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Petfinder.my
Capstone 2 Milestone Report

Problem Statement

Animals all over the world are waiting in shelters for adoptive homes. And the length of time before an adopter is found can literally mean the difference between life and death. One organization is looking to data science to help find a solution. Petfinder.my is Malaysia's leading pet welfare platform. Site visitors can search for new pets by location, type, breed, color, gender and age, among other criteria.

Petfinder.my partnered with Kaggle, the data science competition website, to launch a new challenge using pet adoption data pulled from the site. Petfinder.my wanted to know: Can a machine learning model accurately predict how soon a pet will be adopted? With this information they hope to improve pet profiles so animals find forever homes faster.

Description of Dataset

Petfinder.my provided four subsets of data on the same group of 14,993 cat and dog adoptions. The datasets are all available for download from the Kaggle website.
https://www.kaggle.com/c/petfinder-adoption-prediction/data

1. Train.csv consists of feature information regarding each adoption. The label AdoptionSpeed is a numeric value between 0 and 4 represents the length of time the pet was available before it was either adopted or had been available for adoption at least 100 days. 2,337 dogs and 1,759 cats had not been adopted after 100 days.

   0 - Pet was adopted on the same day as it was listed.
   1 - Pet was adopted between 1 and 7 days (1st week) after being listed.
   2 - Pet was adopted between 8 and 30 days (1st month) after being listed.
   3 - Pet was adopted between 31 and 90 days (2nd & 3rd month) after being listed.
   4 - No adoption after 100 days of being listed. (There are no pets in this dataset that waited between 90 and 100 days).

2. JPEG file of primary image from each adoption profile on the website.

3. Results from Google’s Vision API analysis of each image specifying the likely label annotations.

4. Results from Google’s Natural Language API which provides analysis on sentiment and key entities of the description of each pet.

Dataset Cleaning and Wrangling

The following manipulation was done on the train.csv dataset.

1. One hot encoding of categorical features except those with ordinality (fur length, maturity size, health)
2. Reviewed dataset for missing or outlier values. Found one misclassified adoption speed (value = 6, which is not an option). Updated to 4. Otherwise data was clean.
3. Ensured numeric features are in dataset as numeric and not text.

Exploratory Data Analysis and Inferential Statistics

Initial Findings

After cleaning the dataset I completed a correlation analysis of features for dogs and cats. These are the strongest positive and negative correlations to AdoptionSpeed found:

Dogs

-0.105275	Fur Length
-0.070336	Sterilized (Is the animal sterilized? Yes/No/Mixed or Unknown)
-0.038337	Vaccinated (Is the animal vaccinated? Yes/No/Mixed or Unknown)
0.065419	Quantity (Number of animals in the posting)
0.083946	Gender
0.166792	Breed 1

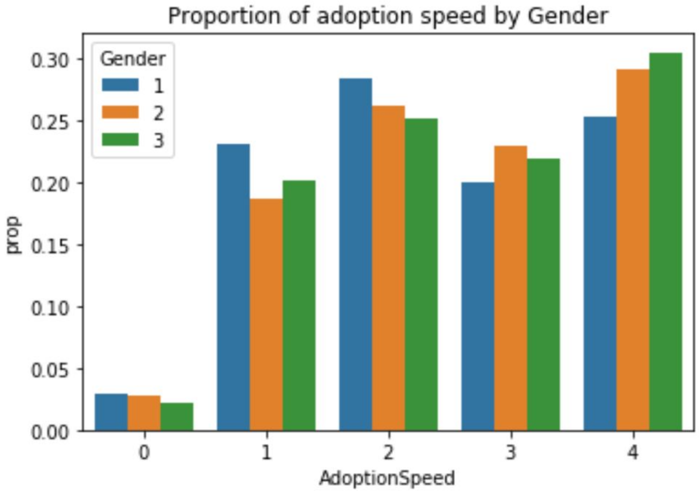
Cats

-0.100239	Sterilized
-0.076639	Fur Length
-0.067206	Vaccinated
0.043446	Gender
0.068437	Quantity
0.143387	Age

Data Visualizations

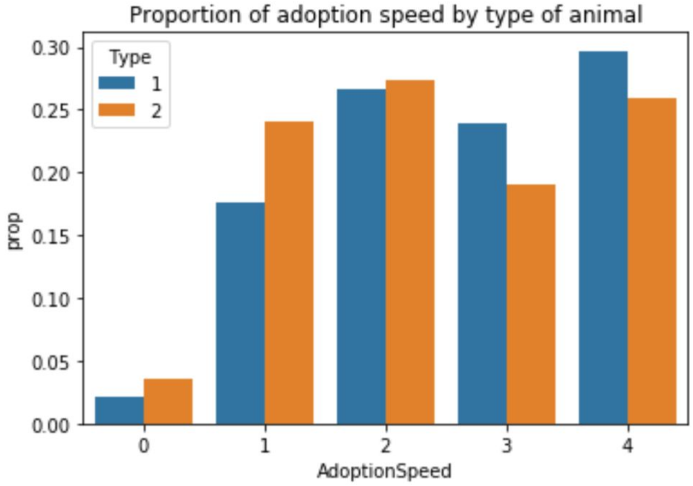
Through a review of data visualization, the following trends and characteristics were noted:

