

Reddit Posts Analysis with Natural Language Processing

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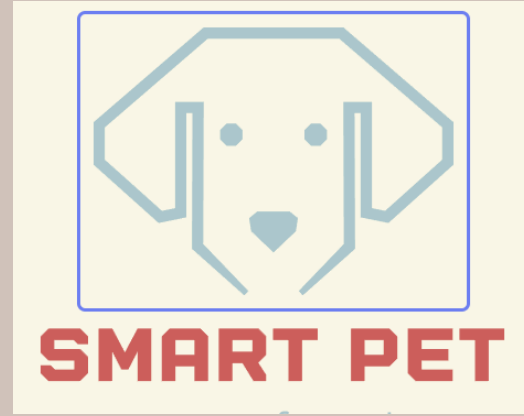
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Executive Summary



Who are we?

- **Smart Pet**, Established in **August 2017** by *Florian Combelles*
- Former vets, pet store owners and animal shelter volunteers
- Worked with organisations and companies such as:
 - **SPCA**
 - **AVA**
 - **Petslovers**



Our mission:
"We care for them"

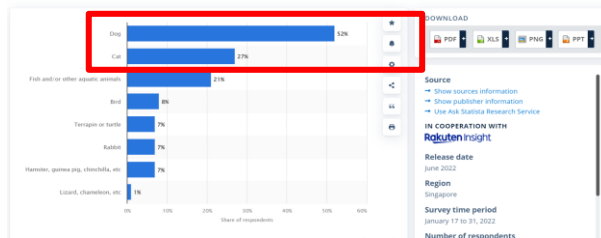


Background

- Most common pets in Singapore
 - Dogs - 52%**
 - Cats - 27%**

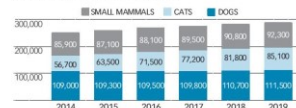
↑ Increased interest in pet ownership → Rise of inexperienced pet owners

Share of people who owned pets in Singapore as of January 2022, by type



Growing pet population

Singapore's population of pet dogs, cats and small mammals like hamsters, guinea pigs and rabbits has been growing over the years



Note: Figures include pets not registered with AVS as well as adopted pets
Source: Curator.com international

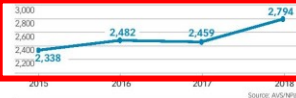
Top import markets

Of the 2,794 total imports of dogs and cats into Singapore in 2018, about half were sourced from just four markets: Australia, the US, Hong Kong and the UK.



Foreign furry friends

Total net imports into Singapore



More people in Singapore interested in adopting or fostering pets during Covid-19 pandemic

LIFE



Ms Jiny Mohandas adopted Whisky, a four-year-old female Singapore Special, in May. PHOTO: COURTESY OF JINY MOHANDAS

Centre, says that cut off from social contact, people feel isolated. Pets, especially dogs and cats, make wonderful companions, providing warmth and distraction, she adds.

At Causes for Animals, co-founder Christine Bernadette, 31, notes an increase in adoptions during the pandemic.

Before April, the organisation had six to eight dog adoptions and two cat adoptions a month. Since the circuit breaker, the number has jumped to 10 to 12 dogs and five cats a month.

At Chained Dog Awareness In Singapore, a volunteer-run advocacy group which specialises in helping dogs suffering from confinement or tethering for long hours, co-founder Lee Pin observes a spike in the number of people looking to adopt or foster dogs since phase two, which started on June 19.

In June, July and this month, the group received 20 such enquiries - double the number pre-Covid-19.

Mr Colin Chew, 52, a volunteer with Just For Paws, says enquiries for adoption doubled during the circuit breaker, compared with the same period last year. Since

Stakeholders Concerns

- Lack of local resources regarding information on:
 - Licensing, upkeep costs, aftercare

How does it affect you?



Decrease in work efficiency

- Pet store owners occupied answering queries



Overbooking of Vet appointments

- Pet owners coming in for minor enquiries/non-emergencies



More animals abandoned

- Animals abandoned after pandemic are sent to the shelters

A close-up photograph of a light-colored dog, possibly a pit bull mix, with its mouth open in a happy, smiling expression. The dog's eyes are dark and focused on the camera. The background is a warm, golden-yellow color with soft, out-of-focus light spots, creating a bokeh effect. On the left side of the image, there is a dark grey, irregularly shaped circle containing the number '2'. Below this circle, the text 'Problem Statement' is written in a large, bold, serif font. Underneath that, the phrase 'The challenge at hand' is written in a smaller, sans-serif font.

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Problem Statement

The challenge at hand

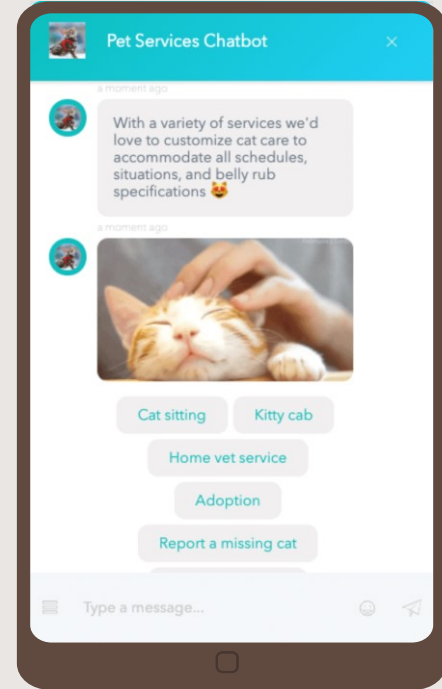


Problem Statement:

An influx of **inexperienced** pet owners **overly**
reliant on vets and pet store **reduces work**
efficiency, how can we optimize it?

