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Convolutional Neural Networks (CNN) Artificial Neural Networks Deep Learning

Artificial Intelligence Computer Science Machine Learning

#### What are some applications of deep learning?

http://www.wired.com/2014/08/enlitic/

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#### 27 Answers



Nipun Ramakrishnan, Undergraduate Research Assistant at Berkeley Artificial Intelligence Research (2017-present)

Answered Jul 17, 2017 · Upvoted by Anubhav Balodhi (अनुभव बलोघी), inDependent reSeacher at Artificial Neural Networks (2017-present) and Eeshan Jaiswal, MComp Computer Science, University of Sheffield (2022) · Author has **278** answers and **2.7m** answer views

Here's an amazing one I learned about a couple days ago.

#### Deep learning creates fake news.



Researchers at the University of Washington trained a Recurrent Neural Network to make fake videos of former President Obama speaking. The network learned mouth shapes, mannerisms, and timings of his speech after many training examples.

They were able to modify the location in which he made his weekly addresses as well as the times in his life in which he said particular statements.

Perhaps the most astonishing result was that they were also able to change the order of his sentences.

This technology shows the potential of people using deep learning to spread

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Synthesizing Obama: Learning Lip Sync from Audio 🗗

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#### Chomba Bupe, develops machine learning algorithms

Answered Feb 1, 2017  $\cdot$  Author has **1.1k** answers and **3m** answer views

Originally Answered: What are the applications of Deep Learning?

Deep learning (DL) is applied in many areas of artificial intelligence (AI) such as speech recognition, image recognition and natural language processing (NLP) and many more such as robot navigation systems, self-driving cars for example.

#### Let me go a bit deeper:

1. Speech recognition<sup>[1]</sup>: Here the sound waves need to be represented as a spectrogram<sup>[2]</sup>, which is like a time-snapshot of different frequencies and their intensities something like the cochlea in the human hear. This spectrogram is a spatial-temporal signal, thus it varies with time so a typical deep neural network won't do, thus one needs a neural network capable of remembering sequence inputs and thankfully there is such a neural net called the long-short-term-memory (LSTM)<sup>[3]</sup> deep neural network. LSTMs are capable of recognizing sequences of spatial-



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- b. Amazon Echo<sup>[5]</sup>: Also uses deep learning for speech recognition
- 2. Image recognition <sup>[6]</sup>: Image recognition is another interesting area of application. Here images are represented as a 2D array of pixels, each pixel with RGB-channels or grayscale, feed directly into a convolutional neural network (CNN)<sup>[7]</sup> which is trained end-to-end. A CNN consists of alternating layers of convolutions, called convolutional layers, and pooling & subsampling layers. The result is a deep abstract representation of images at the output layer, thus CNNs or convNets are powerful tools for classifying the contents of images. Such networks are behind the success of:
  - a. Google photos<sup>[8]</sup>: Powered by a large scale CNN in the cloud<sup>[9]</sup> running on powerful Google servers with tensor processing units (TPU)<sup>[10]</sup> and developed using TensorFlow <sup>[11]</sup>, a now popular machine learning (ML) library. Google photos basically scans and tags your backed up photos in the cloud automatically so that they are easily accessible and searchable.
  - b. Microsoft How-Old<sup>[12]</sup>: Though not very accurate at determining a persons age from photos, even humans find it difficult to do so.
  - c. Clarifai<sup>[13]</sup>: Another interesting cloud-based image recognition service.
- 3. Natural language processing (NLP)<sup>[14]</sup>: Involves two main challenges:
  - a. Natural language understanding (NLU)<sup>[15]</sup>: Which is different from speech recognition because it is not just about mapping speech to words, it is more about extracting **meaning** from spoken words. In this case this sub-system needs to extract meaning from a conversation just as a real human would. This is such a very hard problem that it is termed AI-hard or AI-complete<sup>[16]</sup> because solving it is like ushering in real AI or what is termed strong-AI.
  - b. Natural language generation (NLG)<sup>[17]</sup>: The natural language understanding is about finding meaning but NLG is about generating language so that the system can respond in a respectable, understandable and contextually correct manner to another intelligent agent, usually a human in a human-computer interface. But to respond, the system needs to somehow crawl through it's knowledge representations effectively and efficiently and be able to formulate a way to respond back. The actual robot voice can then be generated by other generative models, and DeepMind demonstrated WaveNet<sup>[18]</sup> for such tasks.

