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Домашнее чтение
«Что такое нейронные сети и для чего они нам нужны» («What are neural networks and what do we need them for»)

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For a long time, people have been thinking on how to create a computer that could think like a person. The **advent** of artificial neural networks is a significant step in this direction. Our brain consists of neurons that receive information from sensory organs and process it: we recognize people we know by their faces, and we feel hungry when we see delicious food. All of this is the result of brain neurons working and interacting with each other. This is also the principle that artificial neural networks are based on, simulating the processes occurring in the human brain.

advent – пришествие

Artificial neural networks are a software code that imitates the work of a brain and is capable of self-learning. Like a biological network, an artificial network also consists of neurons, but they have a simpler structure.

If you connect neurons into a sufficiently large network with controlled interaction, they will be able to perform quite complex tasks. For example, determining what is shown in a picture, or **independently** creating a photorealistic image based on a text description.

independently – самостоятельно

An artificial neuron receives signals through several inputs, then transforms them and transmits them to other neurons. That is, the work of a neuron is to convert several parameters into one.

For instance, a neural network is trying to determine if there is an image of a **tabby** cat in a picture. It has already processed hundreds of thousands of cat photos and knows that the color of their coat is a combination of certain shades, such as black, silver and **brindle**. Signals are sent to the neuron that these three colors are **predominant** in the image, which means that, most likely, there is a cat in it. Next, the neural network checks if the picture has eyes, ears, and a tail. If all four factors match, it can state with confidence that the image is that of a cat.

tabby – полосатый

brindle – тигровый (светло бурый)
predominant – преобладают

In a very simplified way, the operational scheme of a neural network is like this. Imagine that for each “yes” answer we get 1 point, and for “no” we get 0 points. If, after verification, the neural network gets 4 points, it is totally confident that there is an image of a cat in the picture. If the result is 2-3 points, there is a high probability that the cat is there, but it might have hidden its tail. If the result is 1-0 points, then there is definitely no cat in the picture. Or it has hidden well.

Neural networks help people **to get rid of** monotonous routine work by doing it much faster for them. For example, unmanned vehicles are being developed based on neural networks, which can free drivers from actual driving in the near future. People will be able to work, study or have fun on the road instead of monitoring the traffic situation. Neural networks in the Moscow metro are used when paying the ticket fee through one’s biometric data and when searching for people who are on the federal wanted list.

to get rid of – освободиться от

Neural networks are also used for forecasting, image recognition, controlling, recognition of hidden patterns in a large amount of data, as well as for solving tasks **related** to artificial intelligence, machine and deep learning.

related – связанные

Depending on the task that a neural network performs, it can be classified into one of the five types:

1. Classification. A neural network recognizes a person by their face or determines what is shown in the picture. For example, the Google neural net can identify what you are

drawing with your mouse on a canvas.

2. Regression. A neural network can predict **growth of stocks**, the value of real estate or a person's age based on a photo. A neural net determining gender based on a photo will help to avoid mistakes when filling out documents.
3. **Time series** forecasting. A neural network makes forecasts of weather, price rises or electricity consumption. This also includes neural networks that control unmanned vehicles. They predict the behavior of other road users based on analyzing millions of hours of **dashcam** recordings.
4. Clustering. A neural network combines large amounts of data into groups according to certain criteria. The DeepCluster neural network arranges photos by subject: sunsets, planes, forest and buses.
5. Generation. A neural network creates music, images, video or text according to the given parameters. The Yandex neural net not only creates poems from user search queries, but also reads them aloud.

The main advantage of neural networks is their ability to self-learn. If we return to the example of finding a cat in a photo, then, after confusing it several times with a fox, a neural network will conclude that **pointed** ears is not the most specific attribute of a cat. And then it will start giving not 1, but 0.5 points for the answer "yes". A well-trained neural network can recognize data that was not in the training set, as well as corrupt or incomplete data. For example, it will recognize a cat in a photo, even if only part of its face is visible.

