

Object Recognition and Classification Task of the Military Aircraft Recognition dataset

Task 2: Exploratory Data Analysis

Dataset structure

Analyzed dataset is a remote sensing image Military Aircraft Recognition dataset that include 3842 images, 20 types, and 22341 instances annotated with horizontal bounding boxes and oriented bounding boxes.

Dataset has 3 folders:

- Images - folder of images in jpg format. Every image has 3-channels (RGB format).
- Imagesets - consists of two text files. Train.txt has ids of train set and test.txt has ids of testset. Train set consists of 1331 image ids. Test set consists of 2511 image ids.
- Annotations - consists of two folders, one for Horizontal bounding boxes and one for Oriented bounding boxes. Bounding boxes are presented in xml files.

XML file structure:

- Filename
- Image dims (h, w, depths)
- Database (probably where did image come from)
- Segmented
- Objects:

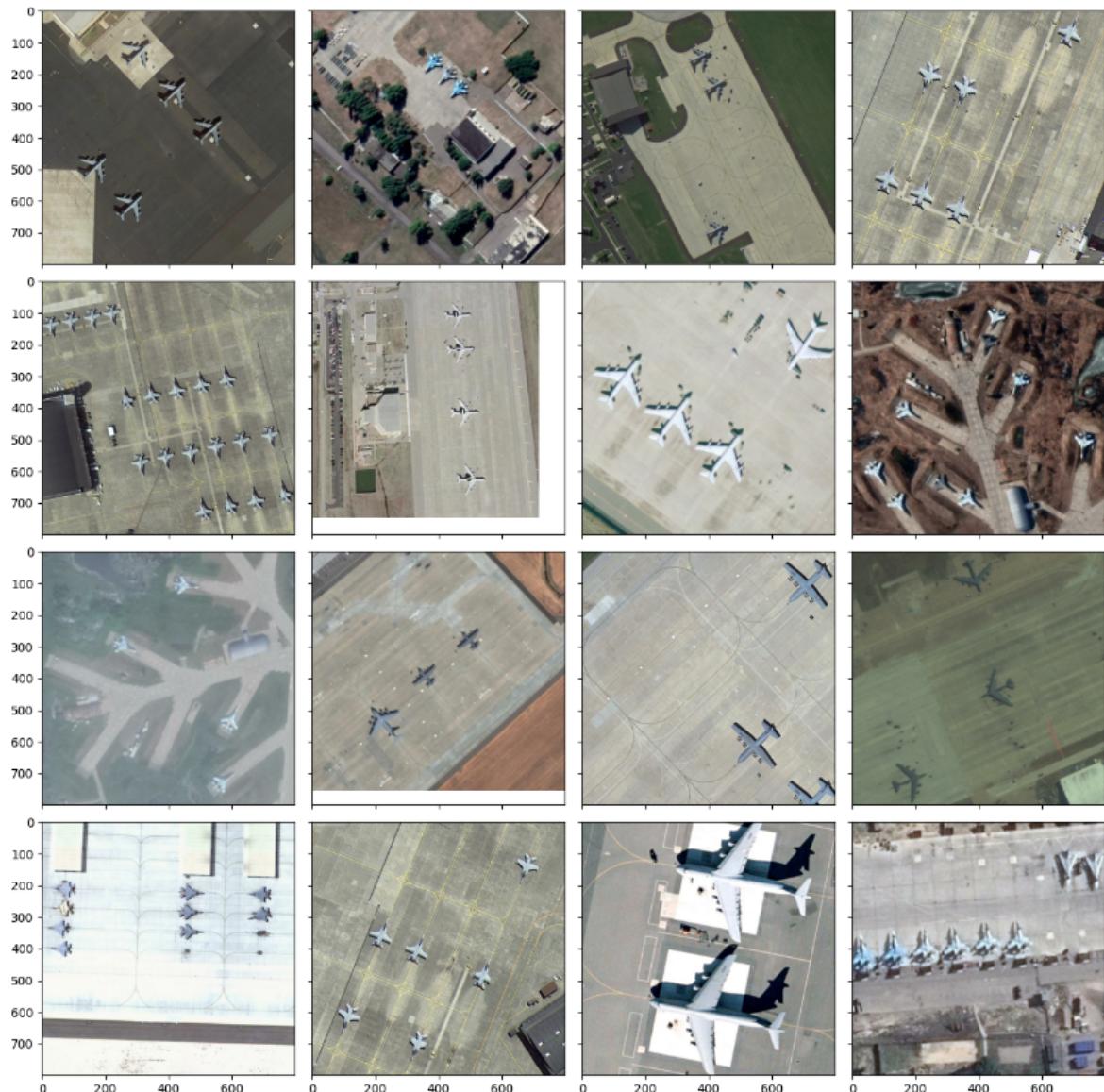
Each object has:

