Drone Image clustering with K-Means

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What is the future of drones?

In the past drones were only available for military purposes but over the last decade, the drone equipment has become easily accessible to regular folks and businesses of all sizes.

Drone Food delivery

Drone Fly on Mars

Drone Photography

Drone Images

Antenna

no_Antenna

K-Means

- K-Means algorithm: given a dataset X, determine k points ("cluster centers") that define clusters in the data. A point x_j is in center i if it is closer to the ith cluster center than to any of the other cluster centers.

- This is an _unsupervised learning algorithm_ because we do not have any labels (in general, this is much harder than supervised learning).

K-Means

- calculate distance from each object to each cluster seed.

- What type of distance should we use?
  - Cosine distance similarity

- Assign each object to the closest cluster

Results

Results

# Selecting some representative images (medoids)

Choosing an 'optimal' number of clusters based on the elbow method

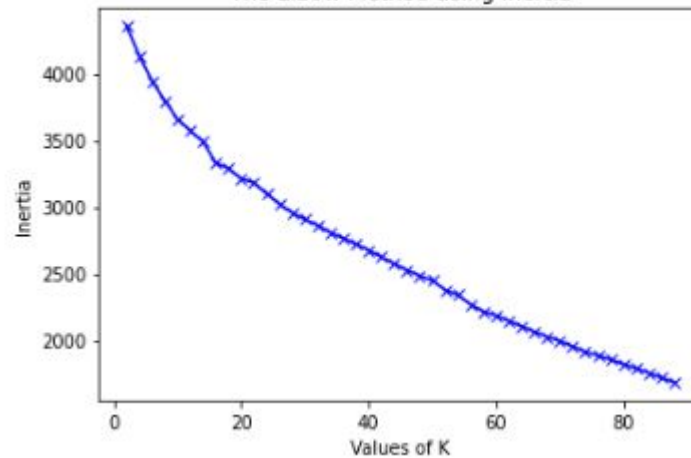We want to see find where the inflexion point happens.

- Distortion: It is calculated as the average of the squared distances from the cluster centers of the respective clusters.
- Inertia: It is the sum of squared distances of samples to their closest cluster center.

Results
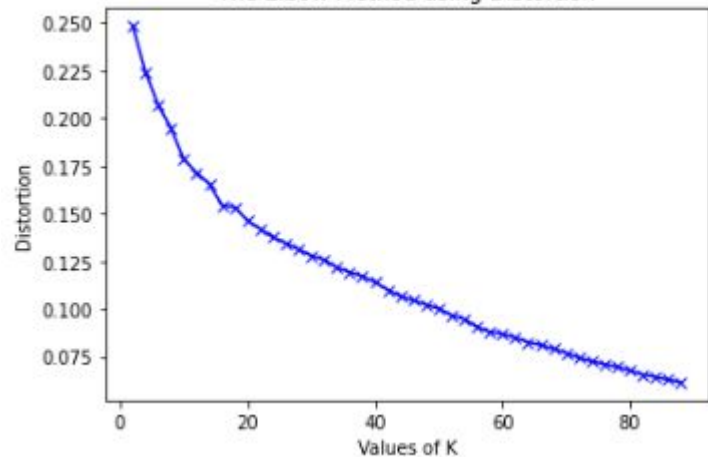
Summary

- The lack of labels severely limited the number of options at our disposal to solve our problem.
- We opted for K-Means, an unsupervised learning algorithm for clustering. It can be thought of as the inverse of the k-nearest neighbors algorithm.
- Its performance is determined by initialization and appropriate distance measure.
- To choose the number of clusters K, we chose the elbow method, which minimizes the aggregate distance between centroids and data points

Image classification

Creating a pandas DataFrame from the images and labels

	Paths	Labels
0	/content/drive/MyDrive/dron/inspection/drone_i...	antenna
1	/content/drive/MyDrive/dron/inspection/drone_i...	antenna
2	/content/drive/MyDrive/dron/inspection/drone_i...	antenna
3	/content/drive/MyDrive/dron/inspection/drone_i...	antenna
4	/content/drive/MyDrive/dron/inspection/drone_i...	antenna

