Oriented object detection (OOD)

CSE 541 Computer Vision
End-Semester Presentation
Group - 3

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Problem Statement

- Oriented Object Detection (OOD).

- Investigate OOD models suitable for oriented rectangular bounding box detection.

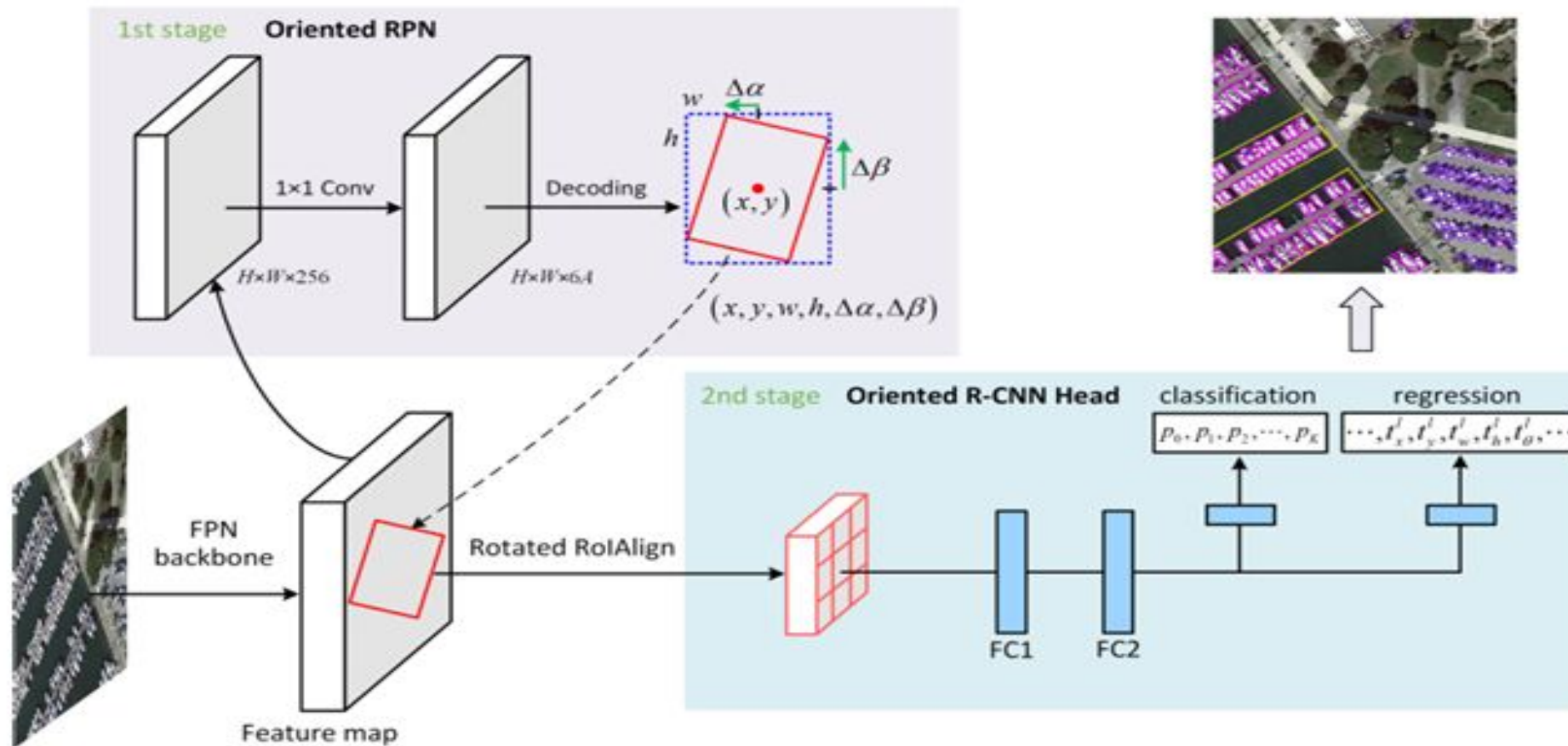# Oriented R-CNN for Object Detection Architecture

Figure 2: Overall framework of oriented R-CNN, which is a two-stage detector built on FPN. The first stage generates oriented proposals by oriented RPN and the second stage is oriented R-CNN head to classify proposals and refine their spatial locations. For clear illustration, we do not show the FPN as well as the classification branch in oriented RPN.

- Xie, Z., Zhu, X., Zhang, X., Tan, J., & Huang, Z. (2021). Oriented R-CNN for Object Detection. In Proceedings of the IEEE/CVF International Conference on Computer Vision (ICCV) (pp. 7862-7871). Retrieved from

Dataset Discussion

➔ AU Drone Dataset

➔ The Dataset was divided into 3 categories 9, 10 and 21 each consisting of 3457, 2352, and 6486 images each along with its annotation respectively.

