

ARTIFICIAL NEURAL NETWORK

Artificial neural networks (ANN) is computing systems inspired by the biological neural networks that constitute animal brains. The neural network itself is not an algorithm, but rather a framework for many different machine learning algorithms to work together and process complex data inputs. Such systems "learn" to perform tasks by considering examples, generally without being programmed with any task-specific rules.

An artificial neural network is a network of simple elements called artificial neurons, which receive input, change their internal state according to that input, and produce output depending on the input and activation. An artificial neuron mimics the working of a biophysical neuron with inputs and outputs, but is not a biological neuron model.

ANNs have the ability to learn and model non-linear and complex relationships, which is really important because in real-life, many of the relationships between inputs and outputs are non-linear as well as complex. ANNs can generalize - after learning from the initial inputs and their relationships, it can infer unseen relationships on unseen data as well, thus making the model generalize and predict on unseen data.

In common ANN implementations, the signal at a connection between artificial neurons is a real number, and the output of each artificial neuron is computed by some non-linear function of the sum of its inputs. The connections between artificial neurons are called 'edges'. Artificial neurons and edges typically have a weight that adjusts as learning proceeds. The weight increases or decreases the strength of the signal at a connection. Artificial neurons may have a threshold such that the signal is only sent if the aggregate signal crosses that threshold. Typically, artificial neurons are aggregated into layers. Different layers may perform different kinds of transformations on their inputs. Signals travel from the first layer (the input layer), to the last layer (the output layer), possibly after traversing the layers multiple times.

The original goal of the ANN approach was to solve problems in the same way that a human brain would. However, over time, attention moved to performing specific tasks, leading to deviations from biology. Artificial neural networks have been used on a variety of tasks:

1. computer vision;
2. speech recognition;

3. machine translation;
4. social network filtering;
5. medical diagnosis.

From the point of view of machine learning, a neural network is a special case of recognition method, discriminant analysis, clustering methods, etc.

From a mathematical point of view, learning neural networks is a multiparameter problem of nonlinear optimization.

From the point of view of cybernetics, the neural network is used in problems of adaptive control and as algorithms for robotics.

From the point of view of the development of computing and programming, the neural network is a way to solve the problem of efficient parallelism.

And from the point of view of artificial intelligence, ANN is the basis of the philosophical course of connectivism and the main direction in the structural approach for studying the possibility of building (modeling) natural intelligence using computer algorithms.

Conclusion. Artificial Neural Network is a multi-purpose tool that deserves further development. The development of this technology will bring humanity to technical progress.