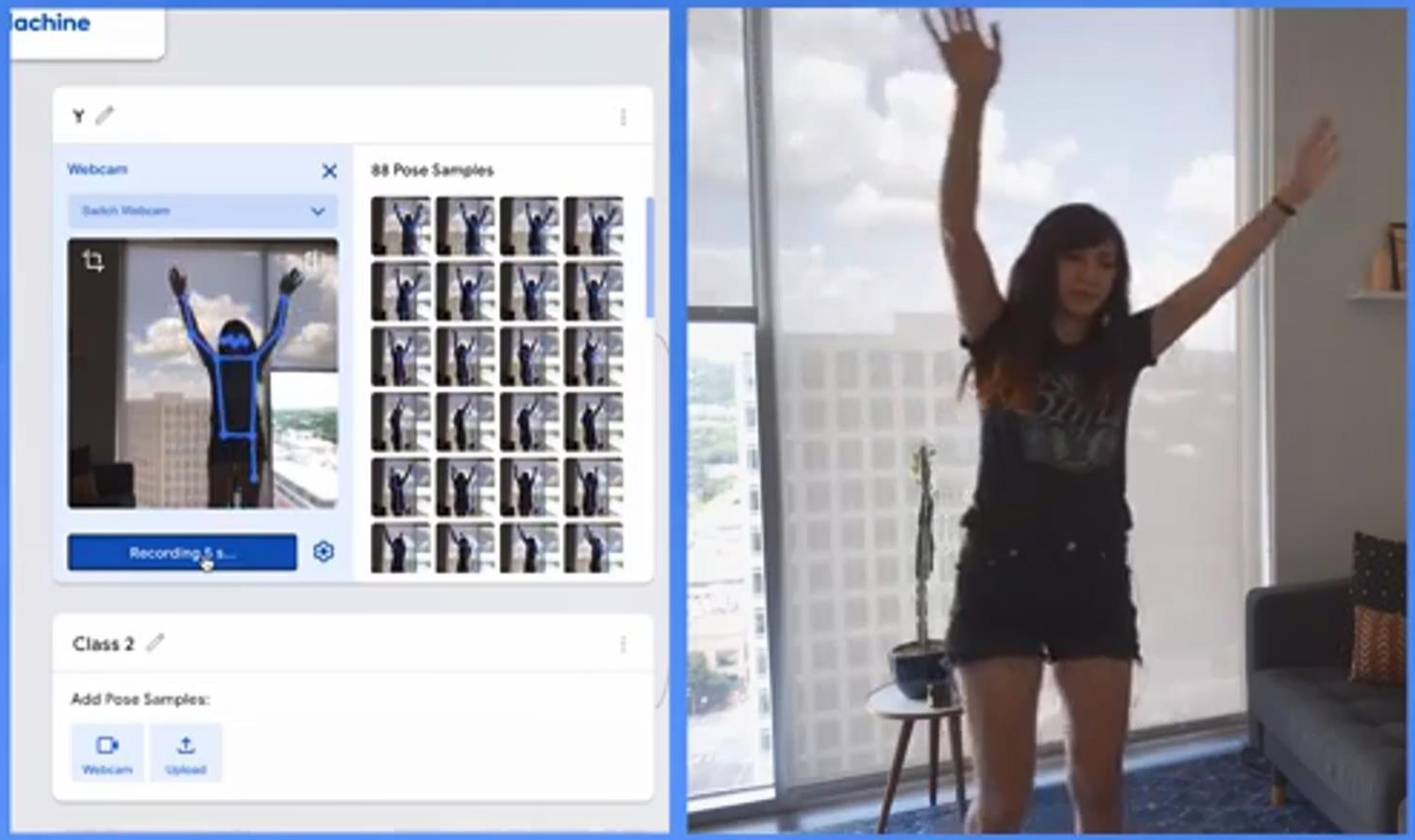
von Ready AI

Entdecke Teachable Machine und lerne die Konzepte für maschinelles Lernen, Klassifizierung und gesellschaftliche Auswirkungen kennen.

K-12

teachablemachine.withgoogle.com

Google Teachable Machine: An Example



Machine learning without code in the browser, 2020 2min
www.youtube.com/watch?v=i9tjzr1KME0

StyleGAN2: Playground ThisPersonDoesNotExist

https://thispersondoesnotexist.com/

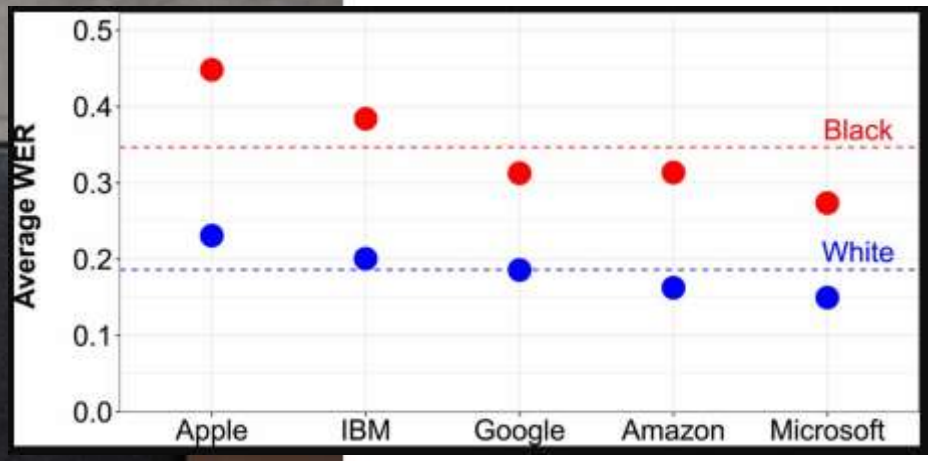
Playing Atari Breakout with Reinforcement Learning

Google DeepMind's Deep Q-learning playing Atari Breakout, 2015
www.youtube.com/watch?v=V1eYniJ0Rnk

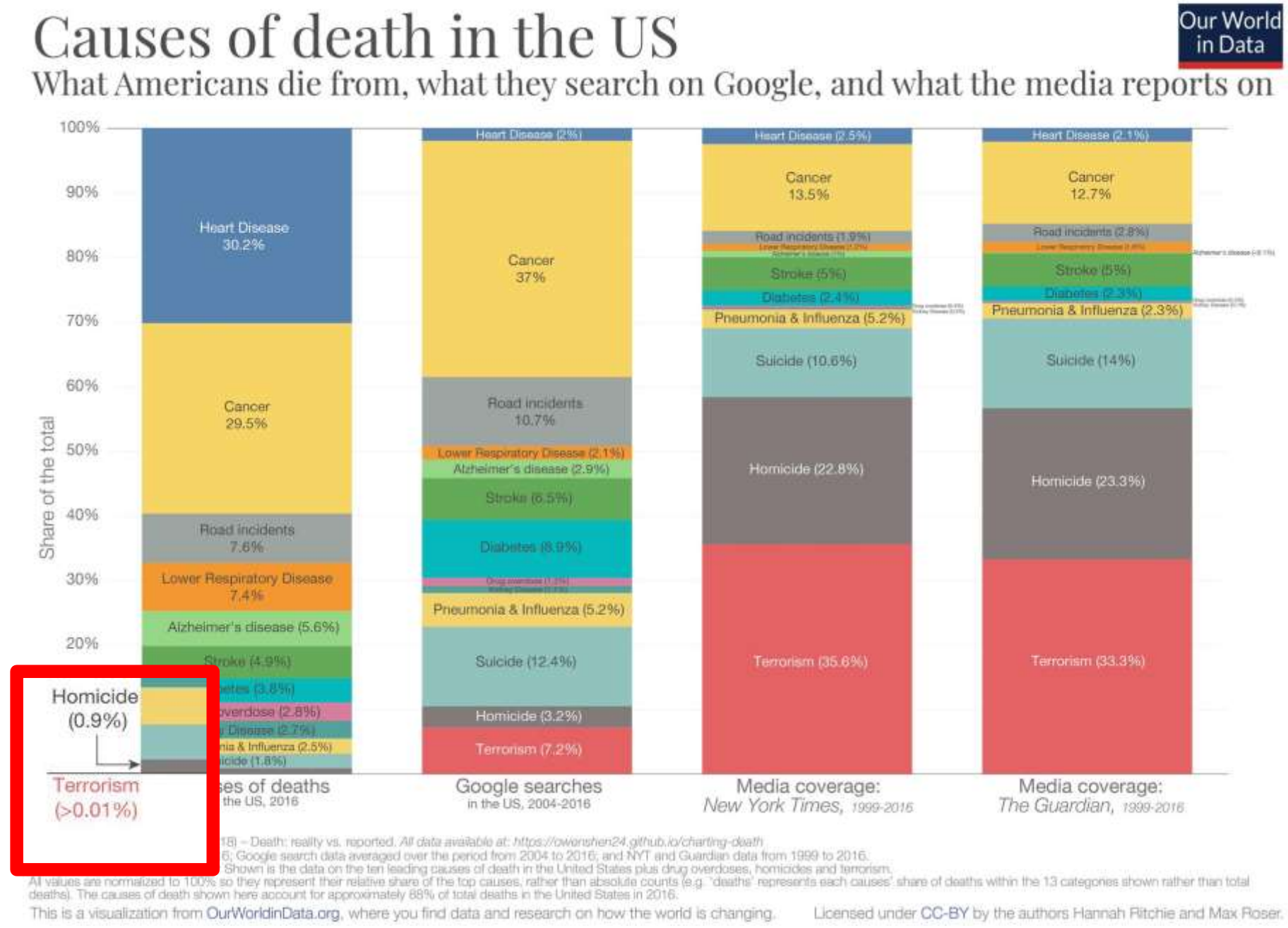
New York Times, 23.3.2020

There Is a Racial Divide in Speech-Recognition Systems, Researchers Say

Technology from Amazon, Apple, Google, IBM and Microsoft misidentified 35 percent of words from people who were black. White people fared much better.

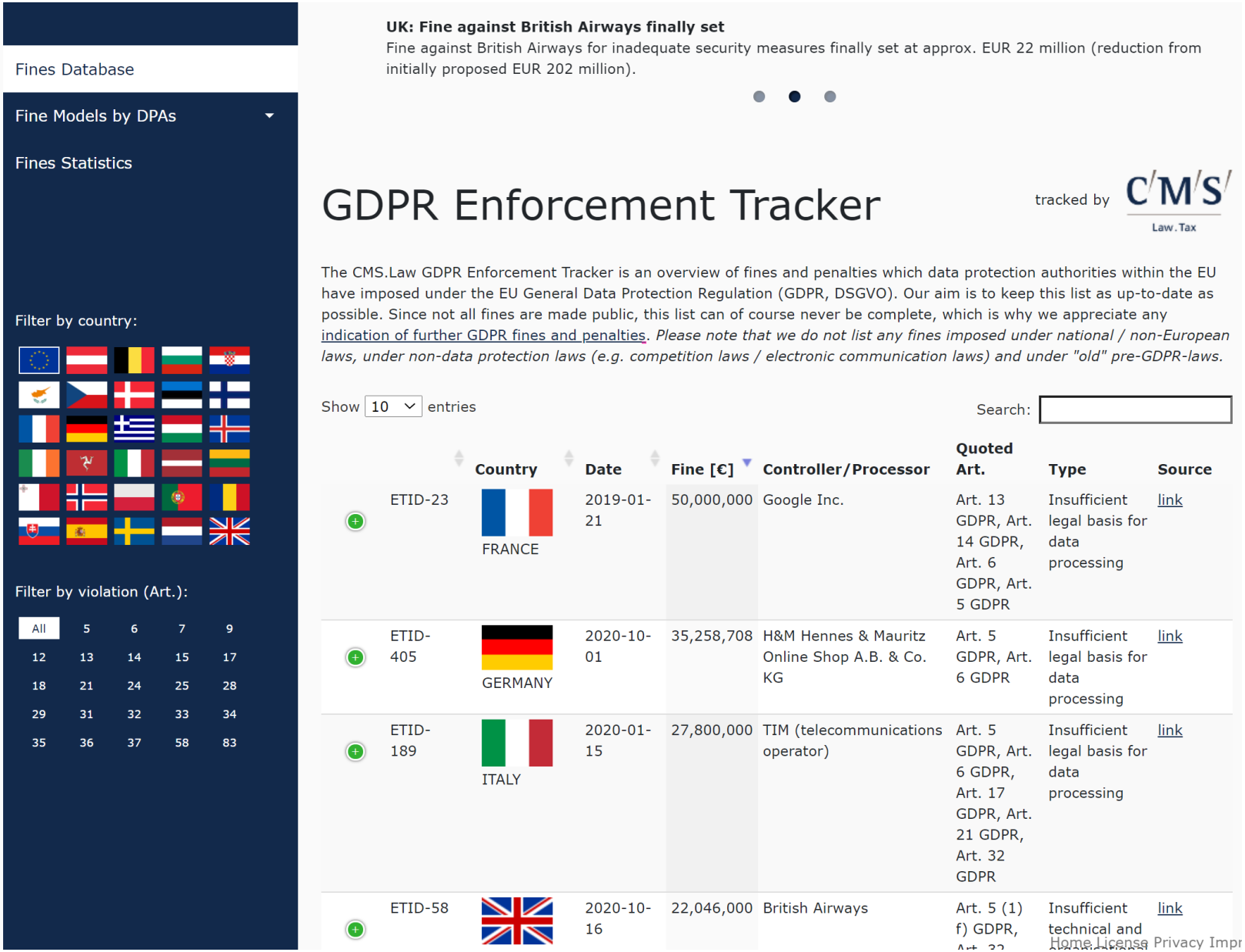


Cognitive Biases durch Medien



18) – Death: reality vs. reported. *All data available at: https://owenshen24.github.io/charting-death*
6; Google search data averaged over the period from 2004 to 2016; and NYT and Guardian data from 1999 to 2016.
Shown is the data on the ten leading causes of death in the United States plus drug overdoses, homicides and terrorism.
All values are normalized to 100% so they represent their relative share of the top causes, rather than absolute counts (e.g. "deaths" represents each causes' share of deaths within the 13 categories shown rather than total deaths). The causes of death shown here account for approximately 88% of total deaths in the United States in 2016.