Our flagship product

- **Pet Companions**, our highly-rated mobile application offering pet owners information through:
 - AI-powered chatbot
 - First level of customer inquiry
 - Source of information for pet owners
 - Recommends articles based on classification of queries
 - A knowledge-bank filled with information sourced from vets, pet experts and users



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Methodology

How we've been doing it



Existing model - K-Nearest Neighbours (KNN)

78%
Accuracy

How does this work?

Kennel	
Litter box	
Resource guarding	
Long walk	
Meowing	
Scratching post	

- Classification of observation depends on the number of surrounding data points taken as reference

E.g. Classification of 'Resource guarding':

- If $K = 3 \rightarrow$ Dog (correct)
- If $K = 5 \rightarrow$ Cat (wrong)

Potential model - Naive Bayes



P (dog-related post): 0.60

15	10	4
Toy	Walk	Night

10	2	9
Toy	Walk	Night



P (cat-related post): 0.40

- Classification of the text post is based on comparing the conditional probabilities of the it belonging to either r/CatAdvice or r/DogAdvice

“night walk”



- To compare probability of the phrase belonging to r/CatAdvice or r/DogAdvice given that the text post contains ‘night walk’
- Classified according to the highest probability

Potential model - Logistic Regression



- Each word/token within the model are weighted according to their importance to the respective categories
- The model will generate the probabilities for each category
- The text post will be labelled according to the category with the highest probability



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Data Collection & Cleaning

How we collect and clean the
information



Overview of data collected



- *r/CatAdvice* and *r/DogAdvice*
- User-generated data scrapped using Pushshift API

	r/CatAdvice	r/DogAdvice
Period of Posts	12 Oct - 24 Nov	25 Aug - 24 Nov
No. of Posts	4,247	4,000

Cleaning process

Content Management

- Posts w/o main text were dropped
- Text data for analysis: Main text + Title
- Both categories have 2,300 data points for analysis

Word Processing

- Remove stopwords, punctuation, digits, random characters
- Transform each word to lower-case and lemmatise

Remove Subject Words

- Words that are related to either categories e.g. dog, cat, kitten, puppy
- Words that are common to both categories e.g. vet, veterinarian, month, old

Note:

1. Lemmatisation: Grouping together inflected forms of a word so that they can be analysed as a single term identified by the word's dictionary form

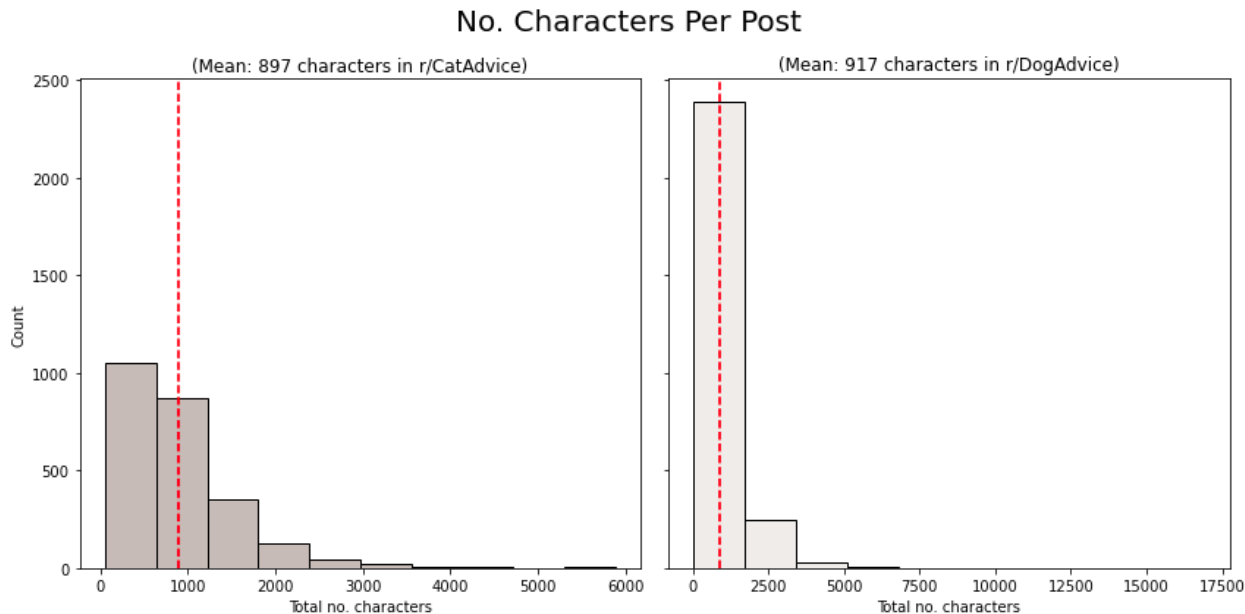
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Exploratory Data Analysis

