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Report Writing Individual Report

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Role of Linear Algebra in AI

Linear Algebra is a branch of mathematics that studies vectors, matrices, and linear transformations. From the notations used to define the application of algorithms to the implementation of algorithms in code, it is a critical framework for the field of machine learning. Despite the fact that linear algebra is fundamental to machine learning, the close relationship is often ignored or clarified using abstract terms like vector spaces or specific matrix operations. The analysis of vector spaces, lines and planes, and mappings used in linear transformations is known as linear algebra.

Following are the areas where linear algebra are used:

1. Dataset and Data Files
2. Images and Photographs
3. One-Hot Encoding
4. Linear Regression
5. Regularization
6. Principal Component Analysis
7. Singular-Value Decomposition
8. Latent Semantic Analysis
9. Recommender Systems
10. Deep Learning

Probability in AI

Information theory measures the disturbance (or ambiguity) in a probability distribution, while probability theory helps one to make uncertain claims and reason in the face of uncertainty. Machine learning, in particular the branch of artificial intelligence concerned with predicting outcomes and making decisions, incorporates probability theory. Softmax functions are used in computer science to restrict the outcome of functions to a value between 0 and 1. These functions, also known as squashing functions, are useful in the process of assigning a probability value to outcomes in an algorithm. These functions allocate values to the neural network that help it make better decisions, and they are often the last step in a neural network function.

Information theory in AI

Information theory is an important discipline that has contributed significantly to deep learning and AI, but it is still unknown to the general public. Calculus, probability, and statistics are the fundamental building blocks of deep learning, and information theory is a complex amalgamation of them. Claude Shannon, a mathematician and electrical engineer, first proposed Information Theory in his groundbreaking paper "A Mathematical Theory of Communication" in 1948. Such AI principles derived from information theory or related fields include:

- Concept of encoder-decoder popularly used in Machine Translation
RNNs and various other type of models
- Building decision trees on basis of maximum information gain
- Popular cross-entropy loss function
- Viterbi algorithm widely used in NLP and Speech