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Interactive comment on "Technical note: AI-Track-tive: automated fission track recognition using computer vision (Artificial Intelligence)" *by* Simon Nachtergaele and Johan De Grave

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We also want to thank Reviewer 3 (A. Gleadow) for taking the time to review our manuscript. When taking an overarching view, it appears Reviewer 3 has three major topics of concern and in addition, also lists several minor changes to be adopted in the manuscript. The suggested minor corrections (i.e. specific comments) along with citing the Kumar 2015 abstract again in other lines than line 25 and 46, will all be incorporated in the revised version of the manuscript. Reviewer 3 correctly assumes that the input images were single transmitted light images covered by a polygonal mask. Reviewer 1 asked the possibility to see reflected light images and multiple transmitted

light images for each apatite and external detector. Based on both the constructive comments of Reviewer 1 and Reviewer 3 we changed the program following their advice. Now, the program uses a z-stack of 2 transmitted light images with different focus levels and 1 reflected light image. One of these 2 transmitted light images is covered and the other is not covered by a polygonal mask. This way, you won't lose information from outside your region of interest (aka polygon). It is also possible to only use 1 image for the transmitted light image, in case the microscope only has taken 1 image and not a z-stack.

The first main matter of concern is that the Deep Neural Networks were only trained on 15-20 images. Indeed, it is quite surprising that the DNN is already performing well based on such a small training dataset with only 5 images yielding high track densities and consequently many overlapping tracks. Feeding a larger image dataset into the Deep Neural Network would (1) increase DNN training times, (2) require better (and more expensive) GPU's and, last but not least, (3) could improve track recognition success rate.

The second major concern of Reviewer 3 is that too few details on the Deep Neural Network (DNN) training were given. In the journal "Gchron", Technical Notes are recommended to be short and only take a few pages, so we originally devised the manuscript with this in mind, i.e. trimming down where possible. However, if permitted by the editors, and to meet the reviewer's concerns, we suggest adding two sections (1.2.1 Sample preparation, 1.2.2 Deep Neural Network training) with more information. This way, everybody in essence will be able to train an appropriate DNN, following our approach, and that is calibrated on images from their own microscope/set-up. Hence, the software package AI-Track-tive can be useful for most fission track lab, since it will be distributed using a Creative Commons 4.0 Non-Commercial Share Alike (CC BY-NC-SA 4.0) license.

The third main matter of concern as stated by Reviewer 3 is that we might have compared our approach to an earlier and now outdated version of the one existing system

for automated fission track dating (i.e. the Autoscan system). This perhaps might indeed be the case as we trained on an Autoscan system from before 2015, after which we developed a separate system, i.e. Nikon-TrackFlow (Van Ranst et al., 2020). In our attempt to create a program that counts fission tracks based on AI-recognition we had no access to a more recent Autoscan system, and hence based our comparison on published and available sources such as Enkelmann et al. (2012) and Gleadow et al. (2009). In that sense we will also rephrase the introductory statements on the Autoscan system that the reviewer finds disparaging. We apologize for that, as this was by no means intended. We do however think the comparative table in the manuscript has its merits, and we propose to add in the data provided by the reviewer as an extra comparison to the current Autoscan system. Next to that we propose to add a statement along with the table, conveying the message that these parameters reported in the table are only target values.

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