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PAWrfect Match: A Web-Based Animal Adoption and Rescue System that uses Content-Based Filtering Algorithm for Recommending Potential Adoptees

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***Abstract*—** The study involves an automated system where pets who are adoptable are advertised making it easier for potential adoptees to find the pet for them. Due to the rise of abandonment of pets in recent times, their need for a new home is also rising. The study focuses on streamlining the advertisement of adoptable pets from different shelters or rescuers to promote adoption instead of buying pets. Users will be recommended pets based on their interest from the pre-survey in the sign-up page, this will make it easier for users to find the suitable pet for them. It also includes a notification feature to notify the users if there is a new adoptable pet with characteristics that align with their interests. Users can also file a request for rescue that will be reviewed by the shelter themselves. There is also a forum tab where users and professionals are able to add a new post, and this can be filtered based on their category; the post of the professionals always appears on top in order for users to see the most relevant posts first. The system proved that it was able to successfully serve as an advertising platform for shelters and their stray cats and dogs. The forum section is also a good addition as it serves as a platform for adopters and pet-owners to seek help and tips from fellow pet owners and professionals.

Index Terms*— Algorithm, Animal Shelter, Forum, Pet Adoption*

INTRODUCTION

The COVID-19 pandemic became a global health emergency way back in January 2020; this meant that most people were ordered to stay at home in order to slow down the spread of the said virus [1]. This led to severe health and economic concerns, it has been stated in previous studies that owning a pet or companion animal like cats and dogs can provide positive outcomes that may improve mental health, reduce people's stress, alleviate anxiety, depression, and it can provide comfort, additionally, interactions between human and animals can improve association with other human beings. However, even with all these positive effects, due to the unexpected COVID-19 pandemic, an increase in dog abandonment could potentially occur due to the pandemic, one of the reasons why this can happen is due to inconclusive reports of animals potentially a COVID-19 carrier.

Having pets can reduce people's stress, alleviate anxiety, depression, and it can provide comfort. According to the Humane Society of the United States Organization, by adopting pets, this will basically give them a second chance, this means that the adopter has the obligation to provide the pet: love, trust, and patience that the pets deserve [2]. Another pet that a lot

of people abandon is cats, which is rampant nowadays, and due to this kind of treatment towards animals, animal shelters/animal pounds are having a hard time taking care of such animals. Twelve million stray cats and dogs roamed the nation in 2019, according to the Philippines Animal Welfare Society, Thousands of animals die due to: disease, hunger, or wounds sustained from fighting one another [3].

The provided information regarding the situation about the state of adopting and abandonment of animals leads to problems in the way of adopting pets, the traditional way of adopting pets can be an inconvenience to potential owners, this makes it hard for them to find the suitable pets for them; this is usually done by going physically to the shelter or contacting the shelter itself to inquire about the availability of pets in the shelter dogs and cats. New and curious pet or non-pet owners struggle when it comes to finding information on how to take care of pets, tips on what to do, and other topics relating to pets, without a proper place to find answers, it would be difficult for them to know what to do. One solution is to provide a centralized system or website that adopters and potential owners can browse through in order to easily browse through the available pets. A notification alert is also implemented where users are notified whenever a new pet is added that aligns with the user's preference. An implementation of report system is also added to call for rescue of pets in trouble or in need of help. To help potential owners find the pets they want according to their preferences, filtering will also be implemented in the system with the use of a content-based filtering algorithm, this will aid potential owners in finding the pets based on their own preference. The addition of a forum page is also helpful for old and new pet owners alike; they can learn new things or additional information on how to take care of pets based on other pet owners' experiences. This can also be a space where pet owners communicate with one another and give or receive tips to have a successful relationship with their pet.

1.1 Statement of the Problem

The main problem that this study aims to address is the lack of adoption websites that uses content-based filtering algorithm to make it easier for users to find the adoptee that they want based on their characteristics as well as the lack of forum features in the said websites where users can interact with professionals. Specifically, this study aims to answer these problems:

1. **Lack of a centralized pet adoption and rescue system**. The traditional way of adopting pets can be an inconvenience to potential owners which makes it hard for adopters or potential owners to find suitable pets for them. This is usually done by going to an animal shelter and looking for the potential pet itself or contacting the shelter itself to inquire about the availability of pets in the shelter. Due to the rise of abandonment of pets, this means that more dogs and cats are abandoned in the streets which, this can also be a problem since they do not have a consistent way of getting clean food and people might hurt them. In addition to these problems, a lot of people also do not know the proper process for adopting pets from animal shelters which can lead to them hesitating to go and adopt a stray [4][5].

