Nijigen/Sanjigen Images Classifier Based on Machine Learning

Zhong Mengyan
ShanghaiTech University
zhongmy@shanghaitech.edu.cn

Abstract

Distinguishing between Nijigen/Sanjigen Images is a task that represents high-level human information processing. This project tries to automate the identification of a dataset of Nijigen/Sanjigen Images via machine learning, and I experimented to feed human-created features to some machine learning algorithms.

1 Introduction

1.1 Intention

The number of images accessible on the Internet has increased dramatically in recent years. In information collection systems such as search engines, it is necessary to accurately classify these contents and display them appropriately according to user requirements. Therefore, proper data classification is essential to properly filter content based on user preferences.

1.2 Meaning of Nijigen and Sanjigen

The word "Nijigen" comes from Japanese, and its meaning is similar to two-dimension while "Sanjigen" is similar to three-dimension. However, this word is extended to "characters in animations, games and other works displayed on planes such as paper and screens". Correspondingly, "Sanjigen" has also been extended to refer to people in reality. "Nijigen" is actually a "painting style", which is synonymous with the mainstream style of Japanese animation. So it is obvious that Nijigen images including paintings, cartoons, anime and comics and Sanjigen images means photograph in reality.

The Nijigen/Sanjigen images classification is easily judged by humans, but it is difficult to verbalize the conditions of discrimination. Therefore, this classification is a good representation of the visual information processing ability possessed by humans.

2 Dataset

I get dataset in Kaggle Datasets: `https://www.kaggle.com`

For Nijigen images, I use dataset from `https://www.kaggle.com/mylesoneill/tagged-anime-illustrations`;

For Sanjigen images, I use dataset from `https://www.kaggle.com/lijiyu/imagenet`;

Table 1: Relationship between data size and mis-discrimination rate in SVM

Data size	Mis-discrimination rate	
	(Train)	(Test)
1000	24%	23.5%
2000	22.17%	23.75%
4000	22.04%	22.06%

Table 2: Relationship between data size and mis-discrimination rate in KNN

Data size	Mis-discrimination rate	
	(Train)	(Test)
200	12.5%	30%
1000	19.88%	21.5%
2000	17.19%	19%
4000	16.47%	19.13%

3 Method

3.1 Support Vector Machine(SVM)

The different characteristics of Nijigen images and Sanjigen images are mainly reflected in the distribution of saturation and luminance, and the luminance histogram of gray scale images is a feature that easy to calculate.

Specifically, the original image is converted into the luminance histogram, and then calculate the frequency of occurrence of each gray level $f(i),\ i = 0, 1, 2, ..., 255$. The luminance histogram of a Nijigen image is not as smooth as a Sanjigen image, and there will be more peak point. Therefore, the $\max_j f(j)$ and the number of peak points of the Nijigen image luminance histogram will be more likely to be larger.

3.2 K Nearest Neighbors(KNN)

Compared to SVM, I found that it is also a good choice to focus on the frequency of occurrence of each gray level in the luminance histogram.

4 Result

4.1 Result for SVM method

In SVM, I use the Gauss kernel. Table 1 shows the relationship between mis-discrimination rate and data size. The mis-discrimination rates of train data and test data both tend to be around 20% when the data size is large enough.

4.2 Result for KNN method

In KNN, I choose $k = 17$. Table 2 shows the relationship between mis-discrimination rate and data size. The mis-discrimination rates of test data tend to be around 19% when the data size is large enough.

References

[1] Hazuki Tachibana (2015) *High-precision 2D-3D Classifier Based on Illustration2Vec,* SIG2D'15.

[2] Mori Ideyoshi (2013) *Classifying 2D/3D Images by Machine Learning,* SIG2D'13.