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What is one-hot encoding? Why is this important and how do you implement it in Keras?

One-hot encoding is a method of representing categorical data as binary vectors, where each class is assigned a unique position with a value of 1, and all other positions are 0. This is important in classification tasks because it ensures that the model does not assume any ordinal relationship between classes. In Keras, you can implement it using to_categorical from tensorflow.keras.utils.

What is dropout and how does it help overfitting?

Dropout is a regularization technique that randomly sets a fraction of neurons to 0 during training to prevent reliance on specific neurons and improve generalization. By doing so, it reduces the risk of overfitting to the training data.

How does ReLU differ from the sigmoid activation function?

ReLU (Rectified Linear Unit) outputs 0 for negative values and the input value for positives, which helps mitigate vanishing gradients. In contrast, the sigmoid function maps inputs to a range between 0 and 1, making it prone to saturation and slower convergence for deep networks.

Why is the softmax function necessary in the output layer?

Softmax is used in the output layer of a classification model to convert raw logits into probabilities that sum to 1, making it easier to interpret the model's predictions and compare class scores.

Question 5

- After the convolution layer:

96x96x16

- After the max pooling layer:

48x48x16

The model is a Convolutional Neural Network (CNN) with three convolutional layers for feature extraction, BatchNormalization for training stability, MaxPooling for dimensionality reduction, and Dense layers with Dropout to prevent overfitting. Data preprocessing includes normalization and augmentation using ImageDataGenerator to improve generalization. The workflow involves splitting the data into training and validation sets, training for 30 epochs, and monitoring performance to ensure high accuracy and robust predictions.