➔ The Dataset included 8 classes

➔ We have used 200 images for training, 50 for testing and 20 for validation.

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Dataset Example

Image

1691 931 1691 980 1778 980 1778 931 awning-tricycle 1

1216 215 1216 240 1260 240 1260 215 motor 1

904 668 904 715 922 715 922 668 motor 1

1175 183 1175 208 1216 208 1216 183 motor 1

1244 306 1244 337 1282 337 1282 306 motor 1

1323 314 1323 345 1368 345 1368 314 motor 1

696 672 696 692 744 692 744 672 motor 1

1126 267 1126 333 1175 333 1175 267 awning-tricycle 1

999 479 999 515 1067 515 1067 479 awning-tricycle 1

1392 309 1392 339 1433 339 1433 309 motor 1

1163 630 1163 694 1210 694 1210 630 awning-tricycle 1

1200 242 1200 273 1237 273 1237 242 motor 1

818 409 818 444 884 444 884 409 awning-tricycle 1

1224 190 1224 214 1267 214 1267 190 motor 1

Annotation of the image

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Methodology

Model Selection: Oriented RCNN.

Model Configuration:
  - Set the number of classes in the bounding box head to 8 to match the defined classes.
  - Configure training settings such as learning rate, epochs, and evaluation metrics.

Training:
  - Train the model using with the specified dataset, model configurations, and training settings.
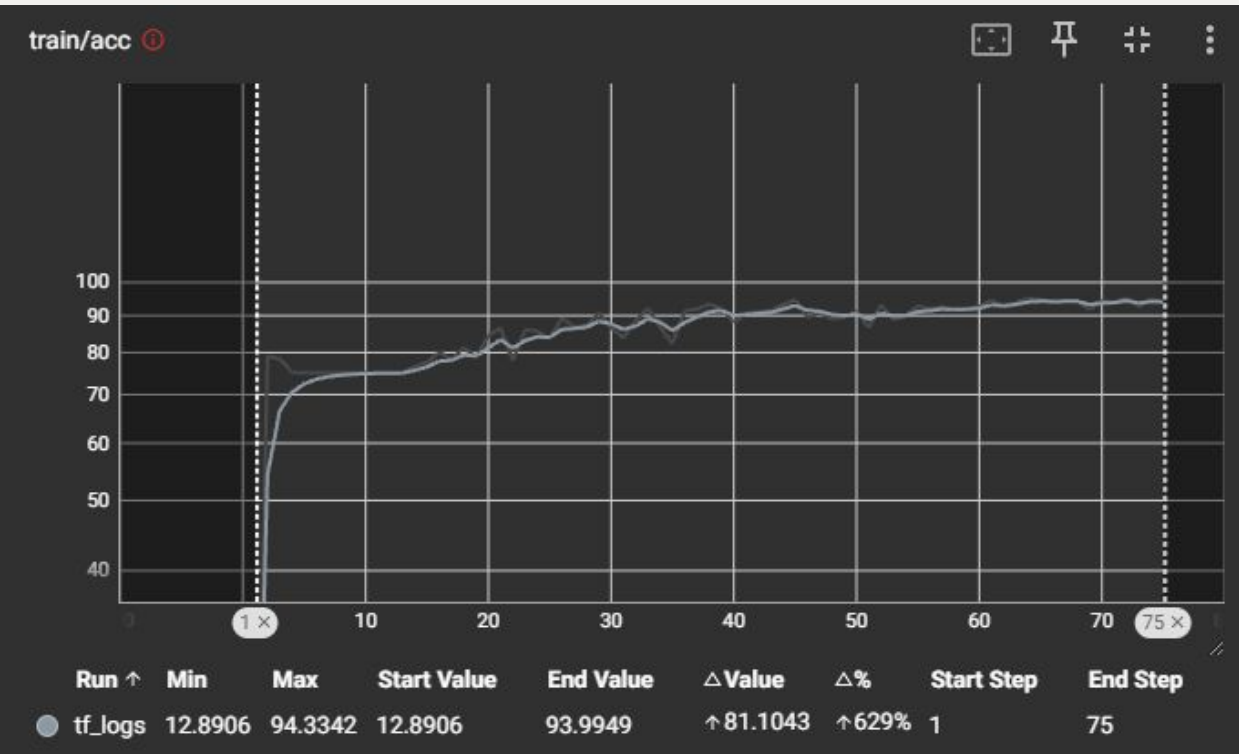
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Results

