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Ocean Science
Discussions

Interactive comment on "Towards operational phytoplankton recognition with automated high-throughput imaging and compact convolutional neural networks" *by* Tuomas Eerola et al.

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C1: Line 62: "FlowCytobot is among the most frequently used imaging flow cytometer". Until now, there was only one or two groups of American scientists using the FlowCytobot. I do not think that we can say most frequently used in this case.

A: Thank you for the comments. We are not trying to say IFCB is the most frequently used, but that it is among the most frequently used imaging flow cytometers. Imaging flow cytometry has only in recent years (ten years or so) emerged as an attractive

method (improved image quality and operationality) for phytoplankton research. There are not many commercially available imaging flow cytometers that are suitable for phytoplankton research and these are FlowCAM, IFCB and Imagestream (e.g. Dashkova et al. 2016, Lombard et al. 2019). We will clarify this in the revised version.

C2: Line 80: what are the practical implications to aquatic research which are mentioned? This needs clarification.

A: Typically studies that are dealing with plankton classification are addressing solely the classification performance of nice, identifiable images. This is possible in the image datasets that are meant for testing and developing machine learning algorithms but is never the case when trying to classify "real ecological datasets". We are referring with "practical implications" to the analysis of the confused classes and considering the classification process from the operational point of view.

C3: Line 100: it will be worthwhile here to mention the principal of a FAIR data: findability, accessibility, interoperability, and reusability.

A: Thank you for correction.

C4: Line 109: "FerryBox"

A: Thank you for correction.

C5: Line 126: is it testing set or training set is equal to 25% Needs clarification (see Table2)? Why 25% has been chosen

A: Number of test images is the same for each class inside each subset. The number is 25% of the minimum number of images per class. For example, with the subset with all classes with at least 100 images, the number of test images for each class is 25.

C6: Line 211: "CNN performs significantly better than the Random Forest implementation". It should be mentioned that that the two methods used different attributes with a higher number used for CNN which explains a better performance for CNN.

A: Could you clarify what you mean by different (higher number of) attributes? Different image features? While we agree that the higher number of features has effect, we believe that the main reason why CNN outperforms Random Forest is the fact that the features are learned from the data.

C7: Line 226: in what identifying the planktonic species is important for the Baltic Sea ecosystem? I understood that the authors want to relate their mathematical approach to an ecological interest but it will be relevant to have some information about why monitoring the species is important, particularly for those who do not know the Baltic Sea.

A: It has been stated in that "cyanobacteria form massive summer blooms" and that "Baltic Sea suffers from eutrophication". We will further clarify the ecology of the Baltic Sea phytoplankton and the importance of the species monitoring in the revised version.

C8: Line 253: "ecological relevance" should be better to mention human health concern?

A: Actually no. In the Baltic Sea the toxicity of the cyanobacteria is not so much related to human health (although of course this is also important) because there is no for example mussel farming through which the toxins would highly affect to humans. Rather the toxins affect the immediate ecosystem around, and are more of a concern for example for dogs. Of course there is a risk for human health also and the summer blooms are monitored extensively but we do not wish to rule this to address only that aspect of the matter.

C9: Line 294: "there exists", replace by there is.

A: Thank you for correction.

C10: Line 304: " It is impossible to create classes for all images. . .." This sentence underlines the lack of information concerning the percentage of phytoplankton recognised compared to the on those which are not recognised and potentially included in "

small roundish or elongated objects".

A: It is very difficult to assess the portion of the images that cannot be classified separately because the image data collected includes so versatile set of these images. The amount very much depends on the study site, the community composition (different one in different seasons), how much decaying matter exists that still contains enough chlorophyll to trigger for image (other words meaning chlorophyll containing trash), etc that assessing this would require a lot of work and would still not be universal estimate.

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