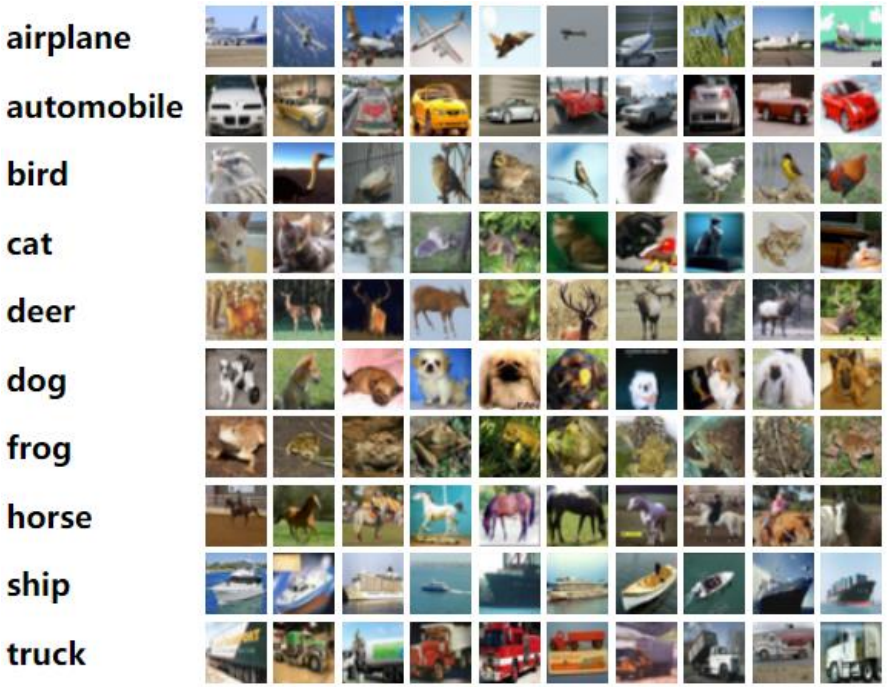
Neural Network Models for Object Recognition

