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EE104 Sec 01
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LAB 8 README

Abstract

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This lab allows users to utilize convolutional neural networks to recognize color images and try different methods to improve accuracy.

Objective

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Fulfill all requirements listed in the table

Program or Requirement	Use Case	Earned Score / Max Score
Demonstration Video	You must submit a demonstration video or your score for this lab will be zero	
README file & Developer Documentation	README is a brief user guide and developer documentation so that the user can install the proper python packages and knows how to execute your program. The documentation section can contain sample screenshots with explanation.	_____ / 10
Check in your README file, documentation, and codes to Github	You will put all your work on your GitHub account and submit the same code to Canvas and share access to your GitHub with your instructor for grading purpose.	_____ / 5
CNN - Baseline + Increasing Dropout + Data Augmentation + Batch Normalization + Your own method	To achieve > 90% accuracy and recognize successfully 90% of the given test images. Video recording note: Because it will take a long time to run this test, you must submit a recording showing the result. The recording can be done by Zoom or any screen video capturing software. *Trim out the irrelevant contents and only submit the last few minutes showing you achieved your highest accuracy.* Achieve > 90% accuracy: Earn full 30 points Achieve > 87% accuracy: Earn 25 points Achieve > 84% accuracy: Earn 20 points Achieve > 80% accuracy: Earn 20 points Achieve > 77% accuracy: Earn 15 points Achieve > 74% accuracy: Earn 10 points Achieve > 70% accuracy: Earn 5 points Else: 0 point	_____ / 30
CNN - Challenge test	Recognize 5 unrecognizable images from the TEST IMAGES section below (3 points each) Hint: you can leverage and modify the test code from this GoogleColab page to test this lab: https://colab.research.google.com/github/tensorflow/docs/blob/master/site/en/tutorials/images/classification.ipynb#scrollTo=dC40sRITBSsQ	_____ / 15
Game Development – Balloon Flight	Leverage the base code from chapter Balloon Flight and add your own Hacks and Tweaks for any 4 of the options below: More High Scores, Lives, Speed It Up, Different Way to Score, File Handling, Add in Multiples of Each Obstacles, Level Up, Space Out the Obstacles	_____ / 40
	TOTAL	**100%**

Requirements

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Google collab:
```
!pip install tensorflow
!pip install keras
!pip install h5py
!pip install Matplotlib
!pip install numpy
```

```python
import tensorflow as tf
# baseline model with dropout and data augmentation on the cifar10 dataset
import sys
import numpy as np
from keras.datasets import cifar10
from tensorflow.keras.utils import to_categorical
from keras.models import Sequential
from keras.layers import Conv2D
from keras.layers import MaxPooling2D
from keras.layers import Dense
from keras.layers import Flatten
from tensorflow.keras.optimizers import SGD
from keras.preprocessing.image import ImageDataGenerator
from keras.layers import Dropout
from keras.layers import BatchNormalization
from tensorflow.keras import datasets, layers, models
import matplotlib.pyplot as plt
```

Pygame:
```python
7   import pgzrun
8   import pygame
9   import pgzero
10  import random
11  from pgzero.builtins import Actor
12  from random import randint
13
```

Instruction

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- Ensure all packages are installed prior to running an programs
- CNN
    - Download and run the Copyofcnn.ipynb
    - Observe the code and view the output
    - The goal of the program is to increase the classification accuracy but applying optimization techniques.
    - The output will look like the following

```
Epoch 34/40
1563/1563 [==============================] - 39s 25ms/step - loss: 0.2085 - accuracy: 0.9311 - val_loss: 0.5383 - val_accuracy: 0.8521
Epoch 35/40
1563/1563 [==============================] - 38s 25ms/step - loss: 0.2061 - accuracy: 0.9324 - val_loss: 0.5112 - val_accuracy: 0.8540
Epoch 36/40
1563/1563 [==============================] - 38s 25ms/step - loss: 0.2007 - accuracy: 0.9339 - val_loss: 0.4867 - val_accuracy: 0.8634
Epoch 37/40
1563/1563 [==============================] - 39s 25ms/step - loss: 0.1934 - accuracy: 0.9375 - val_loss: 0.4819 - val_accuracy: 0.8646
Epoch 38/40
1563/1563 [==============================] - 39s 25ms/step - loss: 0.1867 - accuracy: 0.9389 - val_loss: 0.4981 - val_accuracy: 0.8649
Epoch 39/40
1563/1563 [==============================] - 39s 25ms/step - loss: 0.1888 - accuracy: 0.9383 - val_loss: 0.5077 - val_accuracy: 0.8561
Epoch 40/40
1563/1563 [==============================] - 38s 25ms/step - loss: 0.1831 - accuracy: 0.9388 - val_loss: 0.4777 - val_accuracy: 0.8602
```