This is a visualization from OurWorldinData.org, where you find data and research on how the world is changing.



www.enforcementtracker.com

3,989,020,304

Google searches today

3,833,308

Blog posts written today

421,680,690

Tweets sent today

3,968,790,565

Videos viewed today on YouTube

47,106,638

Photos uploaded today on Instagram

81,811,485

Tumblr posts today

2,644,060,374

Facebook active users

886,599,428

Google+ active users

366,828,425

Twitter active users

https://www.internetlivestats.com/

NYTimes, 16.11.18

How Plato Foresaw Facebook's Folly

Technology promises to make easy things that, by their intrinsic nature, have to be hard.

By Bret Stephens
Opinion Columnist

Nov. 16, 2018

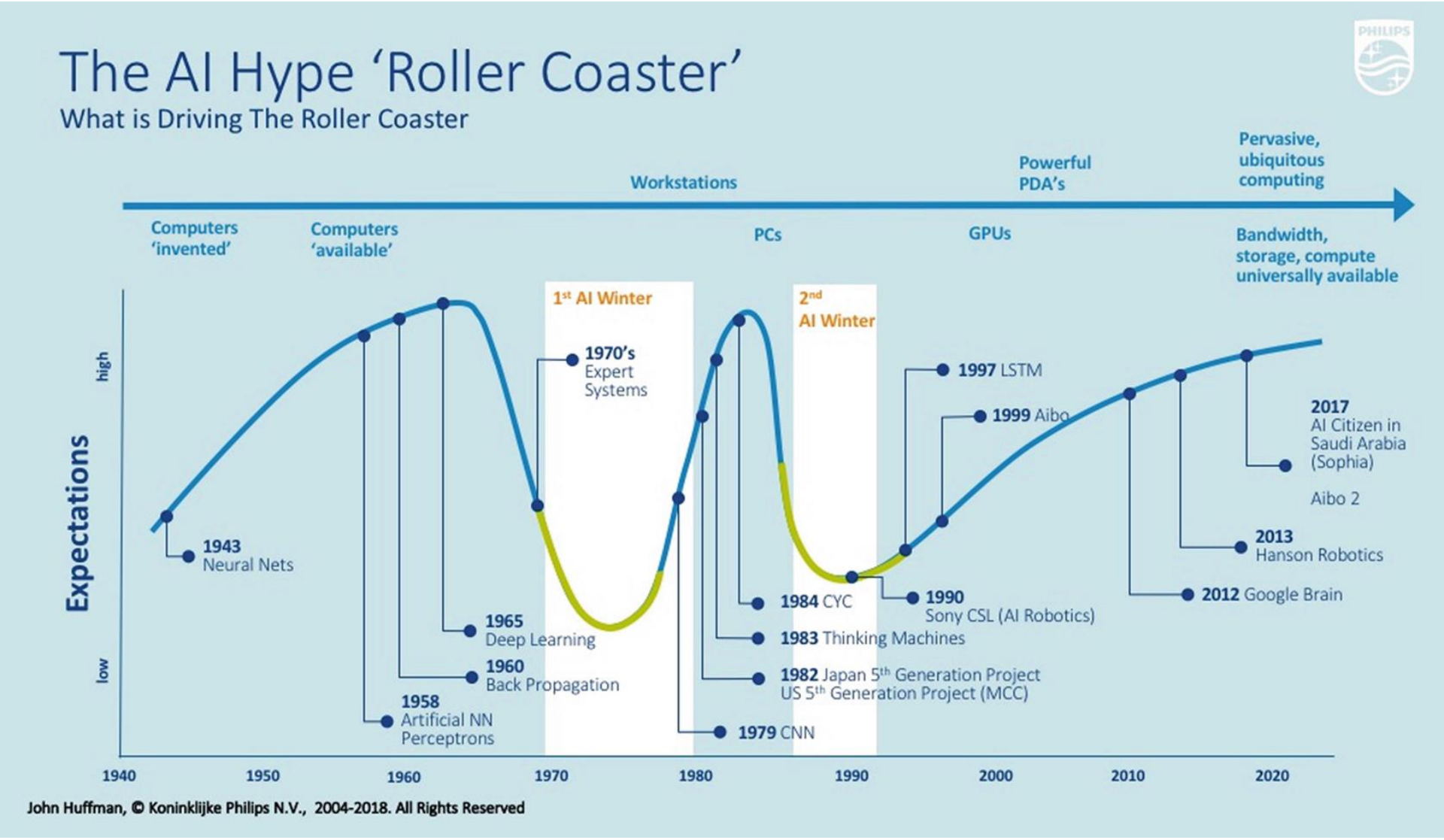
633

- **Tweeting** and **trolling** are **easy**. Mastering the **arts** of **conversation** and measured **debate** is **hard**.
- **Texting** is **easy**. Writing a proper **letter** is **hard**.
- Looking **stuff** up on **Google** is **easy**. Knowing **what** to **search for** in the first place is **hard**.
- Having a **thousand friends** on **Facebook** is **easy**. Maintaining **six** or **seven close adult friendships** over the space of **many years** is **hard**.
- **Swiping** right on **Tinder** is **easy**. **Finding love** — and **staying in it** — is **hard**.

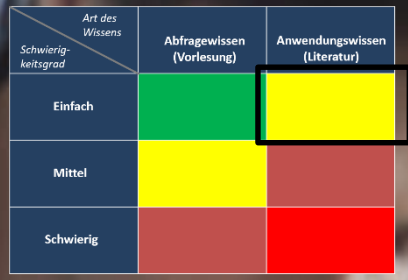
Corporate Shitstorm Management

sentimeo.com/shitstorm-tipps-infografik/

Vitalik Buterin: Change whole Industries?

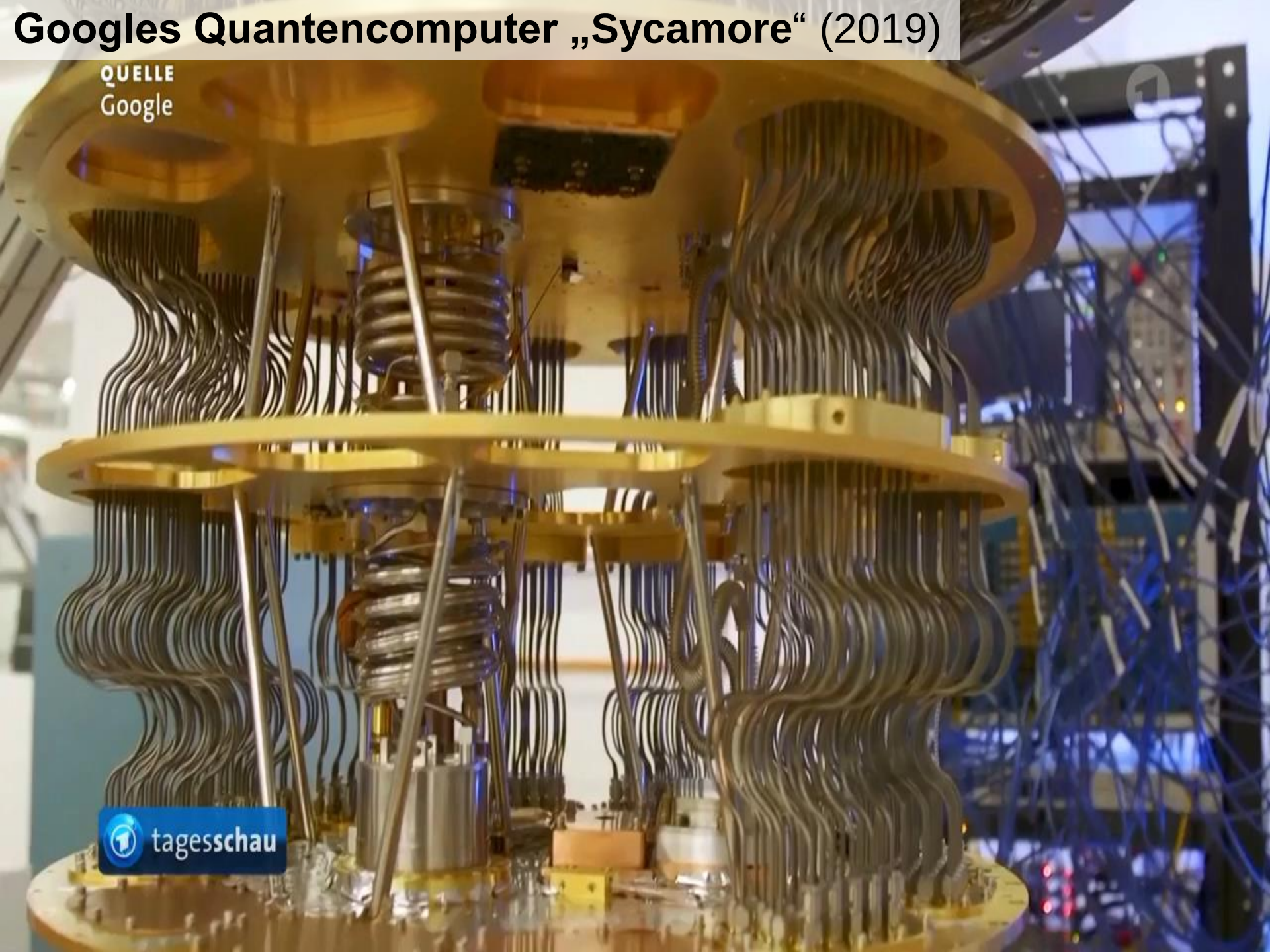


Welches ist **kein** Beispiel für eine **Digitale Plattform**?

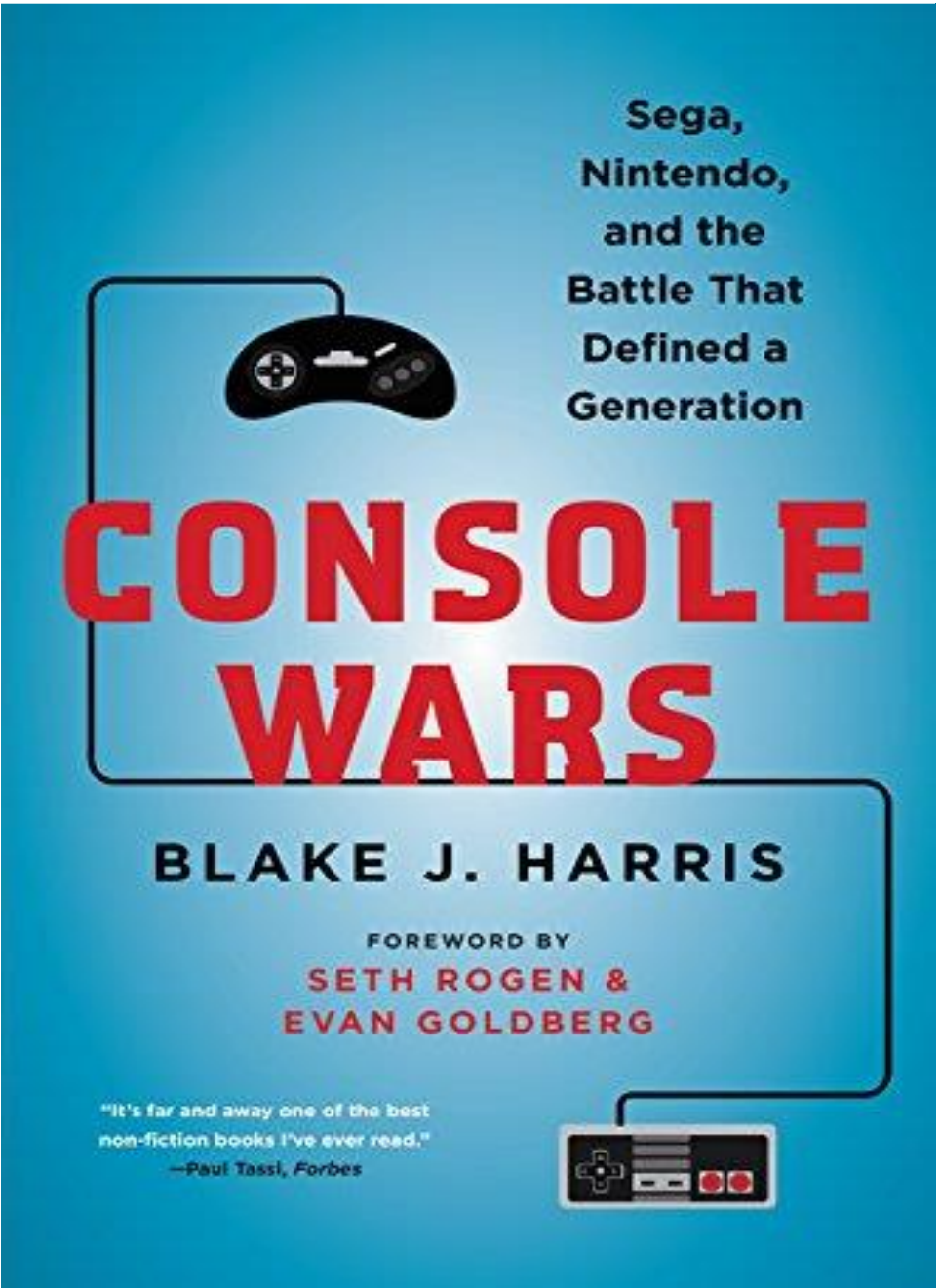


a) **Suchmaschine**, z.B. Google
b) **Lieferservice**, z.B. Lieferando
c) **Hotelportal**, z.B. Trivago
d) **Taxiplattform**, z.B. Uber
e) **None above**

Googles Quantencomputer „Sycamore“ (2019)



Console Wars (1990)



Der „Konsolenkrieg“ ist ein Beispiel für Plattformstrategien als entscheidende Wettbewerbsfaktoren.