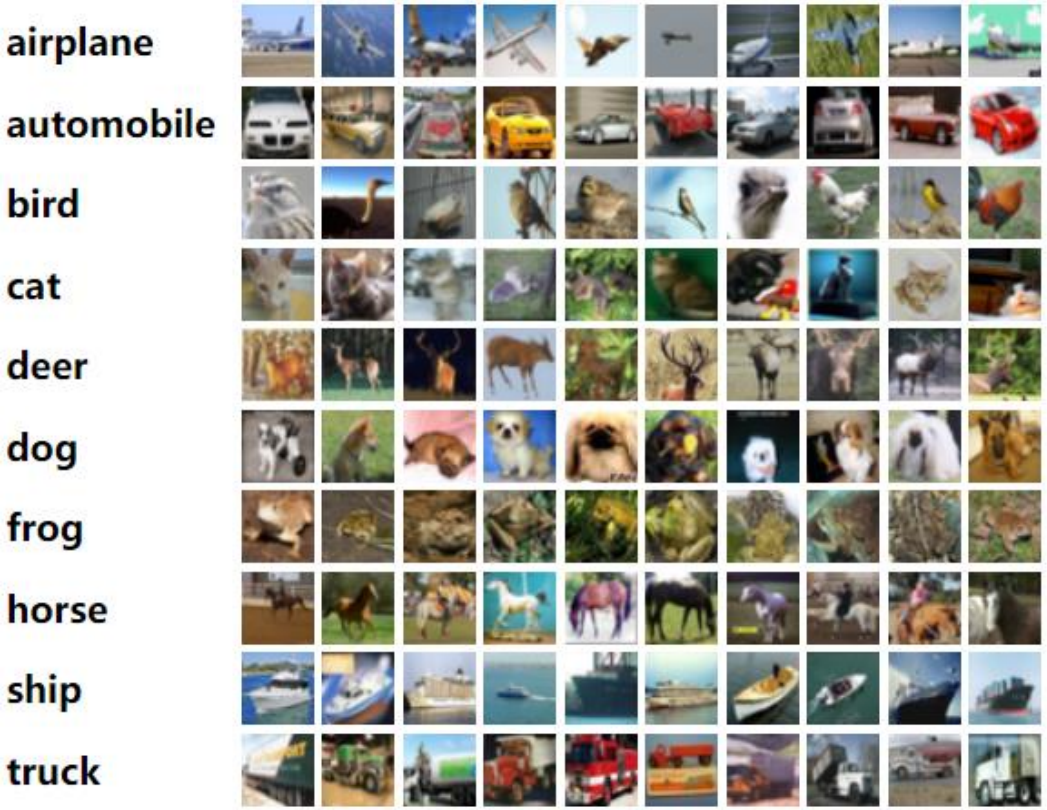
Data Cleaning

- Depickle the data
- Combine the 5 data batches
- Create a Validation Set



Metadata

- 10 classes (airplane, automobile, bird, cat, deer, dog, frog, horse, ship, truck)
- Image Dimensions: 32x32 pixels
- Training Set Size 40,000
- Validation Set Size 10,000
- Test Set Size 10,000



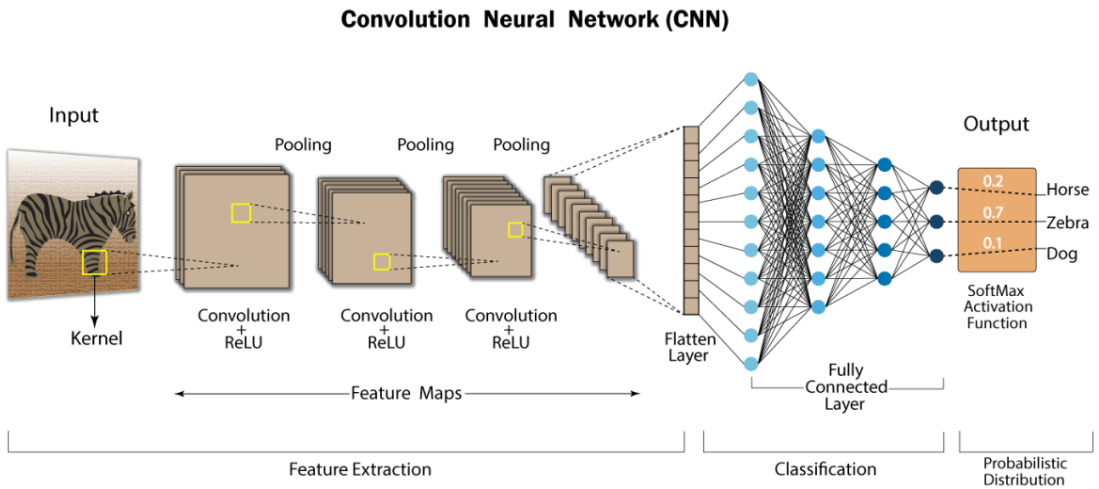
Importance of maintaining a separate Validation Set

- Unbiased evaluation of the model
- Test the model's performance when training
- Helps tune the hyperparameters and reduce overfitting

(Ebner, 2023), (Wilber & Werness, 2022)

Architecture of the Artificial Neural Network.

- Artificial Neural Networks are made up of layers input, convolutional, fully connected and output. (DeepAI, 2019), (IBM, 2021)
- Packages used are Keras and Tensorflow



Chosen activation function

- Activation functions are what chooses what neuron should be activated
- Rectified Linear Units (ReLU) was the chosen activation function
- Softmax function also used to run probability distribution for class based

(McQuillan, 2022), (Priya, 2023), (Tiwari, 2024)

Loss function implementation

- Categorical Cross-Entropy Loss
- Compatibility with softmax and Adam

Number of epochs utilised in the modelling process.

- Epoch is a training cycle
- 50 epochs used
- Early stopping factored in to stop training
  - Prevent over and under fitting

(Brownlee, 2022), (Kishore, 2024)

Neural Network's design elements strategy

- Regularisation – Dropout Layers
- Batch Normalisation
- Optimiser – Adaptive Moment Estimation (Adam)

Reflection

- CIFAR-10 can be a very intimidating dataset to use with how big it is despite how simple the data is
- Layers, how dense they are and filters
- Training a model to be general and unbiased
- Activation functions - ReLU