

Investigation of Data Sets Using k-Means Clustering for Image Classification with Convolutional Neural Networks

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In recent years, aerial photography became easier than before by using the camera loaded in the drone. Also, convolutional neural network (CNN) is one of deep learning and is a network often used for image recognition. With the development of CNN, drones are being researched for applications in various fields such as agriculture [1]. Actually, wild animals such as deer and boars are rapidly increasing in Japanese forests. Agricultural crops damaged in nearby farms. By using a drone, we expected to wild animals management. However, the drone camera's battery and memory are limited. It is important to use the collected data effectively.

In this study, we used clustering to make more efficient data sets from the collected image data. Clustering is used to classify similar data and can also be used to classify images [2]. This time, we used k-means method to classify the image into two clusters and constructed data sets. The flow of learning by k-means clustering and the objective function are described as follows:

$$f(\{C_k\}) = \sum_{k=1}^k \sum_{x_i \in C_k} (\bar{x}_k - x_i)^2. \quad (1)$$

The images for data sets are collected by entering a general name into the search word in the image search of google. We prepare 400 images for training and test. There are animals in 200 images among 400 images. Other than that, they are images of the background. Furthermore, we convert 3D array of input image data is converted to a 2D array data. This data set is trained using CNN. We examine differences in learning accuracy and computational cost on the data set before and after clustering. We compare the differences in learning accuracy and computational cost with the data set before and after clustering. We also change the assignment of cluster images.



Figure 1: Chaotic circuit.



Figure 2: Attractors of chaotic circuit.

References

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