Statistic under AI and its application to engineering sciences

Final Project Report

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Git: https://github.com/swildowicz/AI_image_classer

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1. Introduction

The aim of the project is to present an engineering problem how can be classified the data for groups. Decision making can be solved by implementing Artificial Intelligence algorithm which can sort provided data for dedicated containers. Proposed project will have appropriate dataset used for execute created application. The data library will contain random oriented pictures of animals which are sorted by created sensor for dedicated container. For example the data will have 100 pictures of 70 turtles and 30 fish and the application should sort it for two groups with the smallest error detection.
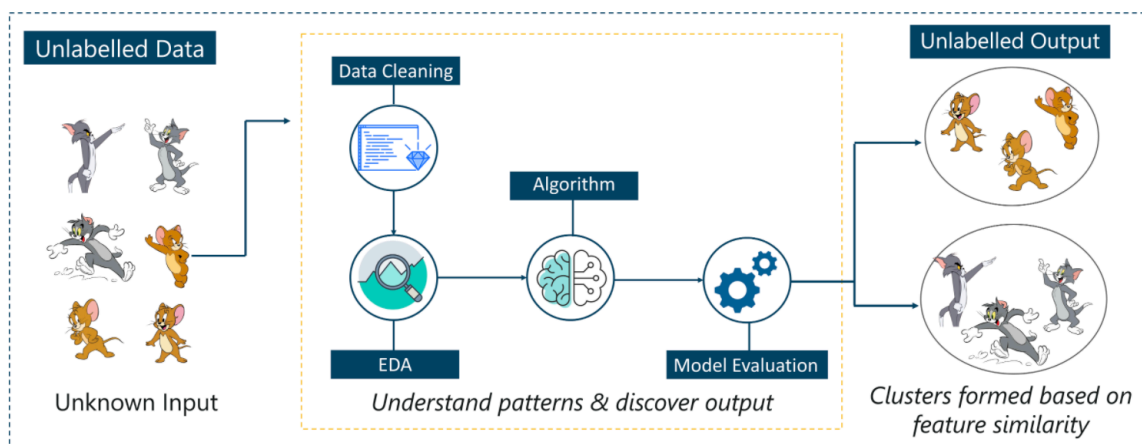

Figure 1: Unsupervised Learning – Artificial Intelligence With Python – Edureka [1].

Unsupervised learning involves training by using unlabeled data and allowing the model to act on that information without guidance. In this type of Machine Learning, the model is not fed

with labeled data, as in the model has no clue that this image is A and this is B, it figures out patterns and the differences between A and B on its own by taking in tons of data [1].

The programming language used in this project will be Python ver 3.x.x. Python is the dynamically typed and garbage-collected. It supports multiple programming paradigms, including structured (particularly, procedural), object-oriented, and functional programming. The TensorFlow and Keras frameworks were used for this task.

2. Program description

Created code can be split into four parts:
- preparing data
- teaching AI agent
- validation of created model
- processing and results validation of the project problem

Model had been teach in five steps by 5000 images for recognize unknown input data. Used framework detected that images belong to 2 different classes. The next task execute teaching and validation procedure. Figure 2 shows console log of application execution.

```
Using TensorFlow backend.

        Classification Turtles and Fishes - AI

$> Reference data:
   *total turtles images: 70
   *total fishes images: 30

        Mix images started ...
$> Total mixed images: 100

$> Create AI model -  started ...
Found 5078 images belonging to 2 classes.
Found 100 images belonging to 2 classes.
Epoch 1/5
50/50 - 41s - loss: 0.6428 - acc: 0.7430 - val_loss: 0.1481 - val_acc: 0.9800
Epoch 2/5
50/50 - 38s - loss: 0.1802 - acc: 0.9400 - val_loss: 0.0537 - val_acc: 1.0000
Epoch 3/5
50/50 - 39s - loss: 0.0244 - acc: 0.9920 - val_loss: 6.8290e-04 - val_acc: 1.0000
Epoch 4/5
50/50 - 38s - loss: 0.0760 - acc: 0.9770 - val_loss: 0.0040 - val_acc: 1.0000
Epoch 5/5
50/50 - 38s - loss: 9.7649e-04 - acc: 1.0000 - val_loss: 6.2643e-05 - val_acc: 1.0000
$> Create AI model -  success

$> Classification started ...
$> Classification finished

$> Total errors
$> SUM: 0
```

Figure 2: Program console log.

