Response to Referee #1

Response: We thank the Reviewer for the comments and for the valuable suggestions. Our responses can be found in this response letter. We updated our manuscript adding new text in **red** (please refer to ***manuscript marked with changes.pdf***).

This paper presents an interesting review on the application of artificial intelligence AI algorithms (Machine learning ML and deep learning DL in particular) for processing and analyzing geomatics data. The authors considered in their review only the papers published between 2016 and 2021.

Response: *We appreciate your effort and attention in evaluating our paper and we thank the reviewer for his/her positive feedback.*

R1.1: Since the authors reviewed on ML and DL, I think that a brief introduction of these tools and especially the difference between them, will help the readers, that are not familiar to work with, to better understand why there is an increasing demand to use AI.

Response: *Thank you for this wise suggestion. We have added a brief description of ML, DL and their differences in paragraph 2.1 (lines 115-145).*

R1.2: I appreciated the way the authors took to describe the motivations of the work. But, I think that the fist question that we should ask is : Why researchers are increasingly interested to DL. Is it because of data complexity only? Efficacity or simplicity of these tools to implement?

Response: *Thanks to your comment we have the possibility to better detail the deduction that can be drawn by analyzing the research questions in the introduction. In particular, the main aspect that arises from our research is that the deep learning methods are increasingly often adopted for complex geomatics data analysis. This is due to the size of dataset available in the state of art and for the network architectures that automate feature learning without the need for manual extraction. The numerous layers in deep neural networks allow models to become more competent at learning complex features and performing more intensive computational tasks, i.e., accomplish many complex operations simultaneously. These aspects have been added together with relevant recent literature in the field (lines 145-160 and 165-170).*

R1.3: On what basis you have selected the “fundamental” sources of Geomatic data?

Response: This is a very interesting question by this reviewer. Thank you for that. Indeed, a categorization of geomatic data is a hard task and difficult to treat as a compartment. However, given the selected journals and considering their SJR, we noted that the categories of data described in Figure 1 are those mostly exploited for AI experiments. Moreover, considering the selection criteria of this review, we identified data representing physical models and phenomena that better fit with the AI tasks. Relevant literature has been added to stress this aspect (paragraph 2.2).

R1.4: In section 2.2.2, the authors cited the use of InfraRed Thermography IRT. First, please correct Thermography not termography.

Response: *According to the reviewer's suggestion, we corrected the typos.*

R1.5: You cited methods like Mask R-CNN, MLP or others. I was wondering why there is not the YOLO algorithm, it is one of the most used in object detection and segmentation in visual and infrared images.

Response: *We have cited the Mask region-based convolutional neural network (Mask R-CNN) since it can benefit from extra data, even if that data is unlabeled. Mask R-CNN is also capable for instance segmentation. We agree that Mask R-CNN takes more time for detection compared to YOLO that can be used in any kind of object detection in real time and can be considered as the better model between the mentioned two. However, these results are data specific and might change with changes in data distribution and Mask R-CNN architecture was adopted in several works because it simultaneously performs object detection and instance segmentation, making it useful for the automated inspection task. For this reason, several papers focusing on GeoAI adopt this network instead of YOLO. Notwithstanding, your comment is valuable and we added two important works which used YOLO for the detection accordingly:*

- *Greco, A., Pironti, C., Saggese, A., Vento, M., & Vigilante, V. (2020, January). A deep learning based approach for detecting panels in photovoltaic plants. In Proceedings of the 3rd International Conference on Applications of Intelligent Systems(pp. 1-7).*
- *Tajwar, T., Hossain, S. F., Mobin, O. H., Islam, M., Khan, F. R., & Rahman, M. M. (2021, May). Infrared Thermography Based Hotspot Detection Of Photovoltaic Module using YOLO. In 2021 IEEE 12th Energy Conversion Congress & Exposition-Asia (ECCE-Asia) (pp. 1542-1547). IEEE.*

R1.6: Besides, I would like to draw your attention that other researchers used image fusion to image preprocessing as a data enhancement method by fusing visible and infrared images. I raised these remarks since you have compared, in Fig 8, the percentage of papers that used geomatic data with AI and you have concluded in line 540 that IRT data is lower than other types of data.

Response: *Thanks for your suggestions and it could be useful to clarify this issue. The consideration on IRT data might appear misleading, but it refers only to the comparison with the type of data examined in this review. As stated in the introduction this work outlines AI-based techniques for analysing and interpreting complex geomatics data. In fact, Figure 1 summarizes and highlighted the purpose of this work, i.e. the definition of guidelines in which the reviewed approaches are categorised and compared from multiple perspectives, including methodologies, functions, and an analysis of the pros and cons of each category. Image fusion and multi task learning are increasingly adopted in several studies, however, these works are not useful for the guidelines definition but deserve investigations, thus we added this important aspect in our future works.*

R1.7: Please provide more accurate description of the improvements to the state-of-the-art knowledge.

Response: *Existing reviews explore particular approaches for analysing geomatics disciplines (e.g. remote sensing), generally based on Artificial Intelligence techniques to solve a specific issue. There are several examples of well-structured systematic reviews focused on this domain which are added in the introduction. The novelty of this work relies on the definition of guidelines in which the reviewed approaches are categorised and compared from multiple perspectives, including methodologies, functions, and an analysis of the pros and cons of each category. In fact, to the best of our knowledge, a complete review on GeoAI for deducing insights from geomatics data is not present in literature.*

R1.8: I have other general remarks:

- Please choose between American English or British English --> Analysing and analyzing for example

- The paper is not well revised. There are some grammatical and form errors, ex. line 175, 540… Also; please correct the legend of Fig. 5

Response: *We agree that the text needed a general revision. The paper underwent a professional proofreading, and the certificate is attached at the bottom of this letter. Now the text is consistent, and the minor glitches amended.*

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