Crowded Estimation of Indonesian Datasets using Deep Learning CSRNet

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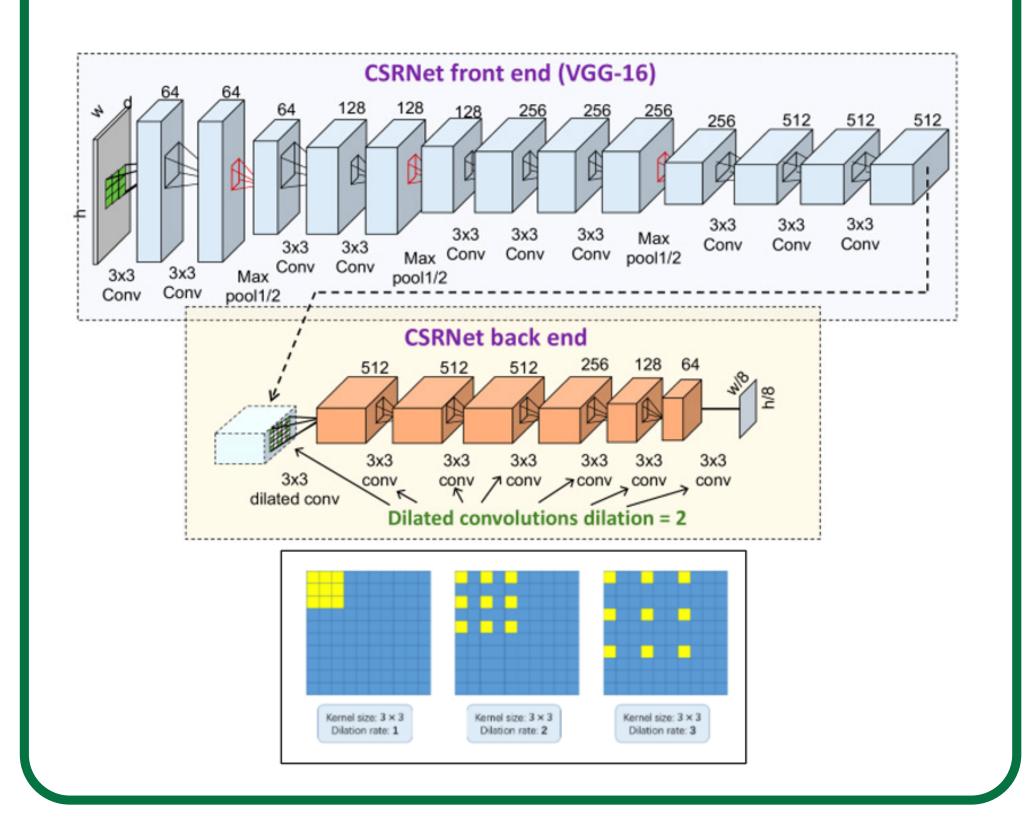


1. Introduction

This research aims to estimate number of person using Indonesian crowded datasets. Taking crowded estimation into consideration, deep learning CSRNet presented as analysis for this problems. By combining normal CNN and dilated CNN in CSRNet algorithm, this research provide further assistance to project to to the crowd analysis that would help for effective business decisions in the real-world problem of transportation areas.

2. Method

To solve crowded estimation analysis, we use deep learning approach. We explore some approach for that used by another researcher and decided to use CSRNet for our crowded datasets. CSRNet consist two process; a convolutional neural network (CNN) as the front-end for 2D feature extraction and a dilated CNN for the back-end, which uses dilated kernels to deliver larger reception fields and to replace pooling operations. CSRNet is an easy-trained model because of its pure convolutional structure [1, 2].



3. Annotation

To do the comparison with the crowded estimation result, we need real calculation or annotation of numbers of person inside the picture. Annotation in this research is point out pixel the position of person head.

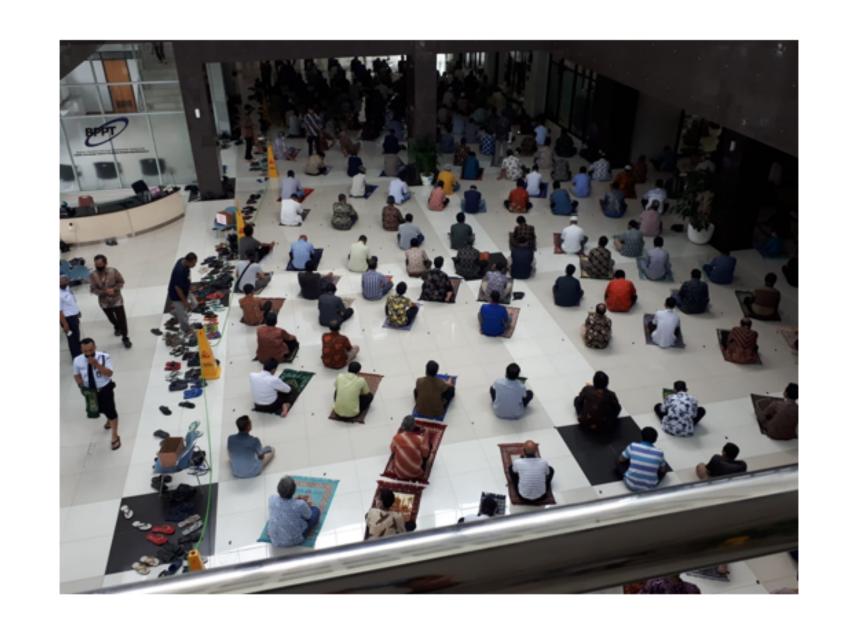


7. References

- [1] Y. Li, X. Zhang, and D. Chen. Csrnet: Dilated convolutional neural networks for understanding the highly congested scenes. pages 1091–1100, 2018.
- [2] Z. Cao, R. Yan, Y. Huang, and Z. Shi. Gigapixel-level image crowd counting using csrnet. In 2019 IEEE International Conference on Multimedia Expo Workshops (ICMEW), pages 426–428, 2019.

4. Indonesian Crowded Datasets

We collect crowded Indonesia datasets from various places and annotated some of them for comparison. It consist few to higher number of person with different size pixel. This data provided especially for this preliminary crowded analysis project and another future project. The Collection process take from the public places, day and night conditions.





5. Crowded Analysis

Original Image

0
50
100
150
200
250
300
400
100
200
300
400
500

0 - 10 - 20 - 30 - 40 - 50 - 60 - 70

Predicted Count: 24

CSRNet algorithm predict or estimate number of person and compared with annotation of the picture. The current result show that accuracy of predictive count versus manual count between 85% to 95%. The experiment result show that our datasets with high number of person tend to show the high accuracy between predictive and manual count. This result will become our consideration to modified current algorithm to get better accuracy.



PREDICTED COUNT: 85 >< MANUAL COUNT: 84

6. Conclusions and Future Works

The conclusion of this research:

- 1. Data annotation are needed to compare the prediction result.
- 2. The accuracy of the result between 0.85-0.95. This preliminary need improvement to get certain certain accuracy for few or higher number of person.
- 3. We proved that CSRNet provided best result to solve crowded estimation for Indonesian Crowded Dataset.

The future works:

- 1. Increase the number of dataset and annotation.
- 2. Modified the CSRNet algorithm.