Zooming in on our data

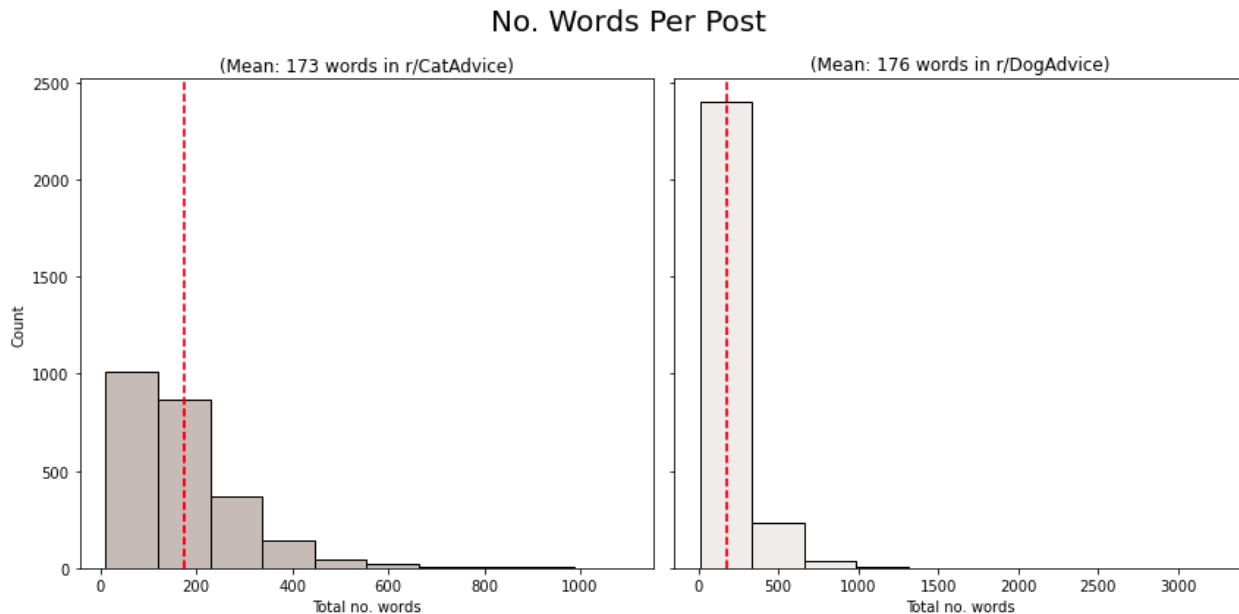


Higher average character count in r/DogAdvice



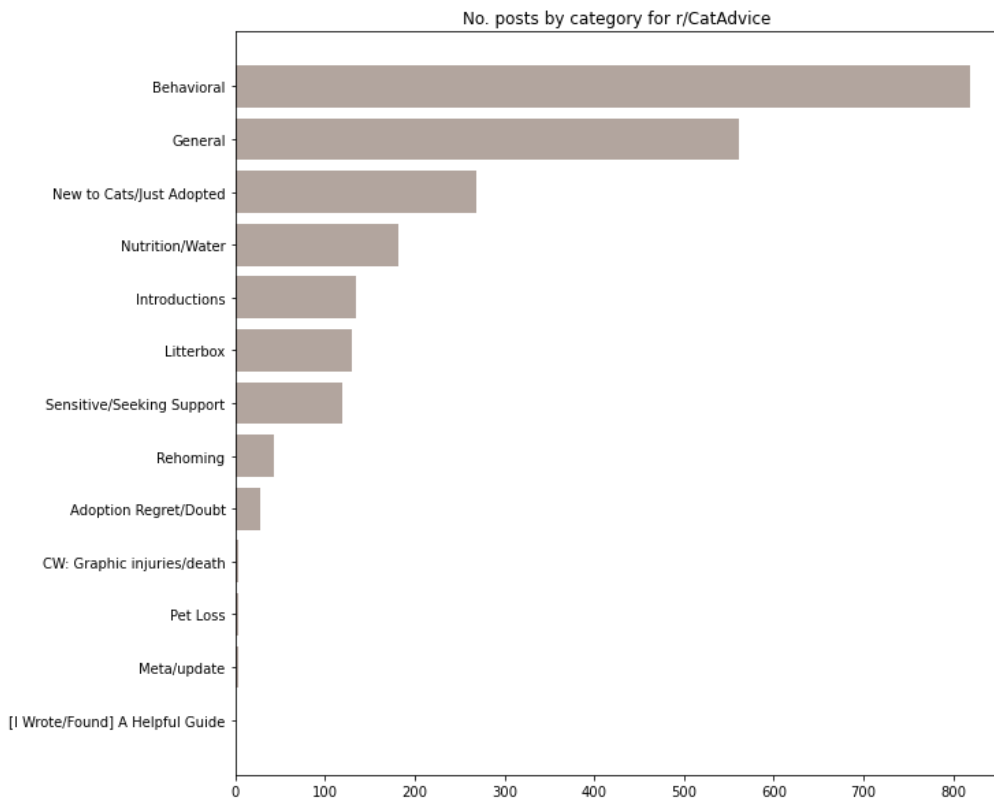
- **Maximum no. characters:** 5,885 in r/CatAdvice & 16,898 in r/DogAdvice
- **Minimum no. characters:** 56 in r/CatAdvice & 39 in r/DogAdvice

Similar word count average in both subreddits



- **Maximum no. words:** 1,097 in r/CatAdvice & 3,267 in r/DogAdvice
- **Minimum no. words:** 11 in r/CatAdvice & 9 in r/DogAdvice

