

Learning Machine Translation Neural Information Processing Series

Neural network (machine learning)

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In machine learning, a neural network (also artificial neural network or neural net, abbreviated ANN or NN) is a computational model inspired by the structure and functions of biological neural networks.

A neural network consists of connected units or nodes called artificial neurons, which loosely model the neurons in the brain. Artificial neuron models that mimic biological neurons more closely have also been recently investigated and shown to significantly improve performance. These are connected by edges, which model the synapses in the brain. Each artificial neuron receives signals from connected neurons, then processes them and sends a signal to other connected neurons. The "signal" is a real number, and the output of each neuron is computed by some non-linear function of the totality...

Conference on Neural Information Processing Systems

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formerly NIPS) is a machine learning and computational neuroscience

The Conference and Workshop on Neural Information Processing Systems (abbreviated as NeurIPS and formerly NIPS) is a machine learning and computational neuroscience conference held every December. Along with ICLR and ICML, it is one of the three primary conferences of high impact in machine learning and artificial intelligence research.

The conference is currently a double-track meeting (single-track until 2015) that includes invited talks as well as oral and poster presentations of refereed papers, followed by parallel-track workshops that up to 2013 were held at ski resorts.

Outline of machine learning

Conference on Neural Information Processing Systems (NIPS) ECML PKDD International Conference on Machine Learning (ICML) ML4ALL (Machine Learning For All)

The following outline is provided as an overview of, and topical guide to, machine learning:

Machine learning (ML) is a subfield of artificial intelligence within computer science that evolved from the study of pattern recognition and computational learning theory. In 1959, Arthur Samuel defined machine learning as a "field of study that gives computers the ability to learn without being explicitly programmed". ML involves the study and construction of algorithms that can learn from and make predictions on data. These algorithms operate by building a model from a training set of example observations to make data-driven predictions or decisions expressed as outputs, rather than following strictly static program instructions.

Machine learning

*Conference on Neural Information Processing Systems (NeurIPS) Automated machine learning -
Process of automating the application of machine learning Big data -*

Machine learning (ML) is a field of study in artificial intelligence concerned with the development and study of statistical algorithms that can learn from data and generalise to unseen data, and thus perform tasks without explicit instructions. Within a subdiscipline in machine learning, advances in the field of deep learning have allowed neural networks, a class of statistical algorithms, to surpass many previous machine learning approaches in performance.

ML finds application in many fields, including natural language processing, computer vision, speech recognition, email filtering, agriculture, and medicine. The application of ML to business problems is known as predictive analytics.

Statistics and mathematical optimisation (mathematical programming) methods comprise the foundations of...

Deep learning

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In machine learning, deep learning focuses on utilizing multilayered neural networks to perform tasks such as classification, regression, and representation learning. The field takes inspiration from biological neuroscience and is centered around stacking artificial neurons into layers and "training"

them to process data. The adjective "deep" refers to the use of multiple layers (ranging from three to several hundred or thousands) in the network. Methods used can be supervised, semi-supervised or unsupervised.

Some common deep learning network architectures include fully connected networks, deep belief networks, recurrent neural networks, convolutional neural networks, generative adversarial networks, transformers, and neural radiance fields. These architectures have been applied to fields...

Machine translation

have since been superseded by neural machine translation and large language models. The origins of machine translation can be traced back to the work

Machine translation is use of computational techniques to translate text or speech from one language to another, including the contextual, idiomatic and pragmatic nuances of both languages.

Early approaches were mostly rule-based or statistical. These methods have since been superseded by neural machine translation and large language models.

Convolutional neural network

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A convolutional neural network (CNN) is a type of feedforward neural network that learns features via filter (or kernel) optimization. This type of deep learning network has been applied to process and

make predictions from many different types of data including text, images and audio. Convolution-based networks are the de-facto standard in deep learning-based approaches to computer vision and image processing, and have only recently been replaced—in some cases—by newer deep learning architectures such as the transformer.

Vanishing gradients and exploding gradients, seen during backpropagation in earlier neural networks, are prevented by the regularization that comes from using shared weights over fewer connections. For example, for each neuron in the fully-connected layer, 10,000 weights would...

Recurrent neural network

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In artificial neural networks, recurrent neural networks (RNNs) are designed for processing sequential data, such as text, speech, and time series, where the order of elements is important. Unlike feedforward neural networks, which process inputs independently, RNNs utilize recurrent connections, where the output of a neuron at one time step is fed back as input to the network at the next time step. This enables RNNs to capture temporal dependencies and patterns within sequences.

The fundamental building block of RNN is the recurrent unit, which maintains a hidden state—a form of memory that is updated at each time step based on the current input and the previous hidden state. This feedback mechanism allows the network to learn from past inputs and incorporate that knowledge into its current...

Google Neural Machine Translation

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Google Neural Machine Translation (GNMT) was a neural machine translation (NMT) system developed by Google and introduced in November 2016 that used an artificial neural network to increase fluency and accuracy in Google Translate. The neural network consisted of two main blocks, an encoder and a decoder, both of LSTM architecture with 8 1024-wide layers each and a simple 1-layer 1024-wide feedforward attention mechanism connecting them. The total number of parameters has been variously described as over 160 million, approximately 210 million, 278 million or 380 million. It used WordPiece tokenizer, and beam search decoding strategy. It ran on Tensor Processing Units.

By 2020, the system had been replaced by another deep learning system based on a Transformer encoder and an RNN decoder.

GNMT...

Transformer (deep learning architecture)

In deep learning, transformer is a neural network architecture based on the multi-head attention mechanism, in which text is converted to numerical representations

In deep learning, transformer is a neural network architecture based on the multi-head attention mechanism, in which text is converted to numerical representations called tokens, and each token is converted into a vector via lookup from a word embedding table. At each layer, each token is then contextualized within the scope of the context window with other (unmasked) tokens via a parallel

multi-head attention mechanism, allowing the signal for key tokens to be amplified and less important tokens to be diminished.

Transformers have the advantage of having no recurrent units, therefore requiring less training time than earlier recurrent neural architectures (RNNs) such as long short-term memory (LSTM). Later variations have been widely adopted for training large language models (LLMs) on large...

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