

Petfinder Pawpularity Score prediction

Problem Statement

Millions of stray animals are on the streets without shelter around the world. To better adopt these animals, Pawpularity which is the visual appeal of the pet animals, significantly affects the adoption rate. Accurate predictions can help animal shelters and adoption platforms optimize photo selection, increasing adoption rate and reducing shelter overcrowding. This project analyzes the different algorithms, their strengths and weaknesses and proposes improvements.

Objectives

The purpose of this project is

- To review and understand existing approaches to predict Pawpularity using images as well as images with the meta data.
- To utilize the pretrained model with modification to improve performance for better prediction.

Data Description

The dataset consists of 9912 train images and 8 test images. Unlike other datasets, this dataset along with the images also contains meta which makes it different and needs different approaches to handle both images and meta data. The images are of different sizes and have three channels. The train and test files contain meta data for each image with label 0 and 1. The description of each feature is as below.

- **Focus** - Pet stands out against uncluttered background, not too close / far.
- **Eyes** - Both eyes are facing front or near-front, with at least 1 eye / pupil decently clear.
- **Face** - Decently clear face, facing front or near-front.
- **Near** - Single pet taking up significant portion of photo (roughly over 50% of photo width or height).
- **Action** - Pet in the middle of an action (e.g., jumping).
- **Accessory** - Accompanying physical or digital accessory / prop (i.e. toy, digital sticker), excluding collar and leash.
- **Group** - More than 1 pet in the photo.
- **Collage** - Digitally-retouched photo (i.e. with digital photo frame, combination of multiple photos).

- **Human** - Human in the photo.
- **Occlusion** - Specific undesirable objects blocking part of the pet (i.e. human, cage or fence). Note that not all blocking objects are considered occlusion.
- **Info** - Custom-added text or labels (i.e. pet name, description).
- **Blur** - Noticeably out of focus or noisy, especially for the pet's eyes and face. For Blur entries, "Eyes" column is always set to 0.

The final target variable is Pawpularity where the value is between 0 and 100. By looking at the Pawpularity distribution in Figure 1, most pets have low-to-moderate Pawpularity (20–40), only a few are highly popular, and the distribution is right-skewed with a spike at 100.

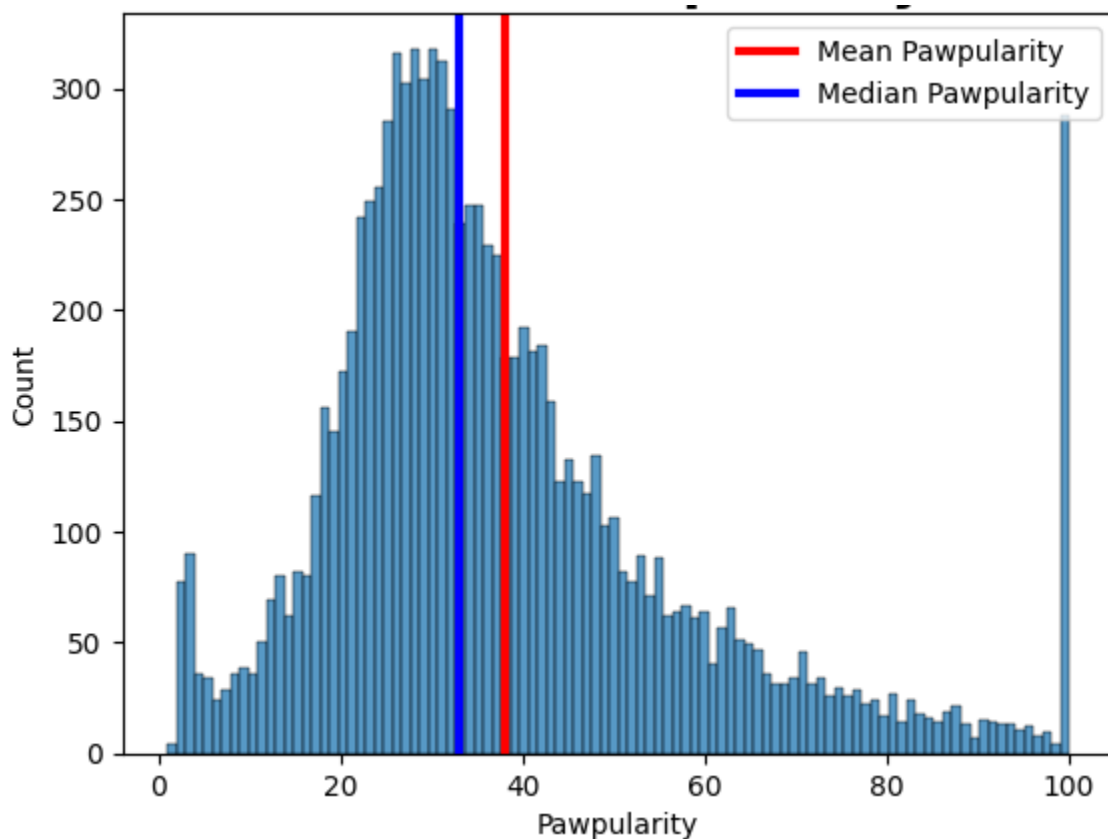


Figure 1 Pawpularity Score Distribution

By looking at each feature correlation **Figure 2**, the blur has minor correlation, However overall, there is not any significant correlation of all features with the target Pawpularity Score.

