100 Terms in Machine Learning *Explained*

- **Supervised Learning**: Training a model on labeled data to make predictions or decisions.
- **Unsupervised Learning**: Extracting patterns from unlabeled data without explicit guidance.
- **Semi-Supervised Learning**: Utilizing a combination of labeled and unlabeled data for training.
- **Reinforcement Learning**: Training models to make sequences of decisions through trial and error.
- **Classification**: Predicting categories or classes for input data.
- **Regression**: Predicting continuous values based on input data.
- **Clustering**: Grouping similar data points together based on their features.
- **Dimensionality Reduction**: Reducing the number of features in data while preserving important information.
- **Feature Engineering**: Creating new features or modifying existing ones to improve model performance.
- **Overfitting**: When a model learns to perform well on the training data but fails to generalize to new, unseen data.
- **Underfitting**: When a model is too simple to capture the underlying structure of the data.
- **Bias-Variance Tradeoff**: Balancing model complexity to minimize errors from bias and variance.
- **Cross-Validation**: Technique to assess model performance by splitting data into multiple subsets for training and testing.
- **Hyperparameters**: Parameters that control the learning process, set before training.
- **Gradient Descent**: Optimization algorithm used to minimize the loss function by adjusting model parameters iteratively.

- **Backpropagation**: Algorithm for efficiently computing gradients in neural networks.
- **Activation Function**: Nonlinear transformation applied to neuron outputs in neural networks.
- **Neural Network**: Computing system inspired by the human brain, consisting of interconnected neurons organized in layers.
- **Convolutional Neural Network (CNN)**: Neural network designed to process structured grid data, commonly used in image recognition.
- **Recurrent Neural Network (RNN)**: Neural network designed to process sequential data, with connections looping back to previous states.
- **Generative Adversarial Network (GAN)**: Framework involving two neural networks, where one generates data and the other evaluates it, promoting realistic output generation.
- **Transfer Learning**: Leveraging pre-trained models for new tasks, often with limited labeled data.
- **Ensemble Learning**: Technique that combines multiple models to improve performance.
- **Bagging**: Ensemble technique where models are trained independently on random subsets of the data.
- **Boosting**: Ensemble technique where models are trained sequentially, with each subsequent model correcting errors of its predecessor.
- **Random Forest**: Ensemble learning method consisting of multiple decision trees.
- **Decision Tree**: Tree-like model of decisions and their possible consequences, used for classification and regression.
- **Support Vector Machine (SVM)**: Supervised learning algorithm for classification and regression analysis.
- **Kernel**: Function for transforming input data into a higher-dimensional space for better separation in SVM.
- **K-Means**: Unsupervised learning algorithm for clustering data into k distinct groups.

- **Nearest Neighbors**: Algorithm for classification or regression based on the majority class or average of nearest data points.
- **Bias**: Error due to erroneous assumptions in the learning algorithm.
- **Variance**: Error due to sensitivity to fluctuations in the training data.
- **Precision**: Proportion of true positive predictions out of all positive predictions.
- **Recall**: Proportion of true positive predictions out of all actual positives.
- **F1 Score**: Harmonic mean of precision and recall, used as a measure of a model's accuracy.
- **ROC Curve**: Graphical representation of the trade-off between true positive rate and false positive rate for different threshold values.
- **AUC-ROC**: Area under the ROC curve, a measure of the model's ability to discriminate between positive and negative classes.
- **Confusion Matrix**: Table representing the performance of a classification model, showing true positive, false positive, true negative, and false negative values.
- **Regularization**: Technique to prevent overfitting by adding a penalty term to the loss function.
- **L1 Regularization (Lasso)**: Penalizing the absolute values of the coefficients in linear models.
- **L2 Regularization (Ridge)**: Penalizing the squared values of the coefficients in linear models.
- **Dropout**: Regularization technique for neural networks involving randomly dropping out neurons during training to prevent overfitting.
- **Data Augmentation**: Technique to increase the diversity of training data by applying random transformations.
- **Batch Normalization**: Technique in neural networks to improve training speed and stability by normalizing input batches.

