Introduction:

The Canadian Institute for Advanced Research, 10 classes is a subset of Tiny image dataset that consists of 60000 x 32 x 32 color images. The images are labelled with one of the 10 mutually exclusive classes: **airplanes, automobiles, bird, cat, deer, dog, frog, horse, ship and truck.**

Importing the dataset

```
from tensorflow.keras.datasets import cifar10
import tensorflow as tf

tf.__version__
```

```
'2.10.0'
```

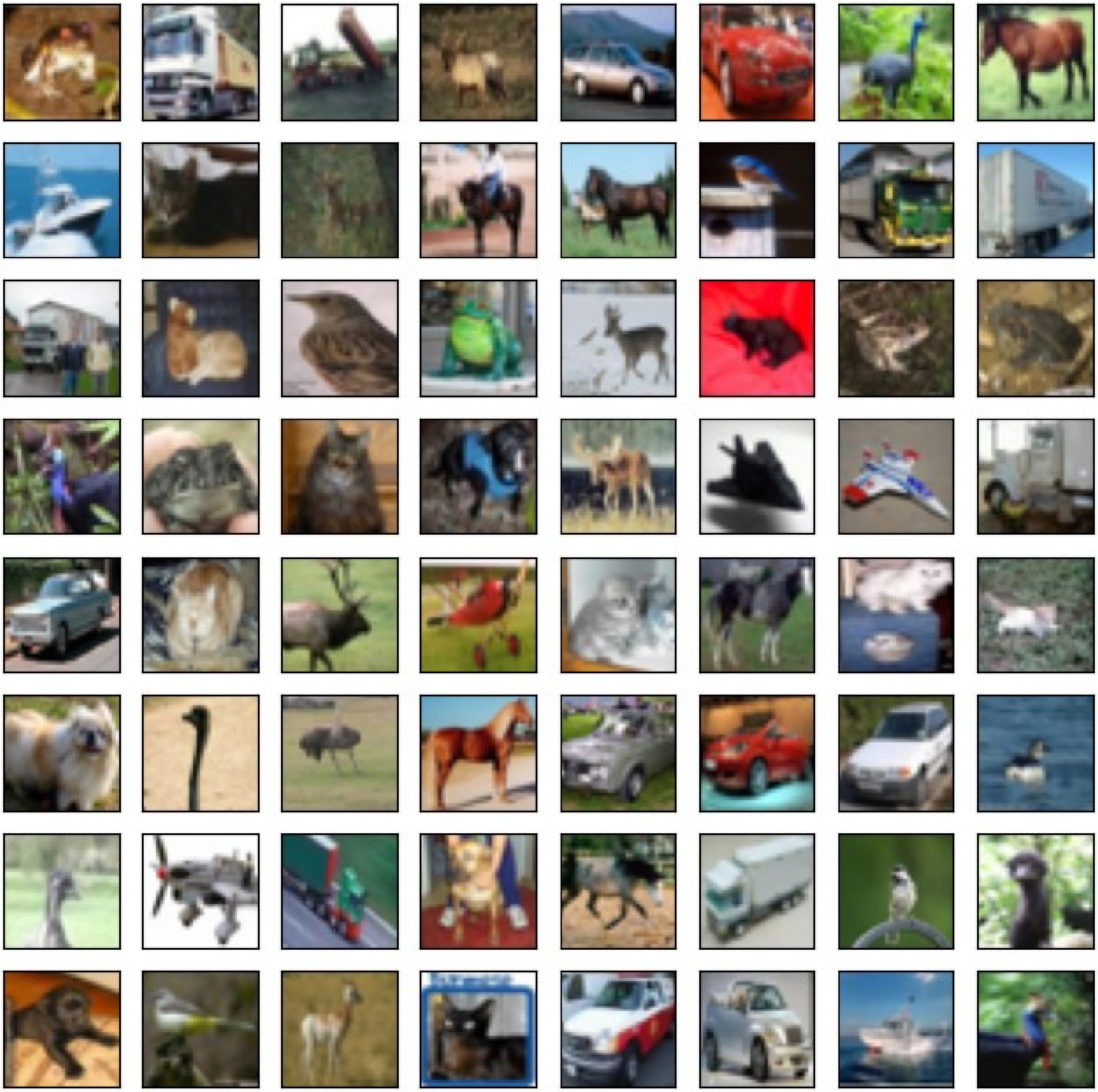
```
(x_train,y_train),(x_test,y_test) = cifar10.load_data()
```