2. **Finding the right pet that suits the potential adopters can be difficult**. It is difficult to find pets that are suitable for specific people, it is nearly impossible for adopters to filter and figure out a cat's or dog's traits with just one look, all person's preferences differ, so finding the right animal for them can be difficult as this can lead to a problem where pets are returned due to incompatibility. There are a lot of characteristics that go into account when looking for a pet that you want, this includes breed, age, color, size, etc. Without seeing the characteristics of the pets available for adoption, it is difficult to know if certain pets are for you [6][7].

3. **Being a pet owner can be a tedious task and help may be required**. Finding help with what to do as a pet owner, especially when it is your first time, can be a tedious task. Advice about what to do can vary from person to person as they all have different experiences. Without a proper place to find various information that they need for taking care of pets, new pet owners can be confused about what to do and have a difficult time taking care of their new pet [8].

1.2 Objectives

The major objective of the system is to provide a web-based system that helps animals find their own home while also giving potential owners an easy way to access available pets, and for the animal shelter to have a simplified and organized pet listing system. Specifically, the study aims to achieve the following objectives:

1. To provide a centralized web-based system for adopters or potential owners to browse through, which can help them have a better way of looking through the available pets that they could potentially adopt. The

system will also have a feature where users can report animals in need of help so that a rescue would be possible. When the user finds the pet that they want, all of the information about the pet, including the requirements for adoption, can be viewed with a simple push of a button.

2. To help adopters or potential owners find the pets they want according to their preferences, filtering will be implemented in the system with the use of a content-based filtering algorithm, this will aid potential owners in finding the pets based on their own preferences. The characteristics provided by animal shelters are Age, Breed, Color, Characteristics, and Gender. These metrics will be used in order to calculate the similarity scores.

3. To add a forum page where new pet owners can learn about the things they need when starting to take care of pets from other pet owners' or professional veterinarians' experiences or tips that all users can access. It can also be a space where pet owners can have a chat with other pet owners [8].

1.3 Significance of the Study

This study aims to provide a system that uses Content-Based Filtering Algorithm to provide recommendations to the users about which pet to adopt and at the same time give them the chance to rescue a pet.

The results of this study will benefit the following:

1. To adopters or potential owners, the study can provide aid to adopters or potential owners since the main goal of this study is to provide them with possible pets that are suitable for them based on their own preferences. The system is able to provide the adopters or potential owners pets that can help them make a better decision.
2. To animal shelters, the study can be beneficial for animal shelters since this will be an improvement to the traditional way of adopting and handling the adoption process. By providing a system where available pets are all centralized on the web with the filtering system, they could potentially have more time for other things like taking care of the animals themselves.
3. To animals or pets, the study will be beneficial to pets since this means that a lot more people can see them, the system will have a centralized system where all available pets are all listed along with their information and filtering system, this could potentially increase the number of successful adoptions and potentially reduce the number of abandonment of pets due to wrong decision-making of adopters.
4. To future researchers, this study shall serve as a relevant reference for those who are interested in the same topic and wish to continue the study. The data that has been gathered and topics that have been discussed in this study can be of additional knowledge and information for their own research.

1.4 Scope and Delimitation

The scope of the study is to develop a web-based system that facilitates and helps adopters or potential owners, animal shelters, and animals or pets which will focus on pet adoption. The system will have features such as a list of possible pets to adopt, request for pet rescue, filtering based on the adopter's preferences, and a forum where users can discuss. The system will have a list of animals or pets that is available and ready to be adopted, additionally, the system will also include a filter that will use a content-based filtering algorithm to aid users to make a reasonable decision to reduce the amount of abandonment of pets due to incompatibility and increase the number of pets that finds a home that they could love. Additionally, users are able to report pets who are in need of help so that a rescue would be possible. Lastly, the system will also have a forum tab or page that new and old pet owners can use in order to learn or give their take or opinion on taking care of pets based on their experiences, this also means that they can give out their tips in order for the pet owners and the pets to have a better relationship. Professionals, specifically veterinarians would also give their insights and/or tips for all the users to see in the forum tab, which can include various topics. The study solely relies on the information that the user's input, meaning, inaccuracy or wrong input of data can hinder the effectiveness of the filtering system which can lead to bad decision-making and possibly bad outcomes. Since the website is accessible online, this means that people without internet access won't be able to use the system. The type of pets is only limited to cats and dogs since animal shelters usually cater "aspins" and "puspins". The system will only advertise the pets to be adopted but the adoption procedure will not be changed. Lastly, for the forum section, tips from users and professionals would only be limited to what they want to say and what they have in mind, the proponents do not have control over what they will post on the forum section.