Netzwerkeffekte in zweiseitigen Märkten haben dazu geführt, dass sich die Anzahl der Konsolenanbieter über die Jahre auf zwei wesentliche Anbieter reduziert hat.

Beispiele:

- Sony vs. Microsoft (Spielekonsolen)
- Apple vs. Google (Mobile OS)
- Microsoft vs. Apple (Desktop-OS)

Die großen Tech-Unternehmen sind breit aufgestellt

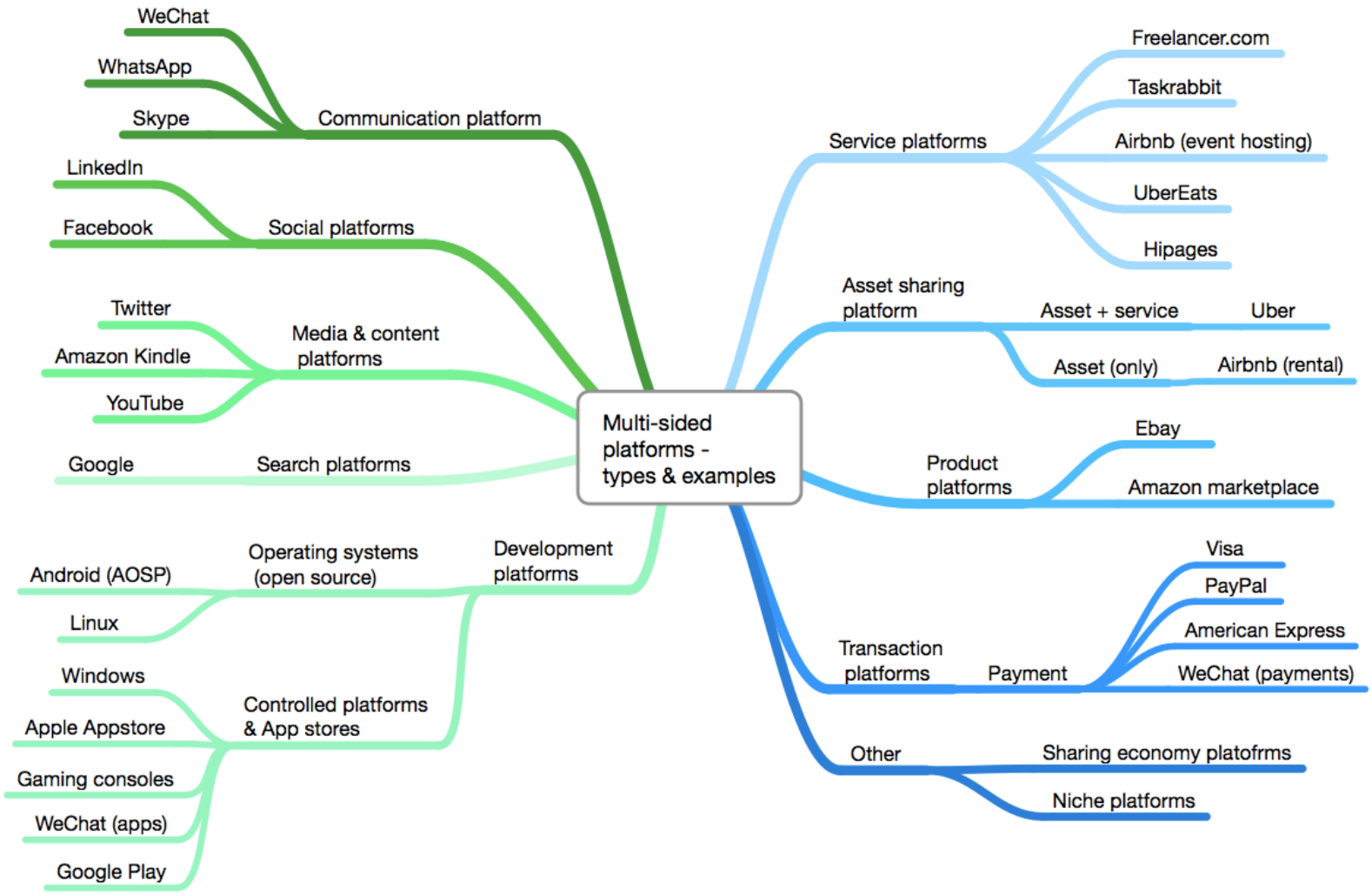
Viele Branchen werden durch Google, Apple, Facebook and Amazon disruptiert

KUBRA CONSULT
Acta, non verba!

	Google	Apple	Facebook	Amazon
TELECOM & IT	Fiber	Apple Sim	WhatsApp	Cloud Drive
HEALTH	Calico	HealthKit	Move	Marketplace
RETAIL	Shopping express	iBeacon	Facebook "Buy" Button	Grocery Delivery
ENERGY & UTILITIES	Smart home	Solar Power	Internet.org project	Fulfillment by Amazon
MEDIA & ENTERTAINMENT	Play	iTunes Radio	Oculus	Gamers Video platform
FINANCIALS	Wallet	Apple Pay	Friend-To-Friend Payment[1]	Payments API
MOBILITY, TRAVEL & LEISURE	Car	CarPlay	Messenger + Uber integration[1]	Media app for connected cars

Kurt Brand

Types & Examples of Platform Businesses



innovationtactics.com/platform-business-model-complete-guide

Laut Wikipedia…

X (company)

From Wikipedia, the free encyclopedia

This article is about the semi-secret research subsidiary of Alphabet Inc.. For the Canadian television series, see X Company. For the online banking company, X.com, see PayPal. For other uses, see X (disambiguation).

X Development LLC. (formerly **Google X**) is an American semi-secret research and development facility and organization founded by Google in January 2010,[1][2] which now operates as a subsidiary of Alphabet Inc.[3] X has its headquarters about a mile and a half from Alphabet's corporate headquarters, the Googleplex, in Mountain View, California.[4][5]

Work at X is overseen by entrepreneur scientist Astro Teller, as CEO and "Captain of Moonshots".[6][7][8] The lab started with the development of Google's self-driving car.[8]

On October 2, 2015, after the complete restructuring of Google into Alphabet, Google X became an independent Alphabet company and was renamed X.

On 25 October 2018, *The New York Times* published an exposé entitled "How Google Protected Sexual Predators", in which it was reported that the company subsequently announced that "48 employees have been fired for sexual misconduct.[9] A week after the article appeared, Google X executive Rich DeVaul resigned pursuant to a [illegible]

- Von **Google 2010 gegründete**, teils geheime **Forschungseinrichtung**
- CEO: **Astro Teller**
- **Erstes Projekt** war das **„Selbstfahrende Auto“**

Contents [hide]

1 Projects
- 1.1 Glass
- 1.2 Makani
- 1.3 FSOC
- 1.4 Barge
- 1.5 Graduated projects
  - 1.5.1 Waymo (self-driving car)
  - 1.5.2 Loon
  - 1.5.3 Wing
  - 1.5.4 Others
- 1.6 Explorations
- 1.7 Other projects

X Development LLC.

Formerly	Google X (2010–2015)
Type	Subsidiary of Alphabet Inc.
Industry	Research and development
Founded	January 2010; 8 years ago (as Google X, under Google) October 2, 2015; 3 years ago (as X, under Alphabet Inc.)
Founders	Sebastian Thrun Yoky Matsuoka Astro Teller
Headquarters	Mountain View, California, United States
Key people	Astro Teller (CEO, "Captain of Moonshots")
Products	Artificial intelligence Computational neuroscience Health care Biotechnology
Parent	Google (2010–2015) Alphabet Inc. (2015–present)
Subsidiaries	**Subsidiaries** [show]
Website	x.company

THE CHALLENGE

Every year 1.25 million people around the world die from car accidents. Of these accidents, an estimated 94% are caused by human error. A common culprit? Human inattention, made worse in recent years by the rise of mobile devices.

This begs the question: what if cars could drive themselves safely from point A to point B? X was home to the Google Self-Driving Car project, which had the goal of developing technology that could transform mobility for millions of people, whether by reducing road deaths caused by human error, reclaiming the billions of hours wasted in traffic, or bringing everyday destinations within reach for those unable to drive. In 2016, the project graduated from X to become Waymo.

OF VEHICLE CRASHES IN THE US

94%

ARE CAUSED BY HUMAN ERROR

*NHTSA

Early on, the team focused on freeway driving because it's a simpler driving environment to master: stay in your lane, maintain speed, don't hit the car in front of you. The cars were offered to a handful of Googlers to use on their daily commute to learn how people would really use the technology. The response was overwhelmingly positive — users said the car made their commute less stressful and tiring. But the team also learned that it wasn't reasonable to expect people to pay attention throughout a ride and be able to take back control of the car at short notice. This insight into human behavior and the team's commitment to safety led them to commit to an even more audacious mission: a fully self-driving car that could take anyone from A to B.

5. **Google Deepmind**
   Deep Learning with **AlphaGo, Zero…**

Wikipedia zu DeepMind

DeepMind

From Wikipedia, the free encyclopedia

DeepMind Technologies Limited is a British artificial intelligence company founded in September 2010.

Acquired by Google in 2014, the company has created a neural network that learns how to play video games in a fashion similar to that of humans,[4] as well as a Neural Turing machine,[5] or a neural network that may be able to access an external memory like a conventional Turing machine, resulting in a computer that mimics the short-term memory of the human brain.[6][7]

The company made headlines in 2016 after its AlphaGo program beat a human professional Go player for the first time in October 2015[8] and again when AlphaGo beat Lee Sedol the world champion in a five-game match, which was the subject of a documentary film.[9]

A more generic program, AlphaZero, beat the most powerful programs playing go, chess and shogi (Japanese chess) after a few hours of play against itself using reinforcement learning.[10]

Contents [hide]

1 History
2 Machine learning
2.1 Deep reinforcement learning

DeepMind Technologies Limit

Type of business	Subsidiary
Founded	23 September 2010; 7 yea ago [1]
Headquarters	6 Pancras Square,[2] London N1C 4AG, UK
Founder(s)	Demis Hassabis, Shane Legg, Mustafa Suleyman
CEO	Demis Hassabis
Industry	Artificial Intelligence
Employees	400 [3]
Parent	Independent (2010–2014) Google Inc. (2014–presen Alphabet Inc. (2015–prese
Website	www.deepmind.com

Wikipedia zu AlphaGo

AlphaGo

From Wikipedia, the free encyclopedia

AlphaGo logo

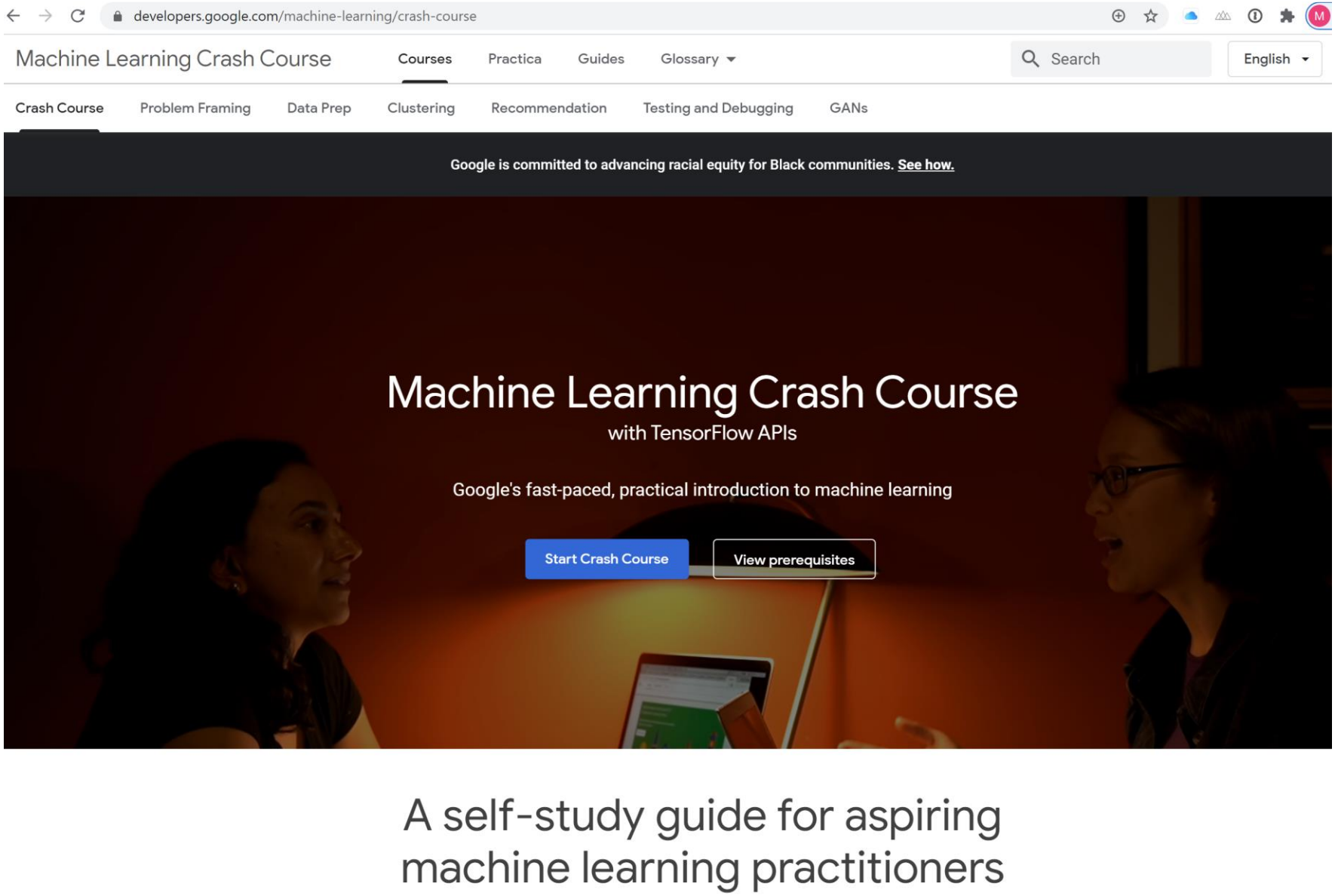
AlphaGo is a computer program that plays the board game Go.[1] It was developed by Alphabet Inc.'s Google DeepMind in London.

