
SOFTWARE REQUIREMENTS SPECIFICATION

for

IMAGE CLASSIFICATION FOR DOGS AND CATS

Version 1.0

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December 6, 2019

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1 Introduction

1.1 Purpose

This is a mini project about image classification to answering the input image is a dog or a cat with machine learning algorithm called convolutional neural networks

1.2 Intended Audience and Reading Suggestions

This SRS is for developers, project managers, users and testers. Further the discussion will provide all the internal, external, functional and also non-functional informations about "Classify Photos of Dogs and Cats" WEBSITE.

1.3 Project Scope

In this project, our task is to develop an algorithm to classify images of dogs and cats, which is the Dogs vs. Cats competition from Kaggle. We mainly investigated two approaches to address this problem. The first one is a traditional pattern recognition model. We extracted some human-crafted features like color and Dense-SIFT, represented images using bag of words model, and then trained Support Vector Machines(SVMs) classifiers. For the second approach, we used Deep Convolutional Neural Networks (CNN) to learn features of images and trained Backpropagation(BP) Neural Networks and SVMs for classification. We tried various experiments to improve our performance on the test dataset, and finally got the best accuracy of 94.00% by the second approach.

1.4 Task Definition

Our basic task is to create an algorithm to classify whether an image contains a dog or a cat. The input for this task is images of dogs or cats from training dataset, while the output is the classification accuracy on test dataset.

The given dataset for this competition is the Asirra dataset provided by Microsoft Research. Our training set contains 25,000 images, including 12,500 images of dogs and 12,500 images of cats, while the test dataset contains 12,500 images. The average size for these images is around 350500.

Our learning task is to learn a classification model to determine the decision boundary for the training dataset. The whole process is illustrated in Figure 1, from which we can see the input for the learning task is images from the training dataset, while the output is the learned classification model.

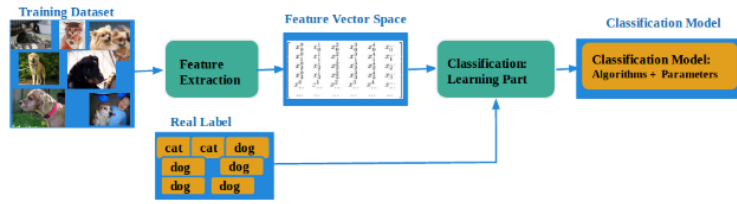


Figure 1.1: Architecture for Learning Task

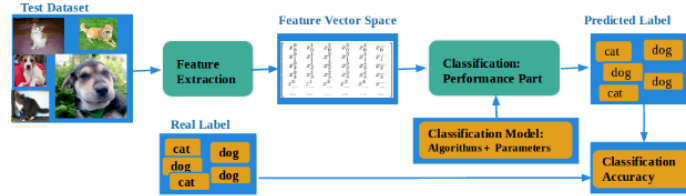


Figure 1.2: Architecture for Performance Task

Our performance task is to apply the learned classification model to classify images from the test dataset, and then evaluate the classification accuracy. As seen from Figure 2, the input is images from the test dataset, and the output is the classification accuracy

2 Overall Description

2.1 Product Perspective

The Dogs vs. Cats competition from Kaggle is trying to solve the CAPTCHA[3] challenge, which relies on the problem of distinguishing images of dogs and cats. It is easy for humans, but evidence [3] suggests that cats and dogs are particularly difficult to tell apart automatically. Many people has worked or are working on constructing machine learning classifiers to address this problem. In [3], a classifier based on color features got 56.9% accuracy on the Asirra dataset [2]. In [17], an accuracy of 82.7% was achieved from a SVM classifier based on a combination of color and texture features. And in [18], they used the SIFT (Scale-Invariant Feature Transform) [13] features to train a classifier and finally got an accuracy of 92.9%. In our project, we also would like to solve this problem and achieve higher performance. We tried different strategies. For instance, we tried Dense-SIFT features and the combination of DenseSIFT and color features, and features learned from CNN. Also, we employed SVMs on the learned features and finally achieved our best classication accuracy of 94.00%.

2.2 Product Functions

The table below is some of the main functions of the product

Table 2.1: Product Functions

Function	Description
Upload Data	Upload data for machine learning and analysis
Classify	Analyze data and give results
View History	See the photos that have been analyzed
Search	Search for the photo you want to view

2.3 Operating Environment

The website will be operate in any Operating Environment - Mac, Windows, Linux etc.

2.4 Design

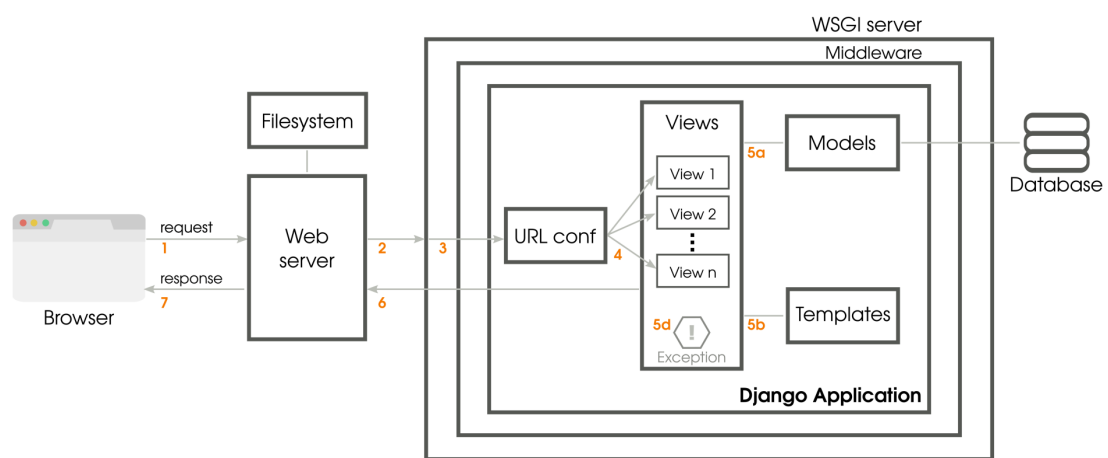


Figure 2.1: Architecture design

3 System Features

"Image Classification for Dogs and Cats" is a result processing web software. So the main art of this product is to enter data and publish.

3.1 Description and Priority

"Image Classification for Dogs and Cats" has features that are main and also some are sub. But all the feature is necessary for this software.

3.2 Functional Requirements

The "Image Classification for Dogs and Cats" website is being build on Django framework, Python language, JavaScript and MongoDB.

Back-End - Django, Python language.

Font-End - Django, Python language, HTML5, CSS, JavaScript.

Database - MongoDB.

4 Other Nonfunctional Requirements