METHODOLOGY

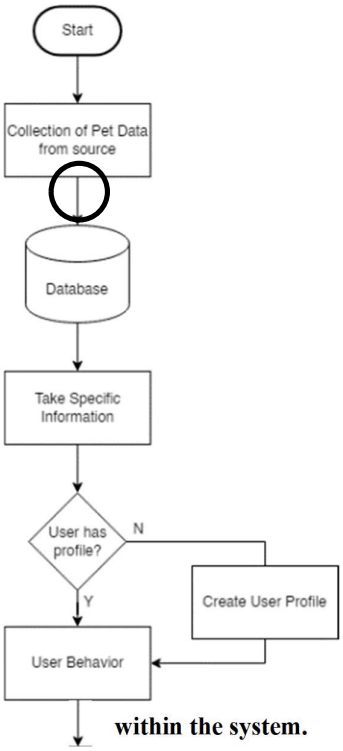
2.1 Requirements

The proponents gathered data through research to determine the necessary and suitable applications and programming language. Preliminary research is a very important requirement in order to come up with a system, the proponents gathered all the components needed that will be utilized for the development of the web-based system. The data consists of pet image, pet name, pet type (dog or cat), gender, pet shelter, pet age, description, and characteristic of the said pet. The characteristic is used to process it and run through the content-based filtering algorithm in order to make it easier for adopters to find the pets that alight with their preference.

2.2 Data Collection

Data Collection is one of the most important aspects of this study as the algorithm requires training in order to function properly and be able to recommend based on the user's preferences. To collect data, the proponents will be using Structured Data Collection. The first type will be used to collect data about pets for adoption. Their information, such as breed, age, size, color, etc. would be organized into a tabular formula where each row represents a different pet, and each row represents a different attribute. Once the data is gathered by the proponents or the users, it will be fed to the deep learning model, which will then make this project functional and complete.

2.3 Development



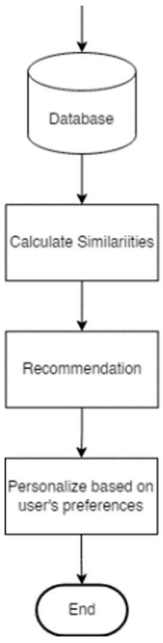


Figure 1: Process Flow Diagram Using the Content Based Filtering Algorithm

As seen in Figure 1, for the system to make recommendations to users, the pet data that is needed for adding adoptable pets should be gathered and added to the database. After gathering the data, users should have an account in order for them to receive recommendations within the system. The users are required to answer a survey after creating an account which includes the pet type, pet color, and certain characteristics that they have interest in. Once the user has a profile, they will then receive recommendations based on the interests that they chose, and afterwards receive more recommendations based on their activity within the system.

2.4 Project Design

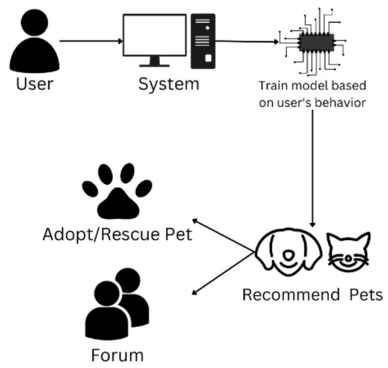


Figure 2: Block Diagram of PAWrfect Match using Content-Based Filtering Algorithm

Figure 2 shows the block diagram of the PAWrfect Match. It shows the major structures and functions of the system which has six (6) major parts in the block diagram.