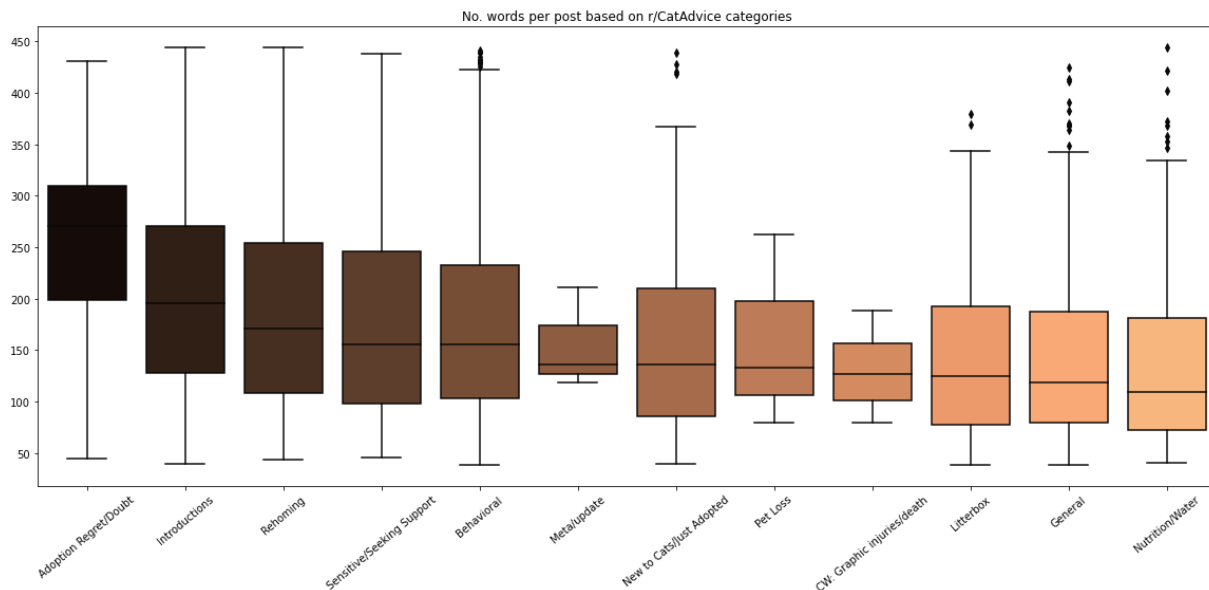
Behavioral queries tops r/CatAdvice discussion



Top topics tagged:

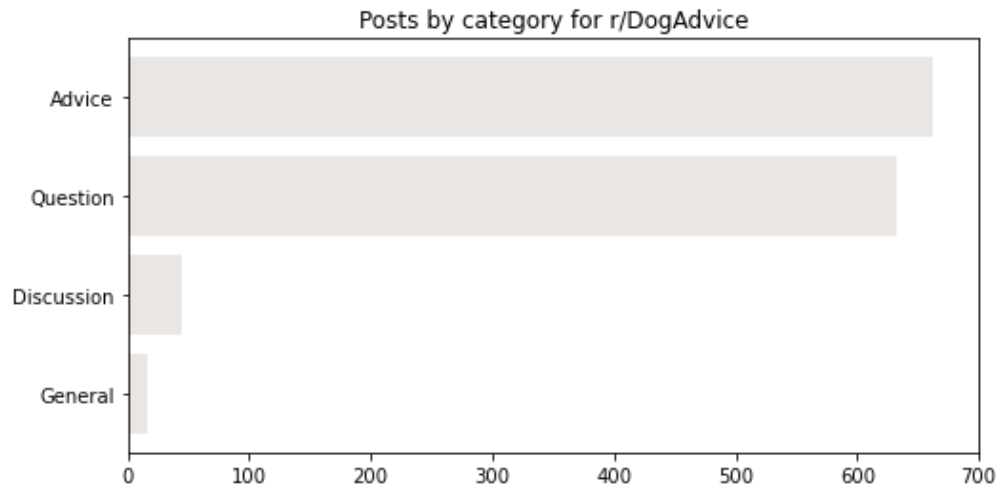
- **Behavioral:** 818 posts
- **General:** 561 posts
- **New Cats/Newly adopted:** 269 posts

Highest word count average on Adoption Regret/Doubt



- **Adoption Regret/Doubt:** 248 average no. words
- **Introductions:** 206 average no. words
- **Behavioral:** 175 average no. words

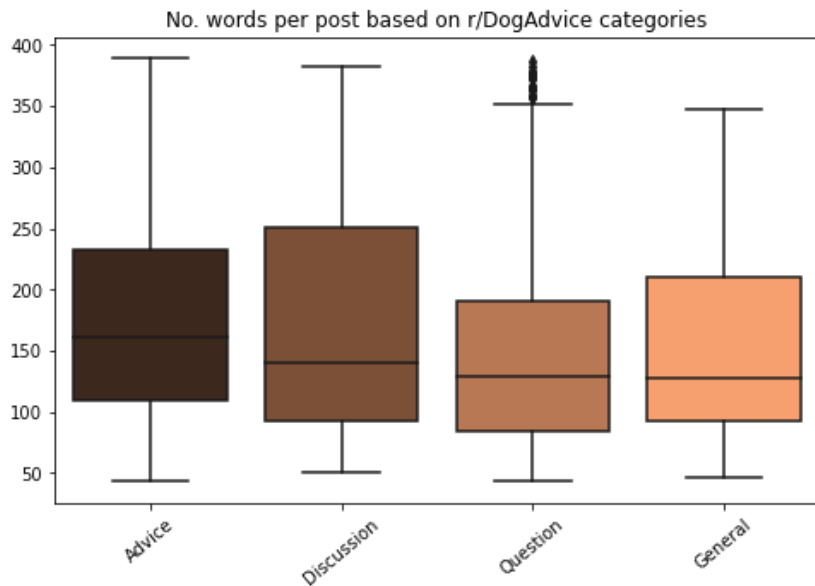
More general categories in r/DogAdvice



Top topics tagged:

