T.C.

YILDIZ TEKNİK ÜNİVERSİTESİ

BİLGİSAYAR MÜHENDİSLİĞİ

BLM4540 - Görüntü İşleme

Ödev – 3

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Dersin Yürütücüsü

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Yöntem

```
(trainX, trainY), (testX, testY) = cifar10.load_data()
```

Dataset deki veriler dizilere aktarılır. Burada;
trainX : Eğitim için kullandığımız dataset
trainY : Eğitim dataset indeki resimlerin etiketleri
testX : Validation için kullandığımız dataset
testY : testX datasetindeki görsellerin etiketleri

Sonraki aşamada bu eğitim ve test verisetindeki görseller 0-1 arasına normalize edilir.

```
model.add(Conv2D(64,(5,5),input_shape=(32,32,3),activation='relu', padding='same'))
```

Görselden özellikleri çıkarmak için kullandığımız, filtre sayısı:64, filtre boyutları 5x5 olan konvülüsyon katmanımız.

```
model.add(MaxPooling2D(pool_size=(2,2)))
```

Ağırlık sayısını azaltmak ve en uygun ağırlıkları almak için kullandığımız layer. Kernel üzerinde gezerek max weigtleri alır.

```
model.add(Dropout(0.2))
```

Yapay sinir ağının eğitim sırasında overfitting yaşamaması için kullandığımız katman. Nöronların %20 sini drop ediyor

Bu katmanları arka arkaya 5 kez kullandıktan sonra

```
model.add(Flatten())
```
Matris formundaki özellik verisi diziye aktarılır

```
model.add(Dense(128,activation='relu'))
```

Önceki katmanlardan gelen input verilerini sonraki katmanlara aktarır.

```
model.compile(loss='categorical_crossentropy',optimizer='adam',metrics=['accuracy'])
```

İlgili modeli adam optimizer ı ile compile ediyoruz. Optimizer temel olarak learning rate ve ağırlıkları değiştirmeye olanak tanıyor.loss fonksiyonu ise beklenen çıktı ile hesaplanan çıktı arasındaki farkı hesaplamaya yarıyor.

```
    history = model.fit(trainX, trainY_en, epochs = 100,batch_size=64,
verbose=1,validation_data=(testX,testY_en))
```

derlediğimiz modeli 100 epoch boyunca eğitiyoruz.

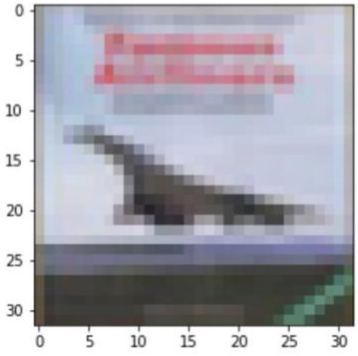
```
model = load_model('/content/model_5_64_3x3.h5')

predictionResults = model.predict(testX)

top_k_values, top_k_indices = tf.nn.top_k(predictionResults, k=x)
```

Eğitim sonucunda oluşan modelimize test görselleri yollayarak tahmin yapmasını sağlıyoruz

