Data Augmentation In Deep Learning

Machine learning in earth sciences machines. The range of tasks to which ML (including deep learning) is applied has been ever-growing in recent decades, as has the development of other technologies 9cb1a03876

Data augmentation Data augmentation has important applications in Bayesian analysis, and the technique is widely used in machine learning to reduce overfitting when training machine learning models, achieved by training models on several slightly-modified copies of existing data. Data augmentation has important applications Data augmentation is a statistical technique which allows maximum likelihood estimation from incomplete data. Data augmentation is a statistical technique which allows maximum likelihood estimation from incomplete data 9cb1a03876

Outline of deep learning provided as an overview of, and topical guide to, deep learning: Deep learning is a subfield of machine learning and artificial intelligence based on artificial 9cb1a03876

Representation learning Labeled In machine learning (ML), representation learning or feature learning is a set of techniques that allow a system to automatically discover the representations needed for feature detection or classification from raw data. Feature learning can be either supervised, unsupervised, or self-supervised: In supervised feature learning, features are learned using labeled input data. This replaces manual feature engineering and allows a machine to both learn the features and use them to perform a specific task 9cb1a03876

Feature learning is motivated by the fact that ML tasks such as classification often require input that is mathematically and computationally convenient to process. However, real-world data, such as image, video, and sensor data, have not yielded to attempts to algorithmically define specific features. An alternative is to discover such features or representations through examination, without relying on explicit algorithms. 9cb1a03876 Self-supervised learning has produced promising results in... 9cb1a03876 During SSL, the model learns in two steps. First, the task is solved based on an auxiliary or pretext classification task using pseudo-labels, which help to initialize the model parameters. Next, the actual task is performed with supervised or unsupervised learning. 9cb1a03876 == Synthetic oversampling techniques for traditional machine learning == 9cb1a03876

Neural network (machine learning) Topological deep learning, introduced in 2017, integrates topology with deep neural networks to address high-order data. Initially rooted in algebraic topology 9cb1a03876

Hyperparameter (machine learning) Florian; Wiles, Olivia; Mann, Timothy (2021). "Claesen. Advances in Neural Information Processing Systems. "Data Augmentation Can Improve Robustness" 9cb1a03876

Synthetic Minority Over-sampling Technique (SMOTE) is a method used to address imbalanced datasets in machine learning. In such datasets, the number of samples in different classes varies significantly, leading to biased model performance. For example, in a medical diagnosis dataset with 90 samples representing healthy individuals and only 10 samples representing individuals with a particular disease, traditional algorithms may struggle to accurately classify the minority class. SMOTE rebalances the dataset by generating synthetic samples for the minority class. For instance, if there are 100 samples in the majority class and 10 in the minority class, SMOTE can create synthetic samples by randomly selecting a minority class sample and its nearest... 9cb1a03876

Deep Learning Super Sampling Deep Learning Super Sampling (DLSS) is a suite of real-time deep learning image enhancement and upscaling technologies developed by Nvidia that are available 9cb1a03876

Ontology learning Ontology learning (ontology extraction, ontology augmentation generation, ontology generation, or ontology acquisition) is the automatic or semi-automatic 9cb1a03876

Self-supervised learning This augmentation can involve introducing noise, cropping, rotation, or other transformations. SSL tasks are designed so that solving them requires capturing essential features or relationships in the data. In the context of neural networks, self-supervised learning aims to leverage inherent structures or relationships within the input data to create meaningful training signals. The input data is typically augmented or transformed in a way that creates pairs of related samples, where one sample serves as the input, and the other is used to formulate the supervisory signal.

Self-supervised learning more closely imitates the way humans learn to classify objects. Self-supervised learning (SSL) is a paradigm in machine learning where a model is trained on a task using the data itself to generate supervisory signals Self-supervised learning (SSL) is a paradigm in machine learning where a model is trained on a task using the data itself to generate supervisory signals, rather than relying on externally-provided labels 9cb1a03876

Feature learning can be either supervised, unsupervised, or self-supervised: 9cb1a03876 Early forms of neural networks were inspired by information processing and distributed... 9cb1a03876

Deep learning The adjective "deep" refers to the use of multiple layers (ranging from three to several hundred or thousands) in the network. In machine learning, deep learning (DL) focuses on utilizing multilayered neural networks to perform tasks such as classification, regression, and representation In machine learning, deep learning (DL) focuses on utilizing multilayered neural networks to perform tasks such as classification, regression, and representation learning. The field takes inspiration from biological neuroscience and revolves around stacking artificial neurons into layers and "training" them to process data. Methods used can be supervised, semi-supervised or unsupervised 9cb1a03876

In supervised feature learning, features are learned using labeled input data. Labeled data includes input-label pairs where the input is given to the model, and it must produce the ground truth label as the output. This can be leveraged to generate feature representations with the model which result in high label prediction accuracy. Examples... 9cb1a03876 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 including computer vision, speech recognition, natural language processing, machine translation, bioinformatics, drug design, medical image analysis, climate science, material inspection and board game programs, where they have produced results comparable to and in some cases surpassing human expert performance. 9cb1a03876

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