كلية الحاسبات والذكاء الإصطناعي
Faculty of Computers & Artificial Intelligence

Team Number :39

****

Teams' IDs	Names
202000727	محمد اسامه فايد عبده شطا
202001064	يسرا رمضان عبد الوهاب جاد
202000032	احمد خالد عبد الفتاح سعد
202000967	ميخائيل سامي لويز سوس
202000219	بيشوي عطية نادي
202000745	محمد حسني أبو الوفا محمد

Paper details: -

A)

Authors name: Sergey Ioffe & Vincent Vanhoucke

Paper name: Inception-v4, Inception-ResNet and the Impact of Residual Connections on Learning

Publisher name: Christian Szegedy Google Inc. 1600 Amphitheatre Pkwy, Mountain View, CA

Year of publication: 23 Feb 2016

B)

The Dataset used: https://www.kaggle.com/datasets/andrewmvd/car-plate-detection

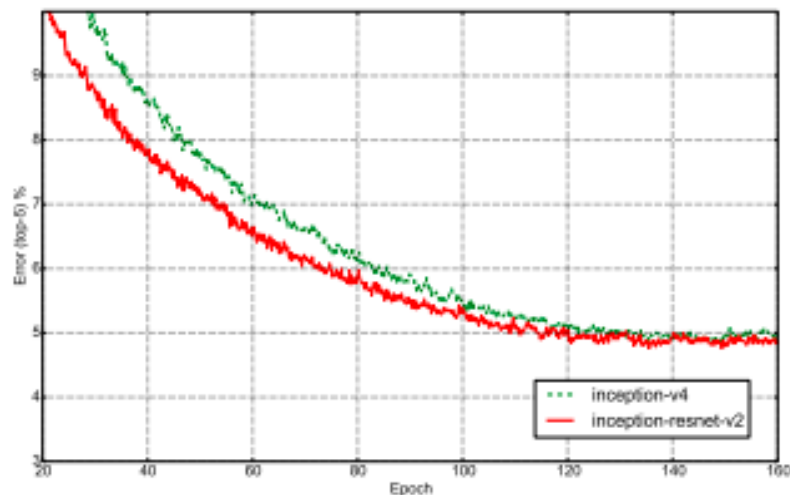**The Implemented algorithms** : Inception-v4, Inception-ResNet2

The results

Figure 24. Top-5 error evolution during training of pure Inception-v4 vs a residual Inception of similar computational cost. The evaluation is measured on a single crop on the non-blacklist images of the ILSVRC-2012 validation set. The residual version trained faster and reached slightly better final recall on the validation set.
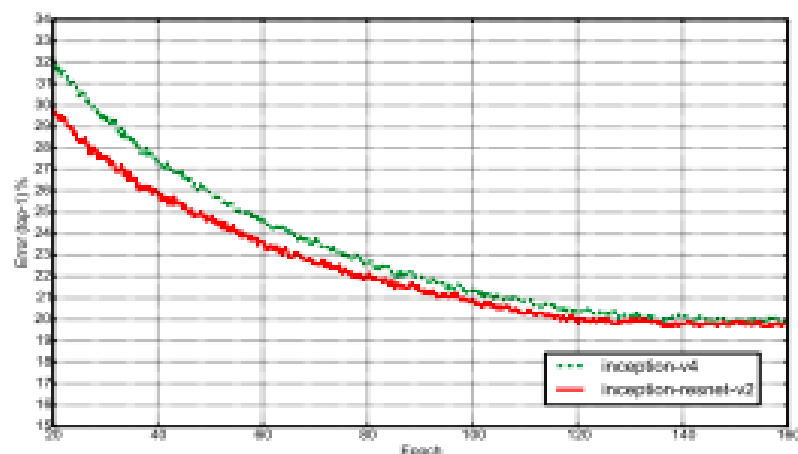

Figure 23. Top-1 error evolution during training of pure Inception-v3 vs a residual Inception of similar computational cost. The evaluation is measured on a single crop on the non-blacklist images of the ILSVRC-2012 validation set. The residual version was training much faster and reached slightly better final accuracy than the traditional Inception-v4.

كلية الحاسبات والذكاء الإصطناعي
Faculty of Computers & Artificial Intelligence

Project Description Document:

A) General Information on the dataset

Name of the Dataset: Car License Plate Detection

Link of the dataset:

https://www.kaggle.com/datasets/andrewmvd/car-plate-detection

The Total Number of Samples: 433.

