Machine Learning Model for Classification of Various Cat Breeds - Project Proposal

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1 Proposal

As outlined in our abstract, we have selected a cat breed classifier as our final project. We believe that this task brings suitably interesting (and hopefully fun) challenges.

We intend to make use of two datasets to bring our idea to life:

- The Oxford-IIIT Pet Dataset [1]
- CAT Dataset (a.k.a. 2GB of Cats) [2]

Each dataset has its set of annotated features. In the Oxford dataset each sample photo has the breed, a image matte, and a facial bounding box. The CAT dataset contains a set of points describing the facial feature placement like eyes, ears, mouth, etc. The intent is to combine the attributes of these two datasets, in addition to our own features, to create a new combined dataset to train a classifier model on.

1.1 Feature Engineering and Curation

To create the combined dataset, we will first take a cross-comparison of the samples common among both datasets. This should give us a decent starting point to start working on model creation and additional feature engineering.

If the amount of common samples between the two datasets is low, then we intend to use the Oxford dataset as a primary source as it contains more useful annotations than the CAT dataset. With the tight facial bounding box already available, we might try an automated approach where we estimate the placement of the facial features.

In either case, we will use the image matte from the Oxford dataset to collect additional features such as fur coloration, fur pattern, and eye-color.

1.2 Model Creation

With our features in hand, we will make a classifier using either a decision tree or a random forest from the scikit-learn library. We will tweak the parameters here to obtain the best performance from a test-train split.

We will also test the model on other random samples obtained from the internet to determine model performance outside of our testing infrastructure.

2   Anticipated Timeline

With the roughly five weeks we have to work on this project, we have created a timeline for our project:

Week	Tasks
1 (Oct 30 - Nov 5)	- Initial data collection via existing sets.
	- Cross-reference datasets to get breeds for those images available.
2 (Nov 6 - Nov 12)	- Data curation for samples not cross-referenced.
3 (Nov 13 - Nov 19)	- Continue data curation for samples not cross-referenced.
	- Attempt automated approach for feature extraction.
	- Start work on model creation.
4 (Nov 20 - Nov 26)	- Continue feature extraction automation if initially successful.
	- Model refinement.
5 (Nov 27 - Dec 2)	- Wrap-up model creation.
	- Report and presentation creation.
6 (Dec 3 - Dec 5)	- Submission.

References

[1] Omkar M Parkhi et al. "Cats and dogs". In: *2012 IEEE Conference on Computer Vision and Pattern Recognition*. 2012, pp. 3498–3505. DOI: 10.1109/CVPR.2012.6248092.

[2] Weiwei Zhang, Jian Sun, and Xiaoou Tang. "Cat Head Detection - How to Effectively Exploit Shape and Texture Features". In: *Computer Vision – ECCV 2008*. Ed. by David Forsyth, Philip Torr, and Andrew Zisserman. Berlin, Heidelberg: Springer Berlin Heidelberg, 2008, pp. 802–816. ISBN: 978-3-540-88693-8.