

PhD external evaluation report

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This is an external evaluation report of the dissertation of Kassab D. K. I., for a degree of Candidate of Medical Sciences (PhD), specialty of diagnostic radiology, written by Dr. Mohammed Amin Matar, MD, Consultant radiologist, Arab board of radiology. The research topic (The potentials of neural network in the automatic assessment of scoliosis grade when analyzing digital spinal radiographs)

STATE OF THE ART AND RELEVANCE

Spinal deformities are common and considered an important subject of research from various perspectives, such as the pathophysiology which is still not fully understood, also the diagnostic evaluation and the application of 3D imaging techniques as well as treatment methods that are constantly changing and improving to include now genetic therapy and robotic surgeries.

This research project included the potentials of using artificial neural networks for the evaluation of scoliosis on spinal radiographs. The use of Artificial intelligence (AI) in medicine in general, and especially in diagnostic radiology, has been increased in the last 20 years. Computer-aided diagnosis and detection (CAD) systems are popular among radiologists around the world. Such systems can be a great helper for the doctors and radiologists in many aspects. Routine time-consuming measurements can be performed by AI accurately and rapidly with less inter-observer variability. So, the researcher and her team has chosen an interesting and timely-relevant research topic with meaningful and impactful research goal and objectives. A new automatic program for measuring Cobb's angle on spinal radiographs was created by the team and tested in a clinical trial by the researcher. The results confirm the accuracy of the program in diagnosing scoliosis and defining its grade by measuring Cobb's angle automatically.

MATERIALS AND METHODS

Research materials that were used were adequate, sufficiently representing each grade of scoliosis. Large annotated database was used to teach the neural network to detect vertebral bodies automatically and identify their locations. Also, different radiographs were used to estimate the accuracy of the proposed program by comparing the results of its work with those of the radiologist's. Statistical analysis methods which were used in the thesis are appropriate to validate the use of the proposed program in clinical practice.

LITERATURE REVIEW

This work contains a literature review that covers the different radiographic methods of estimating scoliosis angle on radiographs, their advantages and disadvantages. Moreover, the researcher deeply studied and represented the causes of measurements' variability of Cobb's angle. A general view of AI applications in medicine and radiology was also provided by the researcher. Also, the author provided a comparison between his work and similar previous works.

STRUCTURE OF THE DISSERTATION AND OVERALL ASSESSMENT.

The research is adequately structured and well-ordered in a logical flow, consisting of an introduction, four chapters, summary, conclusions, practical recommendations, list of abbreviations and references. The text is well written. The thesis is well presented with clear headings and subheadings. The methods and results are presented transparently and included in detailed tables and figures in the text and appendices. The research findings are effectively discussed and align well with the research objectives.

CONCLUSION

This is a complete scientific work that outlines a new AI program for automatic detection and diagnosis of scoliosis on frontal radiographs, with clinical recommendations regarding how to implement it in clinical practice.

After studying the work, may I have an answer to this question:

In your opinion, what are the disadvantages of AI use in medicine, can it lead to medical malpractice?

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