In October 2015, AlphaGo became the first computer Go program to beat a human professional Go player without handicaps on a full-sized 19×19 board.[2][3] In March 2016, it beat Lee Sedol in a five-game match, the first time a computer Go program has beaten a 9-dan professional without handicaps.[4] Although it lost to Lee Sedol in the fourth game, Lee resigned the final game, giving a final score of 4 games to 1 in favour of AlphaGo. In recognition of the victory, AlphaGo was awarded an honorary 9-dan by the Korea Baduk Association.[5] The lead up and the challenge match with Lee Sedol were documented in a documentary film also titled *AlphaGo*,[6] directed by Greg Kohs. It was chosen by *Science* as one of the Breakthrough of the Year runners-up on 22 December 2016.[7]

At the 2017 Future of Go Summit, AlphaGo beat Ke Jie, the world No.1 ranked player at the time, in a three-game match. After this, AlphaGo was awarded professional 9-dan by the Chinese Weiqi Association.[8] After the match between AlphaGo and Ke Jie, AlphaGo retired while DeepMind continues AI research in other areas.[9]

AlphaGo uses a Monte Carlo tree search algorithm to find its moves based on knowledge previously "learned" by machine learning, specifically by an artificial neural network (a deep learning method) by extensive training, both from human and computer play.[10]

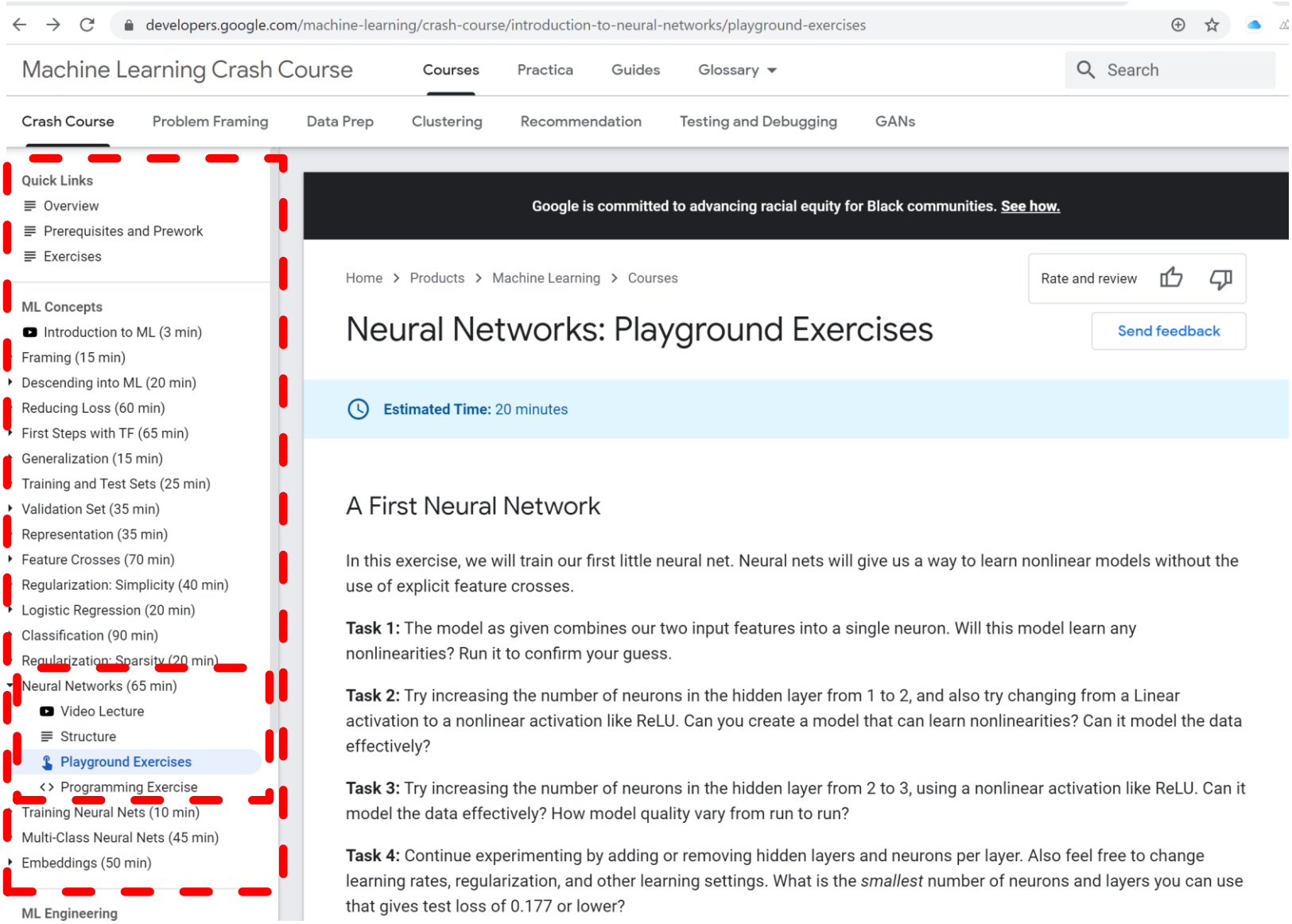
Machine Learning Crash Course – A self-study Guide



A self-study guide for aspiring machine learning practitioners

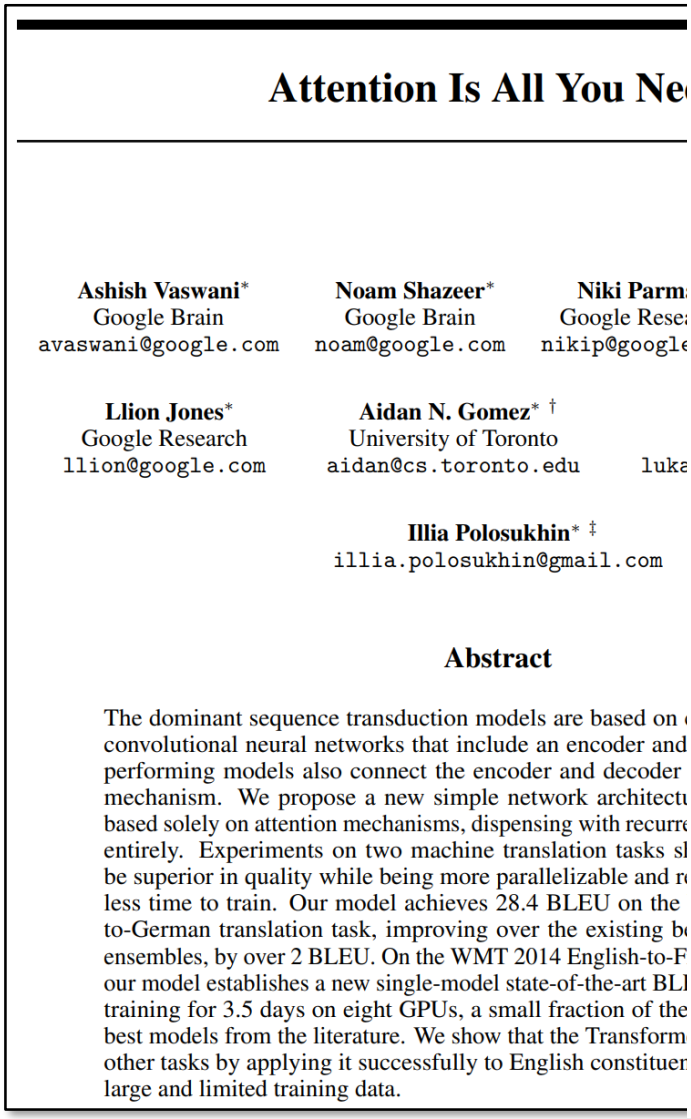
developers.google.com/machine-learning/crash-course

Machine Learning Crash Course – A self-study Guide



developers.google.com/machine-learning/crash-course/introduction-to-neural-networks

Google, 2017: Attention is All You Need



Attention Is All You Ne

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Aidan N. Gomez* † University of Toronto aidan@cs.toronto.edu luka

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performing models also connect the encoder and decoder
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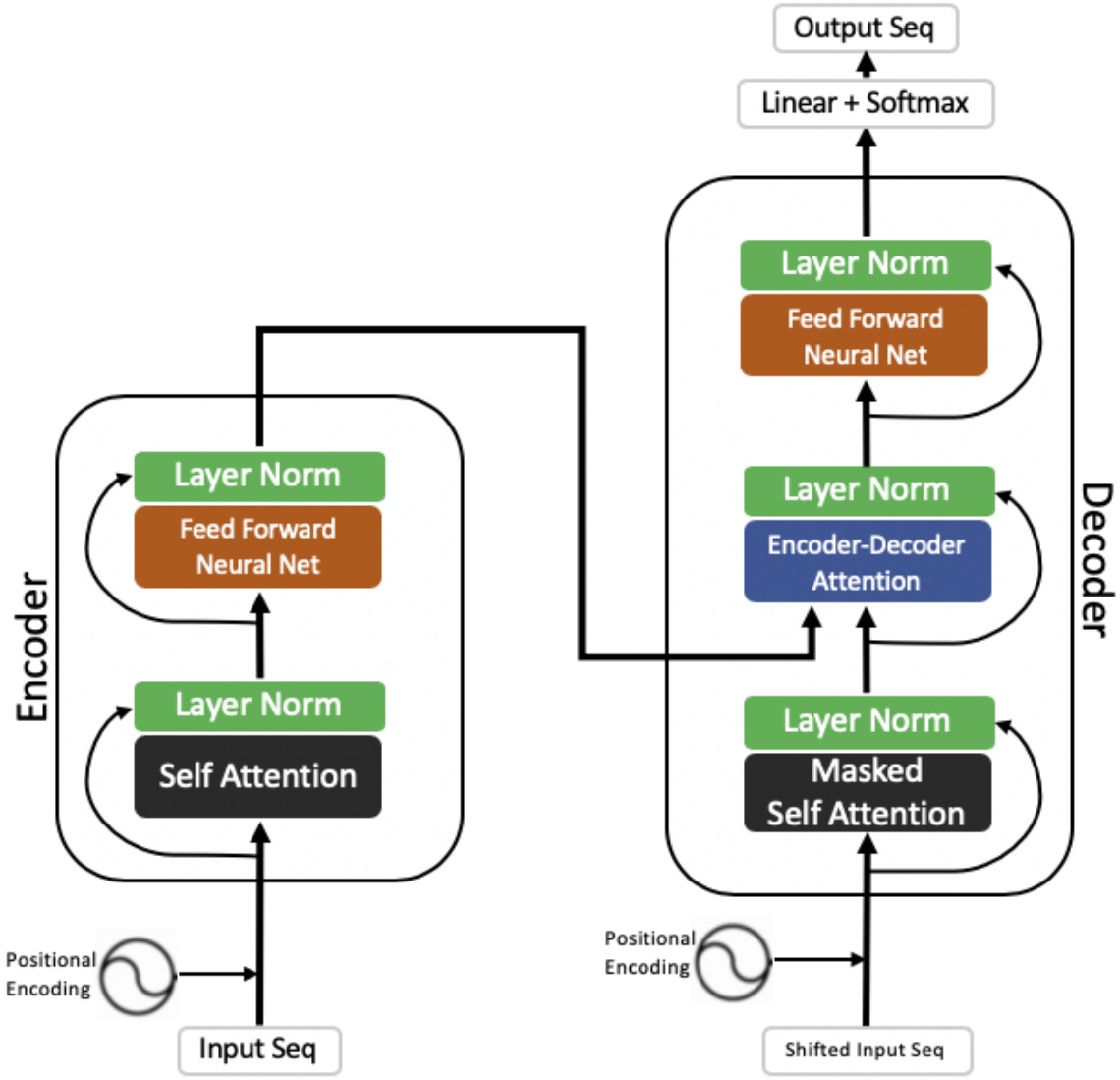
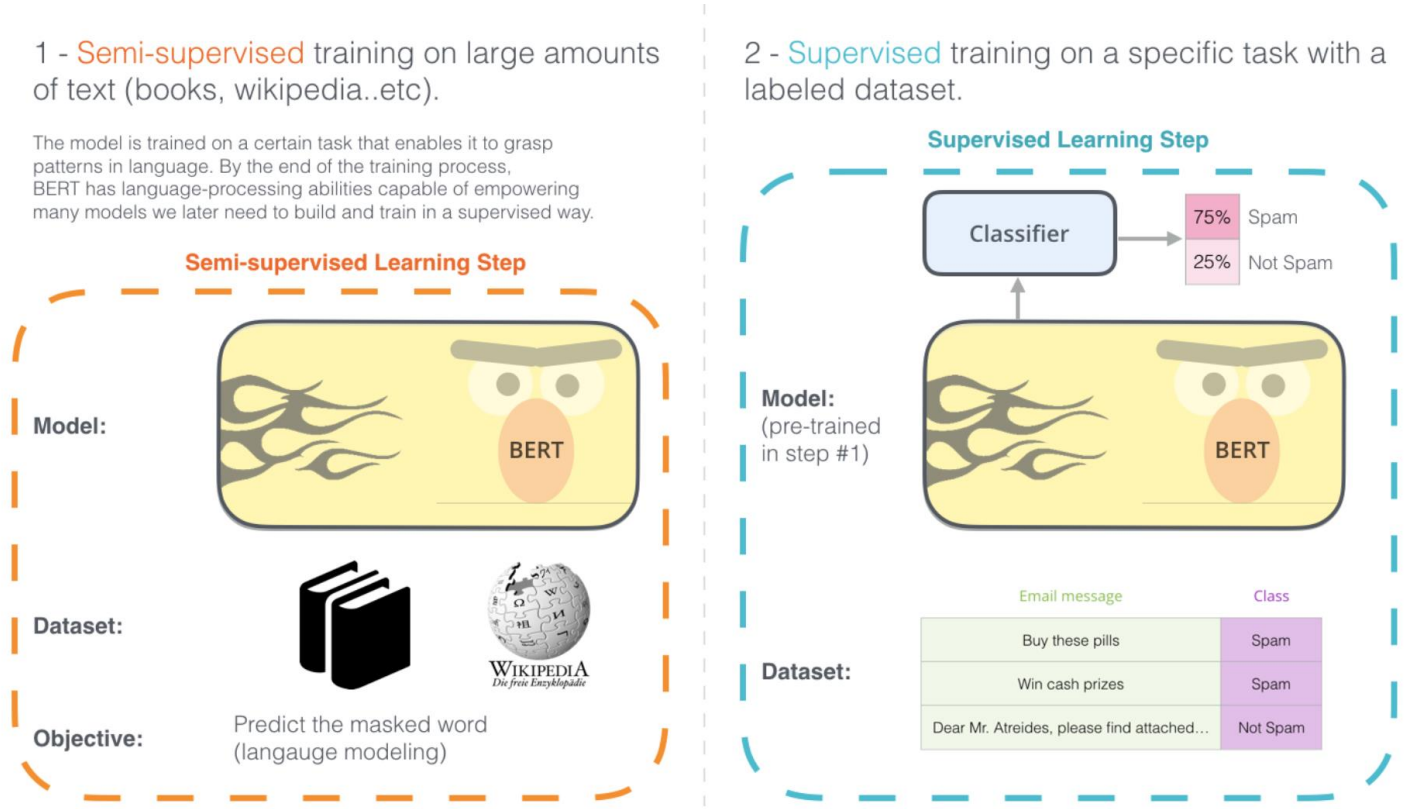