To show how AI model teaches images recognition program created training and validation accuracy and loss. On Figure 3 we can observe the five steps of learning. Obtained results are exactly what we expected. During learning process the loss possibility is decreasing and accuracy is rising.
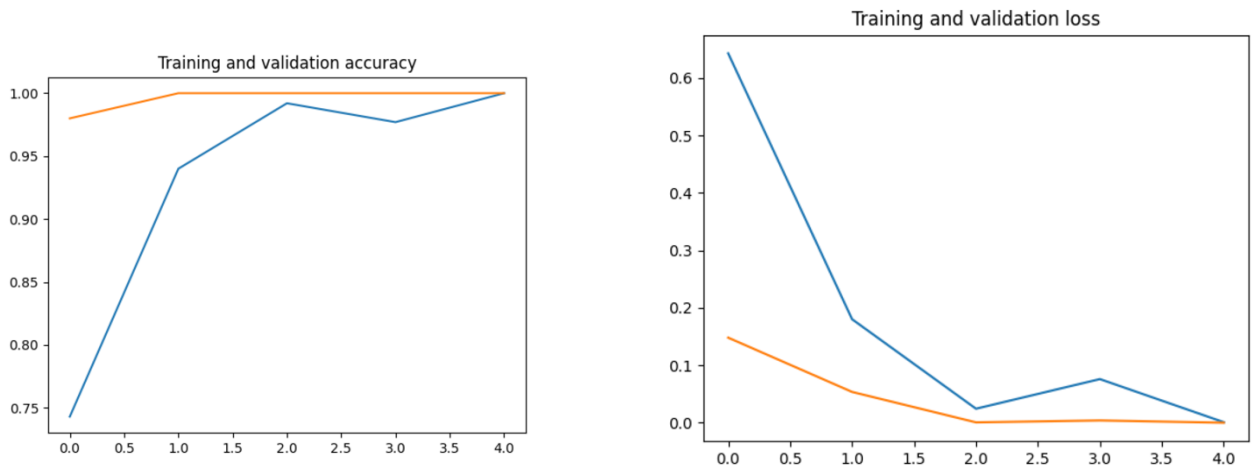
Figure 3: Training and validation of accuracy and loss

3. Results

The final test of problem concerned the sorting of 100 unknown images into two groups using created agent. To prepare this test, program copied to folder 100 pictures, mixed them and mark each image for the errors check at the end of execution.
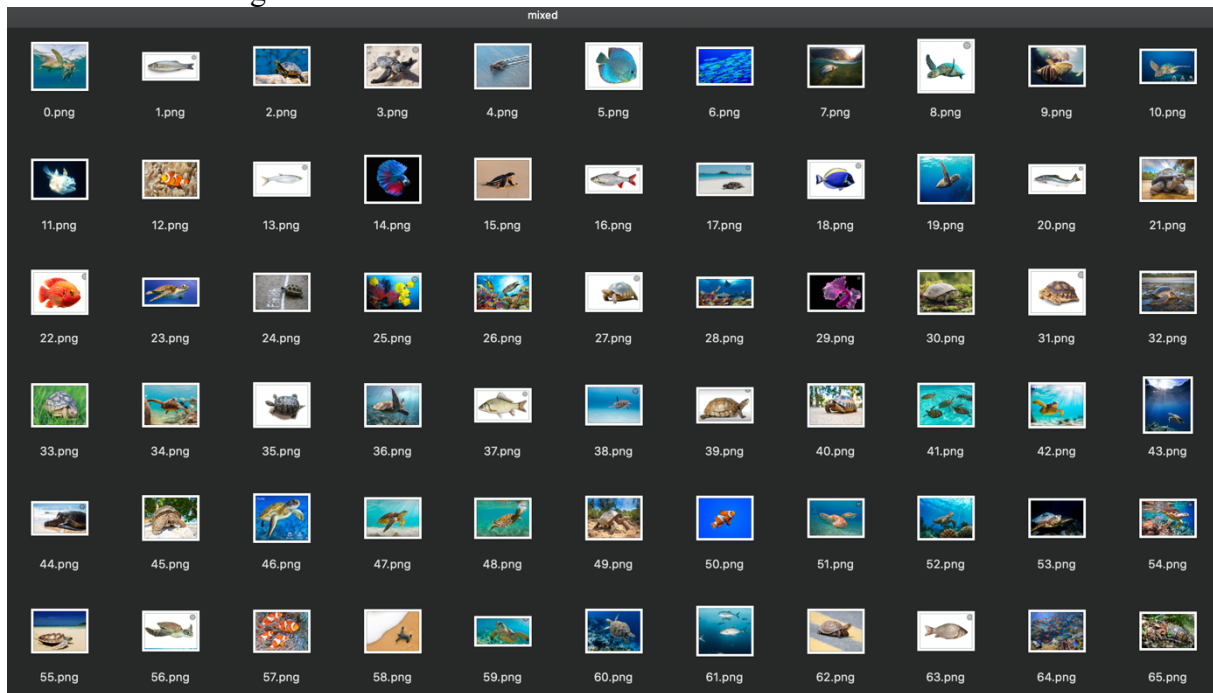

Figure 4: Folder with mixed images.

