Predicting Animal Shelter Outcomes

Phillip Richardson
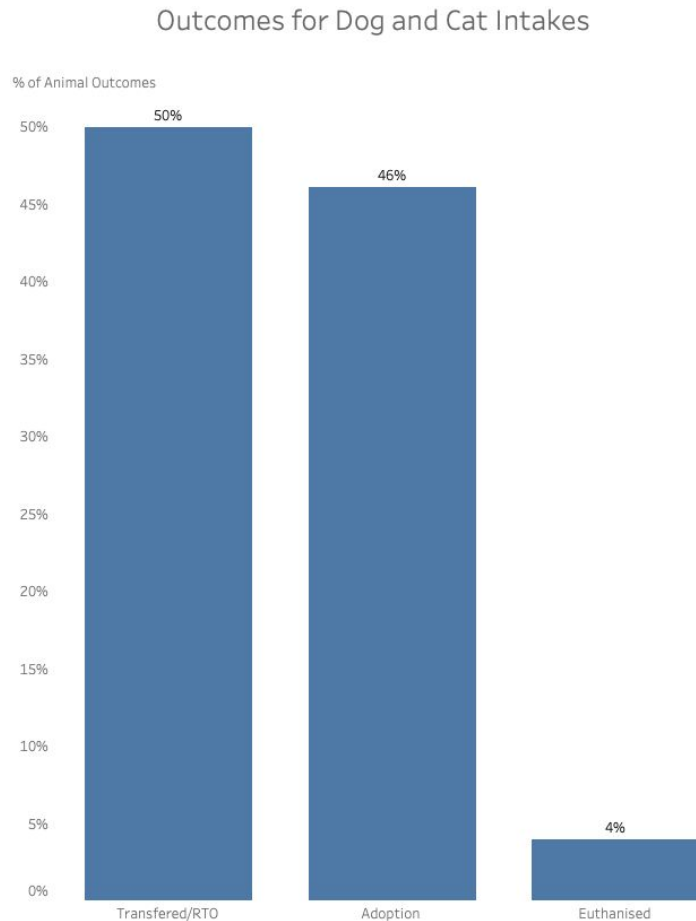
Austin Animal Center (AAC) Goals & Concerns

Mission Statement - "To provide placement services that will assist lost, homeless or sheltered animals to their homes or find new homes when necessary, **to provide live outcomes for at least 90% of sheltered animals**."

Capacity issues - "For the last six months, AAC has had to convert a conference room into kennel space in order to house the surplus of medium and large dogs in the shelter. **That conference room is no longer enough.**"
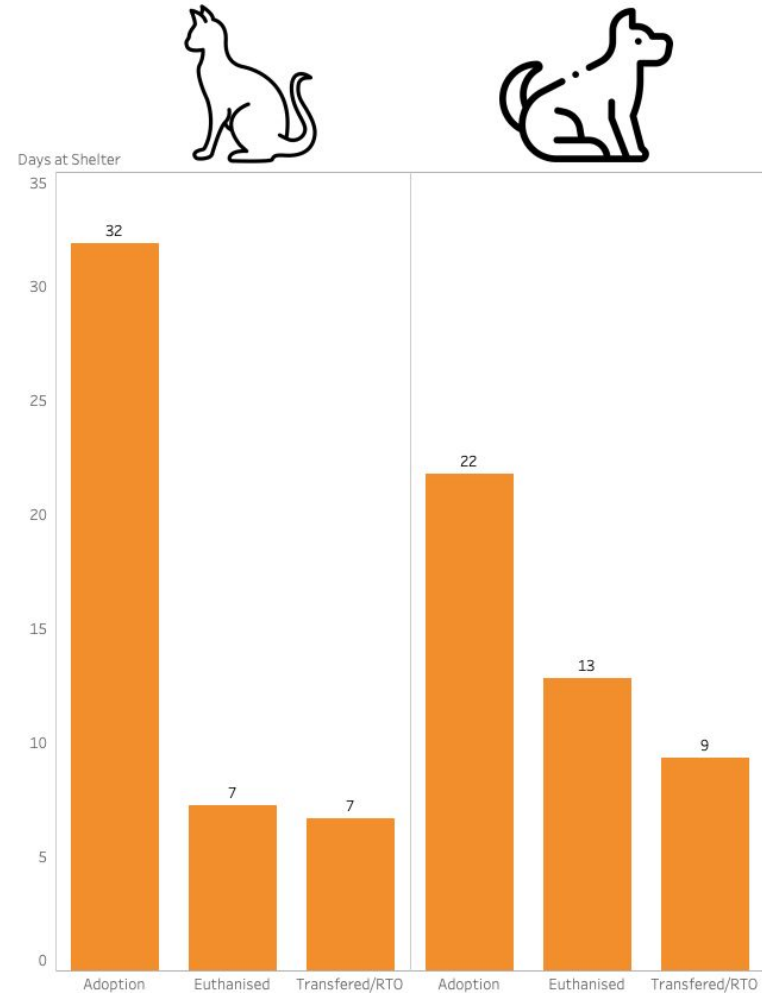
Understanding Animal Outcomes

