

Deep Learning

Supervised Learning with Artificial Neural Networks

Deep Learning is *Unreasonably Effective*

- Imagine you work in drug discovery and fell asleep for 50 years.
- When you awoke, you learned that:
 - Your colleagues now discover an effective drug for every disease.
 - All drugs are discovered with a single method that you used 50 years ago.
- Deep Learning is rapidly conquering every problem we throw at it!
- However, there are many reasons by Deep Learning should not work:
 - **Neuroscience**: Deep Learning vastly oversimplify the brain.
 - **Statistics**: Deep Learning models are overfit to too few data.
 - **Optimization**: Deep Learning models cannot be trained optimally.

What is Deep Learning?

- Deep Learning uses **Artificial Neural Networks** to learn input/output relationships.
- Artificial Neural Networks are mathematical models inspired by neurons and the brain.
- Different types of Artificial Neural Networks perform specialized tasks:
 - **Multi-Layer Perceptrons**: Classification
 - **Convolutional Neural Networks**: Image recognition and computer vision
 - **Recurrent Neural Networks**: Speech processing and synthesis

What can Deep Learning do?

- Play games

The AI That Has Nothing to Learn From Humans

DeepMind's new self-taught Go-playing program is making moves that other players describe as “alien” and “from an alternate dimension.”

DAWN CHAN OCTOBER 20, 2017



A Go match between AlphaGo and Ke Jie in which the machine came out the alpha (CHINA STRINGER NETWORK / REUTERS)

The Atlantic. <https://www.theatlantic.com/technology/archive/2017/10/alphago-zero-the-ai-that-taught-itself-go/543450/>

What can Deep Learning do?

- Play games
- **Identify faces**

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Facial recognition systems are getting better at recognizing masked faces

New data from NIST shows significant improvement since July

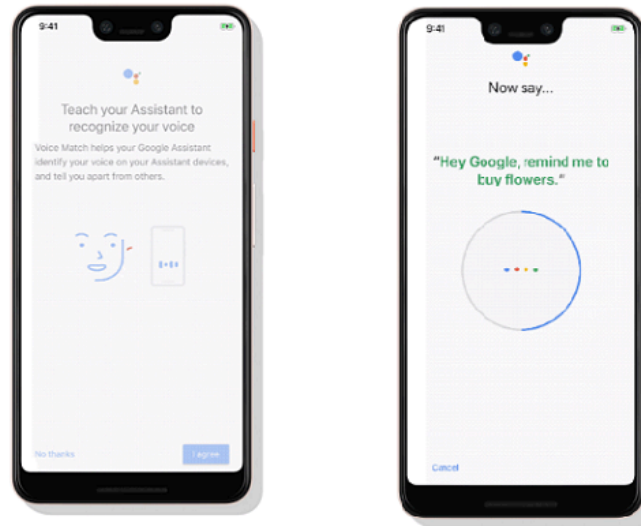
By **Russell Brandom** | Dec 1, 2020, 10:08am EST

What can Deep Learning do?

- Play games
- Identify faces
- **Understand speech**

Google Assistant Can Better Tell Apart Voices After Enhancing Set Up Process

ERIC HAL SCHWARTZ on April 24, 2020 at 9:00 am



Google Assistant will now be able to identify a speaker more accurately than ever before. Google has augmented the Voice Match feature of the AI by adjusting and expanding the setup process to require full sentences from a user.

Voicebot.ai. <https://voicebot.ai/2020/04/24/google-assistant-can-better-tell-apart-voices-after-enhancing-set-up-process/>

What can Deep Learning do?

- Play games
- Identify faces
- Understand speech
- **Drive cars**



Self-driving delivery car hits UK roads as government funds multiple AI vehicle projects

AN ELECTRIC car that can drive itself has hit Britain's roads with the aim of delivering parcels, and experts say it could be a "milestone" for the automotive industry.

By **EDWARD BROWNE**

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What can Deep Learning do?

- Play games
- Identify faces
- Understand speech
- Drive cars
- **Diagnose diseases**

WIRED

TOM SIMONITE

BUSINESS 11.10.2020 07:00 AM

The US Government Will Pay Doctors to Use These AI Algorithms

The artificial intelligence programs can diagnose eye disease in diabetics and complications in stroke patients.

Wired. <https://www.wired.com/story/us-government-pay-doctors-use-ai-algorithms/>

What can Deep Learning do?

- Play games
- Identify faces
- Understand speech
- Drive cars
- Diagnose diseases
- **Fold proteins**

IN DEPTH | STRUCTURAL BIOLOGY

'The game has changed.' AI triumphs at protein folding

Robert F. Service

+ See all authors and affiliations

Science 04 Dec 2020:
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What can Deep Learning do?

- Play games
- Identify faces
- Understand speech
- Drive cars
- Diagnose diseases
- Fold proteins
- **Fight battles**

WIRED

WILL KNIGHT BUSINESS 08.25.2020 08:00 AM

A Dogfight Renews Concerns About AI's Lethal Potential

Alphabet's DeepMind pioneered reinforcement learning. A Maryland company used it to create an algorithm that defeated an F-16 pilot in a simulation.