The Dimension of Images: (224,224,3)

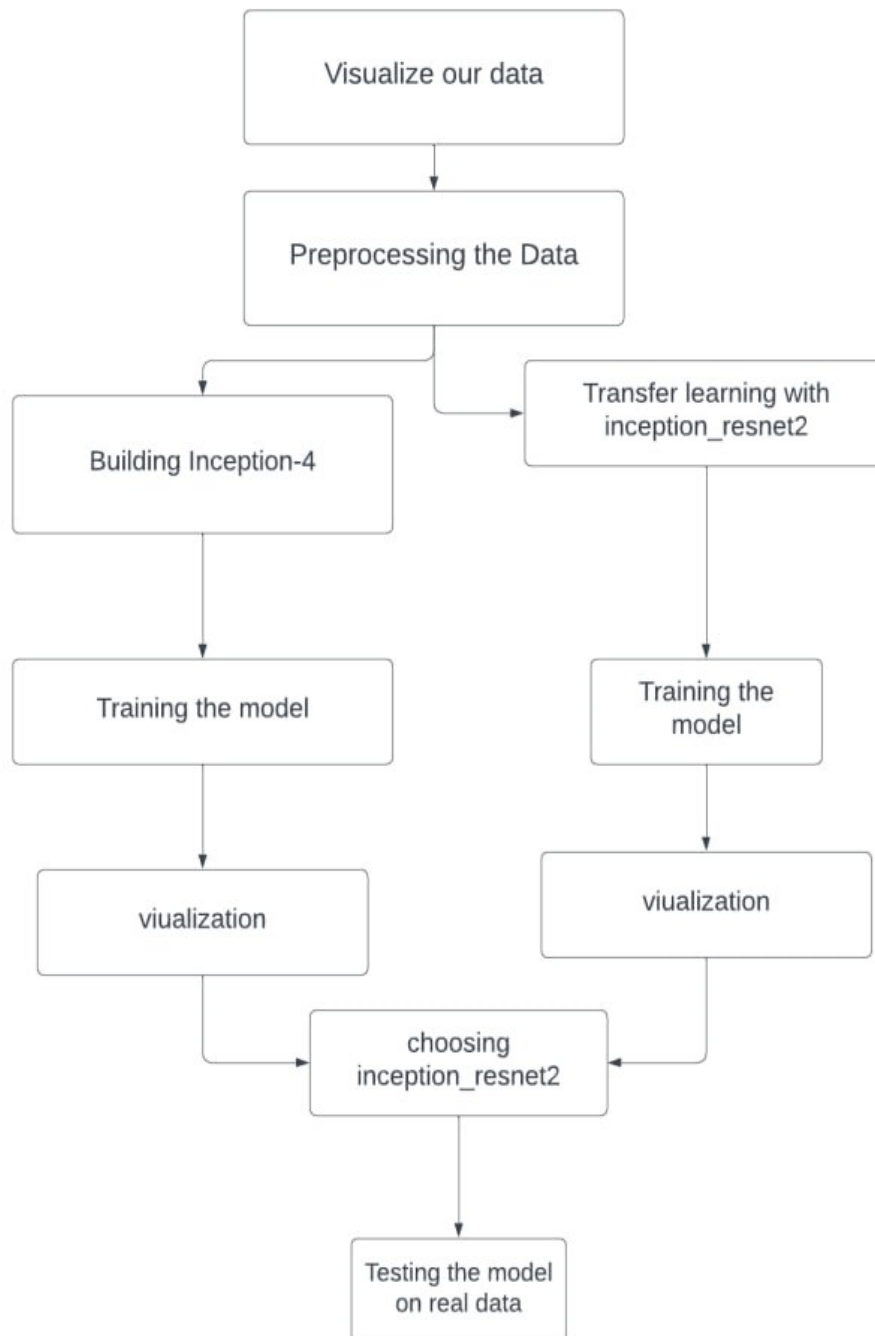## B) Implementation details

The Ratio used for training: 80%

The Ratio used for testing: 20%

The Number of images in Training: 346

The Number of images in Testing: 87

Block Diagram: -

```
                    ┌─────────────────────┐
                    │  Visualize our data │
                    └─────────────────────┘
                               │
                    ┌─────────────────────┐
                    │ Preprocessing the Data│
                    └─────────────────────┘
                       │              │
          ┌──────────────────┐   ┌─────────────────────┐
          │ Building Inception-4│ │ Transfer learning with│
          └──────────────────┘   │   inception_resnet2 │
                   │              └─────────────────────┘
          ┌──────────────────┐            │
          │ Training the model│    ┌─────────────────┐
          └──────────────────┘    │ Training the    │
                   │              │     model       │
          ┌──────────────────┐    └─────────────────┘
          │   viualization   │            │
          └──────────────────┘    ┌─────────────────┐
                   │              │  viualization   │
                   │              └─────────────────┘
                   │              │
              ┌─────────────────────┐
              │     choosing        │
              │ inception_resnet2   │
              └─────────────────────┘
                        │
              ┌─────────────────────┐
              │ Testing the model   │
              │   on real data      │
              └─────────────────────┘
```