Google et.al., 2017: Attention Is All You Need
arxiv.org/pdf/1706.03762.pdf

8 Machine Learning II
- ML in Natural Language Processing (NLP)
(5) Transformer BERT, Google

BERT Transformer, Google 2018



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Das **Training** läuft in zwei Schritten: **Pre-Training** und **Fine-Tuning** (eine Form von **Transfer Learning**)

The Illustrated BERT, ELMo, and co. (How NLP Cracked Transfer Learning), 2018
jalammar.github.io/illustrated-bert/

Elon Musk: “OpenAI wird im Prinzip von Microsoft übernommen”

28.09.2020 | von Matthias Bastian | Twitter | LinkedIn | E-Mail

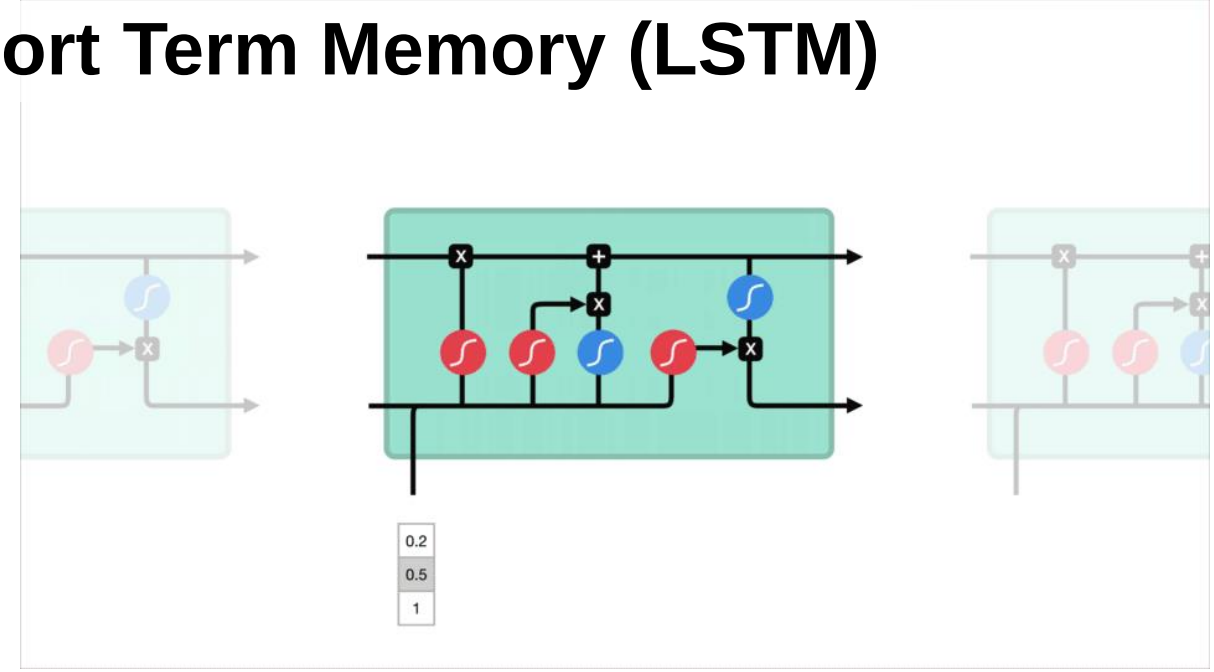
27065 5

Als Mitgründer von OpenAI wollte Elon Musk ein Gegengewicht setzen zu kommerziell orientierter Künstlicher Intelligenz großer Konzerne. Die jüngsten Entwicklungen bei OpenAI sieht er kritisch. Zu Recht?

Im März 2019 startete der Umbau von OpenAI: Die bis dato reine Non-Profit-Organisation öffnete sich für wirtschaftliche Ziele und gründete die gewinnorientierte Einheit OpenAI LP. OpenAI begründete diese Umstrukturierung mit der Notwendigkeit, hohe Einnahmen generieren zu müssen, um mit Konzernen wie Google oder Facebook bei der KI-Entwicklung Schritt halten zu können.

https://mixed.de/openai-wird-microsoft-uebernahme-gpt-3/

Long-Short Term Memory (LSTM)



Laut **Wikipedia**: Seit etwa 2016 setzen **große Technologieunternehmen** wie **Google**, **Apple** und **Microsoft LSTM** als **grundlegende Komponente** ein.

So verwendete **Google** beispielsweise **LSTM** für die **Spracherkennung** auf dem **Smartphone**, für den **Smart Assistant Allo** und für **Google Translate**.

Apple verwendet **LSTM** für die **„Quicktype“-Funktion** auf dem **iPhone** und für **Siri**.

Amazon verwendet **LSTM** für **Amazon Alexa**.

Sketch-RNN Demos

A Neural Representation of Sketch Drawings

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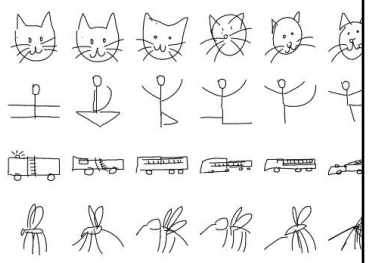
Abstract

We present sketch-rnn, a recurrent neural network (RNN) able to construct stroke-based drawings of common objects. The model is trained on a dataset of human-drawn images representing many different classes. We outline a framework for conditional and unconditional sketch generation, and describe new robust training methods for generating coherent sketch drawings in a vector format.

1 Introduction

Recently, there have been major advancements in ge
networks as a generative tool. Generative Adversarial
(VI) [15], and Autoregressive (AR) [19] models have b
Most of the work thus far has been targeted towards mo
however, do not understand the world as a grid of pix
represent what we see. From a young age, we develo
by drawing on paper with a pencil or crayon. In this
representation of an image as a short sequence of stroke
to traditional pixel image modelling approaches, and pr



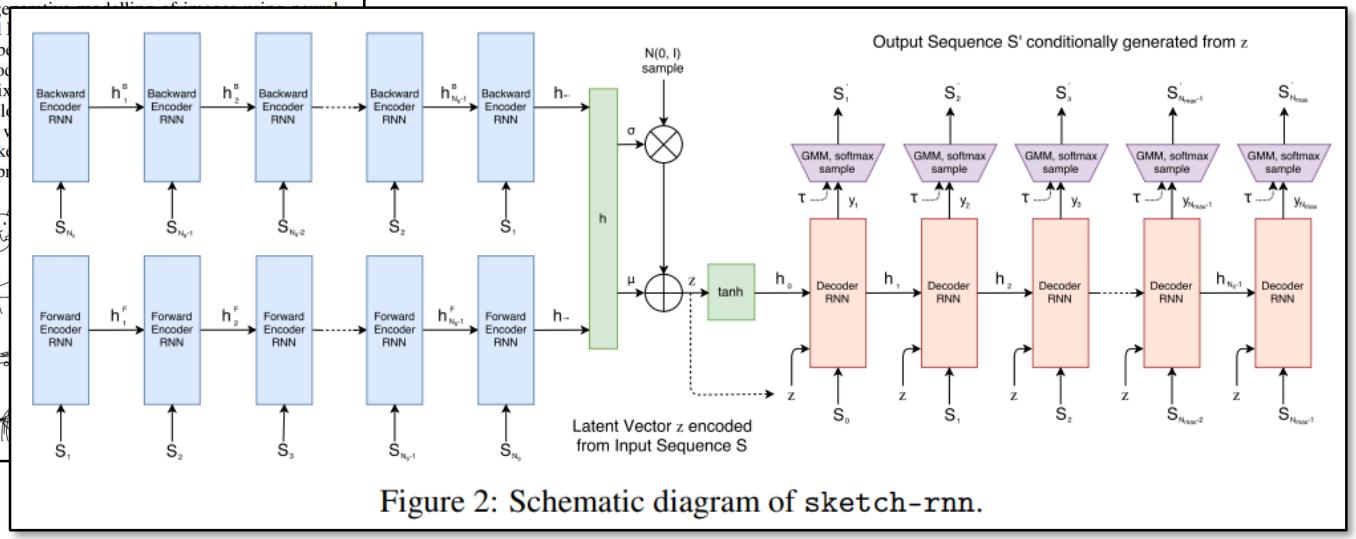
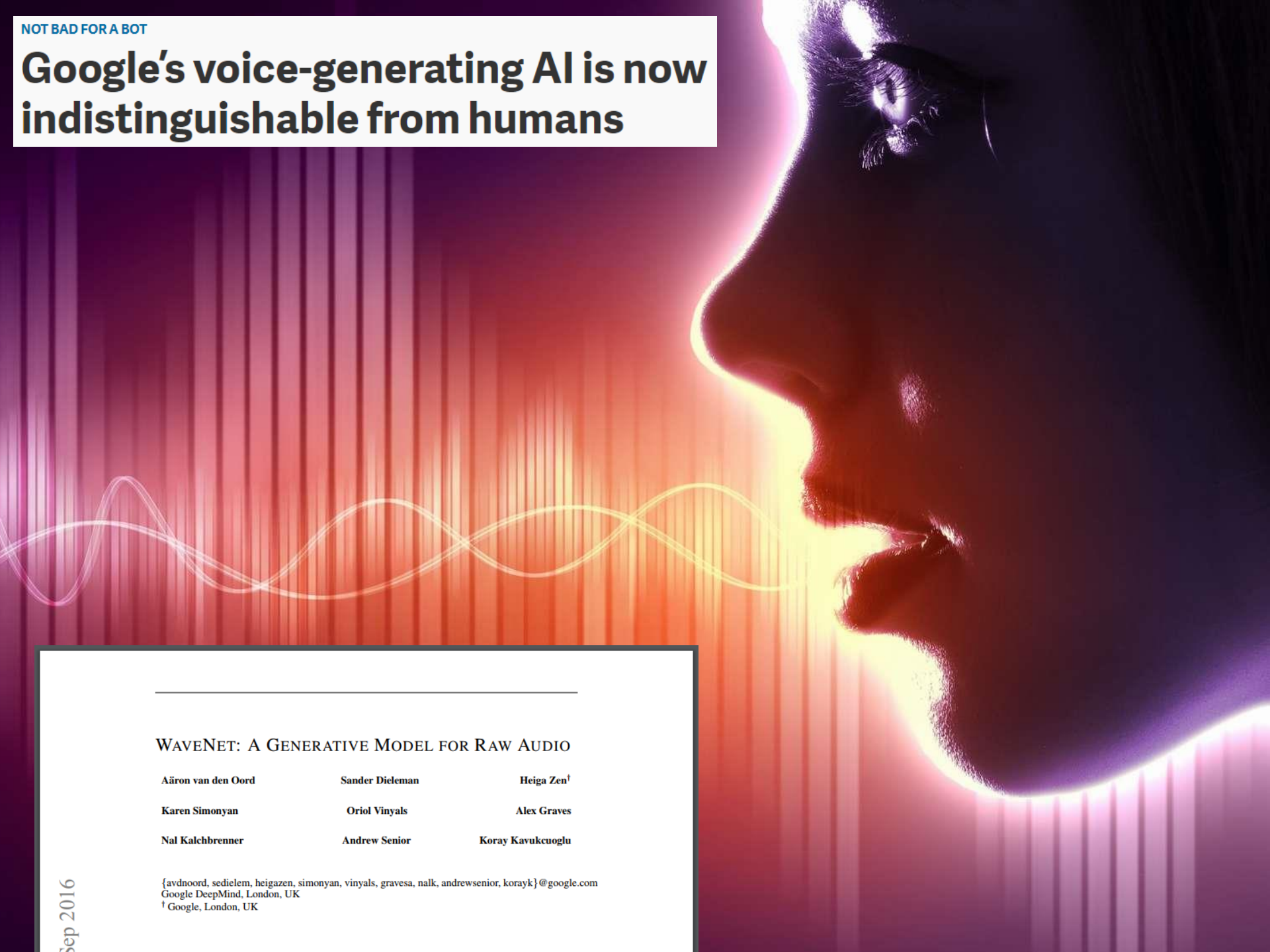


Figure 2: Schematic diagram of sketch-rnn.