- 1) xmin, xmax, ymin, ymax - parameters of bounding box
- 2) Name - plane type

Xml files have some problems, they are not a valid source of information regarding size parameters of an image. After analyzing xml files I've found several images with 0 width/height, and only 1 channel (when in reality the image had 3 channels).

Images

Image examples:



Size and color of plane varies depending on plane type.
Some images have fog/clouds.

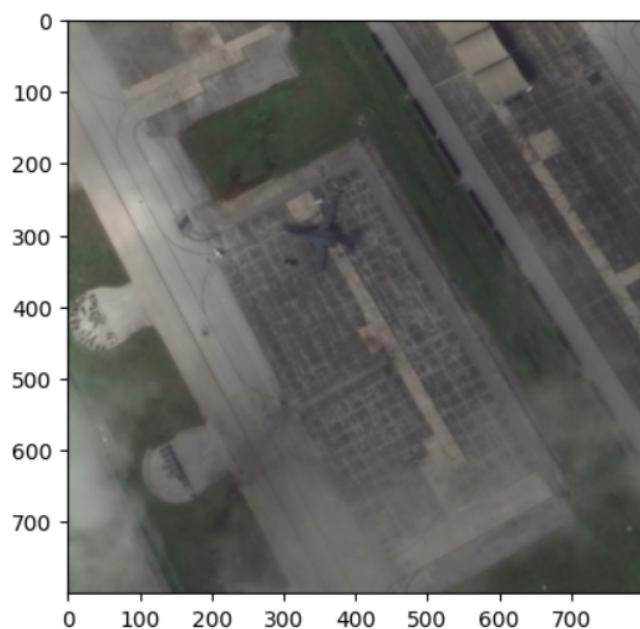
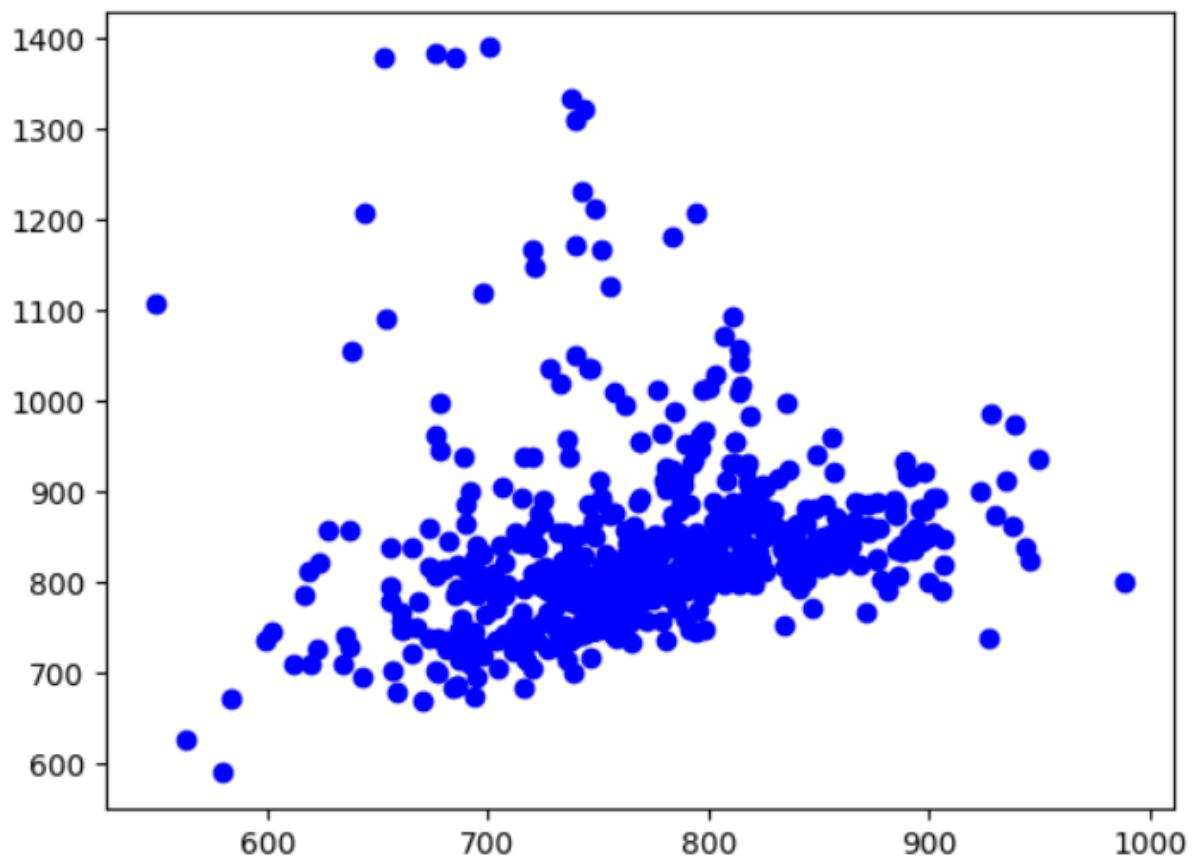


