

Video Classification After Data Augmentation:

Image sharpening/smoothing

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1. New Idea

Data augmentation is a commonly used method to enhance performance of convolutional neural network (CNN). It is a technique that artificially enlarge the data set when we have insufficient number of data, by conducting simple transformation on original data.

The common augmentation methods for visual data are as following:

- 1) Image translation and reflection
- 2) Image scaling and cropping
- 3) Altering RGB channels intensity.

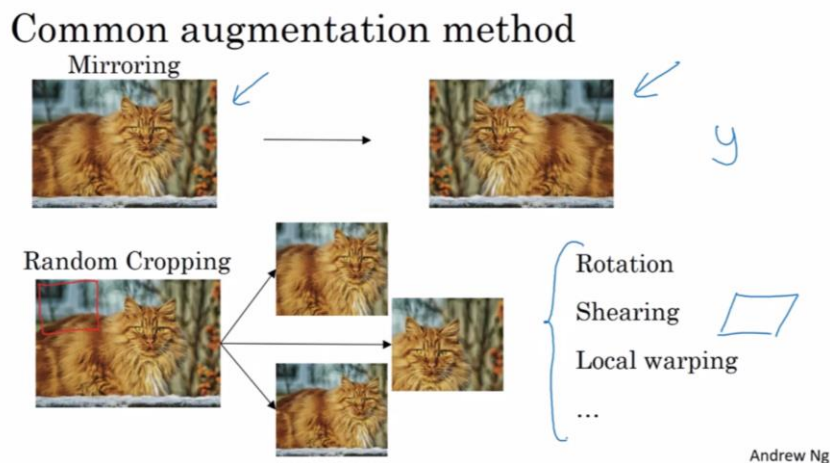


Figure 1 Common augmentation method (introduced by Andrew Ng)

I came to an idea – *what if I use Image sharpening as augmentation method?*

Image sharpening enhances edges by applying high-pass spatial filter kernel to the image. Since image becomes more 'vivid', we often use image sharpening on preprocessing stage.



Figure 2 Original 'LENA' image (left) and sharpened image (right)

I will sharpen each frames of the given image and add sharpened images to the data set. In addition, we will compare result with the augmentation using 'smoothen' images.

2. Project Schedule

- 6/1 ~ 6/8 : - Search and read more references
- MATLAB coding for image sharpening / smoothing process.
- 6/9 ~ 6/15: <FINAL EXAM>
-alter Homework 4 Codes and make project_main.m
- 6/16~6/17: - Conduct learning on augmented data set.
- 6/18: - Write project report.

3. Expected Results

I expect classification accuracy score shall increase after data augmentation. I also expect augmentation with image sharpening will show higher accuracy than augmentation with image smoothing. Because if we smooth image, its edge become more vague. Conducting image smoothing blurs image, which would make our network more difficult to detect features.

Classification Accuracy: (Sharpening) > (Smoothing) > (Baseline)

However, I also expect some difficulty on evaluating classification accuracy, because on Homework 4, we could only use 6 test sets. We may not be able to detect accuracy difference since we have too small data sets. Even when I changed CNN type (SAE, PCA) I could not determine its relation to classification accuracy due to this matter.

➔ I shall concern this matter, and find a way to solve this problem.

4. References

- [1] Lecture by Andrew ng, <https://www.coursera.org/learn/convolutional-neural-networks/lecture/AYzbX/data-augmentation>
- [2] Hall, Mark, et al. "The WEKA data mining software: an update." *ACM SIGKDD explorations newsletter* 11.1 (2009): 10-18.
- [3] Luke Taylor, Geoff Nitschke "Improving Deep Learning using Generic Data Augmentation"
- [4] https://en.wikipedia.org/wiki/Digital_image_processing
- [5] https://en.wikipedia.org/wiki/Edge_detection