The user would be one of the main sources of data for training the algorithm since it needs to have the behavior of the user in order to cater to their preferences. Once the algorithm is trained, it can give the recommendations based on the user's interests and previous searches. From there, the user can choose what to do next. There are three steps the user can take, first is to adopt a pet once they find one that they

like. When they decide to adopt a pet, they will undergo a proper adoption procedure by contacting the animal shelter of their chosen pet that is given by the system before they can take their new pet home. They can also opt to rescue a stray or any pet that they think needs rescuing. Their request would undergo evaluation before taking appropriate action. The last choice for them is to check the forum page of the system where they can chat with other users alike or look for answers on their questions regarding their pets or how to take care of them.

2.5 Sampling Techniques

The proponents chose Convenience Sampling as a sampling technique for this study since the proponents do not have a specific requirement for conducting surveys. Subjects can be chosen at random as long as it is convenient for both the proponents and the people to be surveyed. The data would come from a survey that the proponents would conduct, which ensures that the system will be properly evaluated.

2.6 Evaluation

In order to properly evaluate whether the produced project meets the specified requirements, an evaluation using the ISO 25010:2011. The project can be assessed whether it is good quality, reliable, and secured by utilizing a well-known evaluation technique. The proponents have tested the project to ensure the quality of the project before it is released to the public. The proponents used and applied the ISO 25010:2011 model to properly evaluate the project.

The ISO 25010:2011 is a quality model used to properly measure and evaluate the system. This study aims to evaluate the system with the use of the following attributes: Functional Suitability, RELIABILITY, USABILITY, AND COMPATIBILITY. The result of the evaluation was conducted and interpreted by utilizing a numerical rating scale as shown in table 1.

Scale	Weighted Mean Range	Verbal Interpretation
4	**3.50 to 4.00**	**Strongly Agree**
3	**2.50 to 3.49**	**Agree**
2	**1.50 to 2.49**	**Disagree**
1	**1.00 to 1.49**	**Strongly Disagree**

Table 1. Rating Scale for Interpreting the Evaluation Result

RESULTS AND DISCUSSIONS

3.1 Objective Results

For the evaluation of the study, certain questions are provided by the proponents which can evaluate the effectiveness and the usefulness of the system in terms of finding pets that are available for adoption regardless of the user's background about pet adoption and being a pet owner. The proponents have gathered 80 respondents for their evaluation.

With the help of the 4-point Likert Scale of Agreement, the respondents were able to answer the following questions:

Question 1: How often do you visit pet adoption sites/pages?

Based on the results of the evaluation, out of the 80 respondents that the proponents have gathered, 14 (17.5%) respondents said that they Never visit pet adoption sites/pages, 39 (48.8%) respondents said that they Rarely visit pet adoption sites/pages, 19 (23.7%) respondents said that they Frequently visit pet adoption sites/pages, and only 8 (10%) respondents said that they Always visit pet adoption sites/pages.

Question 2: Do you participate in adoption and pet related forums or discussions?

Based on the results of the evaluation, out of the 80 respondents that the proponents have gathered, 21 (26.3%) respondents said that they Never participate in adoption and pet related forums or discussions, 36 (45%) respondents said that they Rarely participate in adoption and pet related forums or discussions. 15 (18.8%) respondents said that they Frequently

participate in adoption and pet related forums or discussions. While only 8 (10%) respondents said that they Always participate in adoption and pet related forums or discussions.

Question 3: Do you think adopting is better than shopping?

Based on the results of the evaluation, out of the 80 respondents that the proponents have gathered, 42 (52.5%) respondents said that they Strongly Agree that adopting is better than shopping. 35 (43.8%) respondents said that they Agree that adopting is better than shopping. 2 (2.5%) respondents said that they Disagree that adopting is better than shopping. While only 1 (1.3%) respondent said that they Strongly Disagree that adopting is better than shopping.

Question 4: Do you think recommending pets to adopt is better than finding one yourself?

Based on the results of the evaluation, out of the 80 respondents that the proponents have gathered, 42 (31.3%) respondents said that they Strongly Agree that recommending pets to adopt is better than finding one themselves. 35 (60%) respondents said that they Agree that recommending pets to adopt is better than finding one themselves. 2 (6.3%) respondents said that they Disagree that recommending pets to adopt is better than finding one themselves. While only 1 (2.5%) respondent said that they Strongly Disagree that recommending pets to adopt is better than finding one themselves.

