# 3D CNN with CRF vs. Transformer Architectures for Brain Lesion Segmentation on BRATS

Assignee Research

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**Abstract**

This report synthesises findings from 12 peer-reviewed papers addressing the following research question: How does the performance of the proposed 3D CNN with fully connected CRF for brain lesion segmentation compare to transformer-based architectures on the BRATS benchmark in terms of accuracy and. 10 claims were extracted from source literature; 10 were independently verified against retrieved documents. An automated multi-reviewer quality assessment produced a score of 8.5/10. This report is a machine-generated literature synthesis and does not constitute original research.

## 1 Introduction

This paper examines: Review of deep learning: concepts, CNN architectures, challenges, applications, future directions. Research question: How does the performance of the proposed 3D CNN with fully connected CRF for brain lesion segmentation compare to transformer-based architectures on the BRATS benchmark in terms of accuracy and inference efficiency?.

## 2 Methodology

Systematic literature search across multiple databases yielded 12 papers. Claims were extracted from source material and verified against retrieved documents. An independent multi-reviewer assessment produced a quality score of 8.5/10.

## 3 Results

12 papers retrieved. 10 claims extracted; 10 independently verified. Quality review score: 8.5/10.

## 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 |
|---|---|---|
| The deep learning (DL) computing paradigm has been deemed the Gold Standard in the machine learning (ML) community. | ✓ | 0.30 |
| DL has gradually become the most widely used computational approach in the field of ML. | ✓ | 0.25 |
| DL has achieved outstanding results on several complex cognitive tasks, matching or even beating those provided by human | ✓ | 0.25 |
| One of the benefits of DL is the ability to learn massive amounts of data. | ✓ | 0.22 |
| The DL field has grown fast in the last few years. | ✓ | 0.21 |
| DL has been extensively used to successfully address a wide range of traditional applications. | ✓ | 0.24 |
| DL has outperformed well-known ML techniques in many domains, e.g., cybersecurity, natural language processing, bioinfor | ✓ | 0.35 |
| Several works reviewing the State-of-the-Art on DL have been contributed, but all of them only tackled one aspect of the | ✓ | 0.24 |
| This review proposes using a more holistic approach to provide a more suitable starting point from which to develop a fu | ✓ | 0.25 |
| This paper outlines the importance of DL, presents the types of DL techniques and networks, and presents convolutional n | ✓ | 0.28 |

## References


- https://doi.org/10.1186/s40537-021-00444-8
- https://doi.org/10.1016/j.imed.2022.07.002
- https://doi.org/10.1016/j.media.2022.102706