Q3 Readme

Data augmentation is especially necessary for deep learning. Through data augmentation, it can prevent the network from learning irrelevant features, learn more features related to data, and significantly improve the overall performance. Then, for image classification, data augmentation can be generally specified in the following aspects:

1. Flip images horizontally or vertically

2. Rotation. Rotating the image by finer angles will change the final image size;

3. Scale inward or outward; while scaling outward, the final image size will be larger than the original image size

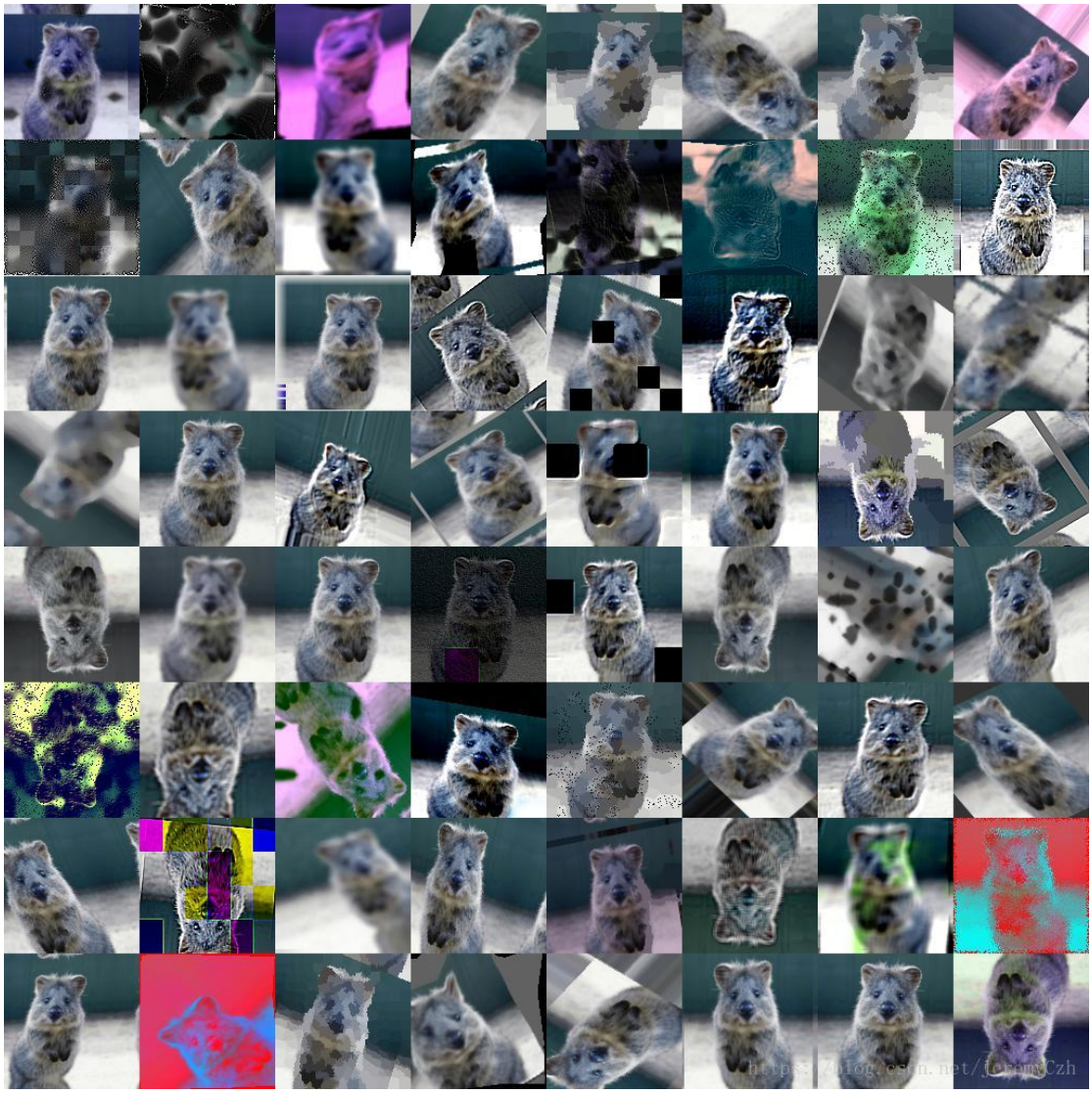
4. Random cropping; Move in the X or Y direction

