

Istanbul Technical University  
Artificial Neural Networks  
Final Exam  
Mehmet Bora Kocabaş  
040190024

Github Link: <https://github.com/BoraKocabas/coin>

## 1.Purpose of The Algorithm

Purpose of the algorithm is to train an AI model to predict where a coin drop will land when dropped from a 1m height and which side of the coin will be up based solely on its initial dropping orientation.

## 2.Data Collection

Collection of the data is done manually by dropping a coin from 1m on a wooden floor and saving the landing position and orientation of the coin. 100 total coin tosses have been collected to create the dataset. The dataset consists of 9 csv files that are split based on if the coin is dropped tails facing up, dropped side facing up or heads facing up and if the samples are for training validation or testing.

Out of the total 100 coin drops 40 of them were dropped tails facing up, 40 of them are dropped heads facing up and 20 of them are dropped from the side. The number of samples for training validation and testing are as follows:

**Training:** 30 Heads up, 30 Tails up, 14 from the side **Total: 74**

**Validation:** 6 Heads up, 6 Tails up, 4 from the side **Total: 16**

**Testing:** 4 Heads up, 4 Tails up, 2 from the side **Total: 10**

A sample photograph is given.



### 3.AI Model

Convolutional neural network is used for this project using tensorflow. Convolutional Neural Networks are a class of deep learning models that are designed to handle visuals.

CNN's use convolutional layers to recognize patterns which make them useful for image recognition.

In addition a sigmoid function is used to predict the end result since the output may only be heads or tails.

### 4.Training and Validation

Total of 30 epocs are done to train the algorithm. Too many epocs will overfit the model therefore should be avoided.

```
Epoch 29/50
4/4 [=====] - 7s 2s/step - loss: 22.8242 - x_output_loss: 14.8015 - y_output_loss: 8.0114 - output_bo
val_x_output_loss: 320.5842 - val_y_output_loss: 153.2694 - val_output_bool_loss: 2.0452 - val_x_output_mae: 14.9273 - val_y_o
Epoch 30/50
4/4 [=====] - 7s 2s/step - loss: 18.0659 - x_output_loss: 11.7737 - y_output_loss: 6.2794 - output_bo
val_x_output_loss: 325.3232 - val_y_output_loss: 160.0237 - val_output_bool_loss: 2.2962 - val_x_output_mae: 15.0346 - val_y_o
```

### 5.Testing Results

Testing results give approximately 50% accuracy. This is due to the inherent randomness of a coin drop. These results can be improved by dropping the coin from a lesser height with a more precise dropping mechanism in order to increase correlation between inputs and outputs.

```
Prediction 1:
Predicted_x : 8.034985 True_x : -13.843839
Predicted_y : 2.884243 True_y : 7.783903
Predicted_orientation : 1 True_orientation : 0

Prediction 2:
Predicted_x : 15.73649 True_x : -8.437543
Predicted_y : -3.892643 True_y : 4.298364
Predicted_orientation : 1 True_orientation : 1
```