Importing the required packages

```
import numpy as np
from sklearn.decomposition import PCA
from sklearn import svm
from sklearn.metrics import confusion_matrix, classification_report
import matplotlib.pyplot as plt
```

Displaying the data in form of images

```
fig = plt.figure(figsize=(8,8))
for i in range(64):
    ax = fig.add_subplot(8,8,i+1, xticks=[],yticks=[])
    ax.imshow(x_train[i])
plt.show()
```



Reshape labels to 1D array

- Flatten the image (32x32x3) = 3072

```
y_train= y_train.flatten()
y_test = y_test.flatten()
```

Flatten the images

```
x_train_flat = x_train.reshape(x_train.shape[0],-1)
x_test_flat = x_test.reshape(x_test.shape[0], -1)
```

Normalize the pixel Values

```
x_train_flat = x_train_flat /255.0
x_test_flat = x_test_flat / 255.0
```

```
x_test_flat.shape
```

```
(10000, 3072)
```

```
from sklearn.preprocessing import StandardScaler
```

```
scaler = StandardScaler()
x_train_flat = scaler.fit_transform(x_train_flat)
x_test_flat = scaler.fit_transform(x_test_flat)
```

```
x_train_flat.shape,x_test_flat.shape
```

```
((50000, 3072), (10000, 3072))
```

Implementing PCA to find the best fit

```
pca = PCA()
transformed_data = pca.fit(x_train_flat)
```

```
k = 0
total = 0
while total < 0.99:
    total = total + pca.explained_variance_ratio_[k]
    k += 1
k
```

```
662
```

Implementing the n_component feature to reduce the processing speed

```
pca_n = PCA(n_components = k, whiten = True)
x_transformed = pca_n.fit_transform(x_train_flat)
```

