

HANDWRITING-RECOGNITION PROJECT REPORT

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ABSTRACT

This project builds a handwriting-recognition project (mnist) based on the Python language, its core techniques are machine learning and Convolutional Neural Networks (CNN). The project is able to recognize the numbers from 0 to 9 written by users.

After testing, the handwriting-recognition project (mnist) can recognize the number efficiently with the accuracy about 91%.

1.INTRODUCTION

1.1 Python

Python is a computer programming language. An object-oriented, dynamically typed language originally designed to write automated scripts (shells) that are increasingly being used for independent, large-scale project development as versions are continually updated and new language features are added, combining with anaconda. It is famous for its concise code style and abundant & convenient class libraries. This project is built on the PyCharm platform with the Python 3.6.8.

1.2 Machine Learning

Machine learning is a multiply cross-disciplinary program that covers probabilistic knowledge, statistical knowledge, approximate theoretical knowledge, and complex algorithm knowledge, etc. It uses computers as tools and is dedicated to real-time simulation of human learning, and the existing content is structured. The main target is to increase efficiency of specific work. The project uses Google's TensorFlow, a machine learning system.

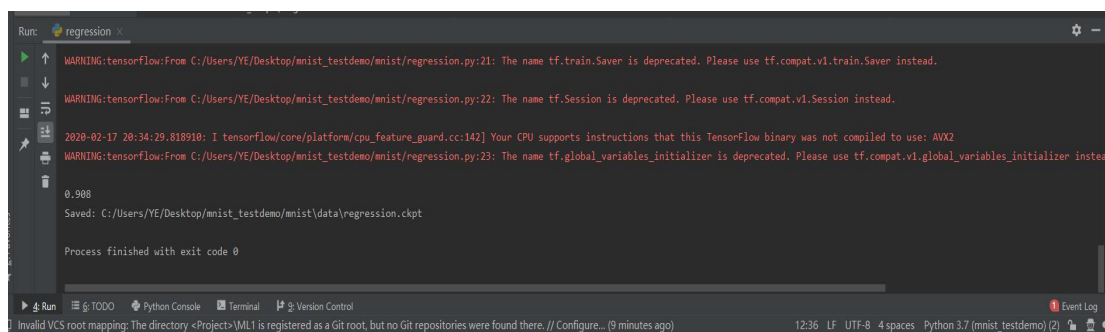
1.3 Handwriting Recognition

Handwriting recognition (or mnist), make the ordered track information into character code means the words written by users could be recognized by the computer, which is an effective way of the interaction between human and the computer. Nowadays, with the further development and research of the artificial intelligent, handwriting recognition project has gradually become a representative basic practice project of the machine learning area, since it involves fundamental concepts about the model training, image recognition and CNN algorithm.

2. PROCESS

2.1 Training Model

In order to build up the model, I download mnist code and the mnist database from github. By using the tensorflow and python, I install the training model, which has a set of 60000 samples. Besides, I also build up the test model, which has a set of 10000 samples. The final training result showed that the error rate is 0.908 and the figure is shown below as follow



```
Run: regression
WARNING:tensorflow:From C:/Users/YE/Desktop/mnist_testdemo/mnist/regression.py:21: The name tf.train.Saver is deprecated. Please use tf.compat.v1.train.Saver instead.
WARNING:tensorflow:From C:/Users/YE/Desktop/mnist_testdemo/mnist/regression.py:22: The name tf.Session is deprecated. Please use tf.compat.v1.Session instead.
2020-02-17 20:34:29.818910: I tensorflow/core/platform/cpu_feature_guard.cc:142] Your CPU supports instructions that this TensorFlow binary was not compiled to use: AVX2
WARNING:tensorflow:From C:/Users/YE/Desktop/mnist_testdemo/mnist/regression.py:23: The name tf.global_variables_initializer is deprecated. Please use tf.compat.v1.global_variables_initializer instead.
0.908
Saved: C:/Users/YE/Desktop/mnist_testdemo/mnist/data/regression.ckpt
Process finished with exit code 0
```

2.2 Mnist Combines With Flask

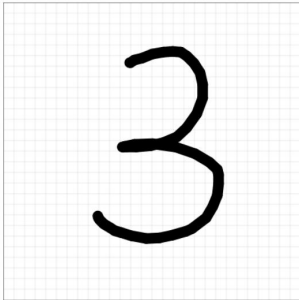
After defining regressive and convolutional function, the JS function and main are following. By learning how to build up a flask, I add it in to main function. In the process, I faced a difficulty when I get the port. I try to open it but the website is unresponsive. For a while I realize I forget to compile the html file and quickly solve it. The

simple interface includes three parts:handwriting board, input board and output board. All you need is to write a number by your mouse. Then the input board will get similar image in 784 points. Besides the output board will calculate two probability: regression and convolution.

The examples are following:


MNIST

draw a digit here!



clear

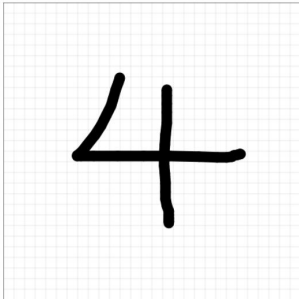
input:



output:


	regression	convolutional
0	0.002	0.000
1	0.010	0.001
2	0.011	0.004
3	0.849	0.983
4	0.001	0.000
5	0.119	0.008
6	0.005	0.000
7	0.001	0.000
8	0.006	0.002

draw a digit here!



clear

input:



output:

	regression	convolutional
0	0.000	0.000
1	0.017	0.003
2	0.001	0.001
3	0.002	0.000
4	0.957	0.985
5	0.025	0.012
6	0.009	0.005
7	0.026	0.011
8	0.003	0.001
9	0.163	0.017

[Fork me on GitHub](#)

3. CONCLUSION

3.1 The feeling

Mnist is a very good project that benefits us a lot. Trying to finish this project is a pleasant thing. During my work, I learn plenty of new knowledge which I may never learn and it's a chance to promote myself. Once I have learned c,c++. Now I learn python, which is important for me.

At the beginning, I think the achievement of this model is easy. After I begin the project, I find out that there are so many troubles such as the environment building and the install of module. I don't achieve higher level project and it's a pity.

The teacher of this project, Zhang fan helped me a lot with patience. Some of problems which can't be find in the internet are solved by him. Without him I couldn't finish it.

3.2 Disadvantage

While this project is finished, it's still not easy to be used in the daily life. And It can only recognize the single number between 0 to 9. So there are so many places can be promoted such as let other people use online directly or in the software.

