Walmart Global Technology
American Pets Alive!

Problems at a Glance

Data Science

- Predict travel
- Examine interactions with city systems (public safety and major roads)
- Understand differences between cities
- Understanding within-city patterns
- Properties of animals related to travel
- Understanding finder scenarios (i.e., in or out of neighborhood finds, super-finders, etc.)

Software

- Information for finders
- Notification for owners
- Resources for owners
- Resources for the community

Innovation

- Distributed data availability
- Navigation to home (Uber for pets)
- Cell phone scannable identifiers

Problem Descriptions

The purpose of American Pets Alive! (AmPA!), as the nation-wide educational program of Austin Pets Alive! (APA!), is to end this urgent crisis and save as many animals as possible from unnecessary deaths. A common scenario encountered by shelters is what is known as a Return to Owner (RTO) scenario. Typically, an animal gets loose in the city and is found by a member of the public or animal control officer (ACO) employed by the city/county. That member of the public then brings the animal to the local shelter where the owner can pick it up (sometimes for free, sometimes for a fee or pending some other agreement). Unfortunately, in larger cities, the shelters are often many miles from the homes of the animals who may have only travelled several hundred feet from home. As a result, this process is very inefficient.

American Pets Alive! has collected data from several other animal shelters on animals which went through the RTO process, including approximate locations of where they were found and where they lived (i.e., where they were returned to their owner). Using this data and your newfound knowledge of this problem, your goal is to develop insights and technologies which can enable animals who encounter this scenario to make it home safely and, in a resource-efficient manner. Below, you will find a set of recommended starting points on this problem including a Data Science, Software, and Innovation perspective on the problem. You are also welcomed to propose your own ideas for how to help owners, animals, shelters, and communities in the above scenarios. Although no tool use is required for these problems, the following tech stacks and/or technology areas are recommended in each domain:

Data Science – Python, Numpy, Scipy, Pandas, Sci-Kit Learn, Plotly, Jupyter, Tensorflow or PyTorch, GeoPy, OSMnx, Dash, OSM

Software – React, OSM, TypeScript

Innovation – Blockchain, XR

American Pets Alive!
Walmart Global Technology

Data Science

Problem Descriptions

A variety of Data Science (DS) problems can be addressed using the provided data as well as publicly available data. These insights can be used by shelters to improve operations, cities to change policies or funding models, and communities to improve safety and decentralize the administration of animal returns. Although any data science deliverable (model, insight, visual, etc) is acceptable for this hackathon, some recommended starting problems are enumerated below:

1. Predict **where animals travel** and why (i.e. biases towards or away from particular landmarks, directions, time-of-day constraints, etc; be creative!)
2. Examine interactions with **city systems** (i.e. do animals cross highways, potentially creating public safety/driving hazards?)
3. Understand **differences between cities** (i.e. do cities have different properties which might contribute to animal or human behavior and outcomes?)
4. Understand **within-city patterns** (i.e. are certain regions of cities more vulnerable to this issue; if so, why?)
5. Understand **properties of animals** related to travel (i.e. do animals with microchips or of certain sizes/ages travel differently?)
6. Understand finder scenarios (i.e. do individuals who find animals generally live near the animal? Are there such things as “super-finders” who repeatedly find and bring in animals such that they could be trained to return the animal directly to home?)

Data Description

See Appendix A for a data dictionary.

Possible Outcomes and Deliverables

Predictive Model(s)

Advanced Visualizations

Actionable Insights

Design-Your-Own

American Pets Alive!
Walmart Global Technology

Software

Problem Descriptions

Some issues which surround getting animals home when they are lost in the most efficient way possible have less to do with *knowledge* and more to do with *tools*. As such, new software and process tools should be considered which might enhance a system if properly adopted or implemented. Some examples of the roles these tools might play are:

1. Tools which provide information for individuals (or animal control officers) who find animals to allow them to take that animal directly home rather than to the shelter (contact-information-tagging on the animal's body, for example)
2. Tools which can help notify owners when their animals have become lost or been found so they can more proactively retrieve them (GPS collars, contact-information-tagging on the animal's body, etc; note that although microchips, in principle, solve this issue, they require specialized tools/knowledge to scan)
3. Resources for owners which can prevent their animal from becoming lost in the first place (i.e. city-funded fencing, education, etc)
4. Resources for the community which help reduce risk surrounding lost animals (such as reporting apps for lost animals such that an individual does not need to pick them up but can report a "sighting")

Note that many solutions are already on the market for some of these scenarios, but their success is often stymied by cost, easy-of-use, user-experience, and design, and/or general failure to understand the underlying issue for the user groups in question. Finding and simplifying existing solutions is as valid a deliverable for this section as inventing something entirely new. You may use any public data and/or the data provided in the Data Science section as needed.