- ~95% of intake animals are cats and dogs

- Outcome types can be rolled up to:
  - Transfer/Returned to Owner
  - Adopted
  - Euthanized

- To meet a 90% live rate, there is a notable imbalance in outcomes historically

Outcomes for Dog and Cat Intakes

% of Animal Outcomes

Transfered/RTO	Adoption	Euthanised
50%	46%	4%

Impact of Specific Outcomes

- Cats and Dogs have different lengths of stay at the shelter

- Adopted animals have significantly longer lengths of stay

Main Features of Consideration

Intake Features Collected

Found Location	Sex upon Intake
Intake Type	Age upon Intake
Intake Condition	Breed
Animal Type	Color

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Engineered Features

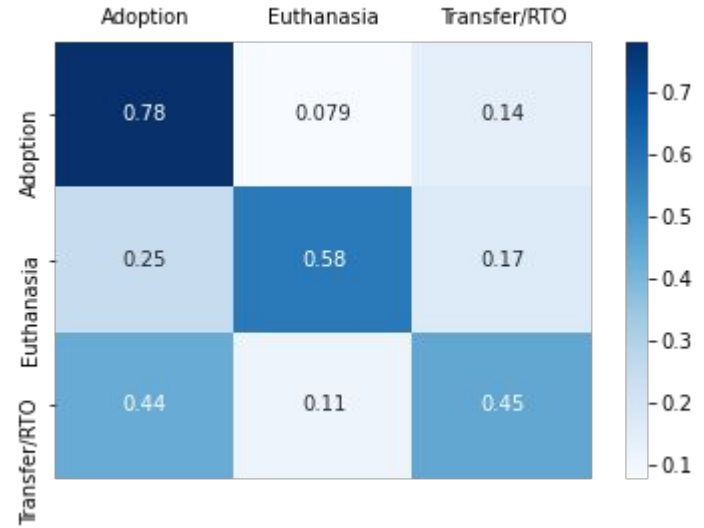|	
Found City	Age Group
Intake Type	Mixed Breed or not
Intake Condition - Rolled up	Multi Color or not
Animal Type	Prior Visits
Sex on Intake	Spayed/Neutered on Intake

Model Selection

- Predicting outcomes requires multi class prediction model

- Primary metric of concern: Macro Recall

- 2 Primary Models under consideration: Random Forest and XGBoost
  - RF for baseline and then both with tuned hyper parameters

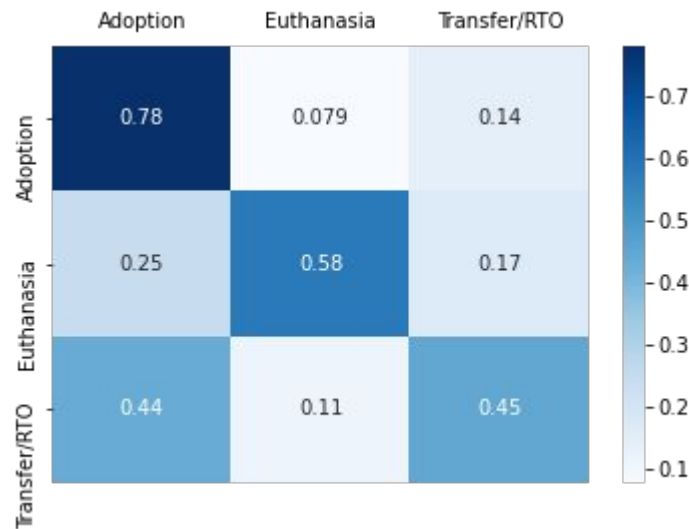| Model	Macro Recall Score
Random Forest (baseline)	0.582
Random Forest (tuned)	0.603
XGBoost (tuned)	0.602

Model Performance - Tuned Random Forest

- Adoption and Euthanasia are the 2 outcomes of interest

- Adoption Recall: 0.78

- Euthanasia Recall: 0.58

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- Over predicting rates of euthanasia & adoption

Outcome	Actual Distbn.	Predicted Distbn.
Adoption	50%	59%
Transferred/RTO	46%	30%
Euthanasia	4%	11%

Primary Applications

For predicted potential euthanasia, animal can be triaged to address medical or behavioral issues immediately.
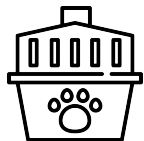
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- Potentially prevent euthanasia

For predicted adoption, facilitate a 'transfer to adopt' process to transfer adoptable pets to less urgent facilities.
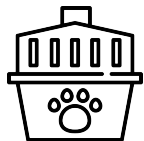
- Saves on space

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- Potentially prevent euthanasia

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This model would be used as a support for decision making, not a replacement

Appendix

Cat Icon: Icons made by [Icongeek26](#)

Dog Icon: Icons made by [Freepik](#)

Health icon: Icons made by [Good Ware](#)

Crate icon: Icons made by [Freepik](#)

Support icon: Icons made by [Freepik](#)

[AAC Capacity](#)

[AAC Mission Statement](#)