Double-click (or enter) to edit

313/313 - 2s - loss: 0.4777 - accuracy: 0.8602 - 2s/epoch - 7ms/step
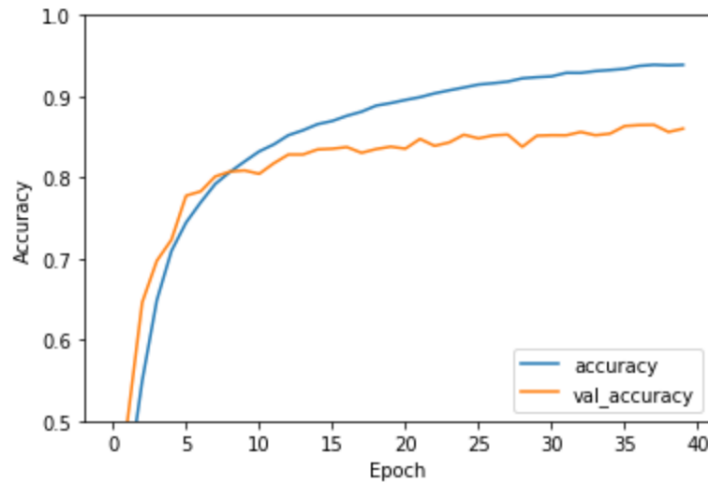
-
- CNN Challenge
  - Run the code at the end of the copyofcnn.ipynb
  - Jaguar car

```
image_url = "https://images.all-free-download.com/images/graphiclarge/classic_jaguar_210354.jpg"
image_path = tf.keras.utils.get_file('classic_jaguar_210354.jpg', origin=image_url)

img = tf.keras.utils.load_img(
    image_path, target_size=(32, 32)
)
img_array = tf.keras.utils.img_to_array(img)
img_array = tf.expand_dims(img_array, 0) # Create a batch

predictions = model.predict(img_array)
score = tf.nn.softmax(predictions[0])

print(
    "This image most likely belongs to {} with a {:.2f} percent confidence."
    .format(class_names[np.argmax(score)], 100 * np.max(score))
)
print(score)
```

```
This image most likely belongs to automobile with a 99.61 percent confidence.
tf.Tensor(
[1.0455601e-04 9.9605584e-01 2.9018420e-06 3.7188004e-06 2.1646790e-06
 2.8373606e-06 2.3319881e-05 3.9860945e-05 1.3030920e-04 3.6344097e-03], shape=(10,), dtype=float32)
```

  - Devel-motors sixteen

```
image_url = "https://hips.hearstapps.com/hmg-prod.s3.amazonaws.com/images/devel-motors-sixteen-1540564064.jpg"
image_path = tf.keras.utils.get_file('devel-motors-sixteen-1540564064.jpg', origin=image_url)

img = tf.keras.utils.load_img(
    image_path, target_size=(32, 32)
)
img_array = tf.keras.utils.img_to_array(img)
img_array = tf.expand_dims(img_array, 0) # Create a batch

predictions = model.predict(img_array)
score = tf.nn.softmax(predictions[0])

print(
    "This image most likely belongs to {} with a {:.2f} percent confidence."
    .format(class_names[np.argmax(score)], 100 * np.max(score))
)
print(score)
```

```
Downloading data from https://hips.hearstapps.com/hmg-prod.s3.amazonaws.com/images/devel-motors-sixteen-1540564064.jpg
1335296/1333618 [==============================] - 0s 0us/step
1343488/1333618 [==============================] - 0s 0us/step
This image most likely belongs to automobile with a 99.90 percent confidence.
tf.Tensor(
[6.44805550e-05 9.98974562e-01 2.19593244e-06 2.68521694e-06
 1.84617898e-06 2.09927771e-06 1.92146726e-05 2.66038642e-05
 1.03100574e-04 8.03270203e-04], shape=(10,), dtype=float32)
```