There also are many more areas of application for DL such as:

• Face detection: In cameras for snapping photos when someone smiles.

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#### **Footnotes**

- [1] Speech recognition Wikipedia 🗹
- [2] Spectrogram Wikipedia 🗹
- [3] Long short-term memory Wikipedia 🗹
- [4] Google Assistant Wikipedia 🗗
- [5] Amazon Echo Wikipedia 🗹
- [6] Computer vision Wikipedia 🗗
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- [17] Natural language generation Wikipedia 💆
- [18] WaveNet: A Generative Model for Raw Audio | DeepMind 🗹

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Kashyap Raval, Passionate about Machine learning

Answered Feb 6, 2017 · Author has 61 answers and 138k answer views

Deep learning excels at identifying patterns in unstructured data, which most people know as media such as images, sound, video and text. Below is a list of sample use cases we've run across, paired with the sectors to which they pertain.

(Open-source, Distributed Deep Learning for the JVM 🖾)

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Clarifai hosts a cloud-based image and video classification system built on deep learning networks. Their visual recognition network took the top five places in the Classification division of the the 2013 ImageNet competition. Clarifai's image tagging system provides solutions in marketing, e-commerce, monitoring user submitted content to identify and eliminate unwanted images, and curating, organizing and accessing image collections of all sizes.

Social media

Automotive, aviation

Gaming, UX, UI

Security, Airports

Telecom, Handset makers

Endpoints, Servers & Mobile Devices 2

#### Healthcare:-

**Image** 

Video

Facial recognition

Image search

Machine vision

Photo clustering

Motion detection

Real-time threat detection

MetaMind ☑ (MetaMind ☑) uses deep learning networks for image recognition and text analysis. Their image recognition software enables ad targeting, prediction of customer preferences and automated data entry using pictures. Their textual analysis software supports identification and tracking of customer sentiment, opinion and attitude monitoring across different online channels, and automated customer service and support. NOTE: Metamind was purchased by Salesforce on April 4 and will be phasing out it's products and customer services over the next two months.

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recognizing, for example, that you might purchase certain things as gifts (and not want the item yourself) or that there might be different family members who have different TV preferences.

- Maybe in Apples Siri
- Microsoft Cortana ☑
- Deep face ☑

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Adelyn Zhou, Bots, AI, and IoT | Entrepreneur, Marketer & World Traveler

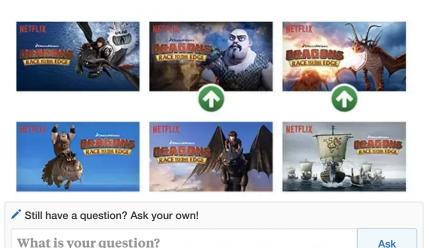
Answered Feb 6, 2017 · Upvoted by Nikhil Badugu, M.S Computer Science & Machine
Learning, Northeastern University

I find it super interesting that companies we use every day such as Netflix, Yelp, Yahoo, etc. all use Machine learning. Sharing from an article originally posted on TOPBOTS . Summarizing here.

## 1) NETFLIX DYNAMICALLY PERSONALIZES LAYOUTS & MOVIE THUMBNAILS

In 2009, the Netflix awarded their \$1 million Netflix Prize ☐ in an open competition for external programming teams to improve upon the company's internal ratings prediction system. The winning team beat the original algorithm by over 10%.

Since then, the introduction of more advanced machine learning algorithms allows Netflix to achieve new levels of prediction and personalization in rankings, layout, catalog, new member onboarding, and more. Tony Jebara , Director at Netflix and Professor of Computer Science at Columbia, explained at REWORK's Deep Learning Summit in SF how Netflix not only recommends better movies, but predicts better thumbnail images for each individual user.



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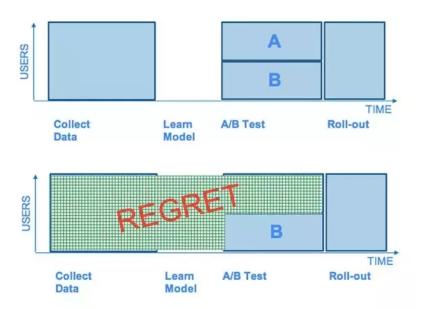
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variants of your test. This loss of experience is called "regret."



