I. Use Case Description

Use Case Name	*Find a Friend*
Use Case Identifier	
Source	
Point of Contact	*Ashley Choi, choia5@rpi.edu* *Danielle Villa, villad4@rpi.edu* *Debjani Ray-Majumder, raymad@rpi.edu*
Creation / Revision Date	*9/22/2022*
Associated Documents	

II. Use Case Summary

Goal	*The goal of this ontology is to recommend a dog breed based on the specifications of a particular household*
Requirements	*The system must be able to differentiate between different breeds and their characteristics, including but not limited to shedding, hypoallergenic status, activeness, and size.* *The system must return a list of all dog breeds and their basic characteristics.*
Scope	*This application can only recommend dog breeds and will not recommend any breeds of other animals. This ontology should evaluate breeds using the following characteristics: height, weight, grooming frequency, shedding, energy, trainability, demeanour, hypoallergenic status.*
Priority	
Stakeholders	*Households looking to adopt a dog, dog breeders, shelters, pet stores, dogs*
Description	*This application recommends dog breeds to households given some specific characteristics of the homeowner based on a list of specifications: activeness of household, presence of children, size of outdoor property, allergies. Additionally, the recommendation would provide a list of other potential dog breeds that may suit the family's needs to account for any potential subjective factors like cuteness.*
Actors / Interfaces	*Customer/Seeking dog – This person will directly benefit from the ontology as it will help them find the dog that best suits their condition.* *Breeders – This actor will use the ontology to better determine households that are a good fit for the limited number of puppies per litter. They will also be more aware of what their specific breeds need and better take care of their litters prior to selling them.* *Pet Stores – This actor will benefit from being able to stock their stores with more dog breeds that fit the description of a large proportion of people in their local area. They will also benefit as owners who are more aware of the needs of their dog will both purchase more dogs and purchase more supplies to properly meet the needs of the dog.* *Shelters – This actor could benefit from knowing which dog breeds benefit in each type of home, allowing for the potential of transferring them to an area where there are more people that can provide them a suitable home. They will benefit if more users utilize this ontology as it will decrease the amount of dogs in shelter as a result of the new owners not being able to meet the needs of the dog.* *Dogs – This actor will benefit from this ontology as more people getting dogs will be aware of their needs and hopefully chose to provide them*

Pre-conditions	*The customer is aware of their family's size, age, housing situation, allergies, and overall level of fitness.* *The ontology must have a knowledge base with all information about all recognized dog breeds.*
Post-conditions	*The ontology will provide many different types of dog breeds, differentiated by their various height, weight, grooming frequency, shedding, energy, trainability, demeanour, and hypoallergenic status. The application will then close.*
Triggers	*A household, looking to adopt/buy a dog but unsure of what breed, launches the application, inputs their information, and requests recommendations.*
Performance Requirements	
Assumptions	*We assume that people opening the application are looking to get a dog and not another type of pet.* *Dog breed assumptions:* *Having children -> breed should be good with kids, friendly, energetic, and less independent as kids will likely want to spend time with a more dependent dog* *Apartment/Small House -> breed should be of small height/weight,low amounts of barking, calm temperament, and friendly with strangers* *Student/Full-Time Employee -> breed should be more independent* *Having other pets -> breed should be friendly with other dogs or different pet species* *Student/Low Budget -> Breed should have fewer expensive health issues and a lower requirement for expensive food/toys* *Enjoys walking/hiking/exercise -> breed should be energetic and have high exercise needs* *Service dog/seeing eye dog/etc. -> breed should have high levels of trainability as they will likely be used for a task*
Open Issues	

III. Usage Scenarios

A young couple without children is looking for a medium sized dog. They live in an apartment with a large backyard in Seattle, Washington. One person has a dog allergy and is not very active, but has a job where they can work at home. The other person is in the office from 9-5, but is interested in running and takes hikes.

A large family consisting of 3 kids is looking for a dog. They live in a very large house with a large front yard. The kids are ages 6, 9, and 15. Their house is in Stamford, Connecticut. There is always someone at home, and there are no known allergies. Additionally, the parents are looking to provide a pet that will both entertain their kids and provide a sense of responsibility. There is no other dog present in the household, but they do have a pet cat.