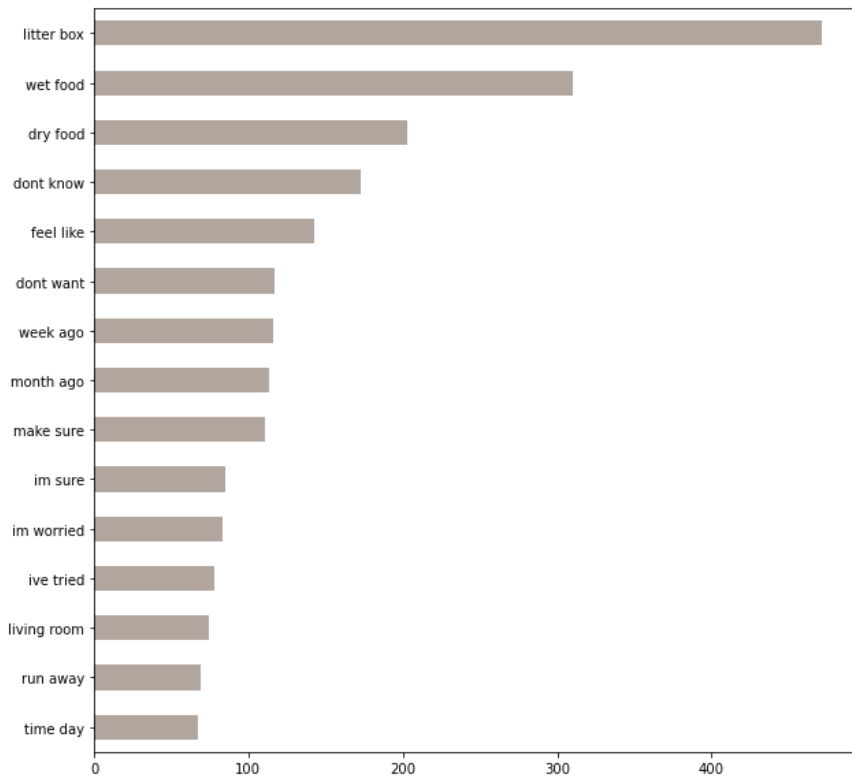
- **Advice:** 662 posts
- **Question:** 632 posts

Highest word count average for Advice category



- **Advice:** 177 average no. words
- **Discussion:** 174 average no. words

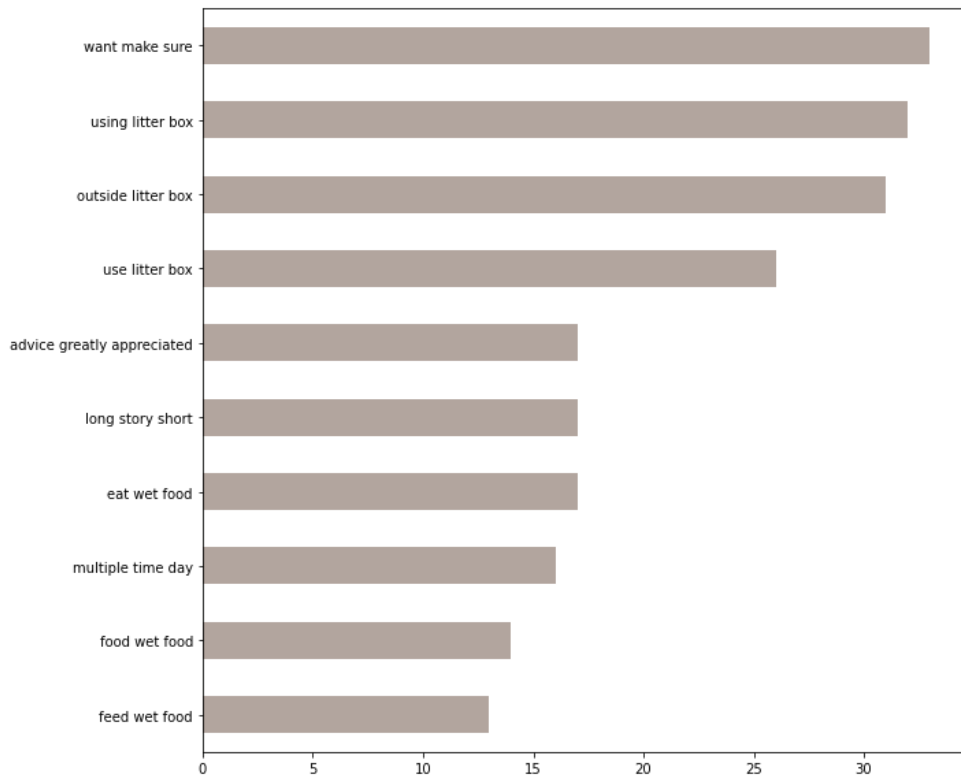
Top 2-word queries in r/CatAdvice



- 'Litter box'
- 'Wet food'
- 'Dry food'

Users are concerned with their cats' environment and nutrition.

