COMP 3004 - Object-Oriented Software Engineering

cuACS:
Algorithm Design Document

4our People

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Introduction

Animal shelter staff often face issues in the processes of animal adoption. One of the main issues is allowing clients to adopt animals which they are not compatible with. A client may want to adopt a pet to enjoy the pets comfort and companionship, however if the pets' attributes are not compatible with the clients' preferences, it would most likely lead to a situation where the pets could get mistreated. Therefore, to avoid this issue, our team has come up with a system called cuACS (Carleton University Animal-Client System) that runs an algorithm which automatically matches an animal with a client based on their compatibility.

The animal-client algorithm is run by the shelter staff who has access of both the client and animal profiles. Clients have their pet preferences mentioned in their profiles. Thus, based on the clients' preferences, the shelter staff runs the animal-client matching algorithm to determine which client is eligible to adopt which animal.

ACM Algorithm

Non Physical Attributes

Each animal's profile contains detailed information of the animal that is ready for adoption; including 12 or more physical and non-physical attributes.

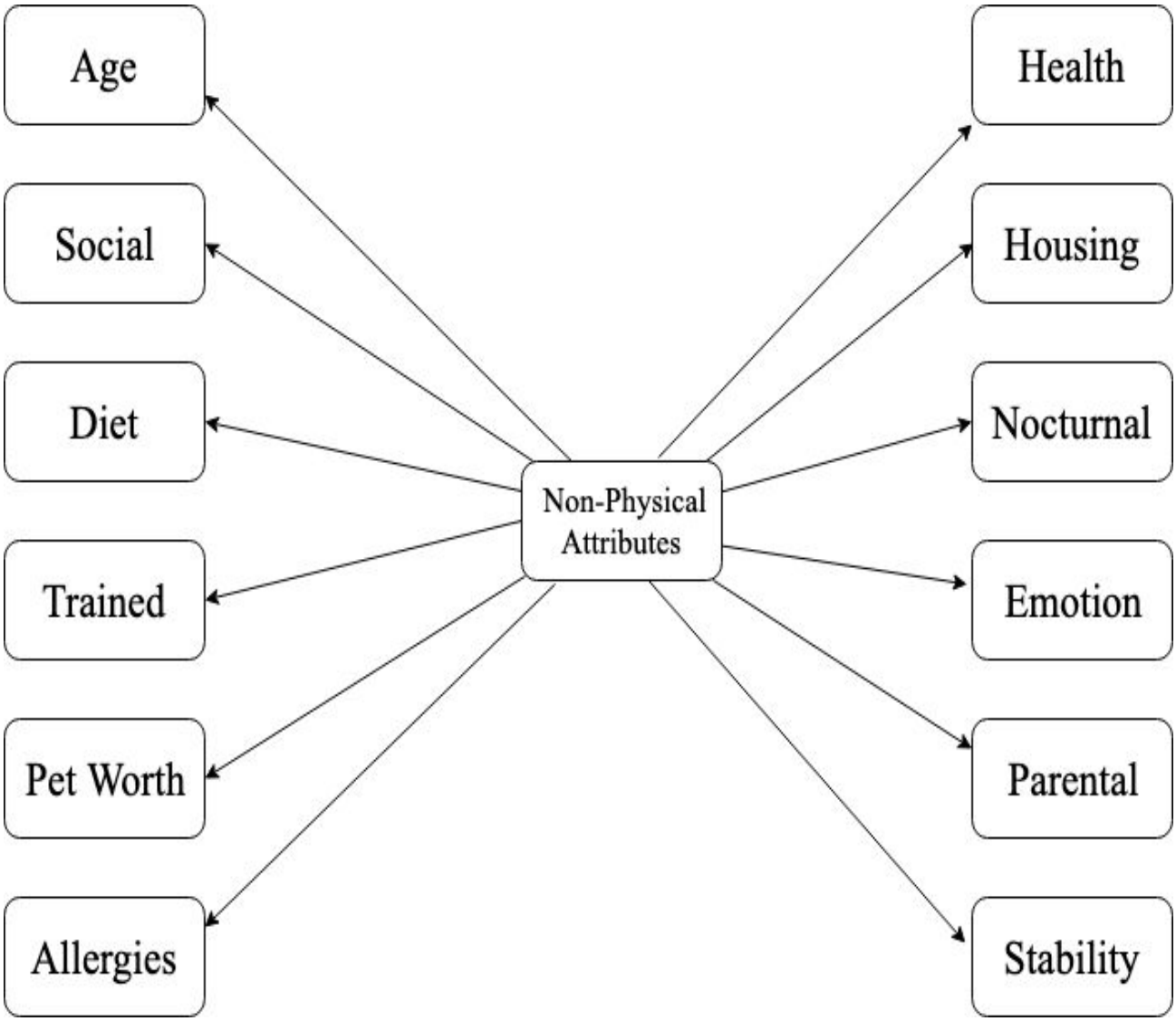

Figure 1 - Non-physical attributes

Our team implementing the cuACS system has defined fixed non-physical attributes and qualities that are critical in coordinating compatible animal to client matches, possibly resulting in an adoption. As illustrated above, figure 1 shows 12 non-physical attributes of the pets in the homeless shelter. These attributes would help the shelter staff determine the animal - client compatibility. Although some of the attributes such as age, diet, training, and allergies are self explanatory, the rest of the non-physical attributes need clarification:

- **Health:** Some pets in the shelter could be healthier than others
- **Social:** A degree to which each pet associates itself with other pets
- **Nocturnal:** Some pets which are more active at night than during the day
- **Emotion:** Different emotional levels of different pets
- **Housing:** Some pets require more space than other pets
- **Pet Worth:** Maintenance or luxury of the pet
- **Parental:** Some pets in the shelter have siblings that they are born or raised with
- **Stability:** The independence of a pet

Attribute Scales

Health

	1	2	3	4	5
	Unhealthy				Very Healthy

Social

	1	2	3	4	5
	Reclusive		Neutral		Extremely Social

Emotion

	1	2	3	4	5
	Angry		Neutral		Loving

Pet Worth

	1	2	4	4	5
	Low-end		Average		Luxury

Stability

	1	2	4	4	5
	Dependent				Independent

Training

	1	2	3	4	5
	Untrained		Basic Commands		Well Trained

Table 1 - Scaling System

Algorithm Rules

Rule Number	Name	Rule Answers	Non Physical Attribute
R-01	What is the client's preferred type of animal to adopt?	Type of Pet	
R-02	How active are you?	**Scale from 1-5**	Social, Health, Trained
R-03	Do you work from home or not?	If yes | **none** If no | **stability, health**	Stability, Health
