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| **Bài tập:** | **Abstract & Introduction** | | | |
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**I/ Abstract**

Today, there are more and more people having pets such as dogs, cats, or birds in their houses. However, not all of them know how to take care of their pets appropriately, lacking the knowledge of their pets, especially about their breeds. That is why the authors propose a new way, based on Deformable Part Model, to classify their breeds efficiently and quickly. The experimental results show that our method achieve the accuracy of 95% on the oxford - IIIT Pet Dataset having 37 category pet dataset with roughly 200 images for each class.

**II/ Introduction**

Nowadays, people have to spend a lot of time to work, so they don’t have enough time for other activities, the fact that makes them to suffer from stress. To deal with this problem, more and more people decide to have pets such as cats or dogs. However, lacking knowledge of pets prevents people from taking care of their pets properly. Unfortunately, people barely have time to consult veterinarians. This problem motivates the authors to find a simple way to recognize pets' breed which is a useful information for the owners to help them understand more about their pets.

There are many researches about this problem. The best one is mentioned in paper "Machine learning attacks against the Asirra CAPTCHA" of Philippe Golle. In his research, he uses a classifier which is a combination of support-vector machine classifiers trained on color and texture features extracted from images. This classifier achieves the accuracy of 82.7%. However, this approach has some disadvantages and releases poor results if pets blend in the background, which makes it difficult to extract texture features or decide the colors of the pet.

The authors' approach includes 2 stages corresponding to two models used in our classifier. First, we use Deep Neural Network to decide which features are important and try to extract them. The features extracted from the first step serve as the inputs for the second model, called Deformable Part Model (DPM), which is responsible for classifying pets based on these features.

Through experiments using Oxford - IIIT Pet Dataset, which is also used by Prof. Philippe Golle in his research, our approach achieves the accuracy of 93%. After some modification such as adding weights to outputs of first stage, the accuracy is then improved up to 95%.

The rest of this paper is organized as follows. In section II, we discuss about models, DNN and DPM, used in this paper. Section III shows how we combine these two models and decide appropriate weights to improve the classifier. Section IV presents the experimental results and evaluations. The conclusions and future work are presented in section V.