A Neural Representation of Sketch Drawings, 2017
arxiv.org/pdf/1704.03477.pdf

NOT BAD FOR A BOT

Google's voice-generating AI is now indistinguishable from humans



WaveNet: A Generative Model for Raw Audio

Aäron van den Oord **Sander Dieleman** **Heiga Zen**[†]

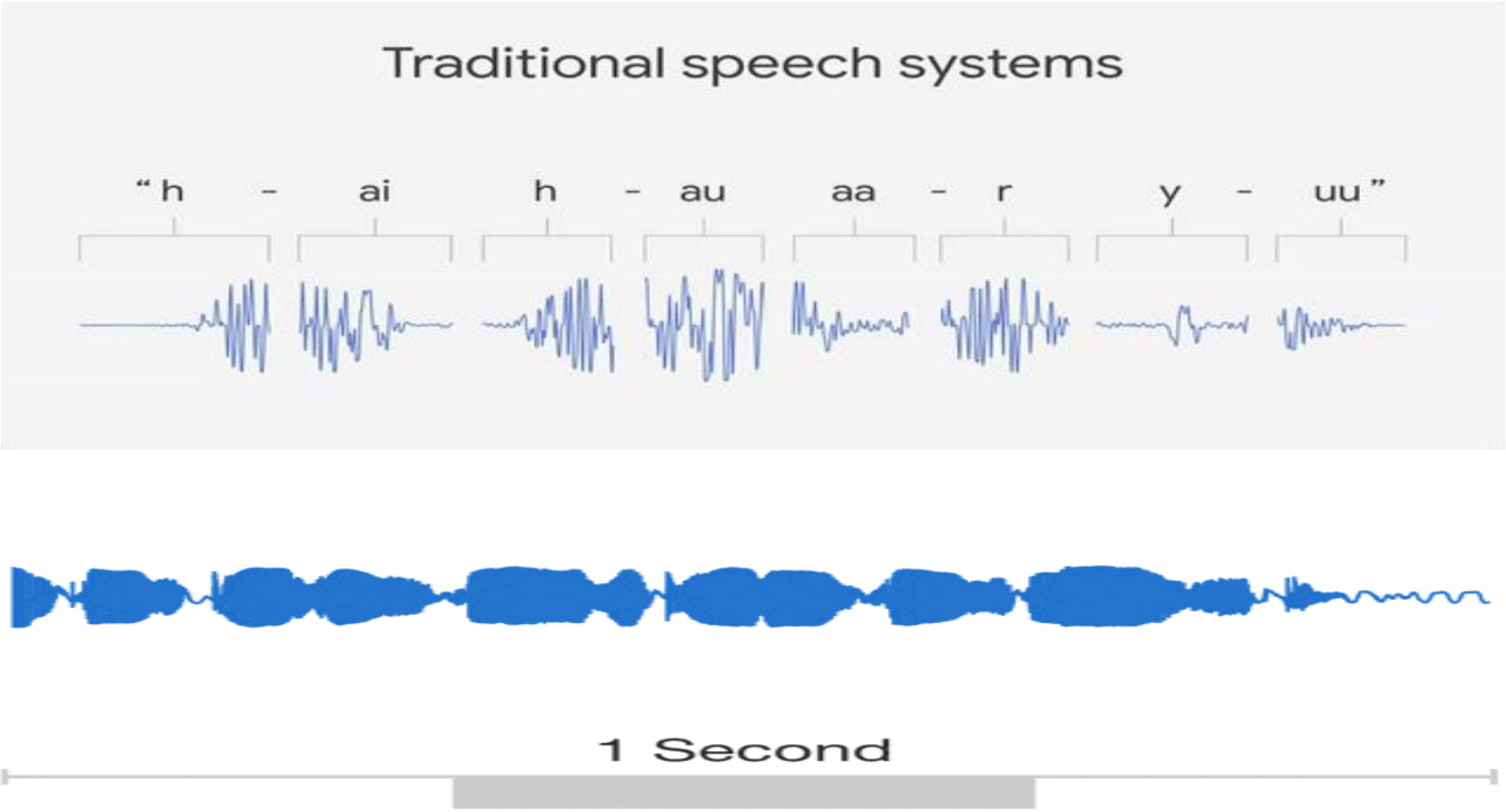
Karen Simonyan **Oriol Vinyals** **Alex Graves**

Nal Kalchbrenner **Andrew Senior** **Koray Kavukcuoglu**

{avdnoord, sedielem, heigazen, simonyan, vinyals, gravesa, nalk, andrewsenior, korayk}@google.com
Google DeepMind, London, UK
[†] Google, London, UK

Sep 2016

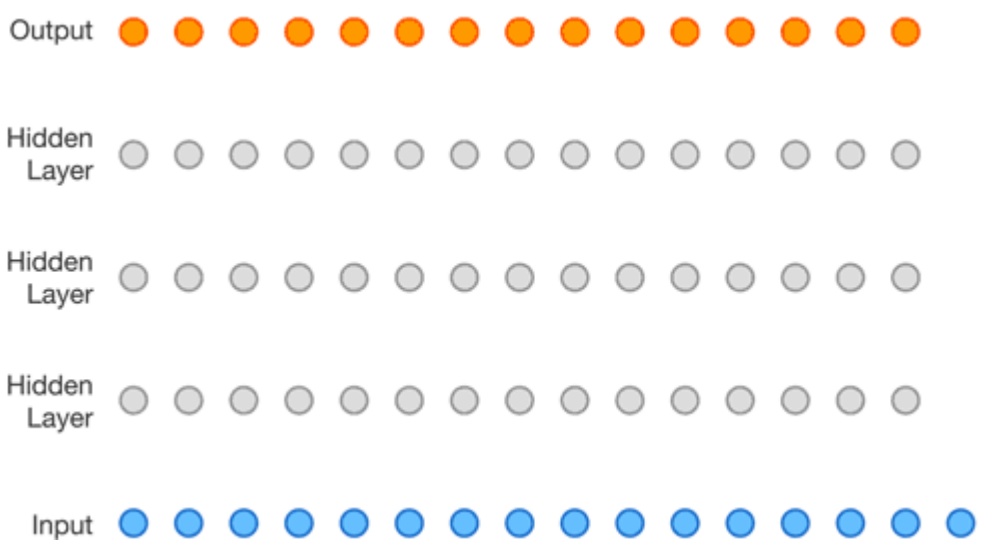
Google WaveNet



WaveNet is a powerful **predictive technique** that uses multiple Deep Learning (DL) strategies from Computer Vision (CV) and Audio Signal Processing models and applies them to **longitudinal (time-series) data**.

Google WaveNet: A generative model for raw audio, 2016
deepmind.com/blog/article/wavenet-generative-model-raw-audio

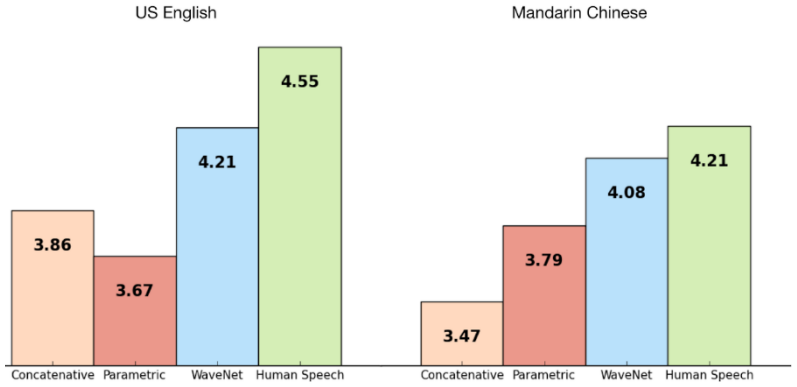
Google WaveNet mit einer CNN-Architektur



A **CNN** that **grows**. It was **trained** on a **large dataset of speech samples**. During training, the network determined the underlying **structure** of the speech and what **waveforms** were **realistic**. The trained network then **synthesised a voice** one sample at a time, with each generated sample taking into account the properties of the previous sample. The resulting voice contained **natural intonation** and other features such as **lip smacks**.

	Subjective 5-scale MOS in naturalness	
Speech samples	North American English	Mandarin Chinese
LSTM-RNN parametric	3.67 ± 0.098	3.79 ± 0.084
HMM-driven concatenative	3.86 ± 0.137	3.47 ± 0.108
WaveNet (L+F)	$\mathbf{4.21} \pm 0.081$	$\mathbf{4.08} \pm 0.085$
Natural (8-bit μ-law)	4.46 ± 0.067	4.25 ± 0.082
Natural (16-bit linear PCM)	4.55 ± 0.075	4.21 ± 0.071

Table 1: Subjective 5-scale mean opinion scores of speech samples from LSTM-RNN-based statistical parametric, HMM-driven unit selection concatenative, and proposed WaveNet-based speech synthesizers, 8-bit μ-law encoded natural speech, and 16-bit linear pulse-code modulation (PCM) natural speech. WaveNet improved the previous state of the art significantly, reducing the gap between natural speech and best previous model by more than 50%.

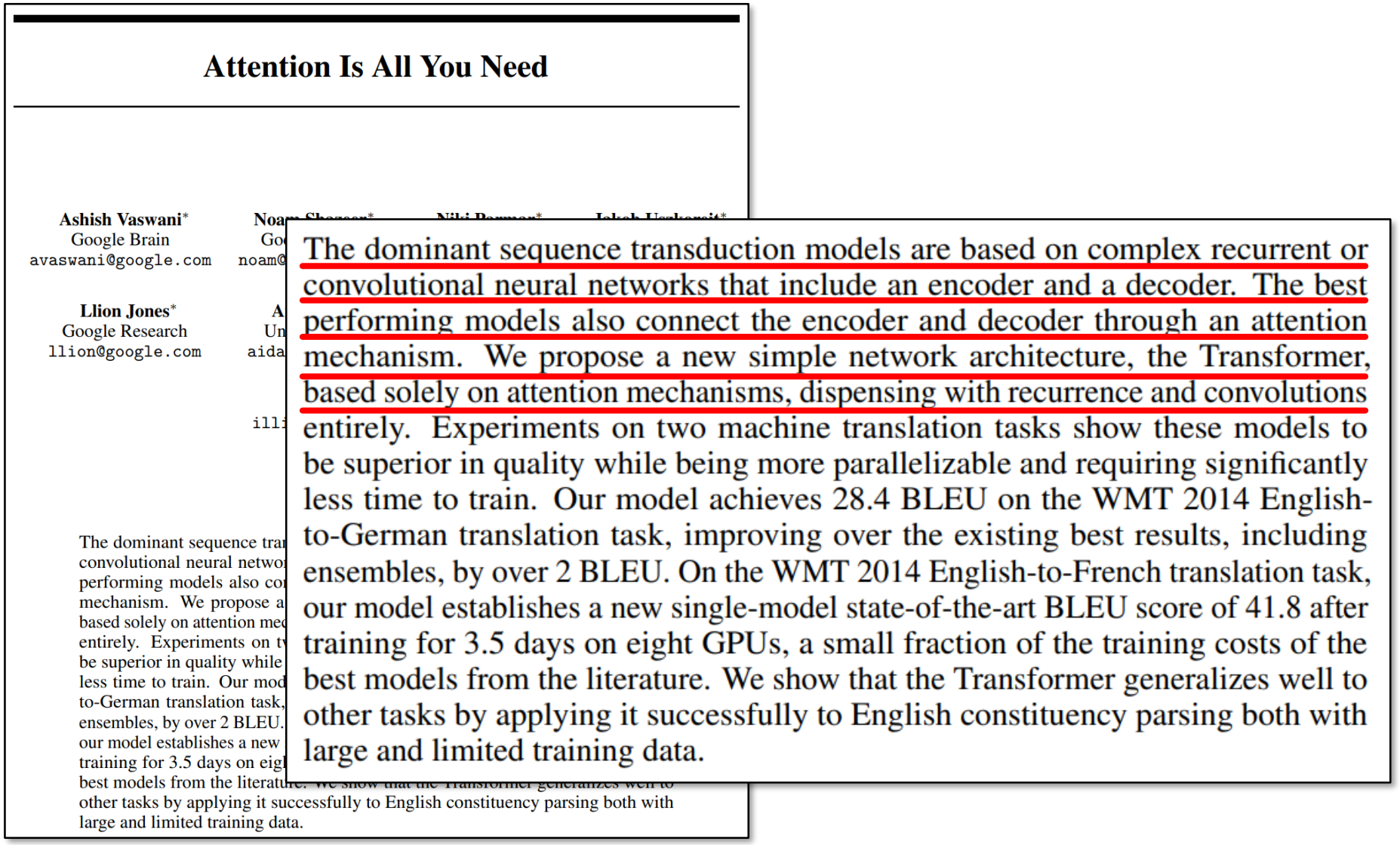


Google WaveNet: A generative model for raw audio, 2016
deepmind.com/blog/article/wavenet-generative-model-raw-audio