R-04	What are your working hours like?	Day | **nocturnal** Night | **stability, emotion**	Nocturnal, Stability, Emotion
R-05	What is the client's place of residence like?	Apartment, House, Condo, Mansion | **housing**	housing
R-06	How many pets are you willing to adopt?	If one | **none** If more than one | **social, parental, housing**	social, parental,housing
R-07	Do you already own pets?	If yes | **social, emotion** If no | **none**	social, emotion

Table 2 - Algorithm Rules

Algorithm Justification

In this section we will explain why and how the rules are used to compute an optimal set of matches. Without exception every client profile must contain the client's matching preferences. The values for the attributes (preferences) that the client is looking for in an adopted animal are stored with

each client. The cuACS animal-client matching (ACM) algorithm uses uniquely particularly arranged rules for coordinating together animal and client profiles.

In order for a shelter staff to find a compatible match between an animal and a client, the shelter staff should ask the client a set of questionnaires about their pet preferences. The system runs a filter based algorithm to determine the pet that meets most of the client's preferences.

The ACM Algorithm will use a set of rules to determine the best fit for a client and animal match. Using these questionnaires, the shelter staff would be able to filter out the irrelevant animals depending on what the client answers. Towards the end of the questionnaire, the number of pets possible for adoption by a specific client should be reduced to its minimum. By the end of the questionnaire, the algorithm should be able to determine which pet is the most compatible with the client.

Rule Table Justification

Rule Number	Justification
R-01	The client is asked for a type of pet to filter out the other irrelevant pets (species and breed).
R-02	The client being active could be associated with the pets' non-physical attributes. Due to the client being active, the adopted pet should be **social, healthy** and **trained.**
R-03	If client works from home, pet can be in more critical health because client can take care of the pet from home, pets **health** can also be lower because client can take care of it. If client does not work at home, the **health** and **stability** of the pet should be stronger because the client may not be home for most of the day and pet may be alone for some time
R-04	If the animal is **nocturnal** the client can work during the day. The animal would be sleeping during the day and active at night, when the client comes home the animal will be awake.
R-05	**Housing** of the client would depend on the number and kinds of pets they adopt.
R-06	If the client is willing to adopt more than one pet, he might want to adopt pets that can get along with other pets (**social**). The client may also consider adopting siblings (**parental)**. The client would also be required to have a big house to accomodate the pets' **housing.**
R-07	If the client has existing pets, the newly adopted pet should be able to **socialize** with the other pets as well as be loving (**emotion**).

Table 3 - Rule Table Justification