Adversarial Robustness of CNNs: Structural Similarity vs. Accuracy Metrics

Assignee Research

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Abstract

This report synthesises findings from 13 peer-reviewed papers addressing the following research question: How does the robustness of CNN architectures to adversarial perturbations compare when evaluated using structural similarity metrics versus standard accuracy on image classification benchmarks. 9 claims were extracted from source literature; 9 were independently verified against retrieved documents. An automated multi-reviewer quality assessment produced a score of 9.2/10. This report is a machine-generated literature synthesis and does not constitute original research.

1 Introduction

This paper examines: A survey on Image Data Augmentation for Deep Learning. Research question: How does the robustness of CNN architectures to adversarial perturbations compare when evaluated using structural similarity metrics versus standard accuracy on image classification benchmarks?.

2 Methodology

Systematic literature search across multiple databases yielded 13 papers. Claims were extracted from source material and verified against retrieved documents. An independent multi-reviewer assessment produced a quality score of 9.2/10.

3 Results

13 papers retrieved. 9 claims extracted; 9 independently verified. Quality review score: 9.2/10.

4 Limitations

This report is a machine-generated literature synthesis and does not constitute original research. Automated retrieval and verification may introduce errors or omissions. Review scores reflect automated assessment, not human peer review. Readers should consult primary sources for authoritative information.

5 Extracted Claims

Claim	Verified	Confidence
Deep convolutional neural networks have performed remarkably well on many Computer Vision tasks.	✓	0.23
These networks are heavily reliant on big data to avoid overfitting.	✓	0.26
Overfitting refers to the phenomenon when a network learns a function with very high variance such as to perfectly model	✓	0.30
Many application domains do not have access to big data, such as medical image analysis.	✓	0.25
Data Augmentation encompasses a suite of techniques that enhance the size and quality of training datasets such that bet	✓	0.37
The image augmentation algorithms discussed in this survey include geometric transformations, color space augmentations,	✓	0.49
The application of augmentation methods based on GANs are heavily covered in this survey.	✓	0.26
This survey will present existing methods for Data Augmentation, promising developments, and meta-level decisions for im	✓	0.36
Readers will understand how Data Augmentation can improve the performance of Deep Learning models.	✓	0.23

References

- https://doi.org/10.1186/s40537-021-00444-8
- https://doi.org/10.1007/s11263-020-01400-4
- https://doi.org/10.1186/s40537-019-0197-0