Data Distribution
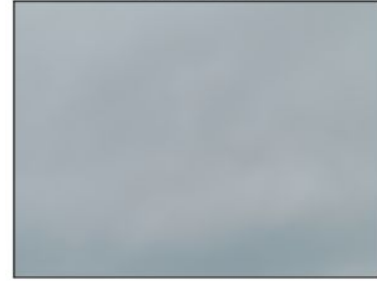
Datased details
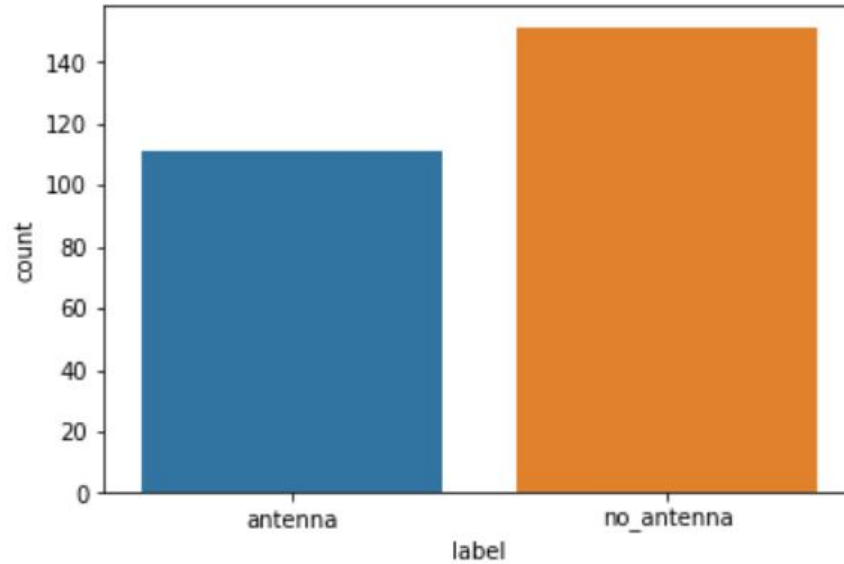
Examples of images from the no_antenna

Accuracy

```
accuracy: 0.9658

accuracy: 0.9726
```

Model evaluation
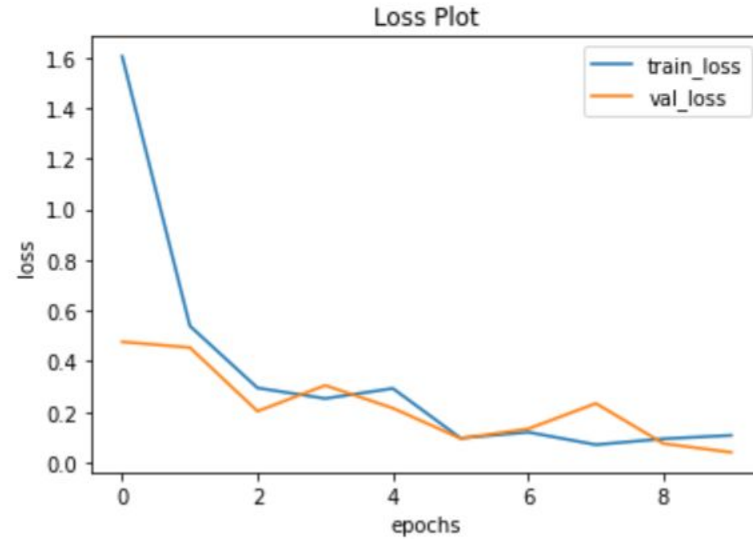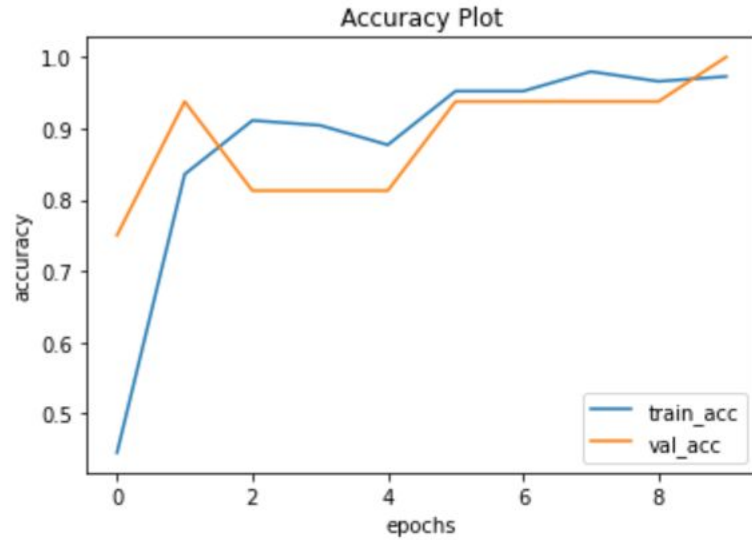
F1-score

