

Exploring machine learning techniques to identify dogs.

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Introduction

This project aims to assist dog owners to retrieve lost pet dogs through an innovative means of identification; detection, breed classification, and abstract feature extraction. This is useful as many modern technologies for pet identification can easily fail. Microchipping your pet is a legal requirement for dog identification in Ireland, however there exists multiple alternative solutions such as muzzle print and bark audio identification. This project considers the problem of breed classification using an image of the dog as part of the identification process, along with manually abstracted features to help identify the dog.

This project proposes using image processing techniques, and machine learning techniques as part of the Keras library written in Python. The application pipeline consists of multiple neural networks, each providing a significant role to the overall project.

Furthermore, the project proposes techniques to aid with gaps in the datasets used during model training and to improve the confidence of a breed classification. The project theorises the use of semantic networks to represent the knowledge base between clades of dog breed.

All this work combined results in a web application built through Python using the Flask microframework. This web application delivers a platform for a user to register their dog and aid in the retrieval of a lost dog.

Output



Figure 3 – Input Image Labradors

The application takes an input image, figure3, and processes the image through the image lifecycle, figure 2. Seen below are the internal instance segmentation and masking, figure 4 & 5. These two techniques allow for greater accuracy for dominant colour analysis, figure 6, and breed classification, figure 7.



#d4b28d tan	49.8
#090909 black	47.5
#62463a darkolivegreen	2.1
#ffffffa white	0.6
#a66932 sienna	0.0



#5c4b43 darkolivegreen	20.0
#ffffffd white	2.4
#aca299 darkgrey	0.2



#76503b darkolivegreen	41.7
#ffffffb white	2.0
#b0a299 darkgrey	0.2



#554d4b darkslategrey	11.3
#ffffff white	2.2
#a39f9c darkgrey	0.1

Figure 4 – Segmentation & Mask

Figure 5 – Dominant Colours

	DOG 1
1 st Classification	Labrador_retriever
%	93
2 nd Classification	golden_retriever
%	0.05
3 rd Classification	Brabancon_griffon
%	0.01

	DOG 2
1 st Classification	Staffordshire_bullterrier
%	36.8
2 nd Classification	Labrador_retriever
%	35
3 rd Classification	Brabancon_griffon
%	5.5

	DOG 3
1 st Classification	Chesapeake_Bay_retriever
%	67.6
2 nd Classification	Labrador_retriever
%	28.1
3 rd Classification	Sussex_spaniel
%	2.7

	DOG 4
1 st Classification	Labrador_retriever
%	49.4
2 nd Classification	Chesapeake_Bay_retriever
%	41.5
3 rd Classification	coated_retriever
%	6.2

