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| Names | IDs |
| Yomna Abdallah Taher | **20190624** |
| Adel Abdelmonem Arfa | **20190280** |

**Assignment 4**

**YOLO Neural Network**

**In first we use two datasets:**

* **First one is custom dataset which we made it by our self and labeled it:**

**This data set detects 5 classes which are**

1. **Fish**
2. **Dog**
3. **Cat**
4. **Cow**
5. **Bird**

**And this data has 61 images for training, 11 images for validation and 10 images for testing.**

**Every image is 416 pixels.**

* **The second one is an online data set which about chess:**

**This data set detects 13 classes which are**

1. **bishop**
2. **black bishop**
3. **black king**
4. **black knight**
5. **black pawn**
6. **black queen**
7. **black rook**
8. **white bishop**
9. **white king**
10. **white knight**
11. **white pawn**
12. **white queen**
13. **white rook**

**And this data has 202 images for training, 58 images for validation and 29 images for testing.**

**Every image is 416 pixels.**

**Architecture of the layers:**

**We use the same architecture with the two datasets, let’s show it:**

* **Layers:**

**Our layers divided into three parts:**

* **First one is backbone which is our NN that take the inputs images and make their whites**
* **Second one is the neck and its part of backbone which is responsible for takes the same inputs with some scaling like colors or positions**
* **Third one is the head and it’s the part which detect the objects by drawing its boxes** 
  + - * **We used 283 layers, 7287458 parameters, 7287458 gradients**
* **Activation function: Leaky ReLU activation function is used in hidden layers and the sigmoid activation function is used in the final detection layer**
* **Grid size: we used a dynamic grid size which generate the size refers to the number of pixels of image.**
* **Number of anchors 3**
* **optimization function for training is SGD**
* **loss function is IOU loss as it gave us the minimum loss**

Chart, line chart

Description automatically generated

Chart, line chart

Description automatically generated

Graphical user interface

Description automatically generated

* **Predicted images:**

**Because our custom dataset not big we will show**

**416x416 1 white-knight**

**1 white-rook**

**(0.014s)**

A screenshot of a game

Description automatically generated with low confidence

* **Time : 0.3ms pre-process, 12.0ms inference, 0.9ms NMS per image at shape (1, 3, 416, 416)**
* **(1, 3, 416, 416) this is the shape of picture which mean that our grid size is (1,3)**