Google WaveNet

Google Wavenet | Google I/O 2018
www.youtube.com/watch?v=JjK8apEishQ

Google, 2017: Attention is All You Need



Attention Is All You Need

Ashish Vaswani*
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Google et.al., 2017: Attention Is All You Need
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Attention Is All You Need

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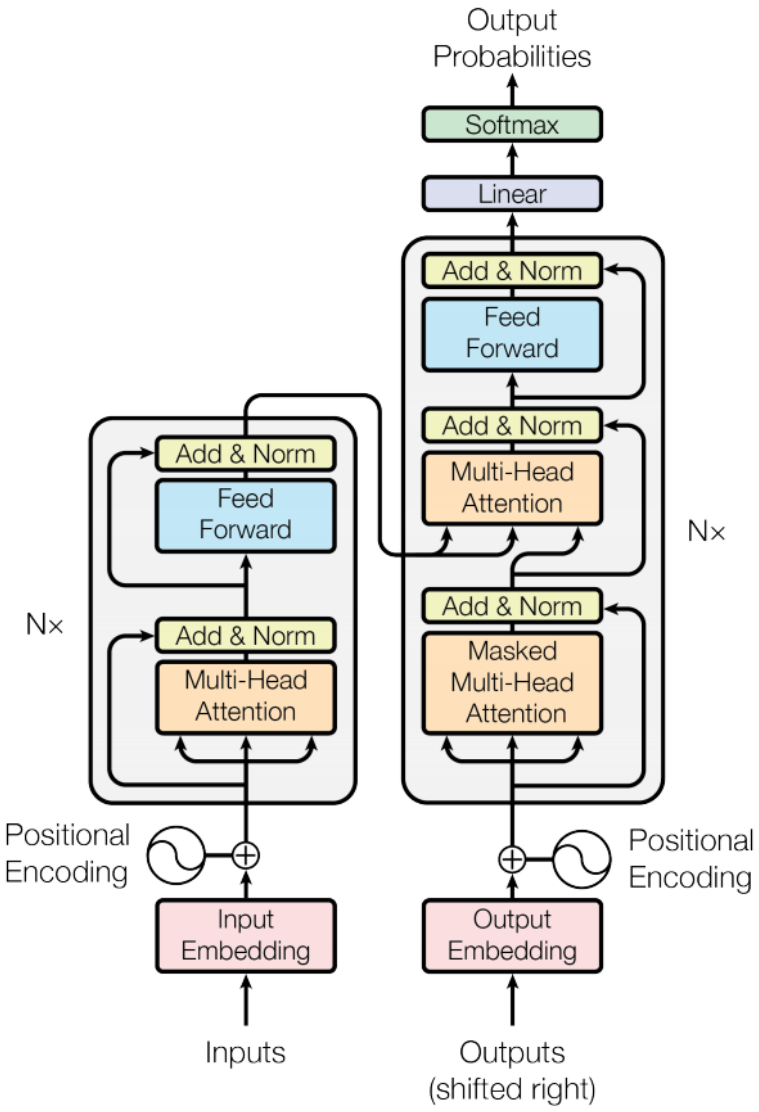

Figure 1: The Transformer - model architecture.

Google et.al., 2017: Attention Is All You Need
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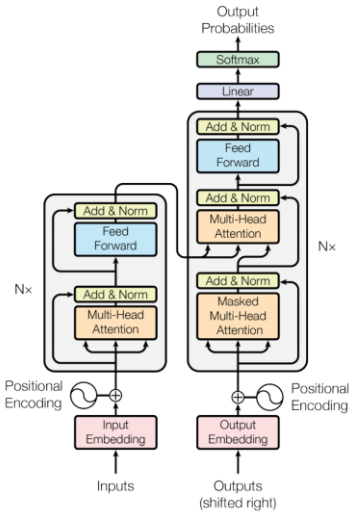

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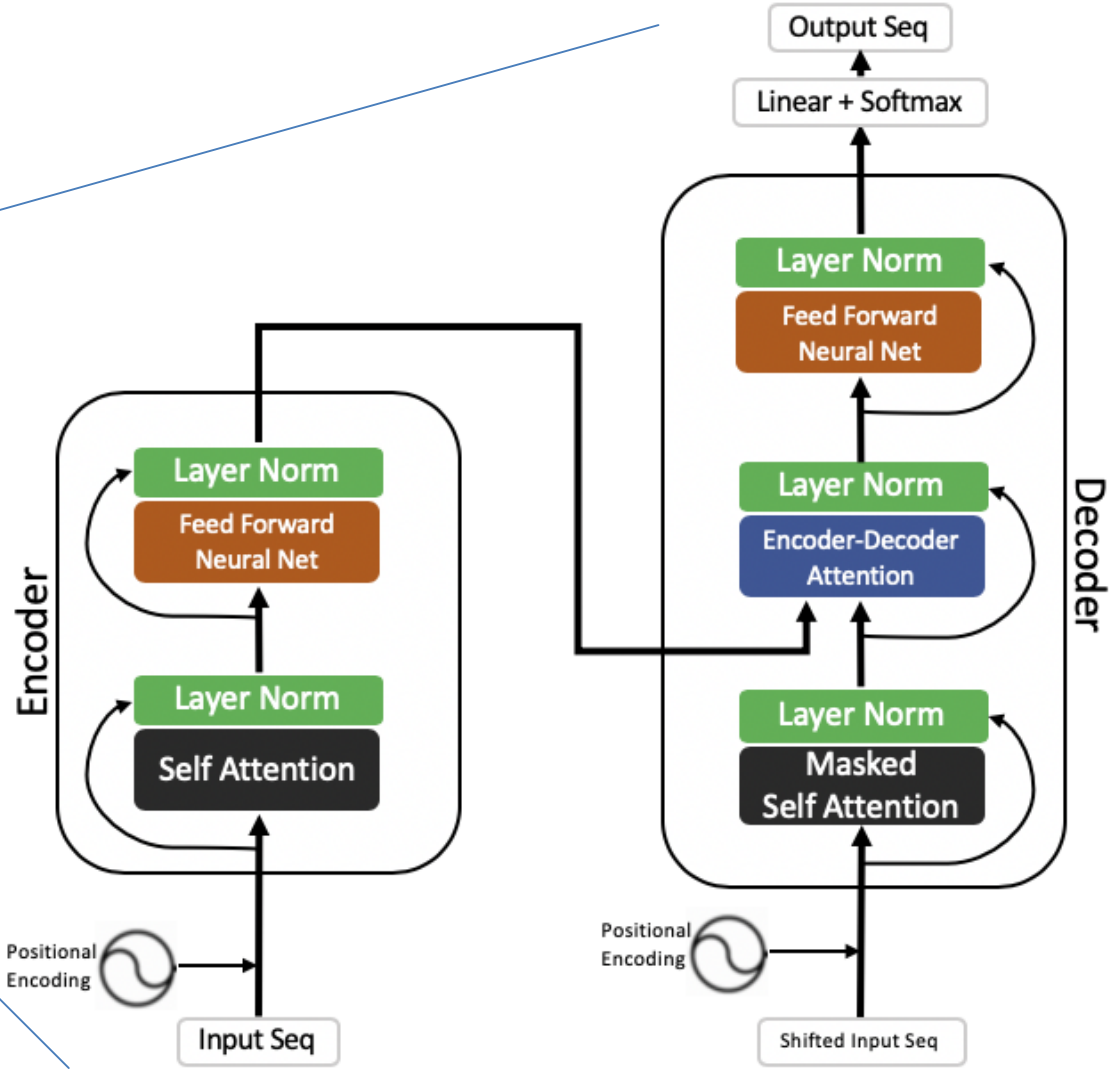


Google et.al., 2017: Attention Is All You Need
arxiv.org/pdf/1706.03762.pdf

5. Transformer BERT, Google

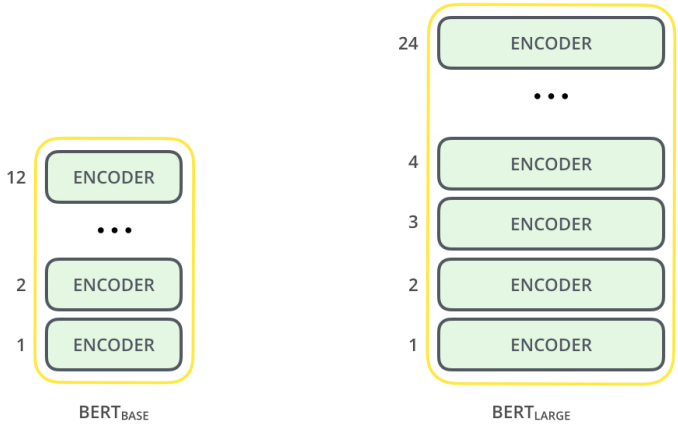
BERT Transformer, Google 2018

BERT (language model)

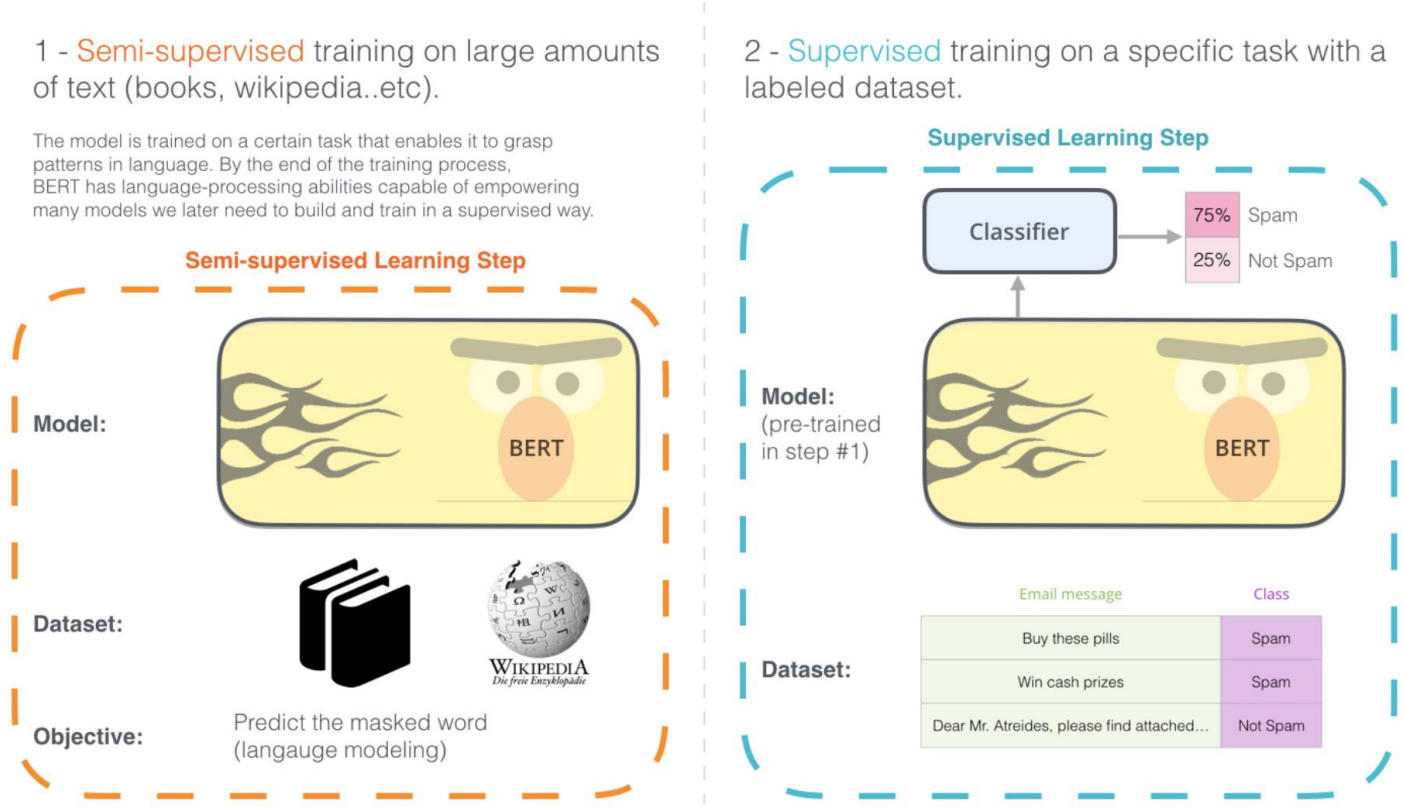
From Wikipedia, the free encyclopedia

Bidirectional Encoder Representations from Transformers (**BERT**) is a Transformer-based machine learning technique for natural language processing (NLP) pre-training developed by Google. BERT was created and published in 2018 by Jacob Devlin and his colleagues from Google.[1][2] As of 2019, Google has been leveraging BERT to better understand user searches.[3]

The original English-language BERT model comes with two pre-trained general types:[1] (1) the $\text{BERT}_{\text{BASE}}$ model, a 12-layer, 768-hidden, 12-heads, 110M parameter neural network architecture, and (2) the $\text{BERT}_{\text{LARGE}}$ model, a 24-layer, 1024-hidden, 16-heads, 340M parameter neural network architecture; both of which were trained on the BooksCorpus[4] with 800M words, and a version of the English Wikipedia with 2,500M words.