Figure 6 – Breed Classification

Methodology

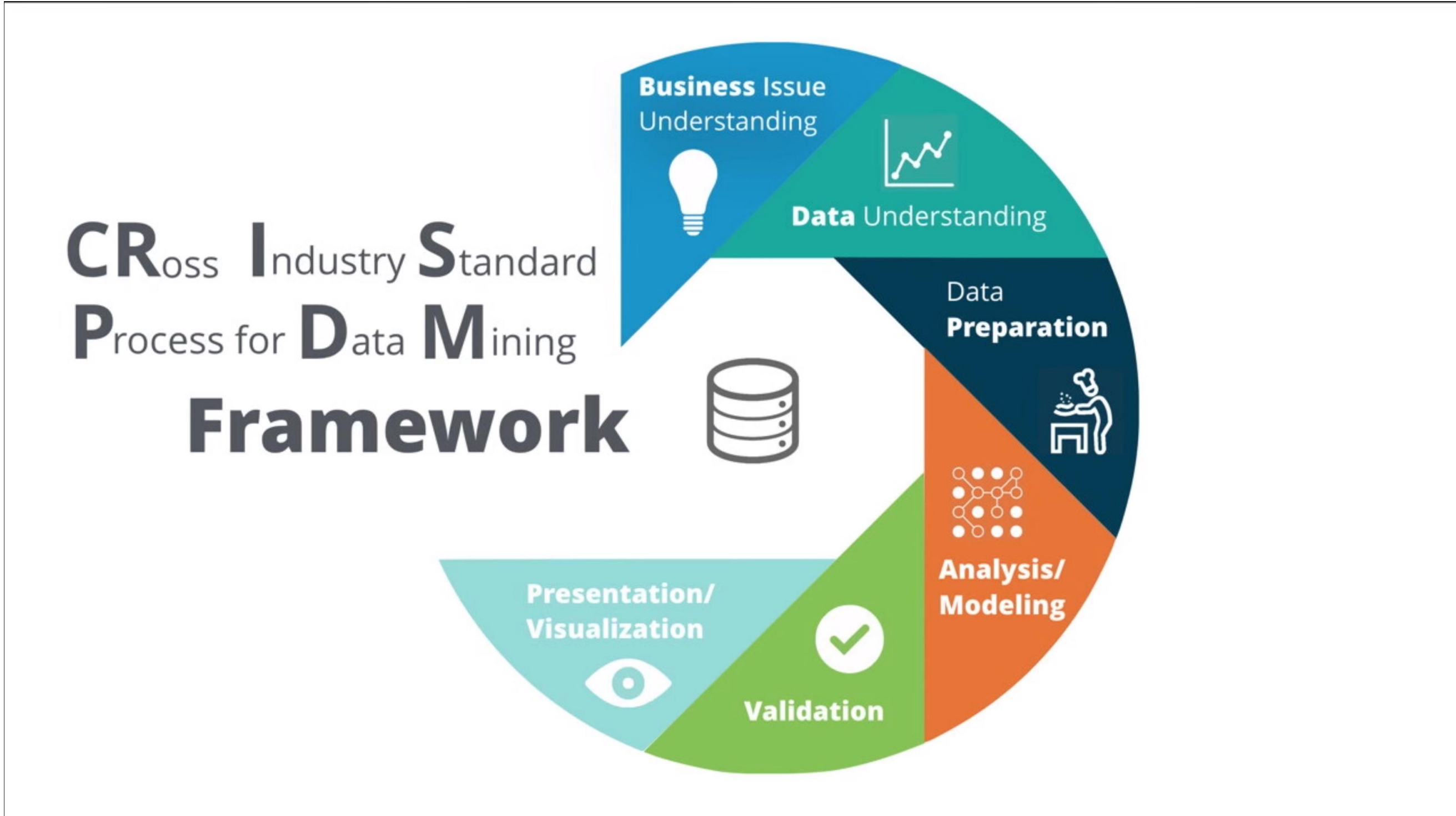


Figure 1 – CRISP DM Model (1)