A young person looking to work as a dog trainer is looking for a new challenge to take on. They live in an area with lots of backyard and local trails for hiking trips. They are hoping to adopt and foster as many dogs as possible, hoping for this first dog to be a good leader for the rest. They currently work a remote job. They have a garden in the backyard that they regularly maintain.

An older person is looking for a new life companion. They were hoping to create a social media page for their new dog as it would give them an excuse to keep in touch with their children and grandchildren. They live alone in a small apartment, but they would like a lively dog. They live on retirement with a very low influx of money.

IV. Basic Flow of Events

Basic / Normal Flow of Events			
Step	**Actor (Person)**	**Actor (System)**	**Description**
1	User		Launches application
2	User		Inputs information regarding household characteristics
3		System	Creates assumptions about household characteristics and returns to use
4	User		Adjusts assumptions/characteristics
5	User		Requests breed recommendations
6		System	Queries knowledge base and ranks potential dog breeds
7		System	Returns rankings,dog breed characteristics, corresponding dog breed characteristics, and source for dog breed information
8	User		Receives and analyses returned results
9	User		Is satisfied with results and finds a pet store/breeder/shelter to adopt the dog

Description: This is the basic flow for a standard usage of the recommender. The user, a person looking to adopt a dog, will log into the application and input their household information. The application will make assumptions based on the household characteristics and wait for confirmation from the user to edit/confirm necessary breed characteristics. The application will then query its knowledge base and return a ranked list of breeds that fit the needs of the user, the breed/user characteristics that match, and the sources of the breed characteristic.

V. Alternate Flow of Events

| Alternate Flow of Events #1			
Step	**Actor (Person)**	**Actor (System)**	**Description**
1	User	System	Proceeds with steps 1-9 of basic flow
2	User		Is unsatisfied with existing results because top rated breed is not cute
3	User		Indicates to the system to not include the previously-suggested breed in its recommendations
4	User		Requests new breed recommendations
5	User	System	Return to step 6 of Basic Flow

Description: This is an alternate use case for if the user is not satisfied with the results of the recommender. Specifically, if the user is not satisfied with the cuteness of the top recommendations.

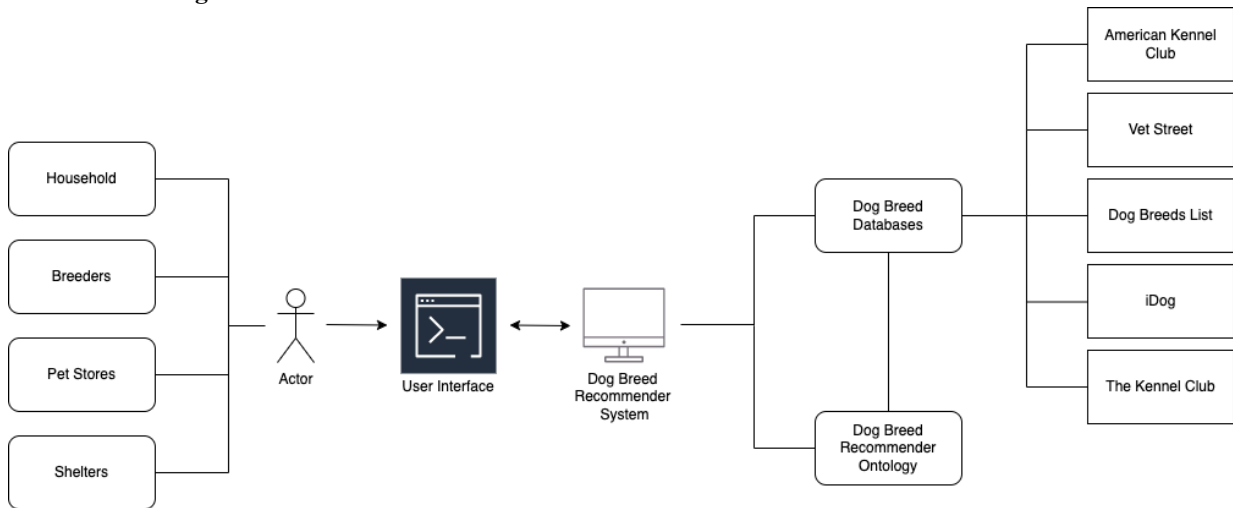## VI. Use Case and Activity Diagram(s)