Possible Outcomes and Deliverables


Mobile Application


Data Management System


Improvement of Existing Solution


Design-Your-Own

American Pets Alive!
Walmart Global Technology

Innovation

Problem Descriptions

Although insights and tools can often be transformative, innovation does not happen in a box. The Data Science and Software sections are largely prescriptive, in that the ideas have been vetted and/or are reflective of some known good practice or concept. In this, the Innovation challenge, there are little to no constraints on the ideas you can pursue. You may use any public data and/or the data provided in the Data Science section as needed. You may take ideas from other existing projects, enhance existing public offerings, or design an entirely new concept. Although this entirely open-ended, a few proposals are presented below to inspire modes of thinking about the space. You need not work on any of these but consider using them as inspiration and/or starting points for your own ideas.

1. Distributed data availability via blockchain or other distributed technologies (all shelters use their own database systems, but these are rarely interoperable or easily allow the sharing of animal data)
2. Uber for pets (i.e., a method of allowing finders to call for a ride to take the pet home rather than to the shelter)
3. Mobile-device-scannable identifiers (i.e., NFC tags, QR codes, computer vision/facial recognition, or other means which would allow identification of animals and lookup of their information in a database using only an internet connected mobile device)

Possible Outcomes and Deliverables

Application

Concept Proposal/Proof of Concept

Enhancement to an Existing Concept

Design-Your-Own

American Pets Alive!
Walmart Global Technology

Appendix A

Data Dictionary

The data comes as an XLSX file with two sheets:

- "animal_data" – contains information on each animal
- "shelter_data" – contains information on each shelter

Animal Data

Column Name	Description	Type	Notes
shelter_id	Unique ID for the shelter	String	Maps to shelter_data
intake_date	Date of intake to shelter	Date	None
Species	Dog or cat	String	May contain alternate formats
found_lng	Longitude at which animal was found	Float	Derived from found_address, may be inaccurate
found_lat	Latitude at which animal was found	Float	Derived from found_address, may be inaccurate
outcome_lng	Longitude of animal home	Float	Derived from outcome_address, may be inaccurate
outcome_lat	Latitude of animal home	Float	Derived from outcome_address, may be inaccurate
distance_miles	Distance between found and outcome locations	Float	Derived from lon/lat values, may be inaccurate
found_address	Address where animal was found	String	None
outcome_address	Address of animal home	String	None
age_at_intake	Age of animal when found (Units of Days)	Integer	May contain errors

primary_breed	Animal breed	String	Subjective evaluation of humans
altered	Whether or not animal was spayed or neutered	String (Yes/No)	May contain alternate formatting
src_animal_id	The unique ID for the animal	String (A######)	Unique within each shelter

Shelter Data

Column Name	Description	Type	Notes
shelter_id	Unique ID for the shelter	String	Maps to animal_data
annual_intake_2019	The number of animals intaked in 2019	Integer	May contain null/malformed values
annual_intake_2020	The number of animals intaked in 2020	Integer	May contain null/malformed values
annual_intake_2021	The number of animals intaked in 2021	Integer	May contain null/malformed values
num_employees	An estimate of the number of employees at present	Integer	May contain null/malformed values
annual_budget_2020	The annual budget in 2020	Integer	May contain null/malformed values
jurisdiction_size	The estimated land area served by the shelter	String	May contain null/malformed values
jurisdiction_pop_size	The estimated number of people in the shelter service area	Integer	May contain null/malformed values
jurisdiction_pop_density	The estimated pop. density in the shelter service area	String	May contain null/malformed values