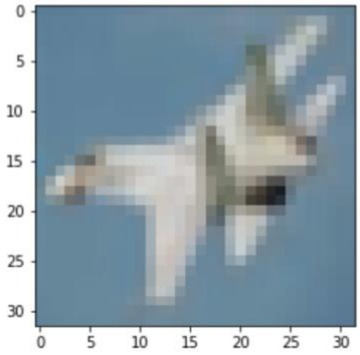
Uygulama

Airplane

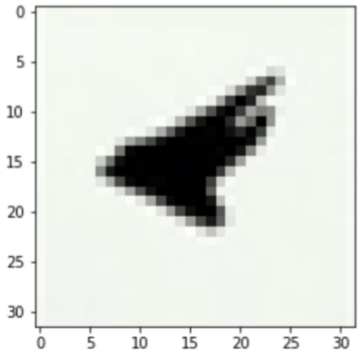
```
Prediction : airplane
Label : airplane

[airplane] : 0.71637523174285895%
[ship] : 0.226880699396133425%
[bird] : 0.026008304208517075%
[cat] : 0.008946128189563751%
[deer] : 0.008442037738859653%
```



```
Prediction : airplane
Label : airplane

[airplane] : 0.8221296668052673%
[bird] : 0.05724518746137619%
[ship] : 0.04563736170530319%
[cat] : 0.03972350060939789%
[frog] : 0.013904743827879429%
```

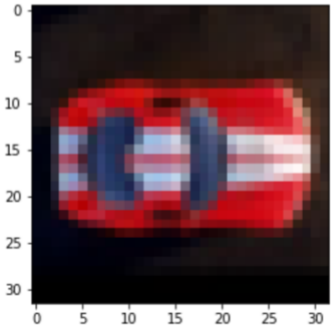


```
Prediction : airplane
Label : airplane

[airplane] : 0.6906034350395203%
[bird] : 0.3078312873840332%
[cat] : 0.00088902836432680049%
[frog] : 0.00049734424101188785%
[deer] : 0.00013362655590754002%
```

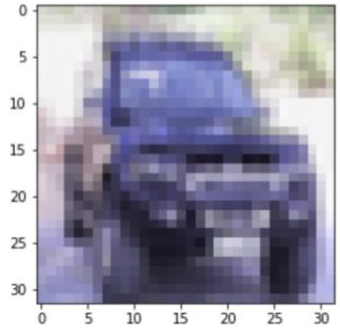


Automobile

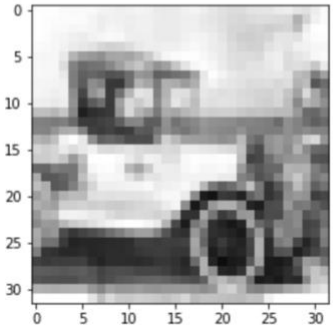
```
Prediction : automobile
Label : automobile

[automobile] : 0.9338823556900024%
[ship] : 0.037824615836143494%
[truck] : 0.02708582393825054%
[airplane] : 0.0010950516443699598%
[frog] : 6.387129542417824e-05%
```



```
Prediction : automobile
Label : automobile

[automobile] : 0.8516584038734436%
[truck] : 0.11814755201339722%
[ship] : 0.013122349046170712%
[airplane] : 0.010889495722949505%
[deer] : 0.0014813074376434088%
```



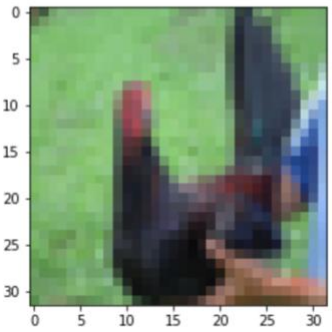
```
Prediction : automobile
Label : automobile

[automobile] : 0.9832775592803955%
[truck] : 0.01595841906964779%
[airplane] : 0.0004678909026551991%
[ship] : 0.00023808401601854712%
[horse] : 1.6169360605999827e-05%
```



Bird

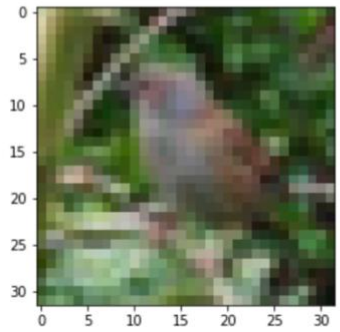
Prediction : bird
Label : bird

[bird] : 0.52634006738662728
[frog] : 0.27110931277275085%
[cat] : 0.07181751728057861%
[deer] : 0.06589484214782715%
[dog] : 0.0346430279314518%