Provide the primary use case diagram, including actors, and a high-level activity diagram to show the flow

of primary events that include/surround the use case. Subordinate diagrams that map the flow for each usage scenario should be included as appropriate
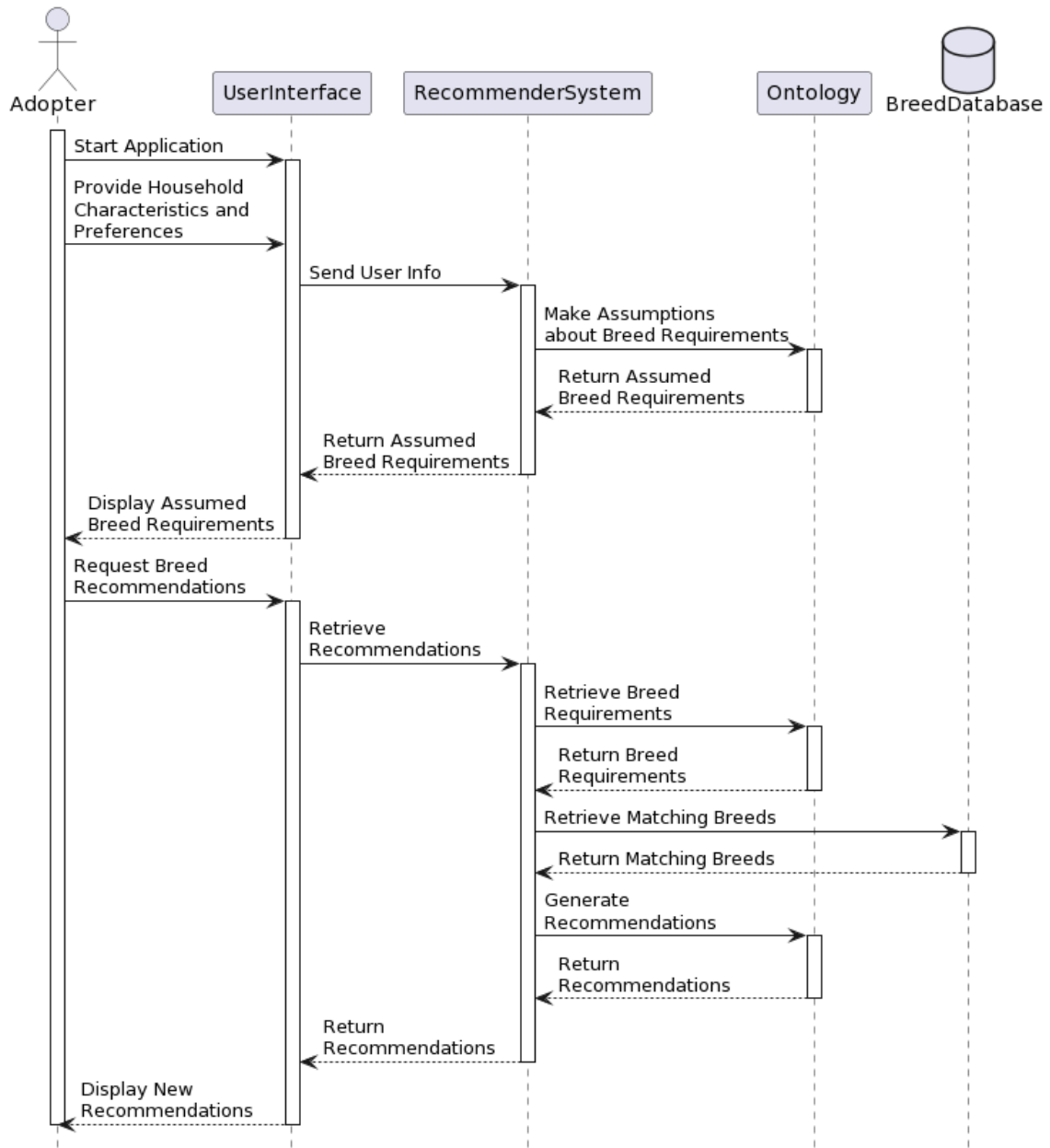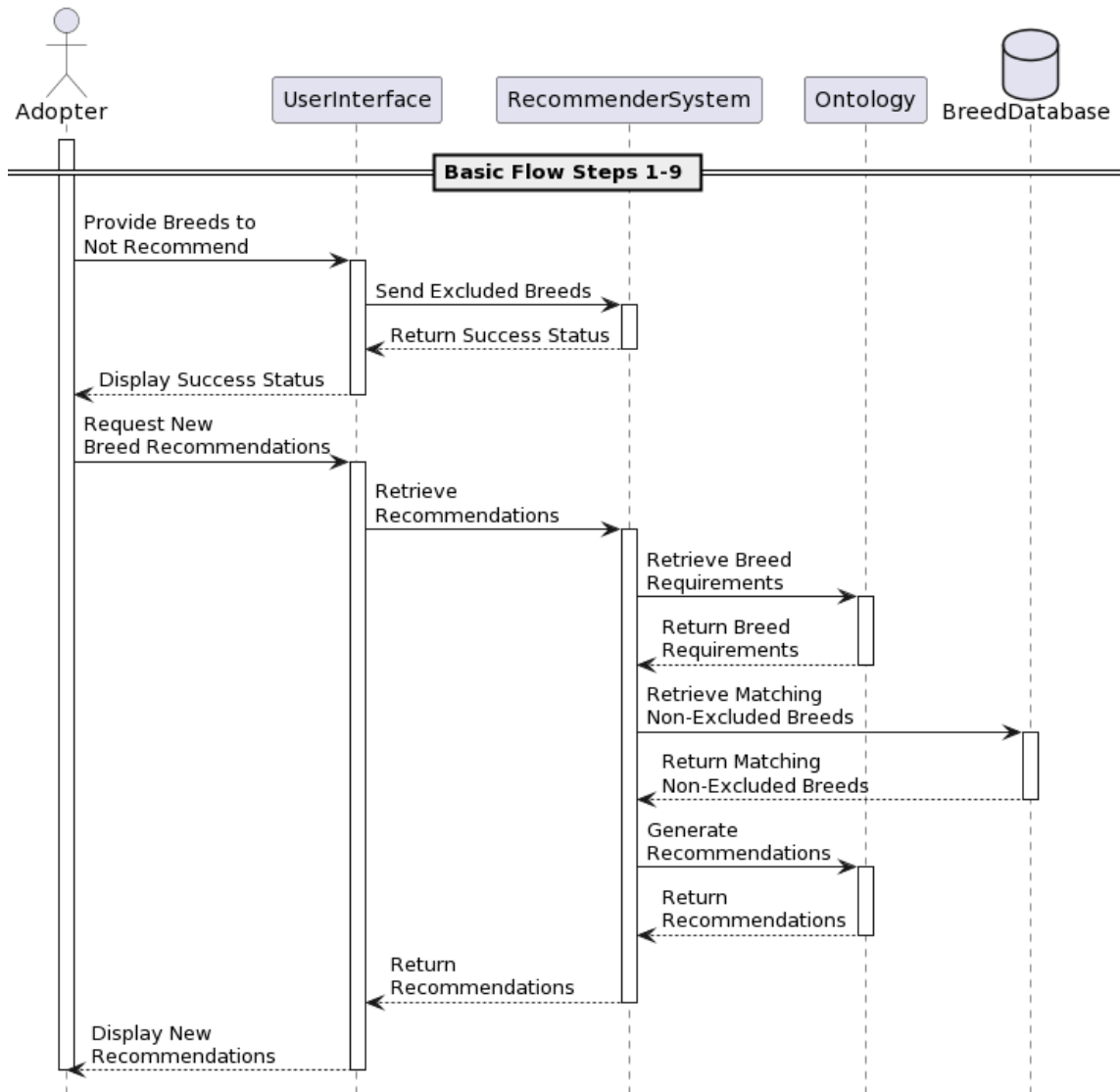
Use Case Diagram
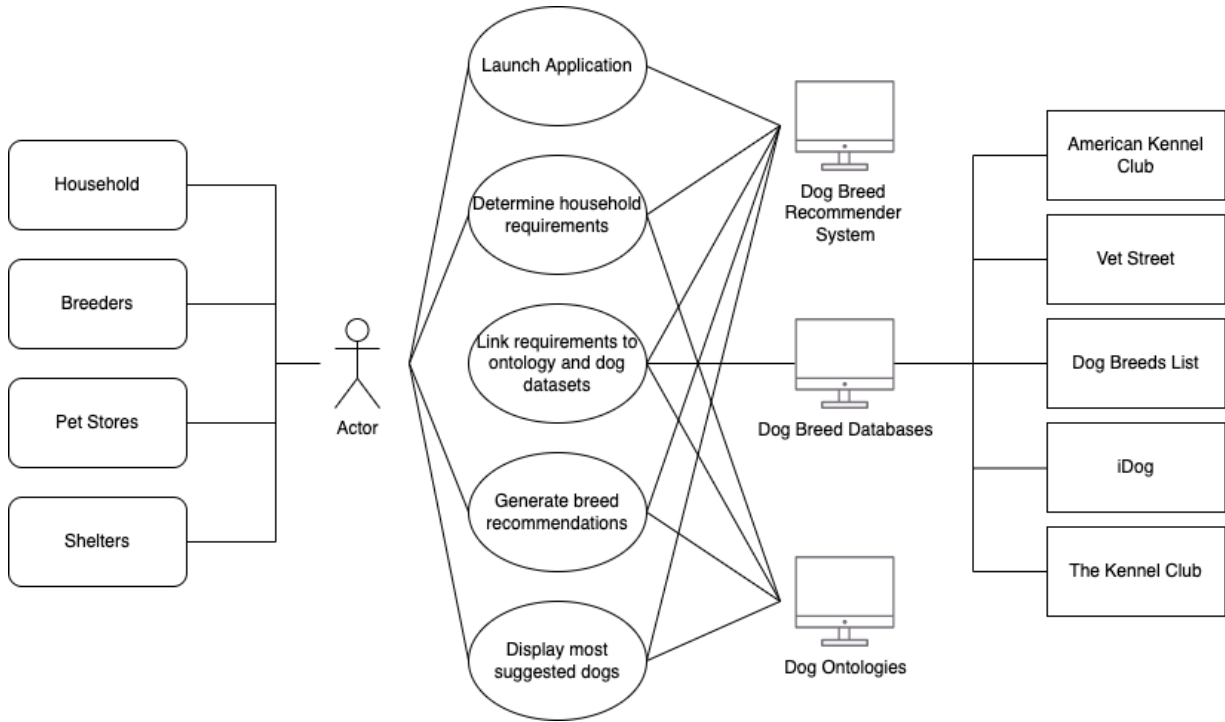
Architecture Diagram