3.2 Evaluation Results

Functional Suitability:

Functional Completeness: The system gives the user everything they require to find and adopt their next pet.

Based on the results of the evaluation, out of the 80 respondents that the proponents have gathered, 38 (48%) respondents said that they Strongly Agree, 40 (50%) respondents said that they Agree, and lastly, only 1 (1%) respondent each said that they Disagree and Strongly Disagree that the system gives the user everything they require to find and adopt their next pet.

Functional Correctness: The recommendations are accurate based on the previous searches of the user and the system provides and the forum posts are properly categorized.

Based on the results of the evaluation, out of the 80 respondents that the proponents have gathered, 35 (43.8%) respondents said that they Strongly Agree, and 45 (56.2%) respondents said that they Agree that the system provides accurate recommendations based on the previous searches of the user and the forum posts are properly categorized with no disagreements.

Performance Efficiency:

Capacity: When the user posted in the forums tab, searched for pets, or requested for rescue, there were no restrictions.

Based on the results of the evaluation, out of the 80 respondents that the proponents have gathered, 31 (38.7%) respondents said that they Strongly Agree, 45 (56.3%) respondents said that they Agree, 3 (3.8%) respondents said that they Disagree, while only 1 (1%) respondent said that they Strongly Disagree that the system has no restrictions when the user posts in the forums tab, searches for pets, or requests for rescue.

Time Behavior: Pet recommendations, listings of pets, forum posting, and management of accounts all process quickly and without any delays.

Based on the results of the evaluation, out of the 80 respondents that the proponents have gathered, 36 (45%) respondents said that they Strongly Agree, 42 (53%) respondents said that they Agree, and 1 (1%) respondent each said that they Disagree and Strongly Disagree that the system quickly processes pet recommendations, listings of pets, forum posting, and management of accounts and without any delays.

Usability:

Learnability: The system's user-friendly interface makes it accessible to a wide range of users. The system would be accessible to users of all ages.

Based on the results of the evaluation, out of the 80 respondents that the proponents have gathered, 41 (51.2%) respondents said that they Strongly Agree, 36 (45.0%) respondents said that they Agree, 2 (2.5%) respondents said that they Disagree, while only 1 (1.3%) respondent said that they Strongly Disagree that system's user-friendly interface makes it accessible to a wide range of users.

User Interface Aesthetics: The design is not complex. Although it is simple, users still experience pleasant and satisfying interactions with the system.

Based on the results of the evaluation, out of the 80 respondents that the proponents have gathered, 35 (43.8%) respondents said that they Strongly Agree, 42 (52.5%) respondents said that they Agree, 1 (1.2%) respondent said that they Disagree, and 2 (2.5%) respondents said that they Strongly Disagree that they experience pleasant and satisfying interactions with the system's design.

Operability: When performing particular tasks and features, the system is easy to operate and has simple controls.

Based on the results of the evaluation, out of the 80 respondents that the proponents have gathered, 36 (45%) respondents said that they Strongly Agree, 42 (53%) respondents said that they Agree, and 1 (1%) respondent each said that they Disagree and Strongly Disagree that the system is easy to operate and has simple controls when performing particular tasks and features.

Reliability:

Maturity: Based on its features and functionality, the system may be relied upon to meet users' needs.

Based on the results of the evaluation, out of the 80 respondents that the proponents have gathered, 35 (43.8%) respondents said that they Strongly Agree, and 45 (56.2%) respondents said that they Agree that the system may be relied upon to meet users' needs based on its features and functionality with no disagreements.

Conclusions and Recommendations

4.1 Summary of Findings

The proponents discovered that the systems that most pet adoption sites use do not include any algorithms in recommending pets, which in turn makes it difficult to find the right pet for the users, especially when there are a lot of pets to choose from. As for the findings in the survey and assessment forms that were provided, where 80 people replied, the proponents found that most of the respondents' own pets. Regardless of 81.3% of them own pets, most of them do not/rarely visit pet adoption sites/pages and participate in adoption and pet related forums or discussions. Nonetheless, they think that adopting pets is better than shopping and that it is better achieved by having recommended pets to adopt than finding one themselves. With that being said, the proponents asked the respondents about how effective the system can be in helping them to find and adopt pets as well as the overall appearance of the system. For the questions based on ISO 25010:2011, most users are satisfied with the system's overall functional completeness and correctness. Its performance based on its capacity and time behavior are also satisfactory according to the respondents. In terms of learnability, aesthetics, and operability, the respondents also said that they are satisfied with what the system has. Lastly, in terms of the maturity of the system, almost all the users said that they are satisfied with its maturity.

