

Which Airline is This? Airline Logo Detection in Real-World Weather Conditions

Motivation

Airline Logo Detection:

Localize and classify all airline logos on airplane tails in an image

General Logo Detection

- State-of-the-art systems mostly based on off the shelf object detectors like Faster R-CNN
- Datasets feature mainly clean images captured under controlled conditions

Open Questions

- Are off the shelf object detectors enough?
- What about real-world weather like rain or fog?



Faster R-CNN [1]



Our system with proposed DA

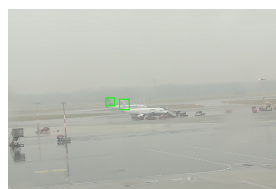
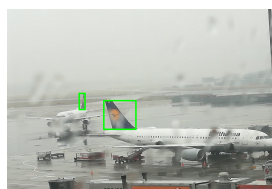
Dataset for Airline Logo Detection

- **Simple Image:** Captured under clear weather conditions
- **Difficult Image:** Mostly captured under adverse weather conditions (e.g. fog, rain, ...)
- **2 Test Splits:** One test split with only simple images, one with only difficult images

Split	Images	Annotations	Classes	Simple Images	Difficult Images
Train	4396	4517	41	✓	
Val	625	665	41	✓	
Test1	1290	1397	41	✓	
Test2	252	459	13		✓
Overall	6563	7038	41		

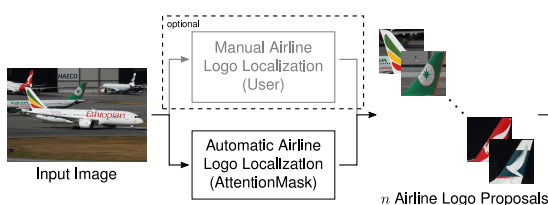


Simple Images



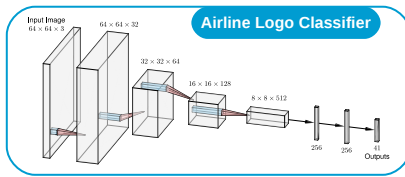
Difficult Images

Airline Logo Detection System



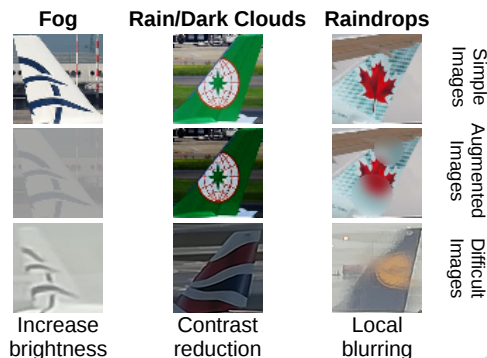
- State-of-the-art AttentionMask [2] for localizing logo proposals
- AttentionMask is adapted in terms of scales and output
- Localization can be provided by the user as well (not used for the reported results)

- Classifier based on VGG
- Optimized architecture
- 7 layers (see below)



Data Augmentation

- 3 scenarios (fog, rain/dark clouds, raindrops)
- Learning free (no training data available)



Results

Green frames around images denote successful cases (correctly localized and classified), red frames denote failure cases (not correctly localized or classified).

Airline logos found/not found by our system with DA on difficult images



Evaluation

- **mAP:** Mean average precision
- **DA:** Our data augmentation strategy

Method	Simple Images		Difficult Images			
	mAP	mAP ₇₅	w/o DA	w/o DA	with DA	with DA
YOLOv3 [3]	0.698	0.869	0.101	0.129	0.123	0.147
Faster R-CNN [1]	0.659	0.826	0.118	0.102	0.128	0.117
Ours	0.708	0.880	0.173	0.221	0.203	0.248

- Tailored architecture works better than object detectors
- Adverse weather conditions have strong effect on the results

References

- [1] Ren, S.; He, K.; Girshick, R.; Sun, J.: Faster R-CNN: Towards real-time object detection with region proposal networks. In: NIPS (2015)
- [2] Wilms, C.; Frintrop S.: AttentionMask: Attentive, efficient object proposal generation focusing on small objects. In: ACCV (2018)
- [3] Redmon, J.; Farhadi, A.: YOLOv3: An incremental improvement. In: arXiv (2018)

Acknowledgment

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