- **Gradient Checking**: Technique for verifying the correctness of gradient computations in backpropagation.
- **Learning Rate**: Hyperparameter controlling the size of the steps taken during optimization.
- **Learning Rate Schedule**: Strategy for systematically changing the learning rate during training.
- **Early Stopping**: Technique to prevent overfitting by stopping training when performance on a validation set begins to degrade.
- **Loss Function**: Objective function quantifying the difference between predicted and actual values.
- **Cost Function**: Synonymous with the loss function, representing the error in predictions.
- **Mean Squared Error (MSE)**: Average of the squared differences between predicted and actual values.
- **Cross-Entropy Loss**: Loss function used in classification tasks, penalizing incorrect class probabilities.
- **Logistic Regression**: Regression analysis for predicting the probability of a binary outcome.
- **Perceptron**: Simplest form of a neural network, consisting of a single layer of neurons with no hidden layers.
- **Word Embedding**: Representation of words as dense vectors in a continuous vector space.
- **Word2Vec**: Popular word embedding technique based on neural networks, capturing semantic relationships between words.
- **GloVe (Global Vectors for Word Representation)**: Word embedding technique based on matrix factorization, considering global word co-occurrence statistics.
- **Bag of Words (BoW)**: Representation of text data disregarding grammar and word order, focusing only on word frequencies.
- **TF-IDF (Term Frequency-Inverse Document Frequency)**: Technique for quantifying the importance of a word in a document relative to a corpus.

- **RNN**: Neural network architecture designed to handle sequential data by retaining memory.
- **Long Short-Term Memory (LSTM)**: RNN architecture with specialized memory cells to address the vanishing gradient problem.
- **Gated Recurrent Unit (GRU)**: Simplified version of LSTM with fewer parameters for training efficiency.
- **Attention Mechanism**: Neural network component focusing on relevant parts of input data, commonly used in sequence-to-sequence tasks.
- **Transformer**: Architecture based entirely on attention mechanisms, widely used in natural language processing tasks.
- **BERT (Bidirectional Encoder Representations from Transformers)**: Pre-trained transformer model for natural language understanding tasks.
- **GPT (Generative Pre-trained Transformer)**: Series of transformer-based models for natural language generation and understanding tasks.
- **Fine-Tuning**: Adapting pre-trained models to specific tasks by further training on task-specific data.
- **Autoencoder**: Neural network architecture for unsupervised learning, aiming to reconstruct input data from compressed representations.
- **Variational Autoencoder (VAE)**: Autoencoder with a probabilistic interpretation, enabling generation of new data samples.
- **Recommender System**: System that predicts user preferences or item relevance.
- **Content-Based Filtering**: Recommender system technique based on the similarity between items' features and user preferences.
- **Collaborative Filtering**: Recommender system technique based on user behavior and preferences.
- **Matrix Factorization**: Technique used in collaborative filtering to decompose user-item interaction matrices into low-rank matrices.
- **Cold Start Problem**: Difficulty in recommending items for new users or items with few interactions.

- **Data Preprocessing**: Transforming raw data into a format suitable for analysis and modeling.
- **Normalization**: Scaling numerical features to a standard range.
- **One-Hot Encoding**: Representation of categorical variables as binary vectors.
- **Feature Scaling**: Technique to bring features to a similar scale to avoid dominance by certain features during training.
- **Imputation**: Filling in missing values in datasets.
- **Cross-Validation**: Technique to assess model performance by splitting data into multiple subsets for training and testing.
- **Grid Search**: Technique for hyperparameter tuning by exhaustively searching through a manually specified subset of the hyperparameter space.
- **Random Search**: Technique for hyperparameter tuning by sampling hyperparameters randomly from a defined distribution.
- **Model Evaluation Metrics**: Measures used to assess the performance of machine learning models.
- **Precision**: Proportion of true positive predictions out of all positive predictions.
- **Recall**: Proportion of true positive predictions out of all actual positives.
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- **Receiver Operating Characteristic (ROC)**: A graphical plot that illustrates the diagnostic ability of a binary classifier system.
- **Area Under the Curve (AUC)**: The area under the ROC curve, providing a measure of classifier performance.
- **Precision-Recall Curve**: Graphical representation of the trade-off between precision and recall for different threshold values.
- **Mean Absolute Error (MAE)**: Average of the absolute differences between predicted and actual values.
- **Mean Squared Error (MSE)**: Average of the squared differences between predicted and actual values.
- **Root Mean Squared Error (RMSE)**: Square root of the average of the squared differences between predicted and actual values.
- **Bias**: Error due to erroneous assumptions in the learning algorithm.
- **Variance**: Error due to sensitivity to fluctuations in the training data.
- **Underfitting**: When a model is too simple to capture the underlying structure of the data.
- **Overfitting**: When a model learns to perform well on the training data but fails to generalize to new, unseen data.

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