Image Lifecycle

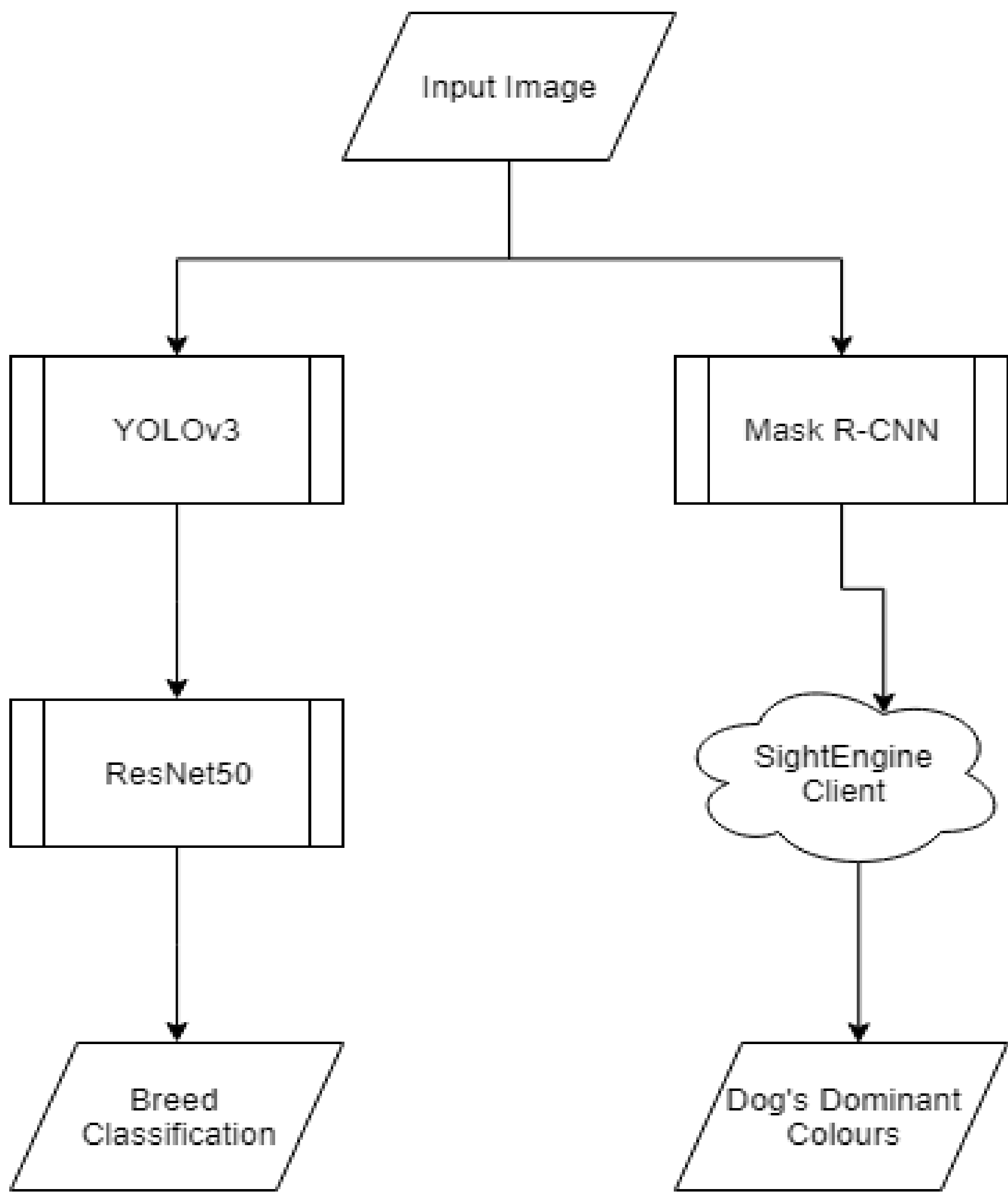


Figure 2 – Image Lifecycle

Future Work

Dog FaceID

Are the two dogs the same dog ?

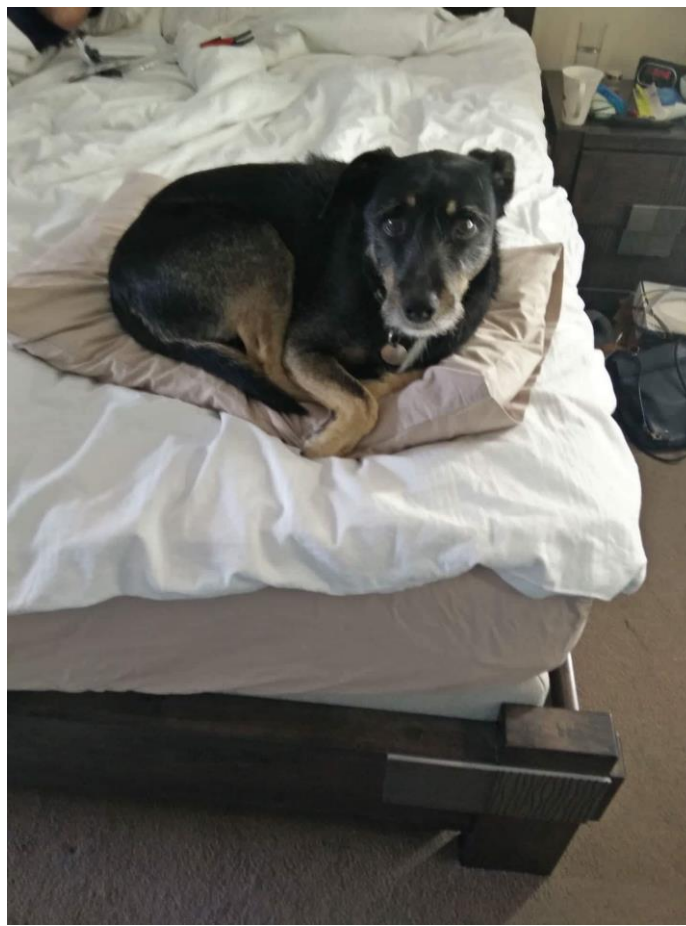


Figure 6– Identifying the same dog

Native Application

This application is well suited to operating as a native mobile application. The use of push notifications will aid in the retrieval of a user's dog who has been found by another user.