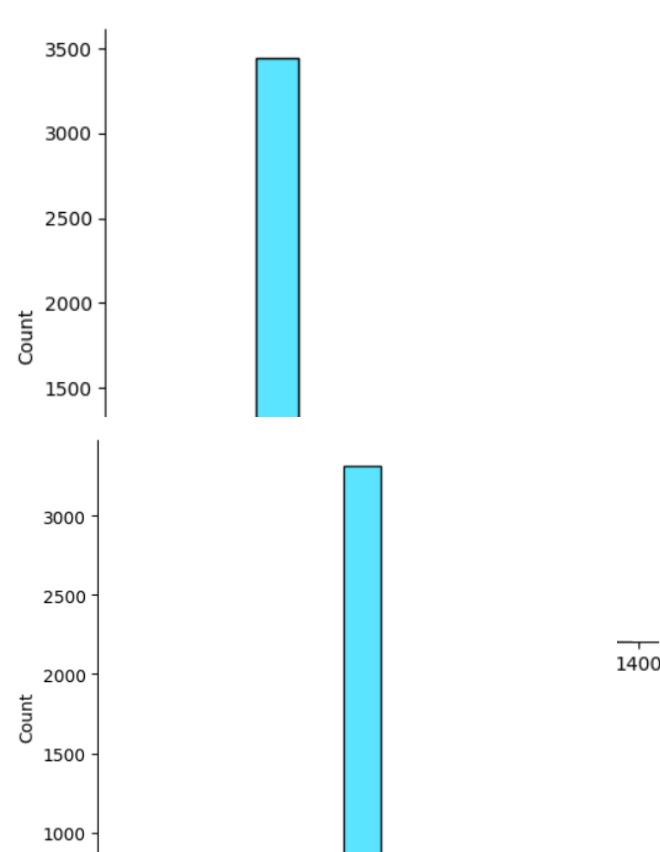
Image with clouds

Size analysis analysis

Width to height plot:



In it, we can see that most of the data lies in 600-900 range. There are also some outliers regarding height and width, and even their combination (we have an image with height > 1100 and width lower than 600).