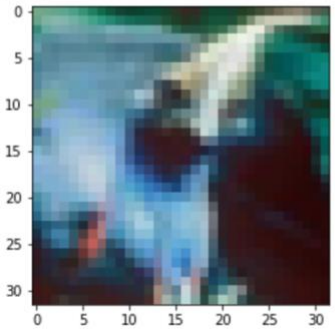
Prediction : bird
Label : bird

[bird] : 0.6439285874366768
[frog] : 0.19383850693702698%
[cat] : 0.0671071857213974%
[dog] : 0.03511130064725876%
[horse] : 0.026652857661247253%



Prediction : truck
Label : bird

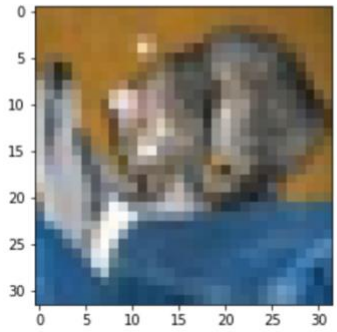
[truck] : 0.41769975423812866%
[bird] : 0.17104074358940125%
[cat] : 0.16067816317081451%
[ship] : 0.09376607835292816%
[dog] : 0.054604489356279378%



Cat

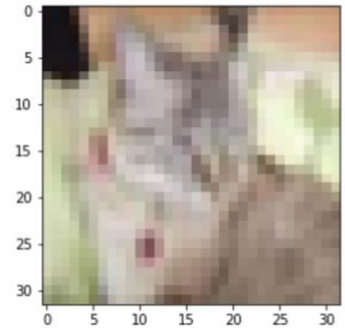
Prediction : cat
Label : cat

[cat] : 0.6681753396987915%
[dog] : 0.130353182554245%
[frog] : 0.10221995413303375%
[ship] : 0.0327462479472160348%
[bird] : 0.026850370690226555%



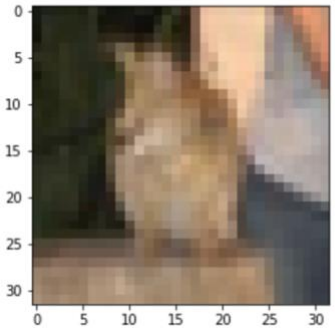
Prediction : cat
Label : cat

[cat] : 0.6629456281661987%
[dog] : 0.3104471266269684%
[deer] : 0.013771264813840398%
[horse] : 0.006193049252033234%
[frog] : 0.0040916050784289848%



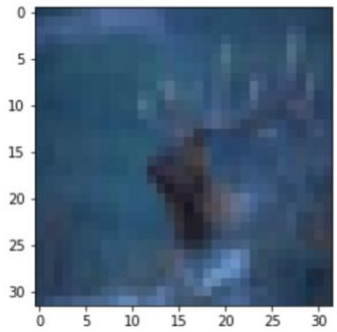
Prediction : cat
Label : cat

[cat] : 0.7032752037048348%
[dog] : 0.2587571442127228%
[horse] : 0.013495602644979954%
[deer] : 0.009691619314253338%
[bird] : 0.008151049725711346%

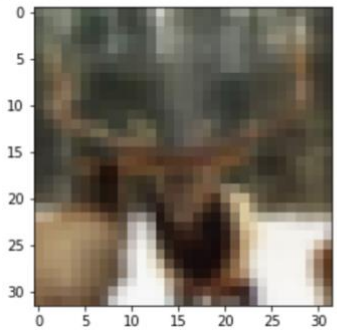


Deer

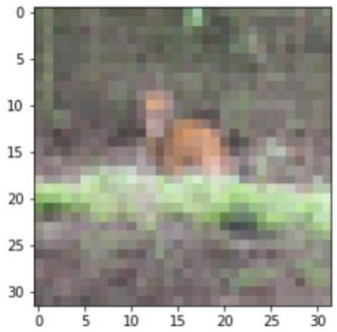
```
Prediction : deer
Label : deer

[deer] : 0.491790175437927 25%
[airplane] : 0.27450042963027954%
[bird] : 0.14442531764507294%
[cat] : 0.04969421401619911%
[dog] : 0.015336345881223679%
```



```
Prediction : deer
Label : deer

[deer] : 0.5544464588165283%
[horse] : 0.2953772544860 84%
[dog] : 0.09584562480449677%
[cat] : 0.03488387167453766%
[bird] : 0.016575705260038376%
```