Activity Diagram - Basic Flow

Activity Diagram - Alternate Flow #1

VII. Competency Questions

1. What dog breed would meet the needs of a large family with allergies in a large home?

   Sample answer: Goldendoodle

   Ontology process: The system first infers that the family requires a hypoallergenic dog. It next must infer from the large family that there are children. Thus, it requires a breed that is good with children, friendly, and has a high energy level. Using this information, the system will query for breeds that are hypoallergenic, good with children, high amounts of energy, friendly, and very active.

2. What dog breeds are good for students living in apartments?

   Sample answer: Japanese Chin

Ontology process: Since the adopter is a student, the system can infer that they likely have little free time and a small budget. Since they live in an apartment, the system can infer that any pet must be apartment friendly and not annoy any neighbours by being loud or aggressive. Using this information, the system can query for breeds with low activity needs, low health problems (since those are expensive), are apartment friendly, bark less, and are less likely to be aggressive towards strangers.

3. What dog breeds are good for a farm environment in Texas?

    Sample answer: Australian Cattledog

    Ontology process: Since the dog will be on the farm, the system will first infer that they will be around other animals. The system will also know to find dogs that are capable of being trained to perform tasks, like herding other animals. From here, the system knows to narrow down for a larger, athletic dog with a loud bark. Additionally, with the owner living in Texas, the dog will need to be able to withstand lots of heat in addition to lots of exercise. Using this information, the system will query for breeds with high tolerance for other farm animals, high activity levels, high intelligence and a light fur coat.