The Hyperparameters used in Our Model: (Batch_Size, epochs, Learning_rate)

C) Results Details:

The Inception-v4 Optimizer (val_loss: 0.1454)

```
35/35 [==============================] - 8s 238ms/step - loss: 0.1179 - val_loss: 0.1448
Epoch 27/50
35/35 [==============================] - 8s 236ms/step - loss: 0.1172 - val_loss: 0.1452
Epoch 28/50
35/35 [==============================] - 8s 237ms/step - loss: 0.1173 - val_loss: 0.1458
Epoch 29/50
35/35 [==============================] - 8s 236ms/step - loss: 0.1163 - val_loss: 0.1452
Epoch 30/50
35/35 [==============================] - 8s 238ms/step - loss: 0.1172 - val_loss: 0.1452
Epoch 31/50
35/35 [==============================] - 8s 237ms/step - loss: 0.1174 - val_loss: 0.1464
Epoch 32/50
35/35 [==============================] - 8s 238ms/step - loss: 0.1173 - val_loss: 0.1478
Epoch 33/50
35/35 [==============================] - 8s 236ms/step - loss: 0.1159 - val_loss: 0.1471
Epoch 34/50
35/35 [==============================] - 8s 235ms/step - loss: 0.1174 - val_loss: 0.1458
Epoch 35/50
35/35 [==============================] - 8s 237ms/step - loss: 0.1170 - val_loss: 0.1461
Epoch 36/50
35/35 [==============================] - 8s 236ms/step - loss: 0.1168 - val_loss: 0.1467
Epoch 37/50
35/35 [==============================] - 8s 235ms/step - loss: 0.1158 - val_loss: 0.1458
Epoch 38/50
35/35 [==============================] - 8s 237ms/step - loss: 0.1160 - val_loss: 0.1461
Epoch 39/50
35/35 [==============================] - 8s 238ms/step - loss: 0.1155 - val_loss: 0.1462
Epoch 40/50
35/35 [==============================] - 8s 239ms/step - loss: 0.1158 - val_loss: 0.1461
Epoch 41/50
35/35 [==============================] - 8s 237ms/step - loss: 0.1155 - val_loss: 0.1476
Epoch 42/50
35/35 [==============================] - 8s 235ms/step - loss: 0.1150 - val_loss: 0.1465
Epoch 43/50
35/35 [==============================] - 8s 236ms/step - loss: 0.1161 - val_loss: 0.1454
Epoch 44/50
35/35 [==============================] - 8s 239ms/step - loss: 0.1151 - val_loss: 0.1453
Epoch 45/50
35/35 [==============================] - 8s 236ms/step - loss: 0.1150 - val_loss: 0.1465
Epoch 46/50
35/35 [==============================] - 8s 236ms/step - loss: 0.1146 - val_loss: 0.1455
Epoch 47/50
35/35 [==============================] - 8s 238ms/step - loss: 0.1151 - val_loss: 0.1460
Epoch 48/50
35/35 [==============================] - 8s 237ms/step - loss: 0.1153 - val_loss: 0.1470
Epoch 49/50
35/35 [==============================] - 8s 237ms/step - loss: 0.1147 - val_loss: 0.1463
Epoch 50/50
35/35 [==============================] - 8s 236ms/step - loss: 0.1145 - val_loss: 0.1454
```

