Atmospheric Measurement Techniques Discussions

Atmos. Meas. Tech. Discuss., referee comment RC1
https://doi.org/10.5194/amt-2022-72-RC1, 2022

Comment on amt-2022-72

Anonymous Referee #1

Referee comment on "Ice crystal images from optical array probes: classification with convolutional neural networks" by Louis Jaffeux et al., Atmos. Meas. Tech. Discuss., https://doi.org/10.5194/amt-2022-72-RC1, 2022

https://amt.copernicus.org/preprints/amt-2022-72/

Review:

Ice crystals images from Optical Array Probes: classification with Convolutional Neural Networks

By Authors:

Louis Jaffeux, Alfons Schwarzenböck, Pierre Coutris, and Christophe Duroure

General comments:

This study presents a methodology for automatic ice crystal recognition using a Convolutional Neural Network (CNN) machine learning (ML) approach. Two different sensors i.e., the Precipitation Imaging Probe (PIP) and the 2DS-Stereo Probe (2DS), commonly used probes that differ in pixel resolution and measurable maximum size range for hydrometeors collect (binary) black and white images. Ice crystal images from four aircraft in-situ campaigns (EXAEDRE, HAIC, AFLUX, and EUREC4A) were collected to train and evaluate the ML model. The ML method and validation is presented in detail. The results show that the CNN approach show good performance on the test set (mean F1-score > 0.9). Additionally, random inspections were made to compare the variability among human predictors and the CNNs.

Overall, this manuscript is well-written and relevant studies are properly cited. I like the Introduction section and the overview tables, since it is quite comprehensive and reads very friendly for researchers who are not very familiar with this topic. Some parts in results section need further clarification. The scientific benefit of this work, which is to use the method for future microphysical studies, seems reasonable to me. After some minor revisions, I would recommend being published on AMT.

Major comments:

- The tables on pages 12 and 13 puzzle me a bit. You say (a) is the normalization of (b). Let *A* be the confusion matrix in numbers. Then the confusion matrix in percentages would be *A/sum(A)*, which does not equal your percentage values. Is there some special way you normalize the confusion matrix values? If so, please explain this step.

Minor comments:

- For classification problems, it is always complicated and labor-intensive to generate large label datasets, with equal amounts of examples for each class. What you could do is to change to a multi-label classification approach, which would reduce your classes and maybe even out the core classes (CP, FA, HPC, RA, Co, WD).

- All figure and table references should start with capital "F" and "T" according to AMT.

- There are multiple occurrences of "convolutionnal" ï□ change to "convolutional"

- More typos and minor suggestions can be found in the PDF document (marked in red or green or blue).

Please also note the supplement to this comment:
https://amt.copernicus.org/preprints/amt-2022-72/amt-2022-72-RC1-supplement.pdf