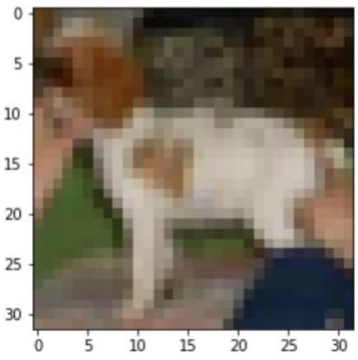


```
Prediction : deer
Label : deer

[deer] : 0.5505792498588562%
[bird] : 0.18684116005897522%
[frog] : 0.09347403794527054%
[cat] : 0.07436604052782059%
[dog] : 0.036566250026226044%
```

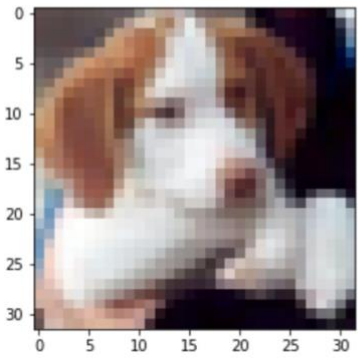


Dog

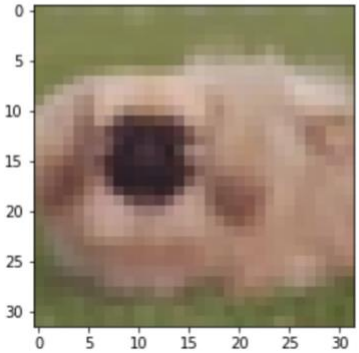
```
Prediction : dog
Label : dog

[dog] : 0.68467658758163 45%
[cat] : 0.16447018086910248%
[deer] : 0.0587560310959816%
[frog] : 0.04679093137383461%
[horse] : 0.028393726795911 79%
```



```
Prediction : dog
Label : dog

[dog] : 0.7174587249755859%
[cat] : 0.270336478948593 14%
[horse] : 0.0035477818455547094%
[bird] : 0.0029500743839889765%
[ship] : 0.0014326366363093257%
```

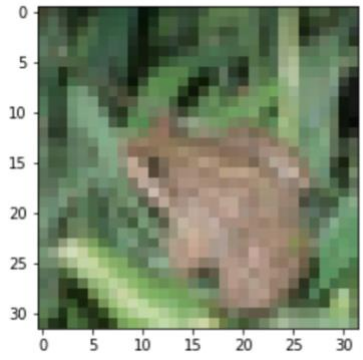


```
Prediction : dog
Label : dog

[dog] : 0.8593490123748779%
[cat] : 0.1138240173459053%
[bird] : 0.019452085718512535%
[horse] : 0.0039097038097679615%
[deer] : 0.0019476586021482944%
```