	precision	recall	f1-score	support
0	1.00	1.00	1.00	15
1	1.00	1.00	1.00	26
accuracy			1.00	41
macro avg	1.00	1.00	1.00	41
weighted avg	1.00	1.00	1.00	41

Confusion Matrix
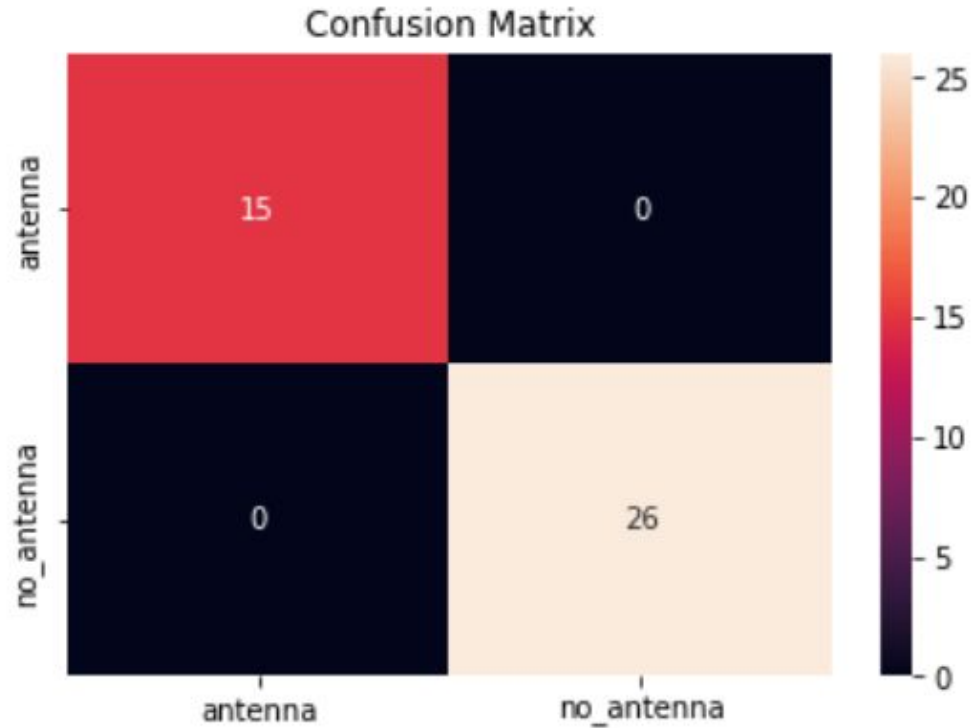
Some of the predictions.

Thank you very much for your attention