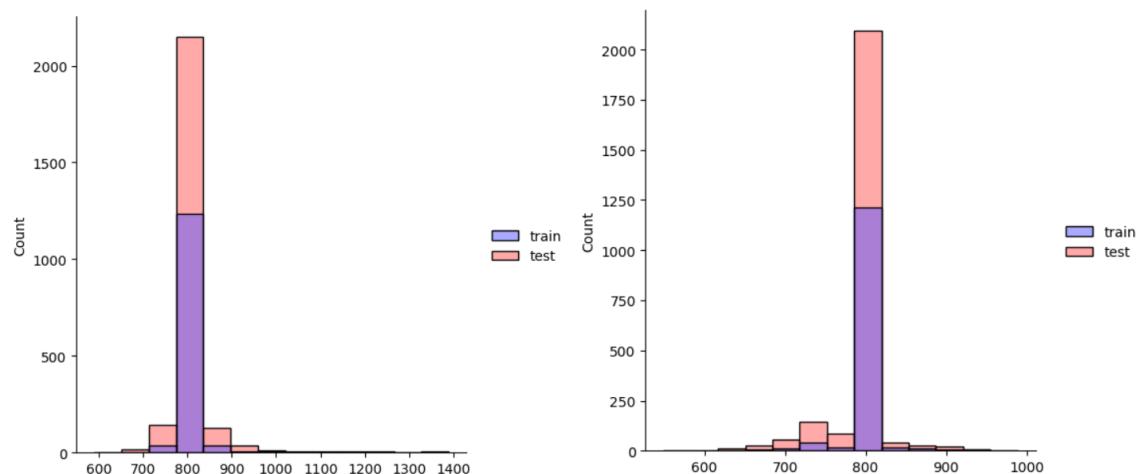


Height distribution
Only 92 values higher than 900, so it seems like a nice value to resize/pad an image.

Width distribution is more balanced, but overall its the same. 17 values have width more than 900 so again

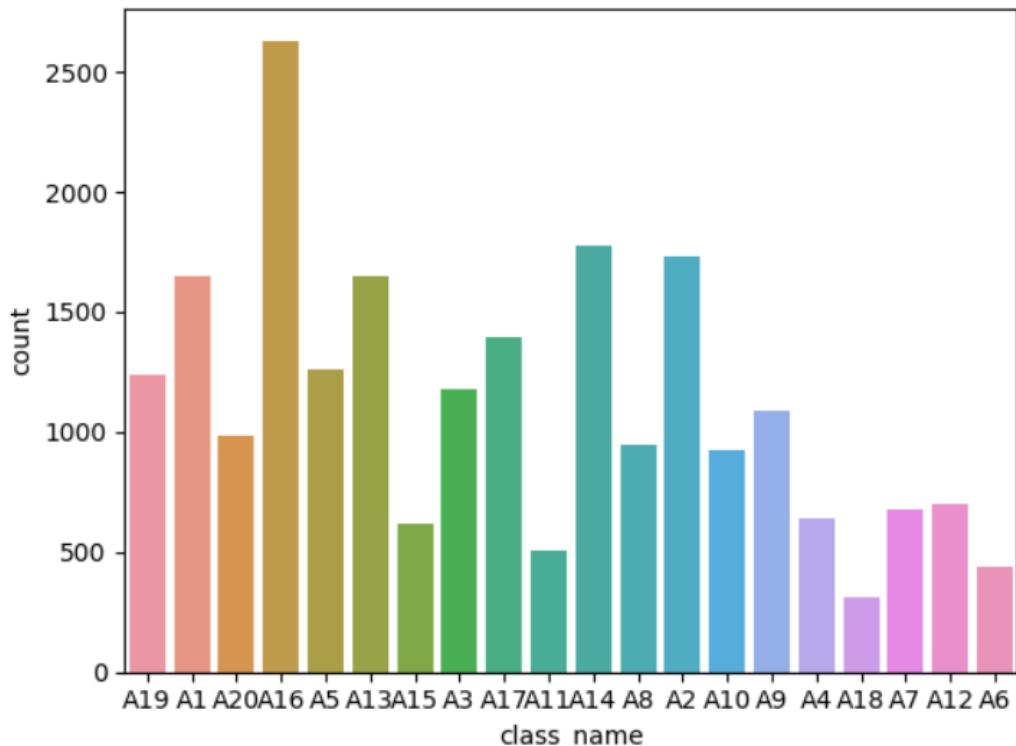
seems like a nice value to reshape the image.