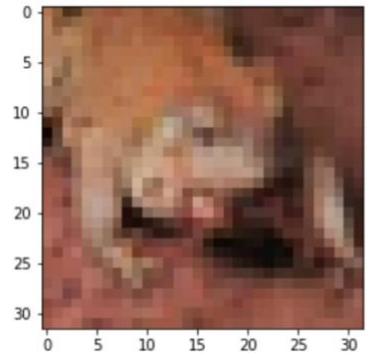


Frog

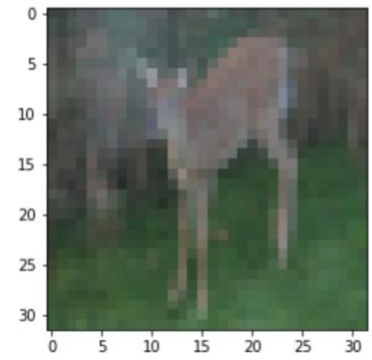
```
Prediction : frog
Label : frog

[frog] : 0.9709337353706360%
[deer] : 0.019151292741298676%
[bird] : 0.006591210141777992%
[cat] : 0.0027918629348278046%
[dog] : 0.00047775672283023596%
```



```
Prediction : frog
Label : frog

[frog] : 0.8508720993995667%
[cat] : 0.07315554469823837%
[deer] : 0.040861260145902634%
[bird] : 0.013589980080723763%
[dog] : 0.013013184070587158%
```

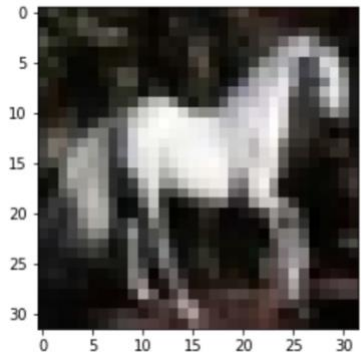


```
Prediction : deer
Label : deer

[deer] : 0.9797317385673523%
[dog] : 0.009909161366522312%
[horse] : 0.005477961152791977%
[cat] : 0.0024332031607627870%
[bird] : 0.0021039119455963373%
```

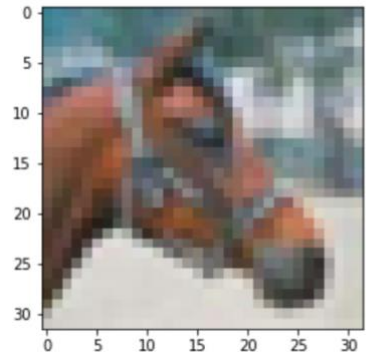


Horse

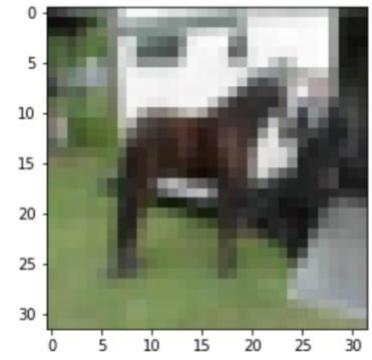
```
Prediction : horse
Label : horse

[horse] : 0.9985874891281128%
[dog] : 0.0012307106517255306%
[deer] : 0.00011997365072602406%
[cat] : 3.7814403185620904e-05%
[bird] : 1.4195922631188296e-05%
```



```
Prediction : horse
Label : horse

[horse] : 0.7669614553451538%
[cat] : 0.11191302537918091%
[dog] : 0.10866903513669968%
[bird] : 0.005730580072849989%
[truck] : 0.0025841279421001673%
```

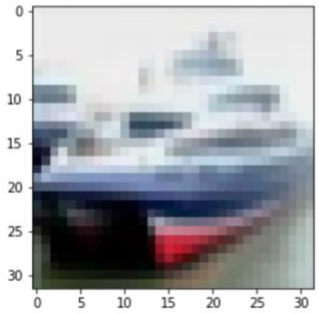


```
Prediction : horse
Label : horse

[horse] : 0.9542384743690491%
[dog] : 0.0317717008292675%
[deer] : 0.006458227522671223%
[bird] : 0.006087053567171097%
[cat] : 0.0011072637280449271%
```

