

Neural Networks Simply Calculated With Numerical Examples

Neural networks have gained significant attention in recent years due to their ability to mimic the human brain's learning process. This article aims to provide a comprehensive understanding of neural networks by using numerical examples to simplify complex concepts. Whether you are new to the field or want to refresh your knowledge, this guide will help you grasp the fundamentals of neural networks.

to Neural Networks

Neural networks, often referred to as artificial neural networks (ANN), are computational models inspired by the biological neural networks found in the brain. Just like the brain, neural networks consist of interconnected nodes called neurons or artificial neurons. These neurons process and transmit information throughout the network, enabling the system to learn and make decisions.

Neural networks are widely used in various fields, including image recognition, speech synthesis, natural language processing, and even financial forecasting. Understanding how they work is crucial for anyone interested in the world of machine learning and artificial intelligence.

Neural networks simply calculated with numerical examples!: Networks calculated

by Óscar Ocaña Parrón([Print Replica] Kindle Edition)

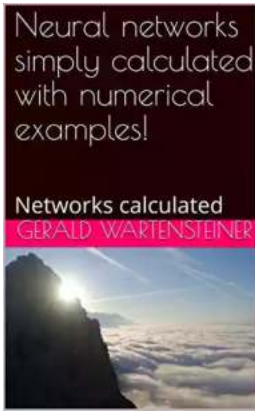
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The Basic Structure of a Neural Network

A typical neural network consists of three main components:

- **Input Layer:** The input layer receives the initial data that the neural network will process.
- **Hidden Layers:** Hidden layers are the intermediary layers between the input and output layers. These layers perform complex calculations to extract relevant features from the input data.
- **Output Layer:** The output layer produces the final result or predictions based on the information processed by the hidden layers.

Calculating Neural Networks - A Step-by-Step Approach

Now, let's dive into the calculation process of a neural network using numerical examples to make it easier to understand. We will focus on a simple feedforward neural network, which is one of the most common types.

Step 1: Initialization

First, we need to initialize the neural network by setting up the appropriate number of neurons in each layer and assigning random weights to the connections between neurons. These weights will be updated during the learning process.

Step 2: Forward Propagation

In this step, the neural network processes the input data by propagating it forward through the layers. Each neuron receives inputs from the previous layer, multiplies them by the corresponding weights, and applies an activation function to produce an output.

Let's consider a simple example where we want to predict whether a person will like a movie or not based on two features: the duration of the movie (in minutes) and the genre (represented by a numeric code). We have an input layer with two neurons, and a single output layer with one neuron indicating the likelihood of liking the movie.

The first neuron in the input layer takes the duration of the movie as input, while the second neuron takes the genre code. Each neuron is connected to the output neuron with weighted connections.

Step 3: Activation Function

Activation functions determine the output of each neuron. They introduce non-linearities into the network, allowing it to learn complex patterns. Common activation functions include the sigmoid function, ReLU (Rectified Linear Unit), and Tanh (Hyperbolic Tangent).

In our example, let's use the sigmoid function as the activation function for the output neuron. The sigmoid function maps the weighted sum of inputs to a value

between 0 and 1, representing the probability of liking the movie. The closer the output is to 1, the higher the likelihood of liking the movie.

Step 4: Error Calculation

Once the neural network produces an output, we need to compare it with the actual desired output to calculate the error. This error represents the discrepancy between the predicted value and the true value.

For instance, if the target output is 1 (indicating a person likes the movie) but the neural network predicts 0.8, the error would be 0.2. This error is used to adjust the weights and improve the network's performance.

Step 5: Backpropagation and Weight Update

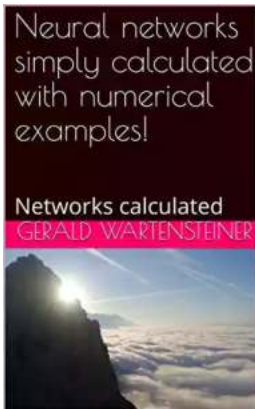
Backpropagation is the process of propagating the error backward through the network to update the weights. It calculates the gradient of the error with respect to the weights, allowing for weight adjustments that minimize the error.

By iteratively performing forward propagation, error calculation, and backpropagation, the neural network gradually improves its predictions. This iterative process is often referred to as training or learning.

Neural networks might seem intimidating at first glance, but with a solid understanding of their foundational concepts and calculations, they become more accessible. This article provided a step-by-step approach to calculating neural networks, using numerical examples to simplify the explanations.

Remember, neural networks are powerful tools with immense potential in various applications. Whether you are interested in computer vision, natural language processing, or any other field harnessing the capabilities of artificial intelligence, understanding neural networks is essential.

So, take the time to dive deeper into this fascinating field and start experimenting with neural networks. The possibilities are endless!



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Neural networks simply calculated with numerical examples!

The author gave himself to this complex subject with interest and curiosity.

Unfortunately, NUMBER EXAMPLES are in the specialist literature hard to find.

This book is intended to close this gap.

Simple Numerical examples are calculated step by step. Thereby the procedure becomes "self-explanatory".

Actually, "anyone" who understands simple calculations can also understand how a neural network works.

Neural networks simply calculated with numerical examples

That is the title of this book.

BECAUSE

“Gray, dear friend, is all theory and green the golden tree of life”
(Johann von Wolfgang von Goethe)

With this in mind, I would like to invite the valued reader
with me a journey into the "realm of neural networks" to start.

Questions after questions:

What can a neural network do?

What does a neural network calculate?

How is that calculated?

How can you program a neural network?

A very simple "perceptron" and a small neuronal Back propagation
network are presented.

The "error correction in reverse gear" is the author in Detail
carried out step by step.

Every arithmetic step becomes understandable through the "NUMBER
EXAMPLES".

Furthermore, the forecasting method according to Holt
is also briefly presented, which fits well with
the topic "forecasting and previewing data series".

This book is also an "artistic" work in the broadest sense
Senses and thus completely incomplete.

The author did “EVERYTHING” and the examples programmed
in a simple classic programming language.

The author also does not want to make any money with this book, this book was written “exclusively” for the fun and enjoyment of the topic.

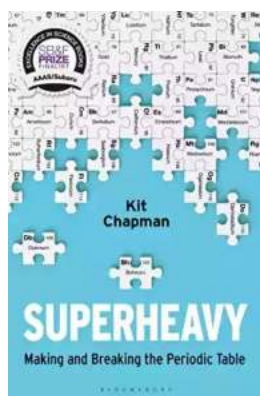
Ing. Gerald Wartensteiner

The author from Austria apologizes for any translation errors caused by the translation program and hope these mistakes are funny



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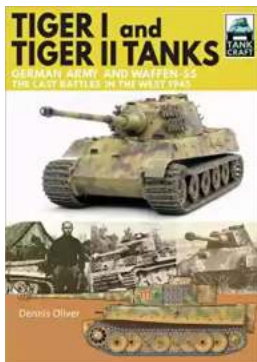
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