Height/Width train/test distribution (Pretty much same distributions across train/test set)

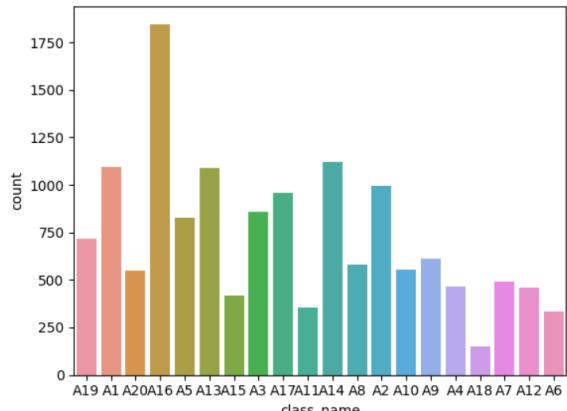
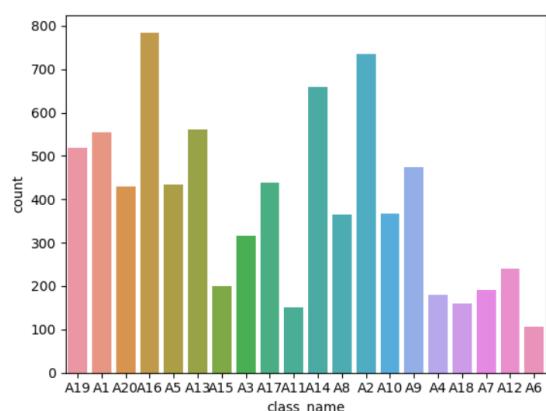


Class distribution

Some data imbalance is presented, varying from 308 to 2632 values per class.



Train/Test sets have almost same distributions



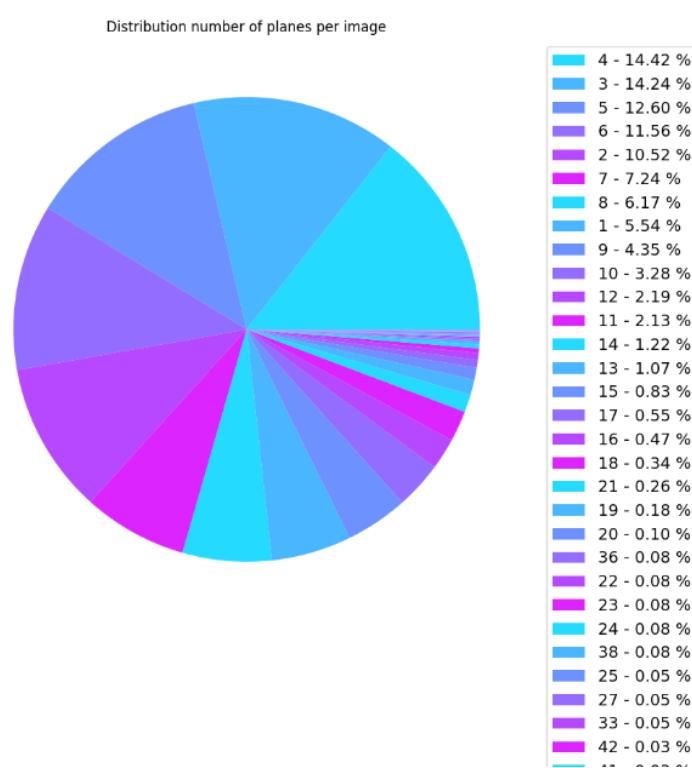
We can see some differences,
especially regarding A16, A18, A20 and A2 planes, but not very huge
one.

Bounding boxes

Visualization of bounding boxes:



Distribution of object count per image:



We can see a huge imbalance for images containing large amount of planes. Only 1 image for 50/41/42 object counts.

Image with 50 planes:



This image contains 50 planes in total. It might be a good image for evaluation of our final model to see if it can handle large amount of objects.

Bounding boxes areas analysis

Most of the bounding boxes aspect ratios lies between 0 and 0.25, so we have a huge amount of small objects. It is also interesting that some of the planes occupies more area than others.

Median area of plane per category:

