Hyperparameter Tunings in the Model

Model Hyperparameters

These are defined when setting up the model's architecture and include:

- **Number and size of convolutional filters**: Specified as 32, 64, and 128 filters in the successive Conv2D layers.
- **Kernel size**: Set to 3x3 for all convolutional layers.
- **Activation functions**: 'relu' is chosen for the convolutional and dense layers, with 'softmax' for the output layer.
- **Dropout rate**: Set at 0.5 to help prevent overfitting by randomly setting input units to 0 at a 50% rate during training.
- **Number of units in the dense layer**: Defined as 512 units in the fully connected layer.

Training Hyperparameters

These are specified during the model's compilation and training:

- **Optimizer**: 'adam', an adaptive learning rate optimizer, is used.
- **Loss function**: 'categorical_crossentropy' is selected, which is appropriate for multi-class classification.
- **Metrics**: 'accuracy' is monitored during training and validation.

Data Augmentation Parameters

Defined in the ImageDataGenerator:

- **Rescaling**: Normalizes the pixel values.
- **Rotation range**: Images are randomly rotated within a range of 20 degrees.
- **Width and height shift ranges**: Shifts the image along width and height by 20%.
- **Shear range**: Shears the images by an angle of 20 degrees.
- **Zoom range**: Randomly zooms inside the pictures up to 20%.
- **Horizontal flip**: Randomly flips images horizontally.
- **Fill mode**: Specifies the strategy used for filling in newly created pixels, which can appear after a rotation or a width/height shift.

Validation Split

- **A validation split of 20%** within the ImageDataGenerator indicates that 20% of the data will be used for validation.

Training Execution Parameters

Set in the model.fit method:

- **Steps per epoch**: Determines how many batches of samples to use in one epoch, set to 100.
- **Number of epochs**: The number of times the entire dataset is passed through the neural network, set to 7.
- **Validation steps**: Number of batches of samples from the validation dataset used to evaluate the model performance after each epoch, set to 50.