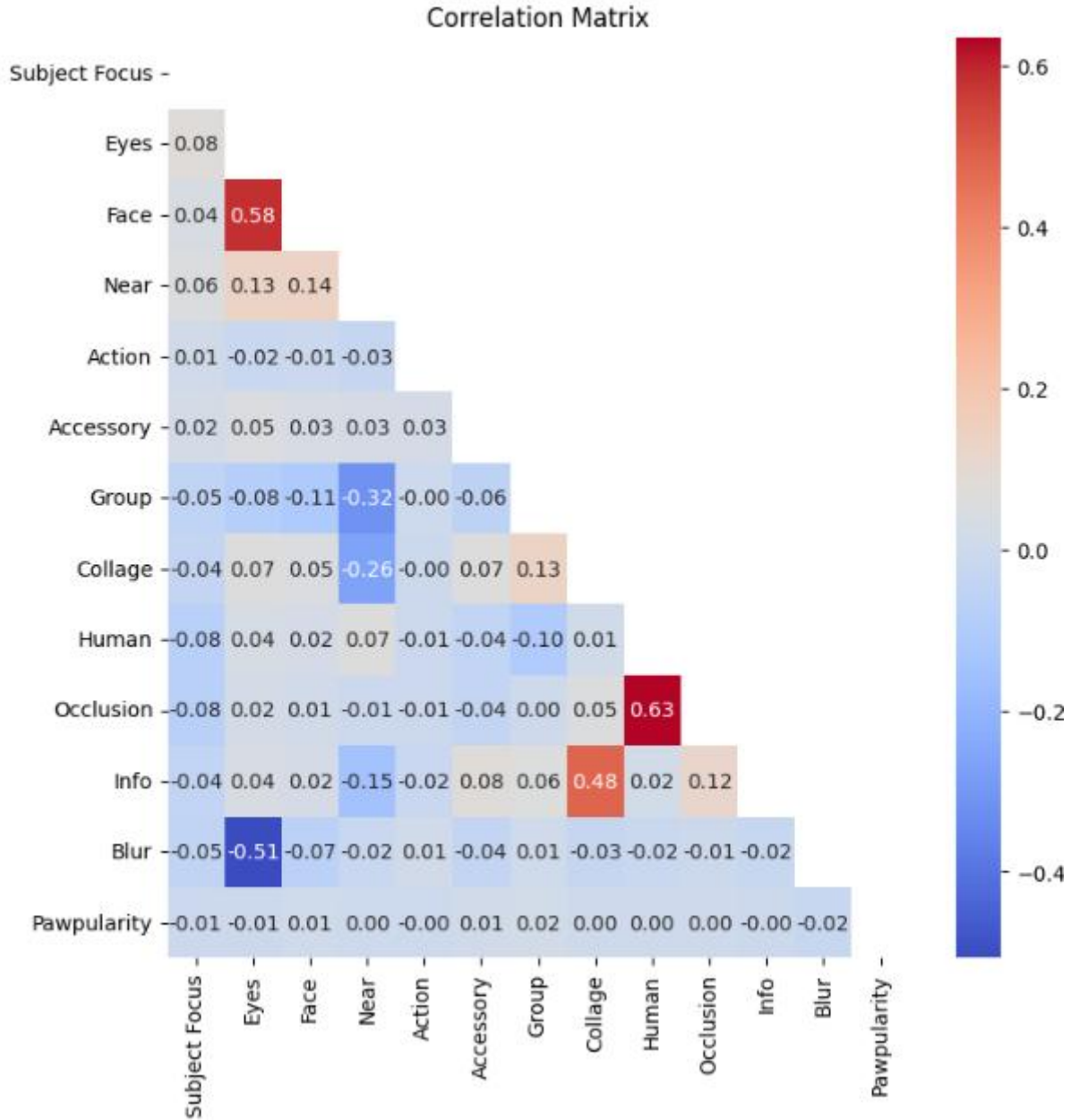


Figure 2 Correlation Matrix

But if we look at the features correlation with each other, then there is some correlation between Face and Eyes, Human and Occlusion. To better understand and analyze, we use the variance inflation factor (VIF) which determines the relationship with all other features. Hence from **Figure 3**, we can see the Face and Eyes have high correlation, and it needs to be handled by Regularization (early stopping, weight decay) while training the model.

	feature	VIF
2	Face	13.715668
1	Eyes	10.118170
3	Near	5.762924
9	Occlusion	2.073562
8	Human	2.064939
11	Blur	1.595109
7	Collage	1.452023
10	Info	1.412621
6	Group	1.163850
5	Accessory	1.090942
0	Subject Focus	1.048292
4	Action	1.010174

Figure 3 VIF Score