In the next step it took picture by picture into prediction by created AI agent. By the result, we can insert current file to proper folder – sorted fish or sorted turtle. The Figure 5 shows results of agent processing. At the end code check the errors by compare classified files and making array.
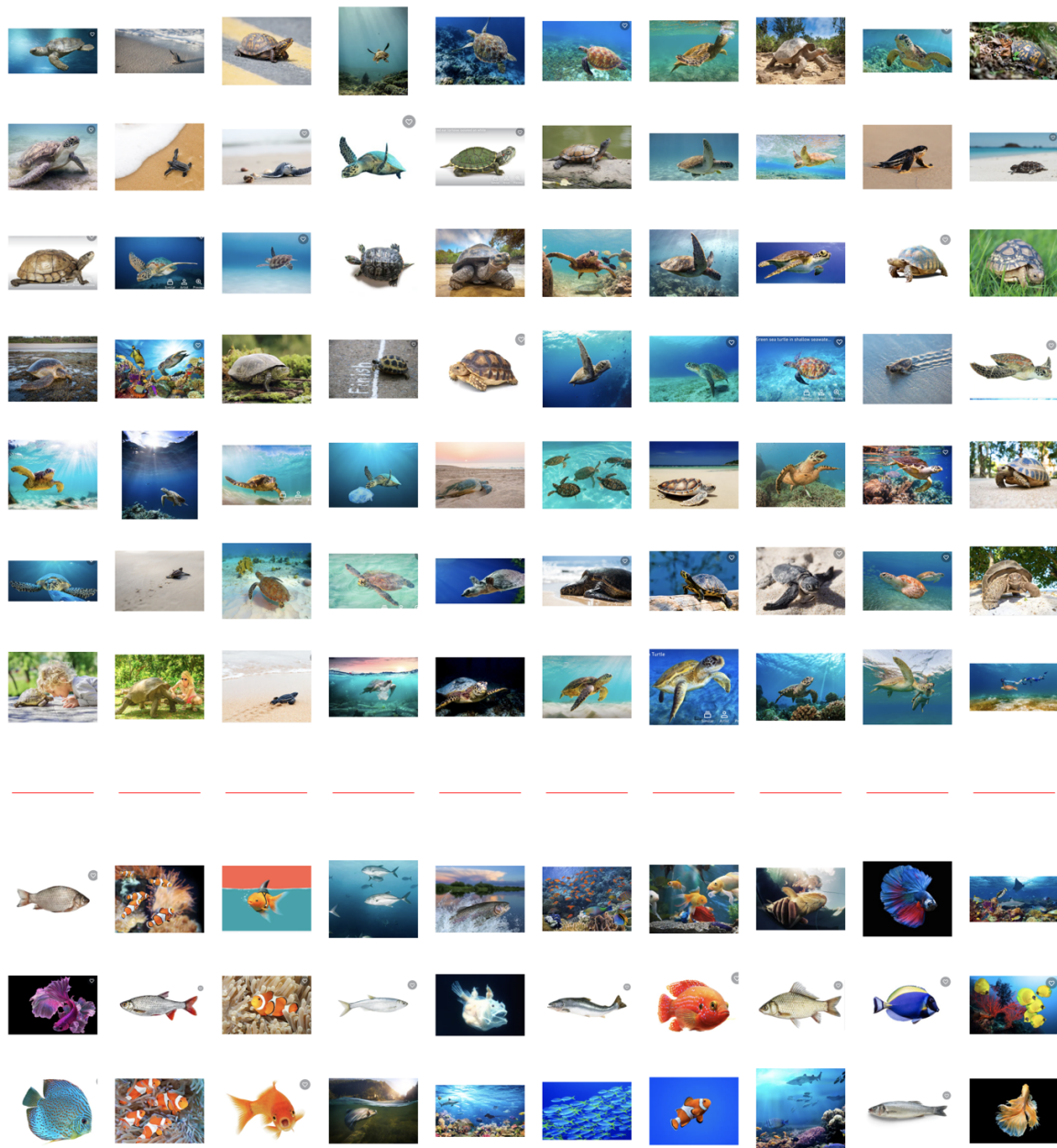
Figure 5: Sorted images

4. Conclusion

The created AI agent is able to recognize 30 fish and 70 turtles from provided 100 images and classified then into two independent groups. The results presented in Chapter 3. show that the agent has good knowledge how to sort unknown input image with high precision. Recognition decision is about 99,9 % so we can be sure that possibility of do mistake by agent is very low.

5. Attachments:

[1] . https://www.edureka.co/blog/artificial-intelligence-with-python/