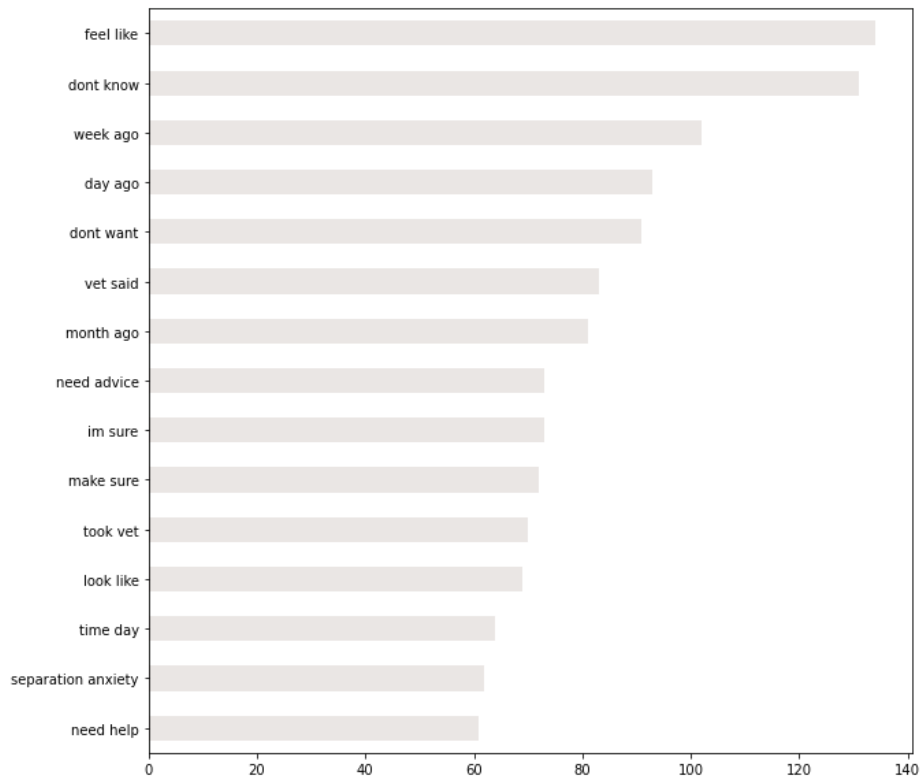
Top 3-word queries in r/CatAdvice



- 'Using litter box'
- 'Outside litter box'
- 'Use litter box'

This reaffirms that users are most concerned with their cats' environment.

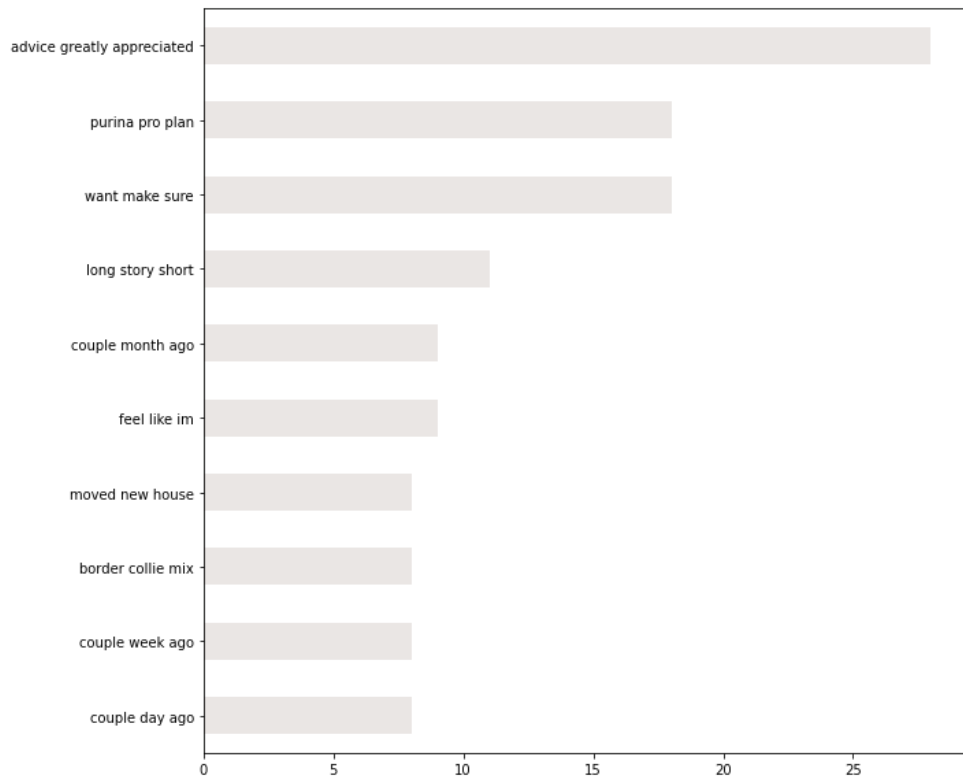
Top 2-word queries in r/DogAdvice



- 'Feel like'
- 'Don't know'
- 'Need advice / help'
- 'Separation anxiety'

Users seem mostly uncertain about the issues faced. The only issue mentioned is 'separation anxiety'.

Top 3-word queries in r/DogAdvice



- 'Advice greatly appreciated'
- 'Purina pro plan'
- 'Want make sure'

This reaffirms users in this forum could be more uncertain and may require more support.

'Purina pro plan' was mentioned often - this is a formula to improve dog's digestion.