To minimize regret, Netflix employs modern explore / exploit methodologies such as the multi-arm bandit model . Such models are able to shift traffic to the best performing creatives dynamically during a test and mathematically reduce regret.

What counts as "better" differs between people, so Netflix also takes into account your consumption profile to perform personalized explore / exploit optimization. If you often watch comedy, they'll use Robin Williams for the cover of Good Will Hunting. If you love romantic chick flicks, they'll feature Matt Damon kissing Minnie Driver instead.

#### 2) YELP SURFACES THE MOST BEAUTIFUL PHOTOS FOR ANY VENUE

A picture is worth a thousand words. When you're trying to pick a romantic spot that will impress your OKCupid date, you'll want to know if the food is plated nicely and the ambience sets the right mood. To help you make the right restaurant choices, Alex Miller and his team at Yelp employed deep learning algorithms to highlight the best user photographs.

While metrics such as number of likes and clickthroughs can be useful to evaluate photos, they can also be thrown off by clickbait or happenstance. A better solution would be to judge a photo based on inherent content and characteristics − such as depth of field, contrast, and alignment − but with 25 million MAU (monthly active users) uploading thousands of photos to Yelp every day, no staff of human evaluators would suffice.

In addition to the photo quality score, the team also added strategic filters and diversification logic, so that a restaurant famous for a particular dish or feature wouldn't have their top 10 photo results all be of the same subject.



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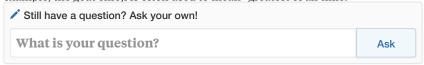
#### 3) YAHOO ENSURES YOU PICK THE BEST EMOJI FOR ANY SITUATION

For lazy texters, emojis are the easiest way to say so much with so little. But with over 1,800 possible emoji choices, how can you be sure you're picking the perfect one for exactly what you want to say?

This is the problem Stacey Svetlichnaya , a machine learning engineer at Yahoo, aims to solve. When a user composes or responds to a message, what emojis should show up in the autocomplete suggestions? Ideally you want to predict the top five emojis that a user is likely to select.



Emoji usage is highly dynamic. Some are used to replace words with images, others are used to express emotion, and yet more have bizarre cultural uses. For example, the goat emoji is often used to mean "greatest of all time."



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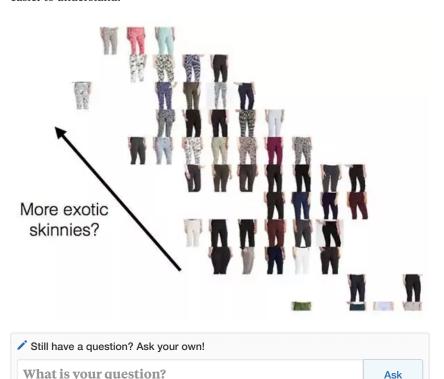


#### 4) STITCHFIX FINDS YOU THE PERFECT FASHION FASTER

Moody is a Data Scientist at StitchFix with a background in statistics, astrophysics, and high-performance computing. Turns out these nerdy skills are now in-demand in the fashion world.

Many deep learning models are opaque black boxes where you can't easily understand why an algorithm came to a particular conclusion. Moody's research focuses on improving model interpretability so that human experts can give feedback on the relative performance of the algorithms.

One method is to use t-SNE (t-distributed stochastic neighbor embedding ), a dimensionality reduction method that helps visualize similar objects. Many deep learning models use high-dimensional data which is impossible for a human to conceptualize. Dimensionality reduction methods flatten complicated data into two or three dimensional scatter plots that are much easier to understand.



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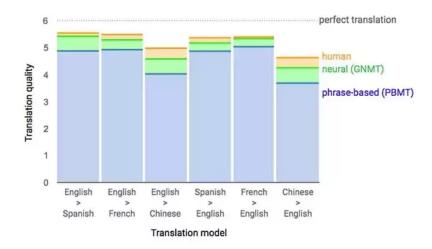


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Translate leveraged a statistical method called phrase-based machine translation (PBMT  $\square$ ) which breaks sentences into words and phrases to be translated separately.

The new GNMT (Google Neural Machine Translation ) system uses RNNs (recurrent neural networks ) to map entire input sentences in one language to an output sentence in another language. This reduces code complexity while maintaining speed and improving performance. In some cases, such as French to English, the GNMT architecture is closing in on human translators.



