Q. difference between parameters and hyper parameters in machine learning

In machine learning, both parameters and hyperparameters play crucial roles in training and fine-tuning a model. They serve different purposes and are adjusted at different stages of the machine learning process. Here's a breakdown of the key differences between parameters and hyperparameters:

1. Parameters:
   * Parameters are the internal variables that a machine learning model learns from the training data.
   * They define the model's architecture and represent the relationships between input features and the target variable.
   * Parameters are optimized during the training process using various optimization algorithms, such as gradient descent, to minimize the model's loss function.
   * Examples of parameters include weights and biases in a neural network or coefficients in a linear regression model.
2. Hyperparameters:
   * Hyperparameters are external configurations and settings that are not learned from the data but are set by the data scientist or machine learning engineer before training the model.
   * They control various aspects of the learning process and the model's architecture.
   * Hyperparameters are typically set before training begins and are not updated during training.
   * Examples of hyperparameters include the learning rate, batch size, number of hidden layers in a neural network, regularization strength, and the choice of a specific algorithm or kernel in certain models like support vector machines.

Here's a more detailed explanation of each:

* Parameters:
  + Parameters are learned from the training data to make the model fit the data as closely as possible.
  + Changing the values of parameters directly impacts the model's ability to make predictions.
  + The goal is to optimize these parameters to minimize the difference between the model's predictions and the actual target values.
* Hyperparameters:
  + Hyperparameters are like settings or configurations for the learning process.
  + They influence how the model learns and generalizes from the data.
  + The selection of hyperparameters can significantly affect the model's performance.
  + Hyperparameters are typically chosen through techniques like grid search, random search, or Bayesian optimization, and their values are not updated during training.

In summary, parameters are learned from the data, while hyperparameters are set by the data scientist or engineer to guide the learning process. Adjusting hyperparameters correctly can have a significant impact on a model's performance, so hyperparameter tuning is an essential step in building effective machine learning models.

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