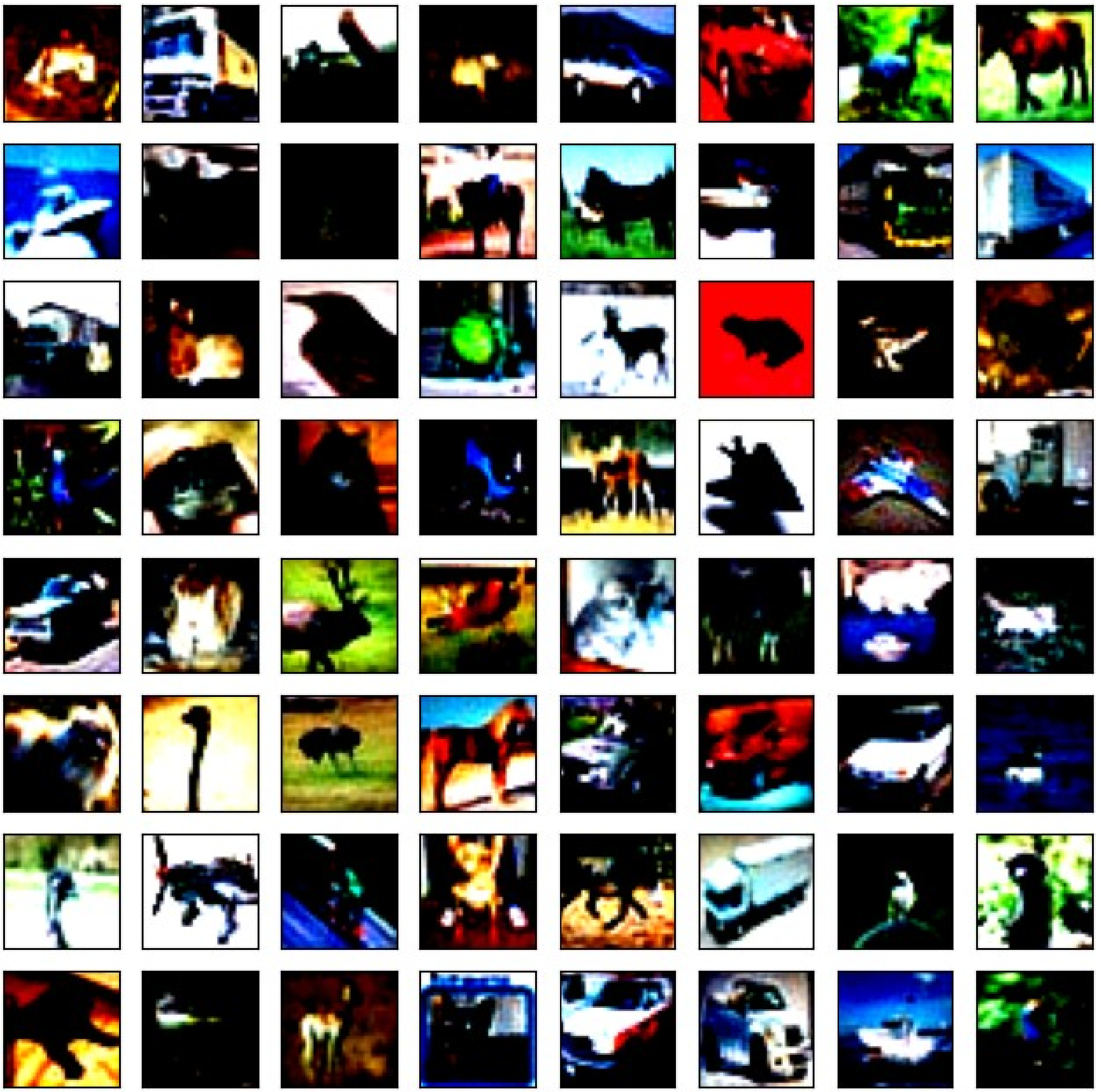
```
x_transformed.shape
```

```
(50000, 662)
```

```
x_approx = pca_n.inverse_transform(x_transformed)
```

Plotting the reconstructed Image

```
fig = plt.figure(figsize=(8,8))
for i in range(64):
    ax = fig.add_subplot(8,8,i+1, xticks=[],yticks=[])
    ax.imshow(x_approx[i].reshape(32,32,3).clip(0,1))
plt.show()
```



```
x_transformed_resize = x_transformed[:10000,:]
x_transformed_resize.shape
```

```
(10000, 662)
```

```
y_train_resize = y_train[:10000]
```

```
from sklearn.ensemble import RandomForestClassifier
clf = RandomForestClassifier()
clf.fit(x_transformed, y_train)
```

```
RandomForestClassifier()
```

```
clf.score(x_transformed, y_train)
```

```
1.0
```

```
x_test_reshaped = x_test_flat[:,:662]
```

```
clf.score(x_test_reshaped, y_test) * 100
```

```
9.2
```

```
y_preds = clf.predict(x_test_reshaped)
```

```
(10000,)
```

```
from sklearn.metrics import classification_report
```

```
print(classification_report(y_test,y_preds))
```

```
              precision    recall  f1-score   support

           0       0.10      0.06      0.07      1000
           1       0.12      0.16      0.14      1000
           2       0.14      0.15      0.14      1000
           3       0.05      0.04      0.04      1000
           4       0.13      0.18      0.15      1000
           5       0.05      0.06      0.05      1000
           6       0.07      0.04      0.05      1000
           7       0.11      0.08      0.09      1000
           8       0.06      0.03      0.04      1000
           9       0.07      0.12      0.09      1000

    accuracy                           0.09     10000
   macro avg       0.09      0.09      0.09     10000
weighted avg       0.09      0.09      0.09     10000
```