كلية الحاسبات والذكاء الإصطناعي
Faculty of Computers & Artificial Intelligence

The SGD Optimizer (val_loss: 0.0477)

```
Epoch 28/50
35/35 [==============================] - 6s 179ms/step - loss: 0.0343 - val_loss: 0.0527
Epoch 29/50
35/35 [==============================] - 6s 171ms/step - loss: 0.0351 - val_loss: 0.0505
Epoch 30/50
35/35 [==============================] - 6s 172ms/step - loss: 0.0365 - val_loss: 0.0505
Epoch 31/50
35/35 [==============================] - 6s 170ms/step - loss: 0.0345 - val_loss: 0.0496
Epoch 32/50
35/35 [==============================] - 6s 167ms/step - loss: 0.0364 - val_loss: 0.0514
Epoch 33/50
35/35 [==============================] - 6s 178ms/step - loss: 0.0356 - val_loss: 0.0510
Epoch 34/50
35/35 [==============================] - 6s 166ms/step - loss: 0.0342 - val_loss: 0.0506
Epoch 35/50
35/35 [==============================] - 6s 169ms/step - loss: 0.0350 - val_loss: 0.0508
Epoch 36/50
35/35 [==============================] - 6s 167ms/step - loss: 0.0340 - val_loss: 0.0489
Epoch 37/50
35/35 [==============================] - 6s 169ms/step - loss: 0.0341 - val_loss: 0.0508
Epoch 38/50
35/35 [==============================] - 6s 167ms/step - loss: 0.0337 - val_loss: 0.0501
Epoch 39/50
35/35 [==============================] - 6s 177ms/step - loss: 0.0341 - val_loss: 0.0503
Epoch 40/50
35/35 [==============================] - 6s 166ms/step - loss: 0.0337 - val_loss: 0.0505
Epoch 41/50
35/35 [==============================] - 6s 173ms/step - loss: 0.0340 - val_loss: 0.0503
Epoch 42/50
35/35 [==============================] - 6s 171ms/step - loss: 0.0351 - val_loss: 0.0479
Epoch 43/50
35/35 [==============================] - 6s 168ms/step - loss: 0.0337 - val_loss: 0.0474
Epoch 44/50
35/35 [==============================] - 6s 175ms/step - loss: 0.0335 - val_loss: 0.0469
Epoch 45/50
35/35 [==============================] - 6s 167ms/step - loss: 0.0333 - val_loss: 0.0474
Epoch 46/50
35/35 [==============================] - 6s 169ms/step - loss: 0.0321 - val_loss: 0.0475
Epoch 47/50
35/35 [==============================] - 6s 167ms/step - loss: 0.0311 - val_loss: 0.0497
Epoch 48/50
35/35 [==============================] - 6s 173ms/step - loss: 0.0318 - val_loss: 0.0497
Epoch 49/50
35/35 [==============================] - 6s 173ms/step - loss: 0.0312 - val_loss: 0.0475
Epoch 50/50
35/35 [==============================] - 6s 173ms/step - loss: 0.0325 - val_loss: 0.0477
```

كلية الحاسبات والذكاء الإصطناعي
Faculty of Computers & Artificial Intelligence

The Adam Optimizer(Rmsprop, momentum)(val_loss: 0.0162)

```
35/35 [==============================] - 6s 174ms/step - loss: 0.0017 - val_loss: 0.0152
Epoch 29/50
35/35 [==============================] - 6s 179ms/step - loss: 0.0016 - val_loss: 0.0182
Epoch 30/50
35/35 [==============================] - 6s 185ms/step - loss: 0.0016 - val_loss: 0.0193
Epoch 31/50
35/35 [==============================] - 6s 178ms/step - loss: 0.0015 - val_loss: 0.0180
Epoch 32/50
35/35 [==============================] - 6s 179ms/step - loss: 0.0014 - val_loss: 0.0176
Epoch 33/50
35/35 [==============================] - 6s 173ms/step - loss: 0.0015 - val_loss: 0.0177
Epoch 34/50
35/35 [==============================] - 6s 174ms/step - loss: 0.0015 - val_loss: 0.0190
Epoch 35/50
35/35 [==============================] - 6s 177ms/step - loss: 0.0014 - val_loss: 0.0173
Epoch 36/50
35/35 [==============================] - 6s 179ms/step - loss: 0.0014 - val_loss: 0.0148
Epoch 37/50
35/35 [==============================] - 6s 173ms/step - loss: 0.0013 - val_loss: 0.0157
Epoch 38/50
35/35 [==============================] - 6s 173ms/step - loss: 0.0014 - val_loss: 0.0142
Epoch 39/50
35/35 [==============================] - 6s 174ms/step - loss: 0.0014 - val_loss: 0.0139
Epoch 40/50
35/35 [==============================] - 6s 185ms/step - loss: 0.0015 - val_loss: 0.0129
Epoch 41/50
35/35 [==============================] - 6s 175ms/step - loss: 0.0013 - val_loss: 0.0125
Epoch 42/50
35/35 [==============================] - 6s 178ms/step - loss: 0.0013 - val_loss: 0.0150
Epoch 43/50
35/35 [==============================] - 6s 179ms/step - loss: 0.0013 - val_loss: 0.0131
Epoch 44/50
35/35 [==============================] - 6s 172ms/step - loss: 0.0013 - val_loss: 0.0149
Epoch 45/50
35/35 [==============================] - 6s 183ms/step - loss: 0.0014 - val_loss: 0.0128
Epoch 46/50
35/35 [==============================] - 6s 180ms/step - loss: 0.0013 - val_loss: 0.0135
Epoch 47/50
35/35 [==============================] - 6s 178ms/step - loss: 0.0013 - val_loss: 0.0158
Epoch 48/50
35/35 [==============================] - 6s 176ms/step - loss: 0.0013 - val_loss: 0.0142
Epoch 49/50
35/35 [==============================] - 6s 173ms/step - loss: 0.0013 - val_loss: 0.0141
Epoch 50/50
35/35 [==============================] - 6s 186ms/step - loss: 0.0013 - val_loss: 0.0162
```