# Machine Learning Concepts: Evaluation & Parameters

### 1. Model Evaluation in Machine Learning

#### a. Evaluation Metrics for Classification (Supervised Learning)

In the realm of classification tasks, the accuracy score is a fundamental metric. It quantifies the ratio of correct predictions to the total number of input data points. The accuracy score is a simple yet powerful indicator of how well a classification model is performing. To implement this metric in Python, you can utilize the **accuracy\_score** function from the **sklearn.metrics** module.

#### b. Evaluation Metrics for Regression (Supervised Learning)

For regression tasks, two commonly used evaluation metrics are Mean Absolute Error (MAE) and Mean Squared Error (MSE). MAE measures the average absolute difference between predicted and actual values. On the other hand, MSE computes the average squared difference between predictions and actual values. The **mean\_absolute\_error** and **mean\_squared\_error** functions from **sklearn.metrics** facilitate the implementation of these metrics in Python.

### 2. Model Parameters & Hyperparameters

#### a. Model Parameters

Model parameters are internal variables that the model determines through the training process with the provided training data. Examples of model parameters include weights and biases. These values are adjusted during training to optimize the model for a specific task.

#### b. Hyperparameters

In contrast to model parameters, hyperparameters are external configuration settings that influence the learning process but are not learned from the training data. Hyperparameters are adjustable values used to fine-tune the model and achieve optimal performance. Learning rate and the number of epochs are examples of hyperparameters.

### Key Definitions:

#### - Weights

Weights in a machine learning model determine the influence of each input on the output. They are adjusted during training to optimize the model's performance.

#### - Bias

Bias is an offset value given to the model. It helps shift the model in a particular direction, similar to the concept of a Y-intercept in linear regression.

#### - Learning Rate

The learning rate is a crucial hyperparameter in optimization algorithms. It determines the step size at each iteration while the model moves towards minimizing the loss function. A well-chosen learning rate is essential for efficient and effective model training.

#### - Number of Epochs

The number of epochs represents how many times the model iterates over the entire dataset during training. Properly setting the number of epochs is crucial for achieving convergence and preventing overfitting or underfitting.

### Conclusion

Understanding these key concepts in machine learning, including evaluation metrics and model parameters/hyperparameters, is essential for building and optimizing effective models. By grasping these fundamentals, practitioners can make informed decisions during the model development process, leading to more robust and accurate machine learning systems.