Use of deep learning for structural analysis of computer tomography images of soil samples

Ralf Wieland, Chinatsu Ukawa, Monika Joschko, Adrian Krolczyk, Guido Fritsch, Thomas B. Hildebrandt, Olaf Schmidt, Juliane Filser and Juan J. Jimenez

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Original submission: 13 August 2020
Revised submission: 15 February 2021
Final acceptance: 2 March 2021

Note: Reports are unedited and appear as submitted by the referee. The review history appears in chronological order.

Review History
RSOS-201275.R0 (Original submission)

Review form: Reviewer 1

Is the manuscript scientifically sound in its present form?
Yes

Are the interpretations and conclusions justified by the results?
Yes

Is the language acceptable?
Yes

Do you have any ethical concerns with this paper?
No

Have you any concerns about statistical analyses in this paper?
No
Recommendation?
Accept with minor revision (please list in comments)

Comments to the Author(s)
The authors proposed a nice work to capture soil structure by deep learning based on computer tomography (CT) images of soil samples from several European countries. The study introduced novel techniques to enhance the ability of artificial intelligence (AI) to detect soil structure metrics, which would be interested for both soil and AI scientists. Some comments are as follows.

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Review form: Reviewer 2

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Have you any concerns about statistical analyses in this paper?
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3. in the figures: add precise scale and description to the axis; give some more words for the figure titles!

Decision letter (RSOS-201275.R0)

We hope you are keeping well at this difficult and unusual time. We continue to value your support of the journal in these challenging circumstances. If Royal Society Open Science can assist you at all, please don’t hesitate to let us know at the email address below.

Dear Dr Wieland

On behalf of the Editors, we are pleased to inform you that your Manuscript RSOS-201275 "Use of Deep Learning for structural analysis of CT-images of soil samples" has been accepted for publication in Royal Society Open Science subject to minor revision in accordance with the referees' reports. Please find the referees' comments along with any feedback from the Editors below my signature.

We invite you to respond to the comments and revise your manuscript. Below the referees' and Editors' comments (where applicable) we provide additional requirements. Final acceptance of your manuscript is dependent on these requirements being met. We provide guidance below to help you prepare your revision.

Please submit your revised manuscript and required files (see below) no later than 7 days from today’s (ie 08-Feb-2021) date. Note: the ScholarOne system will 'lock' if submission of the revision is attempted 7 or more days after the deadline. If you do not think you will be able to meet this deadline please contact the editorial office immediately.

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Thank you for submitting your manuscript to Royal Society Open Science and we look forward to receiving your revision. If you have any questions at all, please do not hesitate to get in touch.

Best regards,
Lianne Parkhouse
Editorial Coordinator
Associate Editor Comments to Author:

Thank you for your patience with the unusually long review period: no doubt the COVID pandemic has been a contributing factor, but we regret the difficulty the editors have had in finding referees - a larger-than-normal number of invitations needed to be sent to secure the two commentaries we have received. We hope these comments are useful in revising your paper, and we'll look forward to the revision in due course.

Reviewer comments to Author:

Reviewer: 1

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Reviewer: 2

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Your revised paper should include the changes requested by the referees and Editors of your manuscript. You should provide two versions of this manuscript and both versions must be provided in an editable format:
one version identifying all the changes that have been made (for instance, in coloured highlight, in bold text, or tracked changes);
a 'clean' version of the new manuscript that incorporates the changes made, but does not highlight them. This version will be used for typesetting.
Please ensure that any equations included in the paper are editable text and not embedded images.

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If you have been asked to revise the written English in your submission as a condition of publication, you must do so, and you are expected to provide evidence that you have received language editing support. The journal would prefer that you use a professional language editing service and provide a certificate of editing, but a signed letter from a colleague who is a native speaker of English is acceptable. Note the journal has arranged a number of discounts for authors using professional language editing services (https://royalsociety.org/journals/authors/benefits/language-editing/).

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-- Ensure that your data access statement meets the requirements at https://royalsociety.org/journals/authors/author-guidelines/#data. You should ensure that you cite the dataset in your reference list. If you have deposited data etc in the Dryad repository, please only include the 'For publication' link at this stage. You should remove the 'For review' link.
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At Step 7 'Review & submit', you must view the PDF proof of the manuscript before you will be able to submit the revision. Note: if any parts of the electronic submission form have not been completed, these will be noted by red message boxes.

Author's Response to Decision Letter for (RSOS-201275.R0)

See Appendices A - C.
We hope you are keeping well at this difficult and unusual time. We continue to value your support of the journal in these challenging circumstances. If Royal Society Open Science can assist you at all, please don't hesitate to let us know at the email address below.

Dear Dr Wieland,

It is a pleasure to accept your manuscript entitled "Use of Deep Learning for structural analysis of CT-images of soil samples" in its current form for publication in Royal Society Open Science. The comments of the reviewer(s) who reviewed your manuscript are included at the foot of this letter.

Please ensure that you send to the editorial office an editable version of your accepted manuscript, and individual files for each figure and table included in your manuscript. You can send these in a zip folder if more convenient. Failure to provide these files may delay the processing of your proof. You may disregard this request if you have already provided these files to the editorial office.

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Thank you for your fine contribution. On behalf of the Editors of Royal Society Open Science, we look forward to your continued contributions to the Journal.

Kind regards,
Anita Kristiansen
Editorial Coordinator

Royal Society Open Science
openscience@royalsociety.org

on behalf of Peter Haynes (Subject Editor)
openscience@royalsociety.org

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Appendix A

Dear Liane, dear Andrew,

thank you both for your great support during the submission process. Only with your help was I able to complete the work. I have revised the work according to the suggestions of the reviewers. They have also done a great job. Please also address my thanks to Professor Peter Haynes for his supervision of the revision process.

Dear Reviewer: 1,

many thanks for your review and your helpful comments. They helped me a lot to make the paper better.

Comments to the Author(s)

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At the beginning of the Introduction, some background and importance of soil structure should be mentioned.

- I have added a comment and a citation.

The first paragraph of Results seems more like methods, which could be considered to move the Methods. Similarly, the first mentioning of grad-CAM should also be done in Methods.

- I have moved the grad-CAM into the method section.

Some figures miss units on axes, like Figs. 7 and 8. Some similar figures could be combined into a single one like Figs 1 and 2, Figs 12 and 13.

- I have added the axis.

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