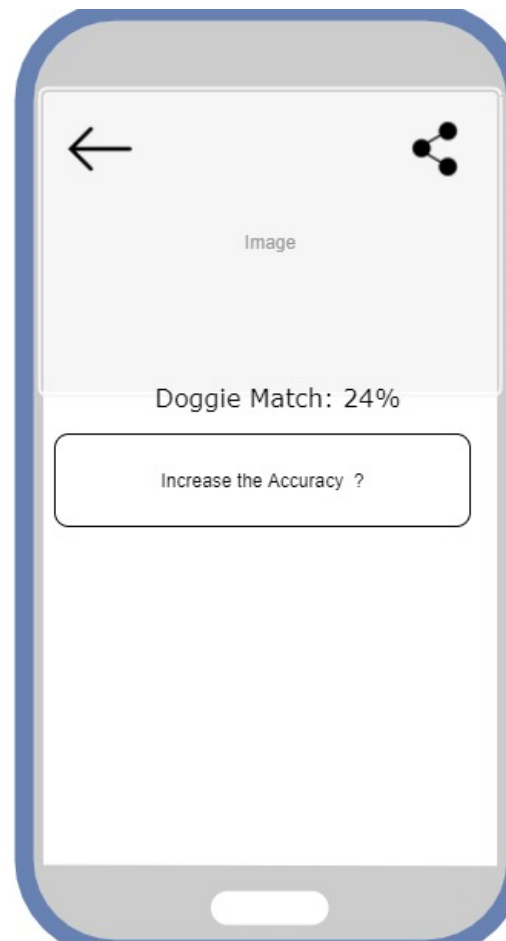
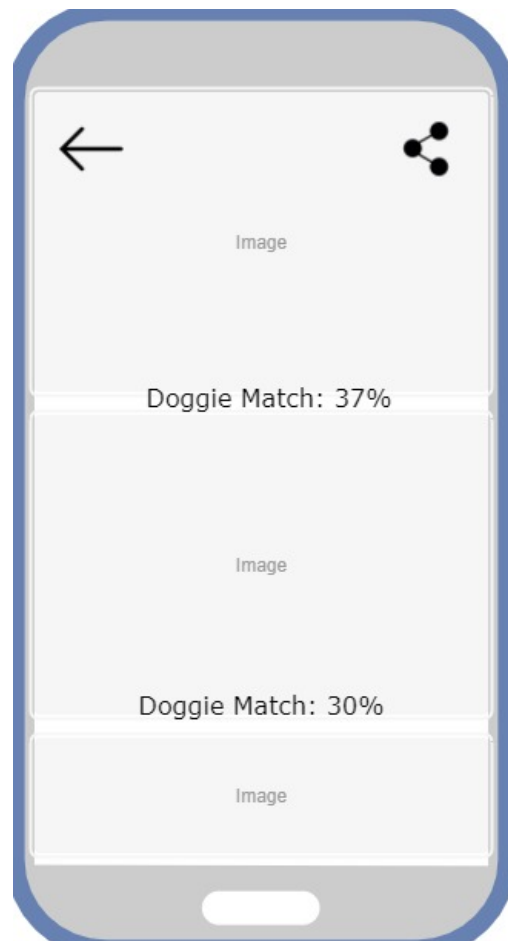


Figure 7 – UI sample for Native App

References

1. Taylor J. Complete CRISP-DM approach diagram [Internet]. [cited 2018 Nov 27]. Available from: <https://www.kdnuggets.com/wp-content/uploads/crisp-dm-4-problems-fig1.png>

Summary and conclusion

In summary identification is currently focused on classifying the breed of the dog. There is still no conformity to the number of breeds and mongrels in circulation. All dogs though still require a non intrusive method of identification. The project attempts to offer a solution to where the current technologies fail. There is still room for improvement with further fine grain analysis of a dog's abstract features. Future work offers some possible solutions to the project's objective: Aid in returning lost dogs to their owners.