

Optilearn.nn.ModelCheckpoint

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ModelCheckpoint

The ModelCheckpoint class implements a mechanism for saving model checkpoints during training, based on monitored metrics. Checkpoints are saved either when the monitored metric improves, according to the specified mode (auto, max, min), or every epoch if save_best_only is False.

Attributes

- **file_name** (str): The base file name for the saved checkpoints. It must have a .h5 extension, which signifies that the model weights are stored in the HDF5 format.
- **monitor** (str): Specifies the metric to monitor during training. Valid options are 'accuracy', 'val_accuracy', 'loss', and 'val_loss'.
- **mode** (str): Defines the mode for saving checkpoints based on the monitored metric:
 - 'auto': Decides whether to save based on whether the monitored metric is increasing or decreasing (depending on its nature).
 - 'max': Saves the checkpoint if the monitored metric increases (e.g., accuracy or validation accuracy).
 - 'min': Saves the checkpoint if the monitored metric decreases (e.g., loss or validation loss).
- **save_best_only** (bool): If True, saves only when the monitored metric improves. If False, saves checkpoints every epoch.
- **verbose** (int): If set to 1, logs detailed messages about checkpoint saving.

Constructor

The __init__ method accepts the following parameters:

- **file_name**: A string representing the base name of the checkpoint file.
- **monitor**: A string specifying the metric to monitor (default is 'val_accuracy').
- **mode**: A string specifying the checkpoint saving mode (default is 'auto').
- **save_best_only**: A boolean that controls whether to save checkpoints only when the monitored metric improves (default is False).
- **verbose**: An integer that controls logging verbosity (default is 0).

The constructor also checks:

- If the file_name ends with .h5 (throws a ValueError if not).
- If the monitor value is valid (throws a ValueError if not).

Method: check

The check method evaluates whether the model checkpoint should be saved based on the monitored metric's value.

Parameters:

- **metrics_values** (dict): A dictionary containing the latest recorded values of the monitored metrics.
- **number_of_epoch** (int): The current epoch number during training.
- **pre_value** (float): The previous best value of the monitored metric for comparison with the current value.

Returns:

- A tuple containing:
 1. **int**: 1 if a checkpoint was saved, 0 otherwise.
 2. **str**: The generated file name for the saved checkpoint.
 3. **float**: The monitored metric's value for the current epoch.

Example Usage:

```
checkpoint = ModelCheckpoint(file_name="model_weights.h5", monitor="val_accuracy", mode="max")
metrics = {"val_accuracy": [0.85, 0.88, 0.90]}
epoch = 3
pre_value = 0.88
checkpoint.check(metrics, epoch, pre_value)
```

In this example, the checkpoint is saved because val_accuracy has increased from 0.88 to 0.90.

Summary:

The ModelCheckpoint class is an essential utility for saving the model's weights at specific points during training, based on the progress of a monitored metric. It supports flexible configurations for when to save checkpoints, and provides logging for transparency.