5. Translation: involves moving the image along the X axis or Y axis or both

6. Zero mean gaussian noise: the learning capability can be enhanced through the right amount of noise.

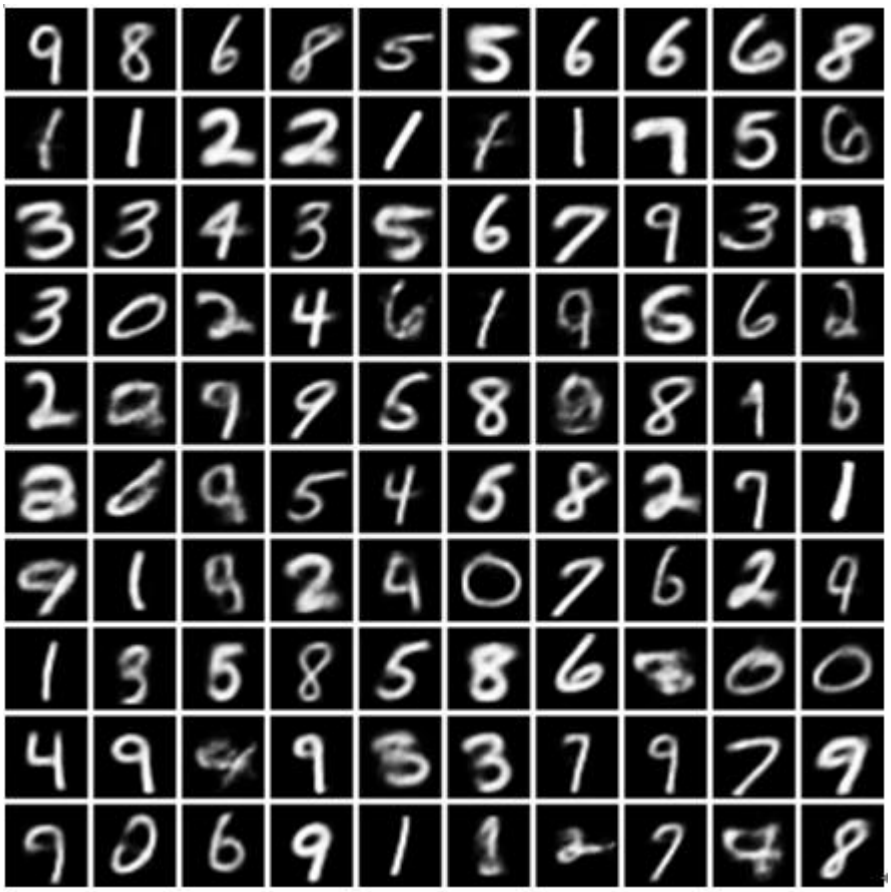
Example 1: **Simple geometric transformation data augmentation**

General image classification problems, in order to improve the robustness of the classifier, the appropriate use of some data augmentation technology can be very good to improve the classification accuracy of the classifier. The following picture is enlarging a large number of training samples.



Example 2: **Data augmentation using Generative Adversarial Networks (GAN) and Variational Autoencoder (VAE)**

A slightly more complex data augmentation is the use of some generative models. At present, the more popular generation models are GAN and VAE. The data generated by GAN and VAE can be self-innovative on the basis of the original data, making the data more abundant. The following figure shows a set of handwritten digits generated by VAE.



Example 3: **Word-swapping and syntax-tree**

Extremely computationally-intensive and there's a strong limit to how much generalization you can build in this way.

Example 4: **Word2Vec, GloVe, FastText**

These models are based on the principle of distributional hypothesis in distributional semantics, telling us that words that occur and are used in the same context are semantically similar to each other and have similar meanings.

References:

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