

## Classification of images with Keras

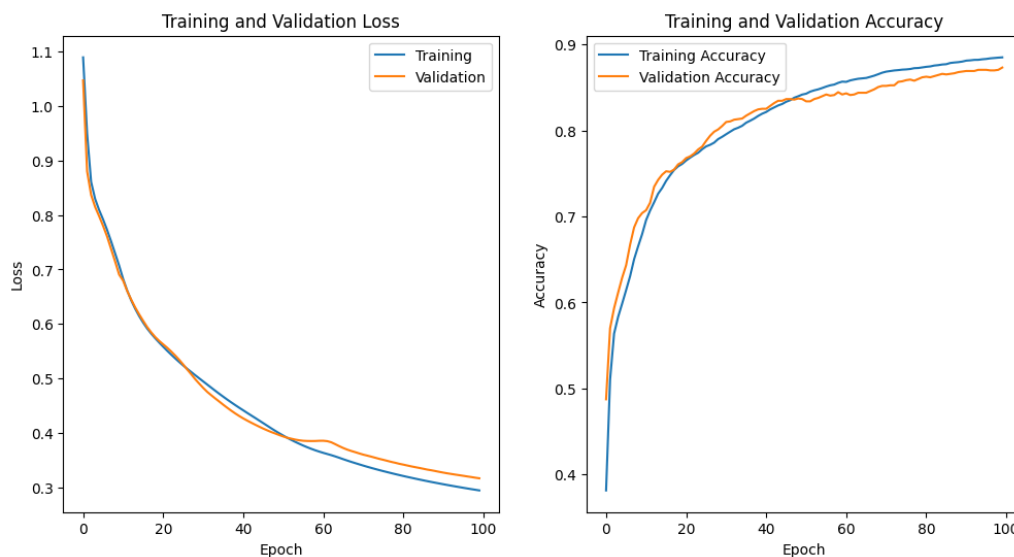
### Introduction:

The primary objective of this assignment is to work with the Animals dataset, which encompasses three distinct classes: cat, dog, and wild. The dataset comprises a total of 16,134 images. The initial steps involve loading the images, processing them to attain the appropriate shape, and conducting comprehensive data preprocessing. Subsequently, the assignment necessitates the construction of a model equipped with convolutional layers, pooling layers, and other essential components for effective training. the assignment requires visualizing the images through plotting and generating graphical representations.

### **Performance Metrics and Achievements:**

The trained model exhibits commendable performance on the validation dataset, boasting an accuracy of approximately 87.7%. This signifies successful learning of image patterns and features, enabling effective generalization to previously unseen data.

### **Analysis of Accuracy and loss trends:**



the loss and accuracy metrics show interesting patterns across epochs. Initially, both training and validation losses decrease steadily, reflecting effective learning. However, around epoch 55, a notable improvement occurs in the validation accuracy, indicating the model's enhanced generalization on unseen data. This is further emphasized by the concurrent decrease in validation loss, signifying improved model performance.

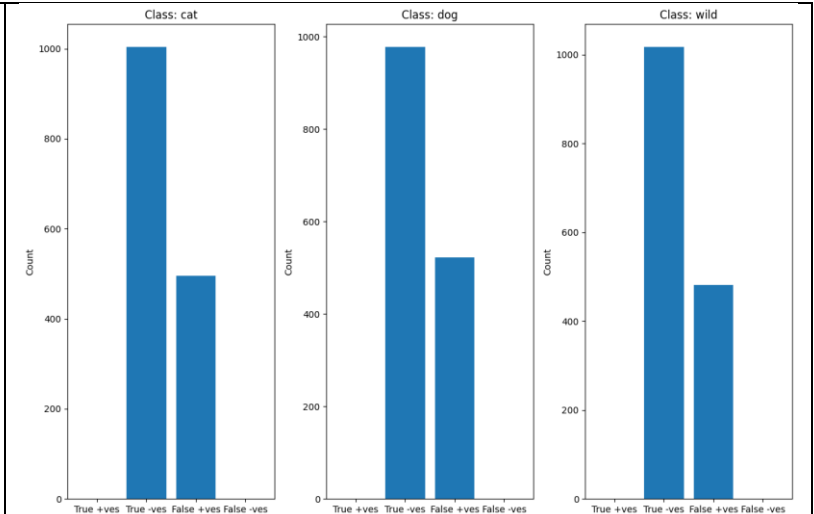
The fluctuation in validation accuracy and loss in subsequent epochs suggests potential challenges in fine-tuning the model. Overall, the training logs provide valuable insights into the model's learning dynamics, emphasizing the need for a balanced approach to training, regularization, and dataset augmentation for achieving optimal performance.



This is one of our plots for visualizing our model to check how our model is performing, plotted a 2X3 images. For every image it has 2 labels, if both the labels match it displays in green text and if not, it appears in red. This image is plotted by considering the best weight in the model. So, from out of 6 images 5 predictions are correct, In the figure, cat is predicted as dog, that means the false positives for that class is high, you can refer the below matrix bar plots for clear understanding of True positives and negatives.

## Multi-Class Confusion Matrix

The above plot is a multi-class confusion matrix used for the model's predictions on the validation dataset. It uses a bar chart to visualize counts for different categories: True Positives, True Negatives, False Positives, and False Negatives for each class. The plot shows the result for all the classes, and for each class, it calculates and visualizes the counts of these categories. Each subplot in the figure represents a class,



and the bars in each subplot correspond to the counts of true positives, true negatives, false positives, and false negatives. This visualization is valuable for understanding the model's performance on individual classes. High counts in the true positive category indicate accurate predictions for that class, while false positives and false negatives provide insights into the types of misclassifications. Analysing this output helps identify areas where the model may need improvement, guiding further fine-tuning or adjustments to enhance its overall performance.

In the above graph, dog class has high false +ves, it implies that the model is frequently misclassifying instances as dogs. The same example you have seen in the above images that the cat is classified as dog. And this is known as misclassification.

Misclassification is very important factor to consider, for instance, a certain Fox image is frequently mistakenly identified as cat This has important ramifications, particularly for fields like animal protection where precise species identification is essential.

## Conclusion:

The multi-class confusion matrix visualization provides valuable insights into the model's strengths and weaknesses for each class, facilitating targeted enhancements and fine-tuning to address specific challenges and further improve its overall predictive capabilities.