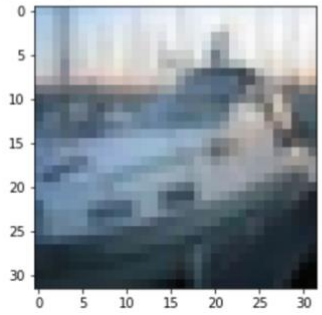


Ship

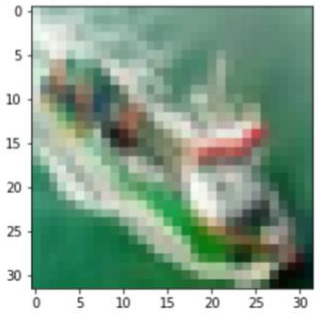
```
Prediction : ship
Label : ship

[ship] : 0.9986656904220581%
[automobile] : 0.0013012521667405963%
[airplane] : 3.098871457041241e-05%
[frog] : 1.0340985454604379e-06%
[truck] : 7.188530730672937e-07%
```



```
Prediction : ship
Label : ship

[ship] : 0.9439495801925659%
[automobile] : 0.025414744392037 39%
[airplane] : 0.019518950954079628%
[cat] : 0.0034671246539801 36%
[truck] : 0.0024980455636978 15%
```

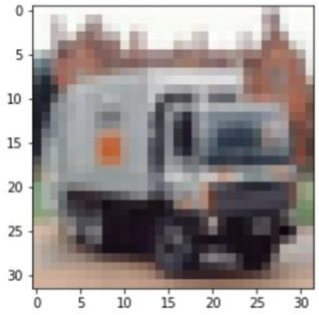


```
Prediction : ship
Label : ship

[ship] : 0.8950455188751221%
[automobile] : 0.0481448732316494%
[frog] : 0.0338454358279705 05%
[airplane] : 0.0104639520868659 02%
[cat] : 0.003926988225430 25%
```

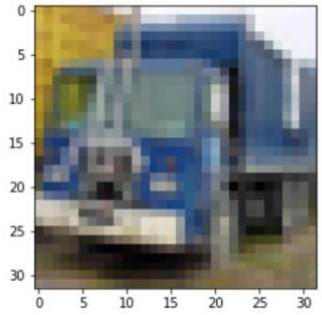


Truck

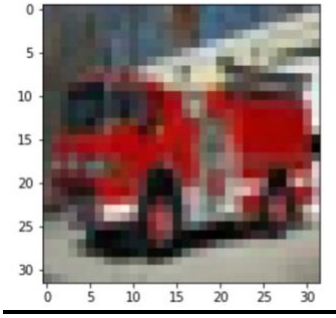
```
Prediction : truck
Label : truck

[truck] : 0.9999931454658508%
[automobile] : 6.468701485573547e-06%
[airplane] : 3.6476208720159775e-07%
[ship] : 2.5280753490619645e-08%
[deer] : 1.1376068143054141e-10%
```



