DEEP NEURAL NETWORKS FOR SCOLIOSIS DETECTION AND ANALYSIS: A LITERATURE REVIEW

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ABSTRACT

Scoliosis affects 2–3% of the population, and manual measurement using the Cobb angle — the gold standard since 1948 — is subject to interobserver variability and too slow for use in large-scale screening programs.

This paper presents a systematic review of the application of deep neural networks (DNNs) in scoliosis detection and analysis through an examination of relevant literature published between 2015 and 2024 from the PubMed, IEEE Xplore, Scopus, and Web of Science databases. Various architectures were considered — ranging from classical convolutional neural networks and encoder–decoder models to Transformer and hybrid CNN–Transformer approaches — together with key datasets, evaluation metrics, and open challenges in the field.

Technical progress is both visible and measurable: recent literature reports that hybrid CNN–Transformer models achieve Cobb angle estimation errors approaching the level of disagreement between two experienced radiologists. Nevertheless, most published models have been tested exclusively on data from their institution of origin, raising a serious concern regarding external validity — it remains unclear whether these models would perform equally well in another hospital, using different imaging equipment and involving different patient populations. This remains one of the key open questions in the field and a major direction for future research.

Keywords: deep learning, convolutional neural networks, scoliosis, Cobb angle, medical image analysis, literature review.