Male animals appear to be adopted faster than female animals.
1=Male, 2=Female, 3=Mixed litter or Unknown



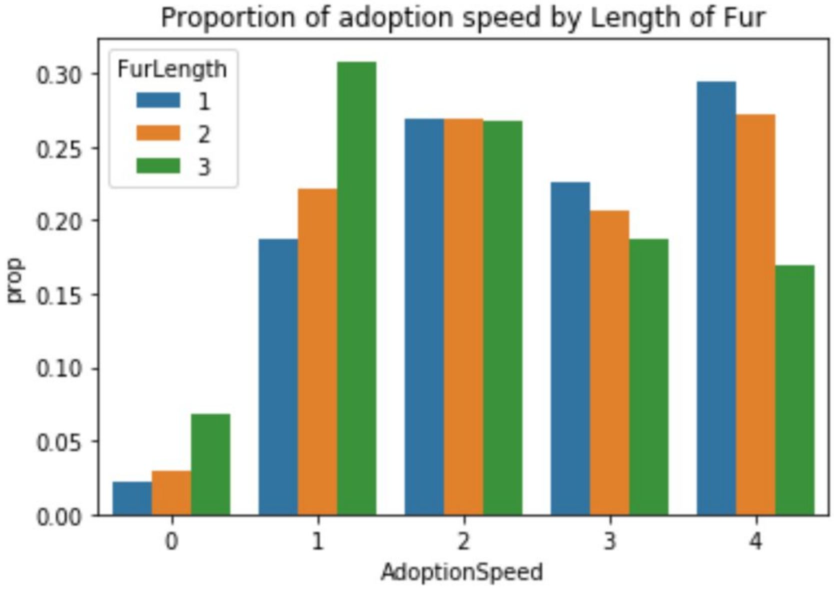
Cats appear to be adopted faster than dogs

1=Dog, 2=Cat



Animals with long fur appear to be adopted faster than those with short fur

1=Short length, 2=Medium length, 3 = Long length



Measures of Central Tendency: Adoption Speed

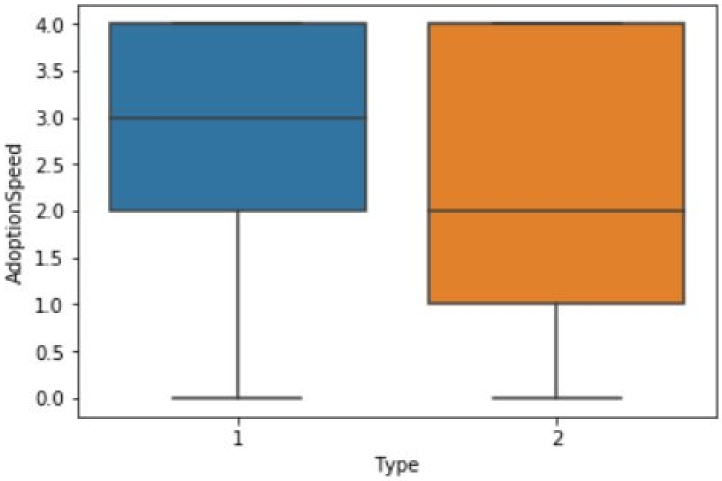
Dogs (Type 1)

Mean: 2.62

Median: 3

Mode: 4

Cats (Type 2)
Mean: 2.34
Median: 2
Mode: 2



Inferential Statistics

The visual representations of the data suggest the following:

1. Cats are adopted faster than dogs
2. Animals with long fur are adopted faster than animals with short fur
3. Male animals are adopted faster than female animals

For this report I will be testing the suggestion that male animals are adopted faster than female animals. Said another way, I will test whether or not the proportion of male animals adopted in the first month is statistically higher than the proportion of female animals adopted in the first month.

Values:
Total number of animals categorized as male or female: 12,510. Remainder are categorized as mixed (for postings with multiple animals) or unknown.

Population 1: Male animals adopted in the first month
Proportion (*p*1) = 0.544523 (2923 of 5368 males)
N (*n*1) = 5368
Population 2: Female animals adopted in the first month
Proportion (*p*2) = 0.478577 (3418 of 7142 females)
N (*n*2) = 7142

Null Hypothesis: The proportion of male animals that are adopted in the first month is equal to or less than the proportion of females that are adopted in the first month. $H_O = P_1 <= P_2$

Alternative Hypothesis: The proportion of male animals that are adopted in the first month is greater than the proportion of female animals that are adopted in the first month. $H_{alt} = P_1 > P_2$

$$p = \frac{(p1*n1+p2*n2)}{(n1+n2)}$$

$$p = \frac{(0.544523*5368+0.478577*7142)}{5368+7142}$$

p=0.507

Standard Error

$$SE = \sqrt{p(1-p)*(\frac{1}{n1}+\frac{1}{n2})}$$

$$SE = \sqrt{(0.507(1-0.507)*(\frac{1}{5368}+\frac{1}{7142}))}$$

SE = 0.0000804

z score

$$z = \frac{p1-p2}{SE}$$

$$z = \frac{.544523-.478577}{.0000804}$$

z = 820.224

Probability of a z value of 820.224 < 0.00001
0.00001 is less than 0.01. The null hypothesis is **rejected**.
Male animals are adopted faster than female animals.