4. Is a greyhound a good breed for a large family with multiple pets, including cats and other dogs?

    Sample answer: Mediocre fit, greyhounds are not cat friendly

    Ontology process: Since the adopter is a large family, the ontology assumes that there are children in the household and that an affectionate dog would be prefered. Since there are other pets in the household, any breed should not be aggressive towards cats or dogs. Using this information, the system would match this adopter with a breed that is cat friendly, child friendly, dog friendly, and affectionate towards family. It compares these characteristics with those of a greyhound, and finds that all characteristics match except being cat friendly.

5. What is a cute dog breed that can do well in an apartment that doesn't get cleaned very often?

    Sample answer: Poodle

    Ontology process: Since the dog will live in an apartment, it should be apartment friendly. Since no precise restrictions are specified the size of the dog is not restricted. If the home is not cleaned frequently, the system can assume that any dog shouldn't shed much to prevent shed hair from building up in the home. Additionally, while the system cannot quantify 'cuteness,' it should prioritise popular dogs under the assumption that cuter breeds are adopted more often. The system can then query for low shedding apartment friendly dogs and sort by popularity.

VIII. Resources

Knowledge Bases, Repositories, or other Data Sources

Data	Type	Characteristics	Description	Owner	Source	Access Policies & Usage
AKC (American Kennel Club) Dataset	Remote	Web-based	Dataset containing the following data points about 277 breeds recognized by	AKC	https://www.akc.org/dog-breeds/	Free for personal/Non-commercial usage

					the AKC	
VetStreet	Remote	Web-based	Dataset containing information about dog breeds from vetstreet	VetStreet	http://www.vetstreet.com/dogs/breeds	Free for personal/non-commercial usage
Dog Breeds List	Remote	Web-based	Contains characteristics per breed, popularity, and standard price range	Dog Breeds List	https://www.dogbreedslist.info/	Free for personal/non-commercial usage
The Kennel Club UK	Remote	Web-based	Dataset containing data points about 222 breeds, with some info specific to the UK	The Kennel Club	https://www.thekennelclub.org.uk/search/breeds-a-to-z/	Free for academic use

External Ontologies, Vocabularies, or other Model Services

Resource	Language	Description	Owner	Source	Describes/Uses	Access Policies & Usage
(ontology, vocabulary, or model name)	*(ontology language and syntactic form, e.g., RDFS - N3)*	*If the service is one that runs a given ontology or model-based application at a given frequency, state that in addition to the basic description*		*Source (link to the registry or directly to the ontology, vocabulary, or model where that model is maintained, if available)*	*List of one or more data sources described by and/or used by the model*	

Other Resources, Service, or Triggers *(e.g., event notification services, application services, etc.)*

Resource	Type	Description	Owner	Source	Access Policies & Usage
(sensor or external service name)		*Include a description of the resource as well as availability, if applicable*	*Primary owner of the service*	***Application or service URL**; if subscription based, include subscription and any subscription owner*	

IX. References and Bibliography

List all reference documents – policy documents, regulations, standards, de-facto standards, glossaries, dictionaries and thesauri, taxonomies, and any other reference materials considered relevant to the use case

"Dog Breed Information Ultimate Resource: Listing of All Dog Breeds." Vetstreet, http://www.vetstreet.com/dogs/breeds.

"Dog Breeds - Types of Dogs." American Kennel Club, https://www.akc.org/dog-breeds/.

"Dog Breeds ." Dogbreedslist.info, https://www.dogbreedslist.info/.

"iDog." China National Center for Bioinformation: National Genomics Data Center. https://ngdc.cncb.ac.cn/idog/breed/getAllBreed.action

K.E. Holland, "Acquiring a pet dog: A review of factors affecting the decision-making of prospective dog owners," Animals, vol. 9, no. 124, Mar. 2019 , doi: 10.3390/ani9040124

Kendall, Elisa F., and Deborah L. McGuinness. Ontology Engineering. Morgan & Claypool Publishers, 2019.

X. Notes

Have not yet found a dog breed ontology. iDog has a gene ontology and a list of breeds with characteristics, but they don't seem to be integrated at all. Other ontologies also seem to be scoped at the gene level.