Swimming Pools Detection from Aerial Imagery

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OVERVIEW

- Complexity with Aerial imagery: detect the objects with different variations, scale and representations.
- Many civil applications: geographic information system mapping, agriculture, traffic planning, and navigation...
- Swimming pool detection: important for property tax assessment because they impact the value of the property.
- For companies to help redirect their marketing efforts.
- For Public health and mosquito control agencies.
- Previous works often use single stage detector like Yolo, SSD or Double stage detector (RCNN)
- Previous works use common benchmark like COCO to detect multiples objects in images.
- Goal: show the efficiency of cutting-edge models for detecting swimming pools with satellites images. We will show that CornerNet and DynamicHead are better.

DATA

Dataset available on Kaggle:
- Original size is 25,000 x 25,000 pixels
- Patches of 512x512 pixels and 1224 patches
- 3,197 annotated pools with different shapes and hues
- We use Cross-validation with k=5folds

REFERENCES


METHODS

- Metrics: We used Precision, Recall and F1 score for the detection task.
- Models: We used a FasterRCNN, CornerNet and DynamicHead with pretrained weights.
- Data augmentation: HueSaturationValue, RandomBrightnessContrast, Horizon and vertical flips, random rotate, transpose, compression, resize and cutmix.

RESULTS

- All implemented models are efficient on this task
- FasterRCNN is weaker with many variations, contrast in images.
- Wrong prediction of swimming pool (using background)
- Bias or exceptional situation in image
- Error of dataset or data augmentation
- CornerNet and DynamicHead achieves higher scores

CONCLUSION

- All models are efficient on this swimming pool detection task.
- CornerNet and DynamicHead are much efficient even when there are many variations and different scale, representations of objects.
- Future work: Try to improve models by using their variants, change backbones or use Dynamic-Head as plugin block to any other model.