

Road Sign Recognition with CNN and RCNN

Aksel Tahir 6548051

11.05.2021

Contents

1	Introduction	2
2	Related Work	2
3	Architectures	2
3.1	CNN	2
3.2	R-CNN	2
3.3	Faster R-CNN	2
4	Dataset	2
4.1	Loading the dataset	2
4.2	Preprocessing data	2
5	Implementation	2
5.1	CNN	2
5.2	R-CNN	2
5.3	Faster R-CNN	2
6	Analysis and Evaluation	2
7	Conclusions	2

1 Introduction

Road signs are a present system in virtually all road infrastructure. They are of critical importance to interpreting correct road usage, road regulations and route recommendations. Their presence is integral to the safe and functional road use.

Contemporary road signs follow strict design rules to optimise their clarity of intention. These rules allow them to be as easy as possible for human interpretation. However, humans are prone to distraction, misinterpretation and other general mistakes, which is why road sign recognition (RSR) algorithms are a fast-advancing point of development in autonomous driving research.

Standard computer vision methods are not versatile enough to deal with the plethora of different physical road conditions. This is why applying a deep learning approach to the problem is necessary - A well crafted AI can exceed even human vision in RSR.

In this project we propose an RSR solution using several different neural network models and evaluating their performance. Since standard computer vision methods are not versatile enough to deal with the plethora of different physical road conditions, it is necessary to apply a deep learning approach to the problem - A well crafted AI can exceed even human vision in RSR.

2 Related Work

With the advent of AI computing autonomous and assisted driving has been an area of extensive research. Road sign recognition (RSR) systems are integral to the field. The functional implementation of RSR systems depends on two related issues - Road sign detection (RSD) and road sign classification (RSC). RSD pertains to localising the relevant information from the data, and RSC to identifying the data with its correct labels. Lots of outstanding results for the detection and classification of traffic signs have been proposed in [1], [2], [3], [4], [5],

3 Architectures

3.1 CNN

3.2 R-CNN

3.3 Faster R-CNN

4 Dataset

4.1 Loading the dataset

4.2 Preprocessing data

5 Implementation

5.1 CNN

5.2 R-CNN

5.3 Faster R-CNN

6 Analysis and Evaluation

7 Conclusions

References

- [1] Smit Mehta, Chirag Paunwala, and Bhaumik Vaidya. Cnn based traffic sign classification using adam optimizer. In *2019 International Conference on Intelligent Computing and Control Systems (ICCS)*, pages 1293–1298, 2019.
- [2] Jianming Zhang, Wei Wang, Chaoquan Lu, Jin Wang, and Arun K. Sangaiah. Lightweight deep network for traffic sign classification. *Annales des tlcommunications*, 75(7-8):369–379, Aug 2020.
- [3] S. Mehta, C. Paunwala, and B. Vaidya. Cnn based traffic sign classification using adam optimizer. In *2019 International Conference on Intelligent Computing and Control Systems (ICCS)*, pages 1293–1298, 2019. ID: 1.
- [4] D. Ciresan, U. Meier, J. Masci, and J. Schmidhuber. A committee of neural networks for traffic sign classification. pages 1918–1921. IEEE, Jul 2011.
- [5] Mrinal Haloi. Traffic sign classification using deep inception based convolutional networks. Nov 10, 2015.
- [6] Reza F. Rachmadi, Keiichi Uchimura, and Yoshinori Komokata. Japan road sign classification using cascade convolutional neural network, Jan 01, 2016.
- [7] Reza F. Rachmadi, Reza F. Rachmadi, Keiichi Uchimura, and Gou Koutaki. Road sign classification using spatial pyramid convolutional neural network campus grid and render farm view project face analysis view project road sign classification using spatial pyramid convolutional neural network, 20-03 1725.
- [8] Amal Bouti, Med A. Mahraz, Jamal Riffi, and Hamid Tairi. A robust system for road sign detection and classification using lenet architecture based on convolutional neural network. *Soft computing (Berlin, Germany)*, 24(9):6721–6733, May 2020.
- [9] Danyah A. Alghmgham, Ghazanfar Latif, Jaafar Alghazo, and Loay Alzubaidi. Autonomous traffic sign (atsr) detection and recognition using deep cnn. *Procedia computer science*, 163:266–274, 2019.
- [10] Faming Shao, Xinqing Wang, Fanjie Meng, Jingwei Zhu, Dong Wang, and Juying Dai. Improved faster r-cnn traffic sign detection based on a second region of interest and highly possible regions proposal network. *Sensors (Basel, Switzerland)*, 19(10):2288, May 17, 2019.
- [11] Rongqiang Qian, Qianyu Liu, Yong Yue, Frans Coenen, and Bailing Zhang. Road surface traffic sign detection with hybrid region proposal and fast r-cnn. pages 555–559. IEEE, Aug 2016.