4.2 Conclusions

In consideration with the objectives of the study, the following conclusions were drawn:

The proponents were successful in creating a web-based application for showcasing the pets that are available for adoption from three different animal shelters. It serves as an effective platform for adopters to find the pets that they want, without the hassle of going to certain animal shelters one by one. They have also created a feature for reporting pets that cannot be taken care of by their owners or are strays. These requests can be either accepted, rejected, or deleted by the shelters based on their capacity and capability. The proponents have no influence on the decisions that the shelters will make on the said requests and have only provided a platform for taking the requests in.

The proponents have also successfully added the Content Based Filtering Algorithm to the system which gave the users the recommended pets based on their interests from the pre-registration survey and their activity within the system. This algorithm can also be used by future users in order for them to find the pets that they want as well.

The proponents have successfully added a forum feature in the web-based application where users can create their own posts and comment on other posts in order to communicate and learn from fellow pet owners and lovers. The forum tab works as intended, can even upload pictures in the posts themselves depending on the user's preference. Regardless of the inclusion of images, the users can still create their own posts in order to achieve user interactions. It also has a feature where the user can sort the posts based on three different categories which are Pet Care, Pet Tips, and General.

4.3 Recommendations

Based on the results that the proponents have gathered in their evaluation, the following recommendations can be used by future researchers when it comes to pet adoption websites:

1. The implementation of a better Machine Learning (ML) algorithm or the use of Artificial Intelligence (AI) in order to have a more precise and accurate recommendation system. Regardless of Content Based Filter Algorithm being fairly accurate, there may be a more efficient method that uses ML or AI.

2. Adding more pet shelters/pounds to have a larger scope and population in order to help more pets to find their new homes as well as adopters to find their new pet.

3. Implementation of a chat system which can help connect more people instead of just using the forum section of the system. With more user interactions, there is more room for learning about what to do and how to take care of pets.

4. Regardless of the system having a pleasing and functional user interface, it is also recommended that future researchers create a better looking and functioning system.

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With the completion of this project, the proponents would like to acknowledge the help and support given by the people around us, as well as the others who are far but gave a significant impact on the paper.

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REFERENCES

[1] STRAY DOGS ARE A SOCIAL RESPONSIBILITY – A PERSPECTIVE. (n.d.-b). https://www.strawindia.org/blogs/12/stray-dogs-are-a-social-responsibility-a-perspective.aspx

[2] Campanilla, B. S., Etcuban, J. O., Maghanoy, A. P., Nacua, P. A. P., & Galamiton, N. S. (2022). Pet Adoption App To Free Animal Shelters. Journal of Positive School Psychology, 6(8), 5993-6006.

[3] Vila, A. C., & Vila, A. C. (2020, August 2). With animal shelters full, millions of stray dogs and cats roam the Philippines – but one clinic is. . . South China Morning Post. https://www.scmp.com/lifestyle/article/3095186/animal-shelters-full-millions-stray-dogs-and-cats-roam-philippines-one

[4] Burgos, M. (2022, July 30). Seeing life through the eyes of a stray - Manila Standard. Manila Standard. https://manilastandard.net/pets/314247916/seeing-life-through-the-eyes-of-a-stray.html

[5] Pet adoption: Barriers and Solutions | Network Partners. (n.d.). Best Friends Animal Society. https://network.bestfriends.org/proven-strategies/operations/fostering-adoption/pet-adoption-barriers-and-solutions

[6] Chen, K. (2021, May 8). Dog recommendation system. Web Mining [IS688, Spring 2021]. https://medium.com/web-mining-is688-spring-2021/dog-recommendation-system-4c1efb77b092

[7] Design of purebred dog recommendation system using mcdm approach. (2020). Advances in Science, Technology and Engineering Systems Journal. Retrieved October 23, 2023, from https://www.astesj.com/v05/i05/p20/

[8] Create a forum about pets and animals on Forumotion. (n.d.-b). forumotion.com. https://www.forumotion.com/create-pets-forum