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OPEN PEER REVIEW

Improvement of Bone Age Assessment Using a Deep Learning Model in Young Children: Significance of Carpal Bone Analysis

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About this report

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1 Original submission

3 comments · 10 Apr 2023 – 7 Jun 2023

Referee 1 Reviewer

ACCEPT 10 Apr 2023

Thanks to the authors for considering IJR for their submission.
I read this manuscript, and it is appropriate in terms of scientific writing structure, sample size, statistical analysis, and the presentation and interpretation of results. Therefore, it is suitable for publication in the IJR.

Referee 2 Reviewer

ACCEPT 7 May 2023

There is no innovation in terms of AI, and a very simple convolutional neural network (CNN) has been used in this study.
Although the bone age assessment (BAA) model presented in this article shows promising results in terms of accuracy and efficiency, it is suggested that these findings be validated through further research. Utilizing machine learning interpretability methods like Shapley additive explanations (SHAP) can be valuable for understanding the model's decision-making process and identifying potential sources of bias. Therefore, it is crucial to conduct additional research using these methods to confirm the model's reliability and generalize its findings to different populations.

Editor-in-Chief

MINOR REVISION 7 Jun 2023

Dear authors,
Your article needs Minor Revision.
Regards

2

Revision 1

AUTHORS' RESPONSE TO REVIEWERS

Authors' reply to reviewers

The next pages contain the authors' point-by-point reply to the comments of this revision round, as submitted with the revised manuscript. It is published as the authors wrote it.

Dear Editor of the Innovative Journal of Radiology,

Thank you for reviewing our manuscript entitled “Improving Bone Age Assessment Deep-Learning Model in Young Children: Significance of Carpal Bone Analysis” and giving us the opportunity to respond according to the reviewer’s comments.

We also appreciate the reviewers for their helpful suggestions, which led us to improve the manuscript. A point-by-point responses follow this letter. (Reviewer’s comments were written in blue letters, the authors’ response was written in black letters, and revised text was written in red letters.)

We are looking forward to hear from you with positive decision.

With best regards,

First and corresponding authors

June 8th, 2023.

[Authors’ response to Reviewer #1]

Thanks to the authors for considering IJR for their submission.

I read this manuscript, and it can be mentioned that it is appropriate according to scientific writing structure, sample size, statistical analysis, results presentation and interpretation. Therefore, it is suitable for publication in the IJR.

➔ We appreciate the reviewer’s valuable comments.

[Authors’ response to Reviewer #2]

Dear authors;

This manuscript is written well and has novelty.

I hope you do a research with more cases in prebuberty group.

➔ Thank you for your valuable comment. We have plan to collect more cases in prepuberty group, as you recommended.

[Authors' response to Reviewer #3]

There is no innovation in terms of AI and a very simple convolutional neural network (CNN) has been used in this study.

Although the bone age assessment (BAA) model presented in this article shows promising results in terms of accuracy and efficiency, however it is suggested to validate these findings through further research. Utilizing machine learning interpret ability methods like shapley additive explanations (SHAP) can be valuable for understanding the model's decision-making process and identifying potential sources of bias. Therefore, it is crucial to conduct additional research using these methods to confirm the model's reliability and generalize its findings to different populations.

- ➔ We agree with the reviewer's comment. Our model used a relatively simple model, and it seems that leveraging advanced techniques such as SHAP can help improve it. We are willing to improve the model based on your recommendation. This will be our next project as it will take a lot of effort.
- ➔ We admit that this is an important issue. Because the validation was done only for Korean patients in our institution, validation on other populations is necessary. We mentioned as a limitation of our study in the Discussion. We are planning to contact the ImageBiopsy Lab to discuss validation of different populations as further research. Thanks for the comment.

[Authors' response to Reviewer #4]

This paper is suitable for publication in IJR.

- ➔ We appreciate your opinion.

[Authors' response to Associate Editor #1]

Dear authors

Thank you for submitting your valuable manuscript in innovative journal of radiology. According to dear reviewers comments, the article was well written with proper methodology, so it is appropriate for publication in our journal.

- ➔ We appreciate the editor's valuable comments.

[Authors' response to Associate Editor #2]

1-the title seems unclear: “Improving Bone Age Assessment Deep-Learning Model in Young Children” [may be, better version is: “Improving Bone Age Assessment using Deep-Learning Model in Young Children” or something like this]

➔ According to your comments, we revised the title below. We appreciate your comment.

Title

Improving Bone Age Assessment Using Deep-Learning Model in Young Children: Significance of Carpal Bone Analysis

2-the authors mentioned: “apply whole hand or regional convolutional neural networks,” this part includes “whole hand” and “convolutional neural network” I can not understand why the authors have connected these two parts with “or” together? These are different concepts and are not of the same variable that we can consider them as potential substitution.

➔ The editor raised a good point. Previous BAA methods I have mentioned used whole hand images or focal hand images (such as radius, ulna, metacarpal bones, phanlges…) detected by CNN. This sentence may confuse the readers, so we revised the sentence to make it clear as below.

Background

Most of the proposed methods used for a BAA apply a deep-learning approach on a whole-hand (9–11, 13, 14) or extracted region of interest (ROI) (12).

3-this part is unclear: “diagnostic-quality radiographs”

➔ We have revised the sentence to make clear that the model required the radiographs with diagnostic quality. Thanks for the comment.

Discussion

Second, our model required radiographs of diagnostic quality.

4-please determine in table 1 which data is model M1 and which one is model M2? It is not clear

➔ We have revised the table to clarify M1 and M2 model data as below. We appreciate your recommendation.

Table 1

Automatic bone age assessment by model with carpal bones (M1 model)			
Mean ± SD	11.12 ± 3.05	11.10 ± 3.79	11.13 ± 1.76
Median	11.41	12.11	11.34
Range, min–max	2.14 – 16.8	2.14 – 16.88	2.97 – 15.22
Automatic bone age assessment by model without carpal bones (M2 model)			
Mean ± SD	11.14 ± 2.59	11.13 ± 3.76	11.15 ± 1.77
Median	11.46	12.11	11.31
Range, min–max	2.09 – 16.86	2.09 – 16.86	2.85 – 15.39

5-figure 4 legend mentions “difference” while the bland-altman is for agreement. Please correct.

➔ We agree with the reviewer’s comment. According to the suggestion, we revised figure 4 legend as below.

Figure Legends

Bland–Altman plots shows agreement between each model estimate and ground truth.

2 Revision 1

1 comment · 19 Jun 2023

Editor-in-Chief

ACCEPT 19 Jun 2023

Dear authors,
Your article is acceptable for publication in IJR.
Regards