BERT Transformer, Google 2018



The two steps of how BERT is developed. You can download the model pre-trained in step 1 (trained on un-annotated data), and only worry about fine-tuning it for step 2. [Source for book icon].

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jalammar.github.io/illustrated-bert/

BERT Transformer, GLUE Benchmark

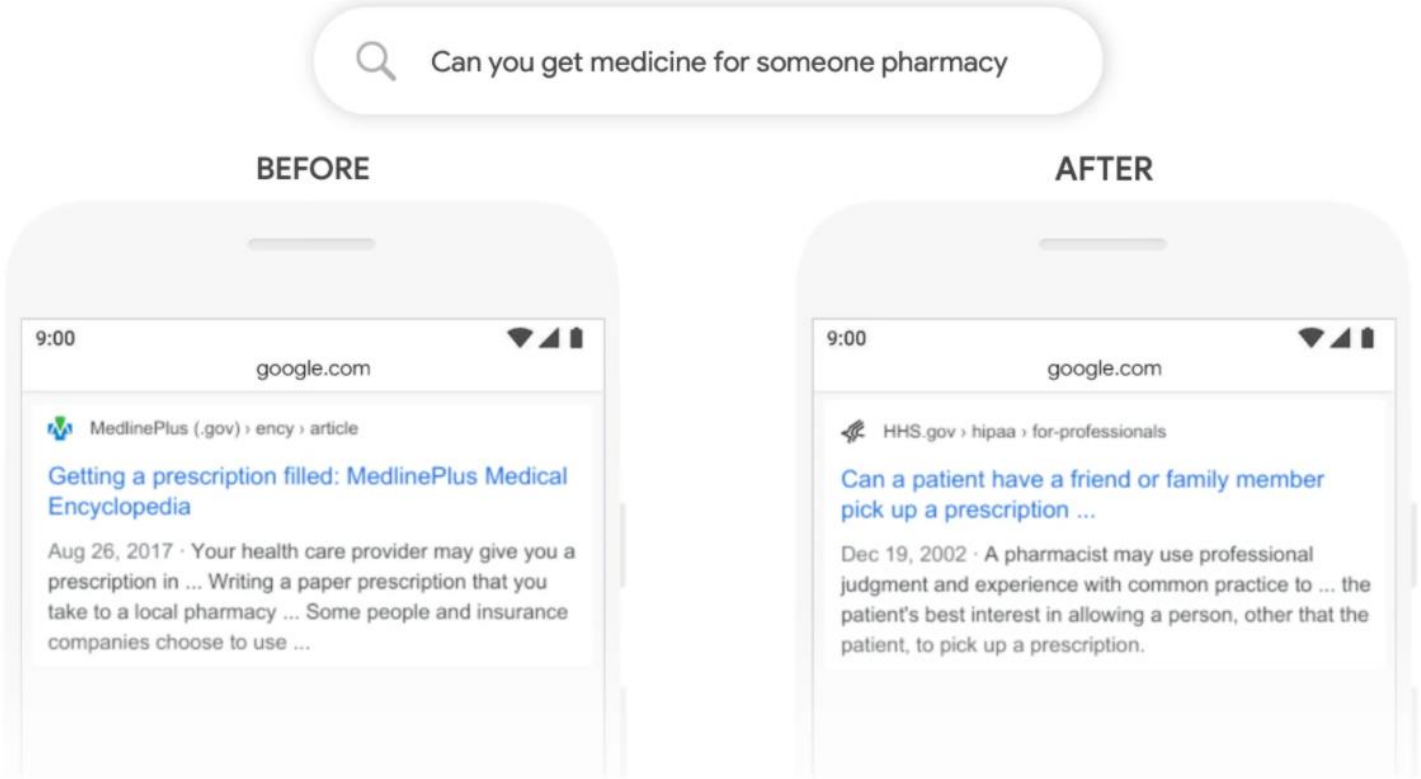
The General Language Understanding Evaluation (GLUE) benchmark is a collection of resources for training, evaluating, and analyzing natural language understanding systems. GLUE consists of:

- A benchmark of nine sentence- or sentence-pair language understanding tasks built on established existing datasets and selected to cover a diverse range of dataset sizes, text genres, and degrees of difficulty,
- A diagnostic dataset designed to evaluate and analyze model performance with respect to a wide range of linguistic phenomena found in natural language, and
- A public leaderboard for tracking performance on the benchmark and a dashboard for visualizing the performance of models on the diagnostic set.

	Rank	Name	Model	URL	Score	CoLA	SST-2	MRPC	STS-B	QQP	MNLI-m	M
	1	DeBERTa Team - Microsoft	DeBERTa / TuringNLRv4		90.8	71.5	97.5	94.0/92.0	92.9/92.6	76.2/90.8	91.9	
	2	HFL iFLYTEK	MacALBERT + DKM		90.7	74.8	97.0	94.5/92.6	92.8/92.6	74.7/90.6	91.3	
+	3	Alibaba DAMO NLP	StructBERT + TAPT		90.6	75.3	97.3	93.9/91.9	93.2/92.7	74.8/91.0	90.9	
+	4	PING-AN Omni-Sinitic	ALBERT + DAAF + NAS		90.6	73.5	97.2	94.0/92.0	93.0/92.4	76.1/91.0	91.6	
	5	ERNIE Team - Baidu	ERNIE		90.4	74.4	97.5	93.5/91.4	93.0/92.6	75.2/90.9	91.4	
	6	T5 Team - Google	T5		90.3	71.6	97.5	92.8/90.4	93.1/92.8	75.1/90.6	92.2	
	7	Microsoft D365 AI & MSR AI & GATECH	MT-DNN-SMART		89.9	69.5	97.5	93.7/91.6	92.9/92.5	73.9/90.2	91.0	
+	8	Huawei Noah's Ark Lab	NEZHA-Large		89.8	71.7	97.3	93.3/91.0	92.4/91.9	75.2/90.7	91.5	

https://gluebenchmark.com/leaderboard

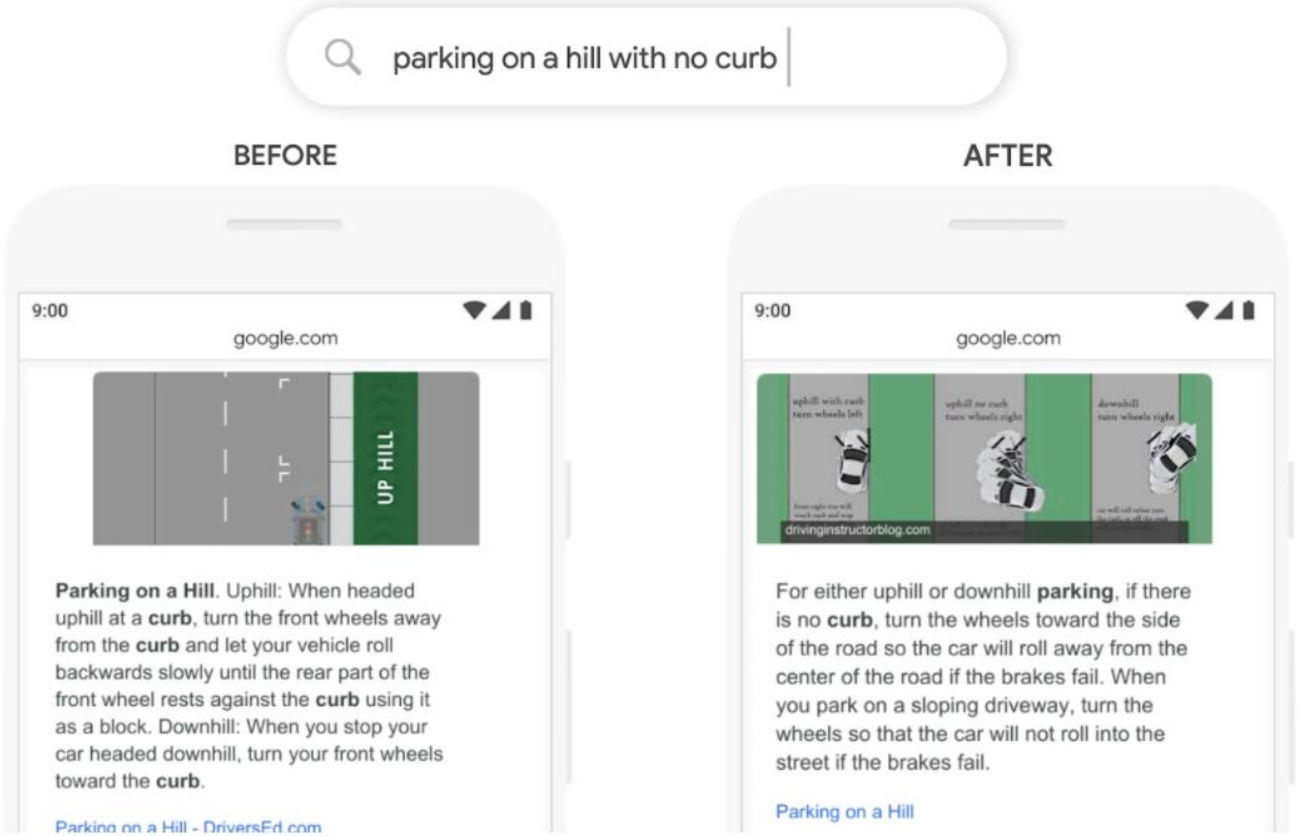
Google Search with BERT (1/3)



"Can you get medicine for someone pharmacy": With the BERT model, we can better understand that "for someone" is an important part of this query, whereas previously we missed the meaning, showing general results about filling prescriptions.

Google: Understanding searches better than ever before, 2019
blog.google/products/search/search-language-understanding-bert/

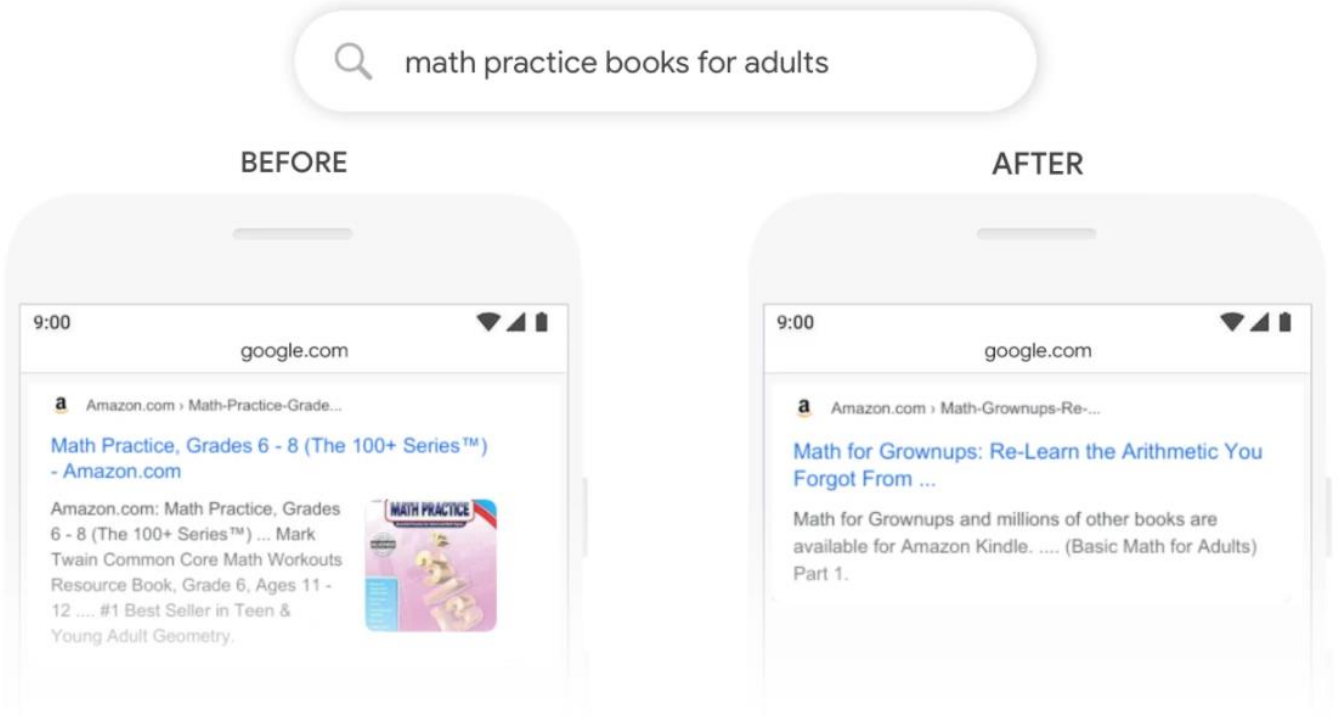
Google Search with BERT (2/3)



"Parking on a hill with no curb": In the past, a query like this would confuse our systems–we placed too much importance on the word "curb" and ignored the word "no", not understanding how critical that word was to appropriately responding to this query. So we'd return results for parking on a hill with a curb!

Google: Understanding searches better than ever before, 2019
blog.google/products/search/search-language-understanding-bert/

Google Search with BERT (3/3)



"math practice books for adults": While the previous results page included a book in the "Young Adult" category, BERT can better understand that "adult" is being matched out of context, and pick out a more helpful result.

Google: Understanding searches better than ever before, 2019
blog.google/products/search/search-language-understanding-bert/