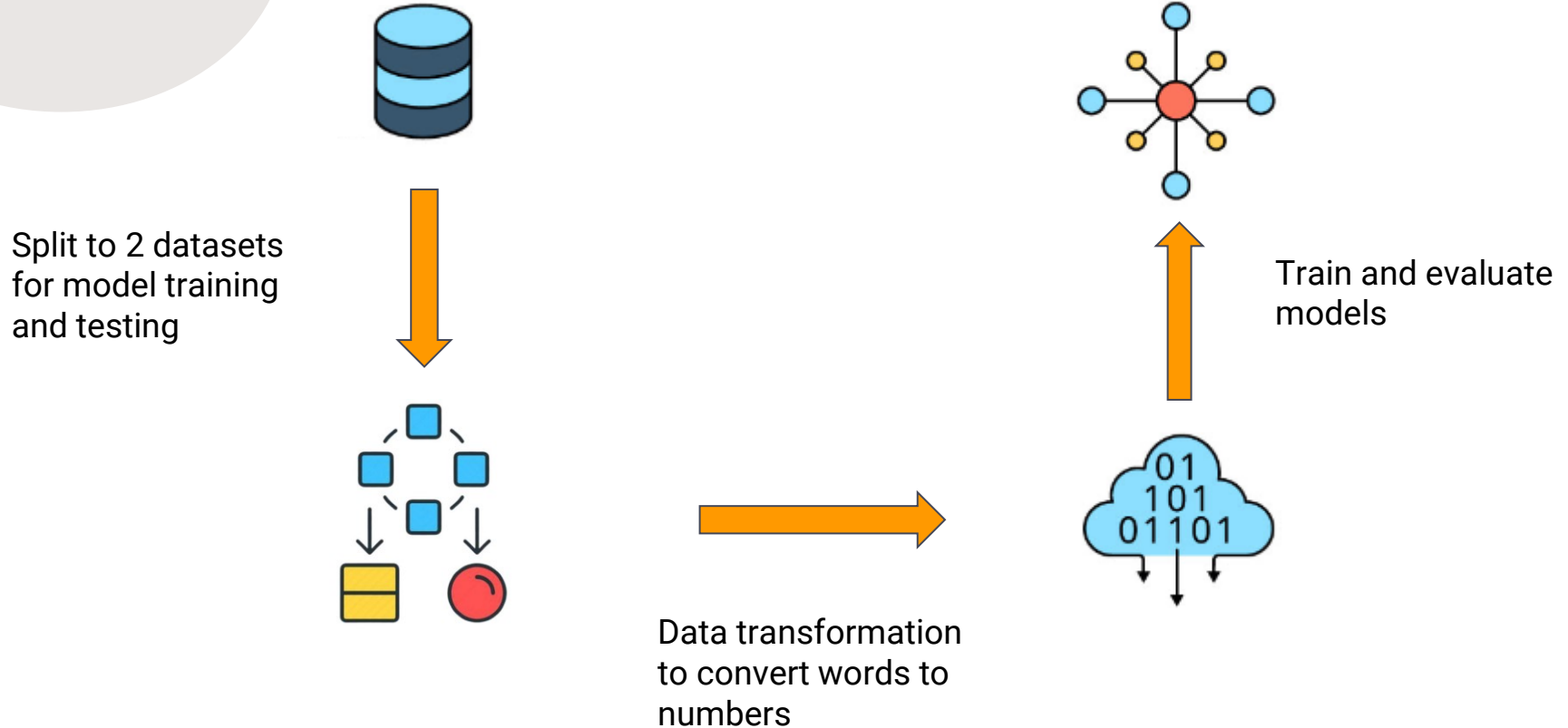
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Classification Models

Processing our data



Data preparation and modelling



Choice of Models and Evaluation Metrics

Classification Models

- Logistic Regression
- Naive Bayes (Multinomial, Bernoulli and Gaussian)

Advantages:

- Algorithm works quickly and can save time.
- Provides a measure of how appropriate a factor is for further analysis

Evaluation Metrics

- Accuracy Score

Accuracy Score = No. of observations classified correctly / Total no. of observations

- F1 score

It measures the accuracy of the model and how good the model is able to classify the posts to the 2 categories.

↑ Higher Accuracy Score / ↑ Higher F1 score,

↑ Better Model Performance

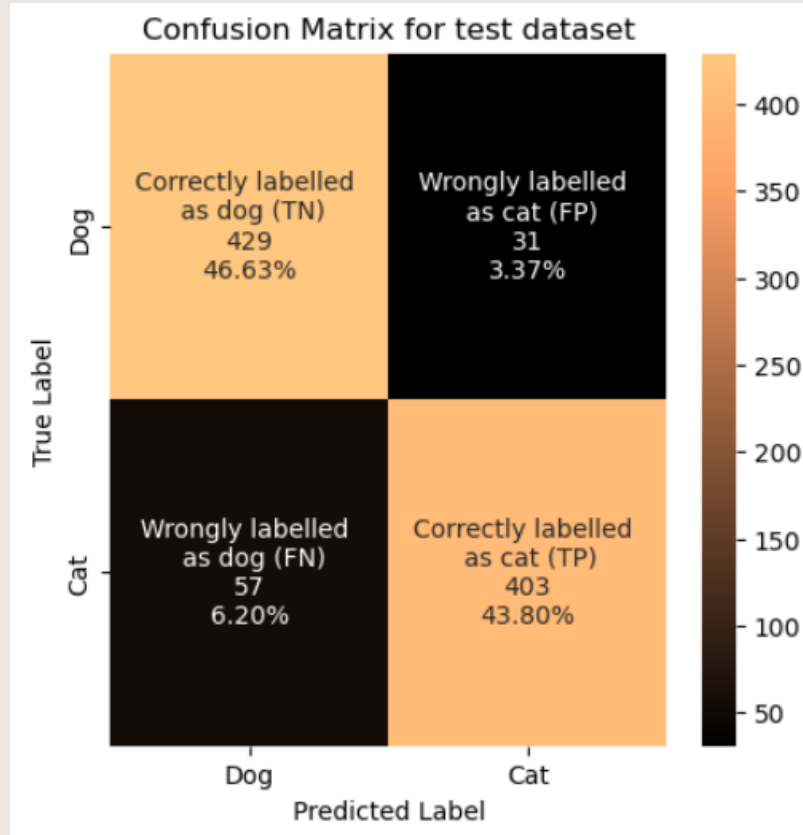
Multinomial Naive Bayes with single word gave the best performance (Accuracy score of 90%)

