AtomCamp Cohort 11 (Computer Vision Module) Assignment 1: Improve Accuracy on CIFAR-10

1 DATASET: UCI FOREST COVERTYPE

- **Name:** CIFAR-10 (available via keras.datasets)
- **Classes:** 10 object categories (airplane, automobile, bird, etc.)

2 OBJECTIVE

Apply your understanding of CNNs to design and optimize a deep learning model that improves classification accuracy on the CIFAR-10 dataset. We have already created a basic CNN model and achieved reasonable accuracy in the online session. Your task is to perform hyper parameter tuning to improve accuracy to above 80% using simple CNN architectures without transfer learning.

3 TASKS

3.1 DATA PREPARATION

- Load and normalize the data.
- Apply image augmentation (Optional).

3.2 BASELINE MODEL

- Run the given notebook with a basic CNN model to establish baseline accuracy.
- Evaluate and record test accuracy.

3.3 IMPROVED MODEL

- Experiment with enhancements such as:
    - Additional layers (depth/width)
    - Batch Normalization
    - Dropout
    - Optimizer tuning (Adam, SGD with momentum)
    - Learning rate scheduler (e.g. ReduceLROnPlateau)
- Add early stopping and checkpoint callbacks.
- Report final test accuracy and compare with baseline.

3.4 EVALUATION

- Plot training and validation accuracy/loss.

- Report confusion matrix and classification report.

- Visualize training curves (accuracy and loss).

4 DELIVERABLES

Submit a Jupyter Notebook containing:

- Complete and readable code with outputs

- Visualizations and model summaries

- Commentary explaining your tuning and design decisions

- Comments on what architectural/ training changes led to improvements and why.