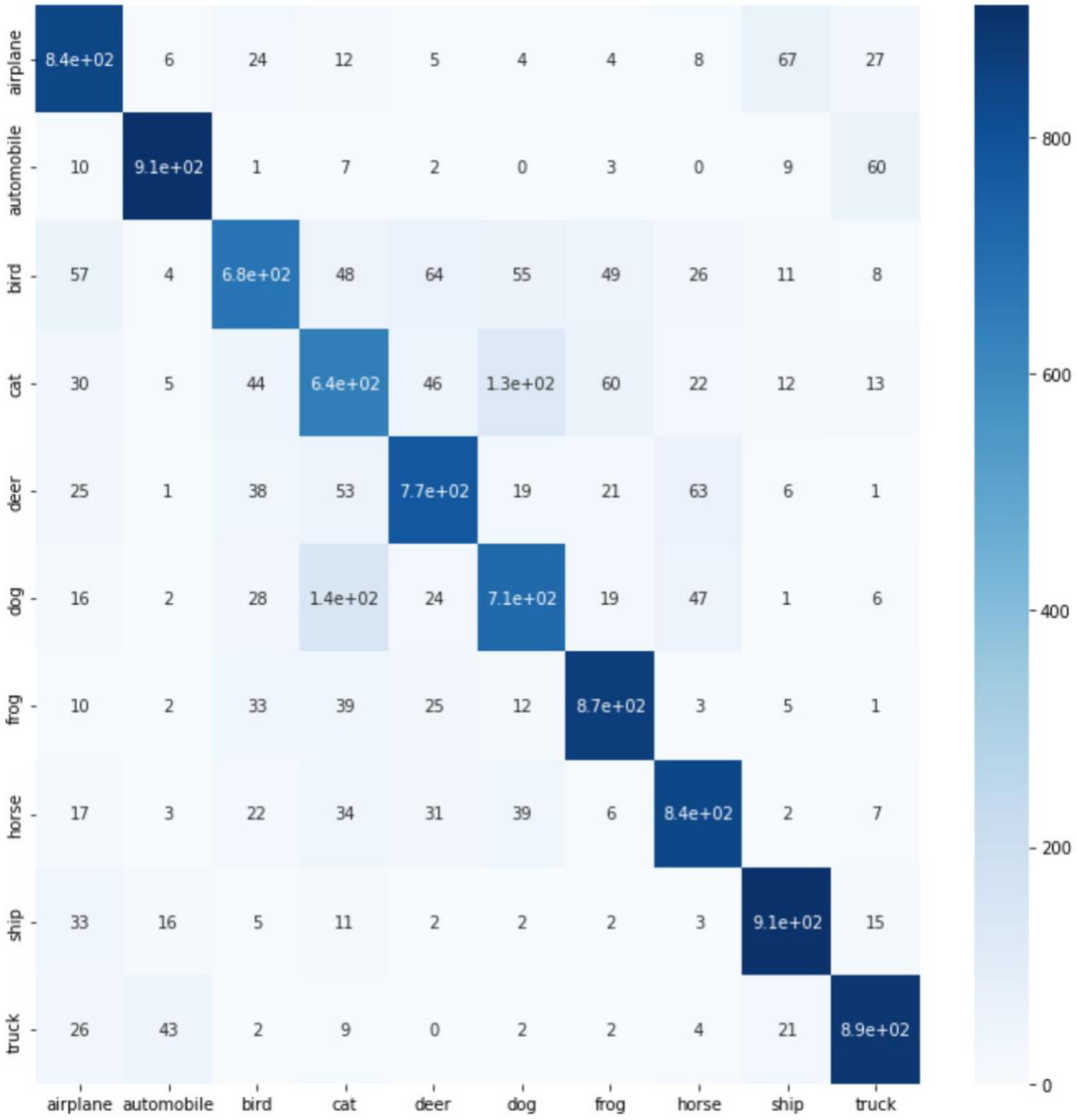
```
Prediction : truck
Label : truck

[truck] : 0.9999716877937317%
[automobile] : 2.52358822763199e-05%
[ship] : 1.9198930658603786e-06%
[airplane] : 1.1120934004793526e-06%
[deer] : 2.122534148440991e-09%
```



```
Prediction : truck
Label : truck

[truck] : 0.9998967051506042%
[automobile] : 0.0001030934508889913 6%
[airplane] : 7.935767598610255e-08%
[ship] : 6.879184333286048e-09%
[deer] : 9.723475496992151e-12%
```



Tüm Test Datasetinin Sınıflandırma Sonucu Confusion Matrix i



Sonuç

Mini Batch Boyutu : 64

Epoch :100

Dropout : 0.2

Aktivasyon Fonksiyonu : relu

Yukarıdaki hiperparametrelere göre en iyi sonucu 5 katmanlı 64 filtreli ve 3x3 filtre büyüklüğüne sahip model vermiştir. İlgili model için 100 epoch sonucunda:

loss: 0.3952 - accuracy: 0.8341 - val_loss: 0.5804 - val_accuracy: 0.8126

başarım oranı elde edilmiştir.