	Model	Data transformation to	Accuracy Score for train	Accuracy Score for test	F1 score
0	KNN (Baseline)	Tf-idf	0.865489	0.781522	0.789529
1	MultiNB	Tf-idf	0.955978	0.890217	0.891515
2	MultiNB	single_word	0.958152	0.902174	0.900222
3	MultiNB	2-word phrase	0.999728	0.840217	0.847668
4	BernNB	Tf-idf	0.963587	0.900000	0.897778
5	BernNB	single_word	0.963587	0.900000	0.897778
6	BernNB	2-word phrase	1.000000	0.825000	0.815578
7	GausNB	Tf-idf	0.971739	0.742391	0.751832
8	GausNB	single_word	0.964402	0.763043	0.777551
9	GausNB	2-word phrase	0.844565	0.773913	0.742574
10	Logistic Regression	Tf-idf	0.960054	0.885870	0.880546
11	Logistic Regression	single_word	0.999728	0.880435	0.878587
12	Logistic Regression	2-word phrase	1.000000	0.781522	0.759857
13	MultiNB with hyperparameter tuning	single_word	0.903261	0.904348	0.901566

Selected
model

Best results
post-tuning

Our Model (Accuracy score of 90%)



Total no. of observation = 920
No. of correct classification
= 832 (90%)

Distinct words between cats and dogs

Top 10 words for cats

- meowing
- meow
- swat
- litterbox
- galaxy
- jackson
- feliway
- diffuser
- tabby
- resident

Behaviours

Cat types

Tabby



Meow!



Swat

Woof!

Top 10 words for dogs

- bark
- trainer
- flea
- diarrhea
- infection
- treatment
- collie
- poodle
- terrier
- daycare

Behaviours

Medical

Dog types

Poodle



A golden retriever puppy stands in a grassy field, looking towards the camera. The background features a warm-toned building with a gabled roof and a large tree, bathed in the soft light of sunset or sunrise. A semi-transparent grey circle is positioned to the left of the puppy, containing the number 8.

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Conclusion and Recommendations

Our key takeaways

Limitations

Article availability

- Limited availability of articles at launch
 - Rapidly expand based on popular topics and what are people looking for

Cat/Dog specific

- Cat and dogs are the most popular pets
 - Model currently limited to cat and dog classification

Context

- Recommendations and articles are based on global trends
 - Not specific to Singapore

Conclusion

Refocus your business

- Focus on the core of your business
 - Treating pets
 - Driving sales growth

Reduce dependance

- Provide users with extensive and comprehensive articles to cover all their basic needs

Leverage insight

- Get information on customers/patients
- Based on their app usage

Recommendations

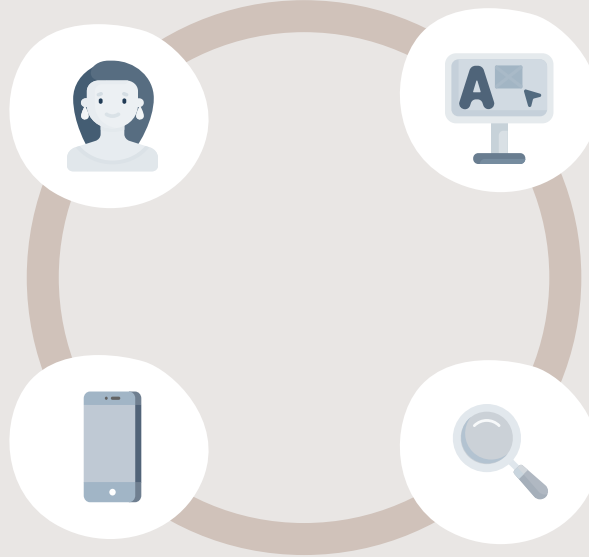


Manpower

Adjust manpower needed to answer phone calls and emails and shift your attention to what really matters

Digitalisation

Display QR codes or provide a device your customers can use to browse articles or get answers



Communication

Improve on communications and website by using focusing on popular and trending terms

Inventory / Stocks

Keep up to date with current trends or outbreaks to always have stocks for critical and popular products

Roadmap



Q1 2023

Offer weekly surveys to gather insights on users preferences and needs



Q2 2023

Provides insights from user usages.

- Popular question
- Survey results



Q4 2023

Organize events and workshops with end users and partners



2025

Deploy service to other countries

- Cater to local markets



Thank you!

Questions?

Reach us at
petwhisperers@smartpet.com