Results

Results
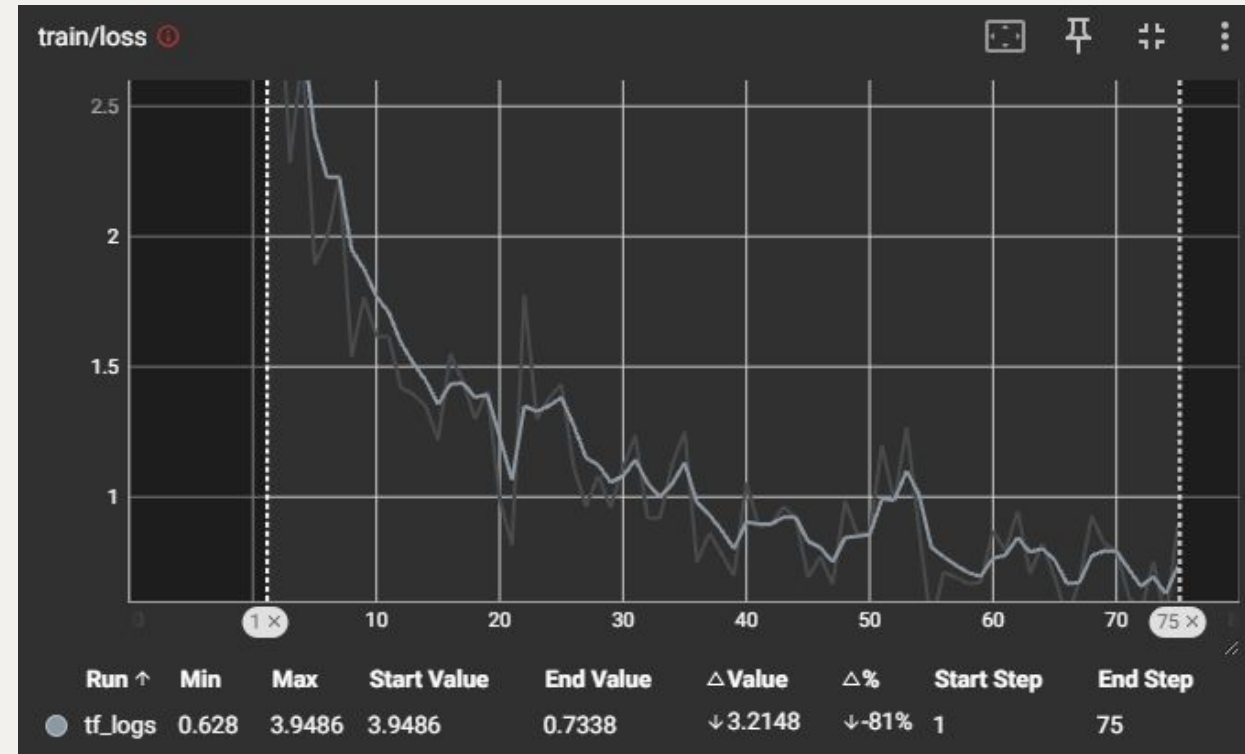
result

Results Statistics

```
+-------------------+------+------+--------+-------+
| class             | gts  | dets | recall | ap    |
+-------------------+------+------+--------+-------+
| awning-tricycle   | 89   | 193  | 0.989  | 0.832 |
| motor             | 334  | 674  | 0.713  | 0.643 |
| people            | 4    | 0    | 0.000  | 0.000 |
| truck             | 1    | 0    | 0.000  | 0.000 |
| car               | 177  | 318  | 1.000  | 0.998 |
| bicycle           | 10   | 0    | 0.000  | 0.000 |
| van               | 6    | 0    | 0.000  | 0.000 |
| tricycle          | 4    | 0    | 0.000  | 0.000 |
+-------------------+------+------+--------+-------+
```

mAP = 0.824

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Results

Accuracy

Loss

Future Works

- We are aiming to complete the whole procedure over the complete AU Drone dataset.

- To make the changes in the existing project to make it robust over the real time detection.

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References

- Xie, Z., Zhu, X., Zhang, X., Tan, J., & Huang, Z. (2021). Oriented R-CNN for Object Detection. In Proceedings of the IEEE/CVF International Conference on Computer Vision (ICCV) (pp. 7862-7871). Retrieved from https://openaccess.thecvf.com/content/ICCV2021/papers/Xie_Oriented_R-CNN_for_Object_Detection_ICCV_2021_paper.pdf

- Thinklab-Sjtu. (n.d.). GitHub - Thinklab-SJTU/CSL_RetinaNet_Tensorflow: Code for ECCV 2020 paper: Arbitrary-Oriented Object Detection with Circular Smooth Label. GitHub. https://github.com/Thinklab-SJTU/CSL_RetinaNet_Tensorflow

- Open-Mmlab. (n.d.). GitHub - open-mmlab/mmrotate: OpenMMLab Rotated Object Detection Toolbox and Benchmark. GitHub. https://github.com/open-mmlab/mmrotate

- Xie, X., Cheng, G., Wang, J., Yao, X., & Han, J. (2021, August 12). Oriented R-CNN for object detection. arXiv.org. https://arxiv.org/abs/2108.05699

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Thank You

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