

## **Project Report on Image Classification using the CIFAR-10 dataset**

### **Problem understanding:**

The name of the project is 'Image Classification using the CIFAR-10 dataset'. We need to develop and evaluate a deep neural network for image classification using the CIFAR-10 dataset. The dataset contains 10 classes including airplane, automobile, cat, dog, deer, truck, horse, ship, frog and bird. The total amount of color image data is 60,000. The main focus of the project is to classify accurately unseen test images by training the developed model on the labeled training data and ensuring generalization.

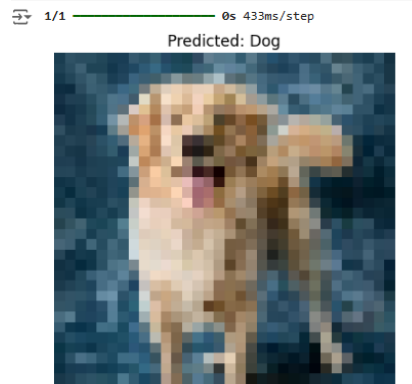
### **Model Design:**

The designed model is a Convolutional Neural Network(CNN) for image classification using the CIFAR-10 dataset. An explanation of each component and layer in the model is given below:

- **Conv2D layers:**  
The input layer is a 2D Convolutional layer with 32 filters of size 3x3. This layer applies filters to the input image to learn spatial hierarchies in the image. The activation function 'ReLU' is used to help in introducing non-linearity.
- **BatchNormalization:**  
Batch normalization helps in normalizing the output of the previous layer to improve the speed, performance and stability of the network.
- **Maxpooling2D layer:**  
Pooling operating to reduce the size of the feature map, helping the model become invariant to small translations of the input image.
- **Dropout:**  
Dropout is applied to further regularize the network and reduce overfitting by dropping 25% of neurons.
- **Fully Connected layer:**  
The fully connected layers allow the model to make predictions by learning the relationships between the features.
- **Dense layer:**  
The final dense layer has 10 units, corresponding to the 10 classes in the CIFAR-10 dataset. The softmax activation function is used to output a probability distribution across 10 classes.

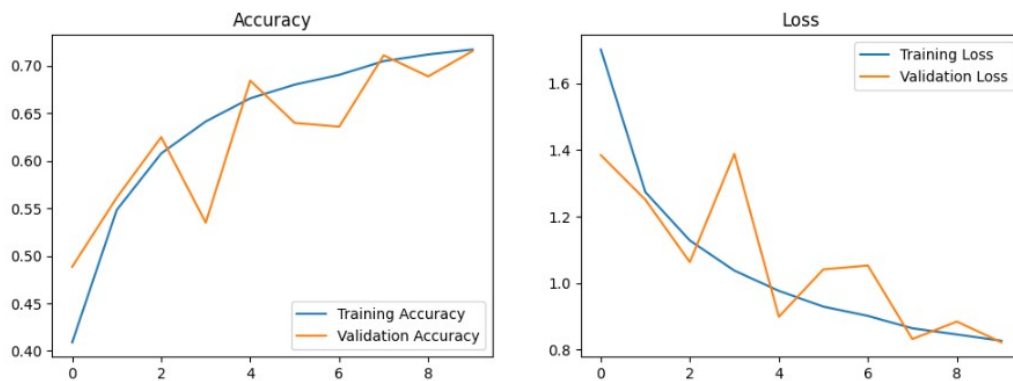
### **Results :**

The output of the project is to classify the image among the 10 classes. The screenshot is added here as an output of the trained model:



### Discussion:

The accuracy of our model is 72%. The accuracy graph & the loss graph are shown below:



### Conclusion:

This project illustrates the development and evaluation of a CNN model for CIFAR-10 image classification. While the model's accuracy is 72%, some inconsistencies in fold performances suggest improvement in regularization and model tuning. This work underscores the importance of preprocessing, model design and evaluation in developing reliable deep learning solutions.