

CS1102 Project (2022-2023 Semester A)
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Our Experience in Coding for Image Classification

Image classification refers to recognizing pictures and classifying them. It is often used where object identification is required, such as in medicine, processing satellite images, etc.

Here are the main steps for creating a neural network that classifies images.

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Choosing Dataset

A dataset is structured data often used for machine learning. Our goal is to find an image dataset with classified labels, which we will use for processing and building our model in the future.

Kaggle is a platform for data scientists that allow users to publish their datasets and models. There is a wide variety of datasets that can be used by beginners as well as by professionals.

At the [kaggle.com](https://www.kaggle.com) homepage, go to "Datasets".

As our topic is image classification, we need to choose "Computer Vision".

There are a lot of image datasets, but we have chosen [10 Monkey Species](#) dataset. The data is only 574 MB, and it was divided into training and validation datasets, so coders will not have to split the data. That is why it is suitable for beginners.

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Choosing Framework

A framework is a tool providing libraries and functions which make development faster and easier. There are specific rules on frameworks that should be used in production to implement all the features.

First of all, we need to choose the language of programming.

As python is one of the most common and simple programming languages, we searched for machine learning frameworks on python. In this project, we have chosen PyTorch for image classification, as it was the most suitable and beginner-friendly for development.

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Preparing Dataset

Before training a model, the dataset of images should be normalized and resized to make it more suitable for computer vision.

First of all, we need to import all the required libraries and modules.

Write the path for the training images folder.

Resize the images, so all the pictures are the same size.

Create a data loader from the resized dataset

Calculate the mean and standard deviation. We will need this to prepare the dataset for building a neural network.

Now, we can start building a neural network by using the prepared dataset.

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Building Neural Network

At this step, we need to define a function for training a neural network, a function for evaluating the built model, and a function for saving the most accurate model.

On a new python file, import all the modules we need

Write the path for training and validation images and the mean and standard deviation from the previous step.

Resize the validation and training images, and create loaders from the datasets

Some computers support the Cuda tool, which makes the training better. We need to set the device.

Before writing the code for training the neural network, we need to write a function for evaluating the model. The function loads the validation dataset and returns the accuracy.

We also need to write a function that saves the best model.

For raw model architecture, we are using resnet18. Then, call all the defined functions.

After building several models, our code saves the most accurate model.

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Use the created model in classifying images

Create a list of classes

Set the settings for images (Save the model path, set the median and std, and set the image transforms.)

Define classify function:

We need to write a web application to make it easier for a user. First, import the streamlit framework, add `streamlit.file_uploader()`, and when the image is uploaded, the classify function should be called.

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Guide on how to use the final project

In the WebPage folder, open the UsingPyTorch folder.

If python 3.7, conda, and other packages are installed, open the Terminal.

Activate the project environment by the command "conda activate UsingPyTorch".

Run the "streamlit run classify.py command".

Open the given URL in the web browser.

Open a new tab and search for a picture of one of these monkeys:

The WebPage uses the image to recognize the type of monkey.

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Used Techniques

Center the text and image

Use div to make a colored banner and, center it, change the background color.

Change padding and margin to regulate the position of objects. Use relative position and pushing to put buttons in one line.

Use "location.href=path" from JavaScript in buttons and anchor tags for loading other pages.

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References

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