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Object Detection, Faster RCNN, Retinanet, Detectron2

HomewoRK 6 rEPORT

CSCI 677

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| --- | --- | --- | --- | --- |
| **Parameter** | **Faster RCNN (lr=0.00025)** | **Retinanet (lr=0.0001)** | **Retinanet (lr=0.0001)** | **Retinanet (lr=0.00025)** |
| **Training time** | **29:22 min** | **35:15 min** | **35:15 min** | **34:59 min** |
| **Total train loss(at end of 3000iterations)** | **0.667** | **0.3119** | **0.3119** | **0.3146** |
| **Train Loss\_classification** | **0.2049** | **0.2066** | **0.2066** | **0.1406** |
| **Threshold** | **0.7** | **0.7** | **0.5** | **0.5** |
| **AP50 on test set** | **67.1612** | **14.4381** | **33.9588** | **66.7985** |
|  |  |  |  |  |

**Faster RCNN**

**Qualitative:**

A picture containing text, platform, station, subway

Description automatically generatedGraphical user interface

Description automatically generated with low confidence

A picture containing bicycle, outdoor, tied

Description automatically generatedA train on the tracks

Description automatically generated with medium confidence

A picture containing fence, grass, outdoor

Description automatically generatedA person riding a horse

Description automatically generated with medium confidence

A person riding a horse

Description automatically generated with medium confidenceA picture containing text

Description automatically generated

A picture containing text, grass, sky, outdoor

Description automatically generatedA group of sheep in a fenced in area

Description automatically generated with medium confidence

**Quantitative:**

**Lr=0.00025**

Chart, line chart

Description automatically generatedChart

Description automatically generated

Chart, line chart

Description automatically generatedChart, line chart

Description automatically generated

**Retinanet**

**Qualitative**

1. **Case 1: lr=0.00025**
2. **Threshold =0.5**

A group of people posing for the camera

Description automatically generated with medium confidenceA picture containing text, indoor, living, floor

Description automatically generatedA picture containing text, sky, water, outdoor

Description automatically generated

A train on the railway tracks

Description automatically generated with medium confidenceA picture containing text, grass, soccer, field

Description automatically generated **A picture containing text, cat, floor, indoor

Description automatically generated**

A picture containing text, indoor

Description automatically generatedA person holding a cup

Description automatically generated with medium confidenceA cat lying on a window sill

Description automatically generated with medium confidenceA boat on the water

Description automatically generated with low confidenceA picture containing text, mammal, dog

Description automatically generatedA picture containing text, sky, outdoor, city

Description automatically generated

A picture containing text, outdoor

Description automatically generatedA computer on a desk

Description automatically generated with medium confidence**A bird standing on a ledge

Description automatically generated with low confidence**

1. **Case 2: lr=0.0001**
2. **Threshold = 0.7**

Two people on a motorcycle in the woods

Description automatically generated with medium confidenceA picture containing text, floor, indoor, room

Description automatically generatedA large airplane on a runway

Description automatically generated with low confidence

A picture containing text, outdoor

Description automatically generatedA picture containing text, person

Description automatically generatedA person holding a baby

Description automatically generated with medium confidence

A group of bicyclists on a road with a crowd watching

Description automatically generated with medium confidenceA picture containing child, baby, indoor, person

Description automatically generated

1. **Threshold =0.5**

A picture containing text, sofa, indoor, living

Description automatically generatedA group of airplanes on a runway

Description automatically generated with low confidenceA silver car parked on a street

Description automatically generated with low confidence

A sign in the snow

Description automatically generated with low confidenceA person in a tree

Description automatically generated with low confidenceA picture containing mammal, horse

Description automatically generated

A living room with a table and chairs

Description automatically generated with low confidenceA picture containing text

Description automatically generated

**Quantitative**

1. **Case 1: lr=0.00025**

Chart, line chart, histogram

Description automatically generatedChart, line chart, histogram

Description automatically generated

1. **Case 2: lr=0.0001**

Chart, histogram

Description automatically generatedChart, histogram

Description automatically generated

**Observations:**

1. **Faster RCNN took less time for training compared to Retinanet on the same dataset.**
2. **Retinanet kind of failed to locate many objects when threshold was kept to 0.7 with LR=0.0001**
3. **When threshold was kept to 0.5 with LR=0.0001, it detected more objects but still failed to miss out few. For eg, in the above results, it failed to identify the bird in one of the photos, then a car with its orientation showing only the headlights was also missed out.**
4. ** In this, LR=0.0001, threshold=0.5, Retinanet identifies the person sitting inside the train**

**But fails to identify the train. This might be argued due to class imbalance in the training data.**

1. **Retinanet does much better when LR=0.00025, threshold=0.5 achieving AP50 score of 58.0239**
2. **Retinanet somehow does poorly on ‘cat’ and ‘dogs’ class.**
3. **Faster RCNN outperformed all the settings of Retinanet, achieving AP50 score of 67.1612.**
4. **One more observation was, Faster RCNN gives high confidence measure on each class predicted whereas Retinanet identifies objects with much lesser confidence.**