  - Valkyrie-spider

```
image_url = "https://amsc-prod-cd.azureedge.net/-/media/aston-martin/images/default-source/models/valkyrie/new/valkyrie-spider_f02-169v2.jpg?mw=1980&rev=-1&hash=
image_path = tf.keras.utils.get_file('valkyrie-spider_f02-169v2.jpg', origin=image_url)

img = tf.keras.utils.load_img(
    image_path, target_size=(32, 32)
)
img_array = tf.keras.utils.img_to_array(img)
img_array = tf.expand_dims(img_array, 0) # Create a batch

predictions = model.predict(img_array)
score = tf.nn.softmax(predictions[0])

print(
    "This image most likely belongs to {} with a {:.2f} percent confidence."
    .format(class_names[np.argmax(score)], 100 * np.max(score))
)
print(score)
```
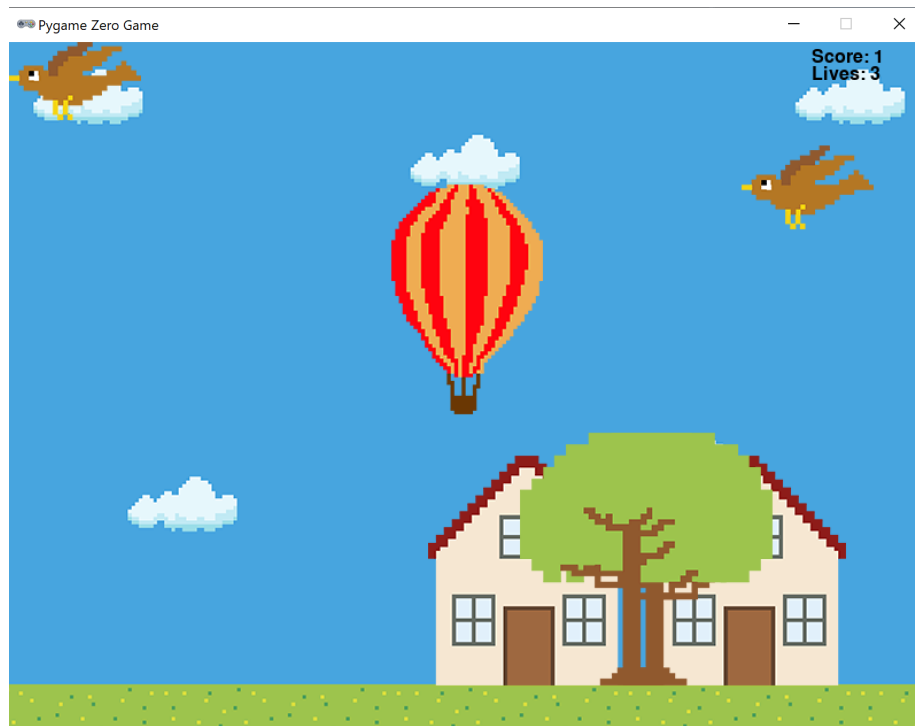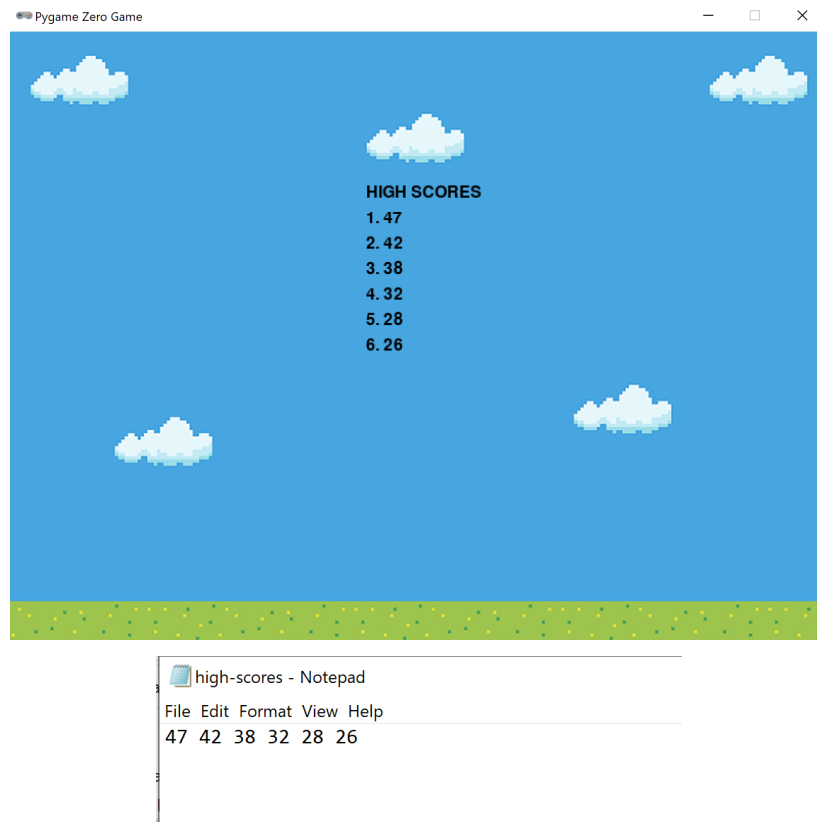
```
Downloading data from https://amsc-prod-cd.azureedge.net/-/media/aston-martin/images/default-source/models/valkyrie/new/valkyrie-spider_f02-169v2.jpg?mw=1980&rev
729088/727309 [==============================] - 0s 0us/step
737280/727309 [==============================] - 0s 0us/step
This image most likely belongs to automobile with a 99.90 percent confidence.
tf.Tensor(
[6.4726781e-05 9.9897408e-01 2.2255635e-06 2.7941962e-06 1.8732994e-06
 2.2226513e-06 1.9458708e-05 2.7087044e-05 1.0330604e-04 8.0223172e-04], shape=(10,), dtype=float32)
```

- Pygame- Balloon Fight
    - Download the program BaloonFight.py run and observe the code
    - Results should look like the following:

Pygame Zero Game

HIGH SCORES
1. 47
2. 42
3. 38
4. 32
5. 28
6. 26

high-scores - Notepad

File Edit Format View Help

47 42 38 32 28 26

.txt file updates to display the scores in the game