If you want to understand the technical evolution of the GNMT and how Google's team iteratively improved upon the design and performance, read Stephen Merity's visual guide 2 to the process.

More details in Mariya's original article on TOPBOTS ☑.

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#### Andrea Maria, Business Development Executive

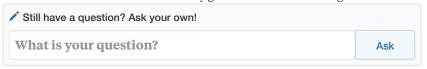
Updated Jun 14, 2018 · Upvoted by Anubhav Balodhi (अनुभव बलोघी), in<u>Dependent</u> reSeacher at Artificial Neural Networks (2017-present) · Author has **99** answers and **79.7k** answer views

**Deep learning** is a subdivision of machine learning in Artificial Intelligence that has networks which are capable of learning unsupervised from unstructured data. Deep learning also known as Deep Neural Learning or Deep Neural Network.

Application of deep learning is excitement around artificial intelligence, machine learning at the moment. It is also an amazing opportunity to get on the ground floor of some really powerful tech.

This post contains amazing and recent applications of deep learning that will inspire to get started in deep learning.

In this post mainly focused on visual examples because we can look at screenshots and videos to immediately get an idea of what the algorithm is



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#### » SafaMAH, Content Writer at Bigclasses

Answered Mar 6, 2018 · Author has 87 answers and 45.1k answer views

#### Examples of Deep Learning

You must have the term "**Deep Learning** Deep Learning Temperature" many times across any tech talks whether in the news, newspaper and Facebook and Instagram Timeline. So what is it? Why is this term constantly appearing here and there? Why is the world so interested in it?

Deep Learning is a discipline of the Data Scientist Training Program. It is an advanced form of **Artificial Intelligence**, where this **Deep Learning** is designed to self-learn the human actions and behavior. Another form such as the Machine Learning isn't independent but dependent on the algorithms taught to it. Deep Learning involves the AI that acts on an input given by the other AI. So, where is Deep Learning used? These may be complex with large volumes of Machine Learning. What are the common examples of the Deep Learning?

#### Speech Recognition

The AI is designed to learn all the languages. It understands the languages and differentiates them. If the person speaks English, the AI understands that the person speaking in English, and therefore, responds in English itself.

If a person speaks English says, "What is Hello in French", the AI responds, "Bonjour".



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#### Self-Driving Car

The vehicles are designed to understand the street it is moving on. This again takes a large amount of data. The Google Map is one of the examples. If you are street number 1, the Google may ask you to go to Street 2 by describing the directions in detail. This only happens when you set a location.

If you have set the location to any place, say Pizza Hut, Google map first looks at all the nearby Pizza Hits and gives you the details. When you choose the direction, it first locates your position and guides you to the nearest Pizza Hut.

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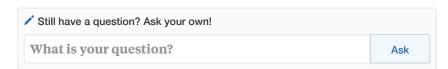
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#### Robotics 🗹

Nowadays, we have different kinds of robots, such as the Dog robot. The dog robot acts just like a Dog. It will bark, it will growl, it can jump, and etc. These robots again use the AI to understand the behaviour of the Dog.

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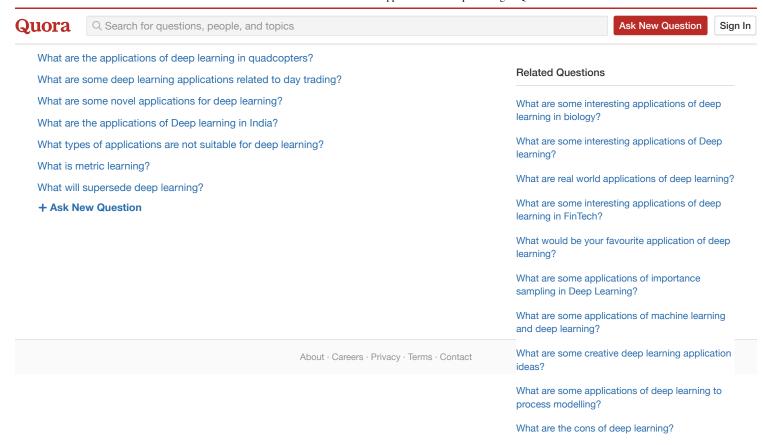
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