Neural networks can learn in three ways:

1. **Supervised** learning. A person trains a neural network using a ready-made set of data. For instance, a selection of photos in which people have their gender and age specified. Based on those data, the neural network on its own begins to determine the parameters of a photo.
2. Unsupervised learning. This algorithm allows you to go without ready-made data. The neural network itself will verify its analysis for accuracy. If it is insufficient, the neural network will repeat the procedure.
3. **Reinforced** learning. A model in which a neural network is reinforced when it obtains a positive result and is **penalized** for incorrect calculations.

Neural networks only seem to be complicated and confusing, but in fact this technology has already **acquired** many auxiliary tools that help even entry-level programmers to create neural networks of their own. For example, hundreds of libraries have been written in Python, allowing one to deploy a ready-made neural network on their computer and to train it **in line** with the parameters needed.

growth of stocks – рост акций

time series – временные ряды

dashcam – видеорегистратор

pointed – заостренные

supervised – контролируемое

reinforced – усиленное

penalized – штрафуется

acquired – приобрела

in line – в соответствии

Реферат

Эта статья посвящена технологии нейронных сетей.

Данная технология основывается на принципе работы человеческого мозга, состоящего из нейронов, которые получают информацию от органов и затем ее обрабатывают.

Нейросеть способна к самообучению и имеет более простую структуру нейронов. Если соединить множество последних в большую сеть, то она сможет выполнять достаточно сложные задачи.

Искусственный нейрон получает сигналы от различных входов, переводит информацию и затем передает ее следующим нейронам.

Так, обработав множество изображений, а также исходя из запомненных комбинаций теней, нейронная сеть способна с некой долей вероятности определить, присутствует ли на данной картинке кот. Проще говоря, за каждый полученный во время обработки верный ответ программа набирает баллы и по их сумме выводит соответствующее заключение.

Нейросети могут освободить людей от монотонной рутиной работы, выполняя ее за них гораздо быстрее. Они применяются в системах биометрической оплаты и поиска разыскиваемых людей в Московском метро.

Нейронные сети могут решать 5 типов задач:

1. Классификация,
2. Регрессия,
3. Предсказание временных рядов,
4. Кластеризация,
5. Генерация.

Главным преимуществом нейронных сетей является их способность к самообучению. Таким образом, ошибившись несколько раз в одном признаке, сеть будет начислять за ее присутствие меньшее количество баллов.

Существует 3 способа обучения нейронных сетей:

1. Контролируемое,
2. Неконтролируемое,
3. Усиленное.

Данная технология лишь кажется сложной. На самом деле уже существует множество инструментов, позволяющих даже начинающим программистам создавать собственные нейросети.

Данная статья может быть полезна тем, кто хочет понять принцип работы нейронных сетей.

Abstract

This article is about neural networks.

This technology is based on human brain simulating and capable of self-training and performing complex tasks.

An artificial neuron receives signals through several inputs, transforms them and transmits result to other neurons.

For instance, a neural network, that has processed thousands of cat photos and knows required shade combinations, can determine if there is an image of the animal. In simple terms, it collects points for positive answers and summarize it.

Neural networks can help people to get rid of routine work by doing it faster for them.

There are 5 types of tasks the networks perform:

1. Classification,

2. Regression,
3. Time series forecasting,
4. Clustering,
5. Generation.

The main advantage of neural networks is self-learning, according to which they decrease points for positive answers in case of an errors.

There are 3 ways of learning:

1. Supervised,
2. Unsupervised,
3. Reinforced.

This technology is quite affordable. There are many tools even for entry-level programmers.

This article may be useful for those, who want to understand neural networks.

Questions

1. How does human brain perform?
2. What is the principle that neural networks are based on?
3. What is a neural network?
4. How does an artificial neuron work?
5. How does a neural network determine if there is an image of certain object?
6. What does a neural network do with positive answers during picture processing?
7. What is the relation between collected points and confidence in an answer?
8. How can neural networks help people to get rid of routine work?
9. What can free drivers in the near future?
10. What do neural networks do in the Moscow metro?
11. How can neural networks be classified depending on their tasks?
12. What is the main advantage of neural networks?
13. How can the points for positive answers be modified?
14. What is the ways of neural networks learning?
15. Why are neural networks not so complicated?