

## ***Interactive comment on “Auroral Classification Ergonomics and the Implications for Machine Learning” by Derek McKay and Andreas Kvammen***

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### GENERAL COMMENT

The present manuscript addresses an important scientific and technical question, i.e. the one related to the potential source of prejudice in machine learning with particular reference to the bias in the training samples. The work is based on a dataset of auroral images captured in Sweden. The topic fits the scope of the journal and is interesting for the readers. Although the study seems to be relevant and displays some promising results, the lack of rigour and essential details are problematic. My opinion is that the paper needs a big improvement before being reconsidered for discussion and eventually, publication. In the following, I list some specific comments that should be addressed carefully.

### SPECIFIC COMMENTS

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#### Section 1.

1) Although the application of machine learning approaches is relatively new for "aurora" purposes, a brief review of cognitive and physical bias in previous studies, also in other fields, is expected. 2) Aurora phenomenon is not described, as well as the different morphological types. I think that for an inexperienced reader can be difficult to go in the core of the topic. I suggest to introduce a brief explanation of the different morphological categories (i.e., in table 1). Also, showing more examples of auroral images (i.e., in Section 2), at different times, can be really appreciated.

#### Section 2.

3) Information is needed about how the pictures were taken and their temporal interval. 4) Details are missing about all the pre-processing phase. Just an example of the final pre-processed image is shown, but no information is provided about all stages of image preparation. I think this part is crucial, having a role in the classification bias. 5) It is essential to clarify how the categories are defined. Is there some overlap between the defined classes? For the trained human eye, there is a clear distinction between the different classes? Authors refer to ambiguous forms and unexpected features, what are they? I suggest introducing some examples. 6) It is not clear why the auroral physicists classify the images using different software. Please motivate this choice.

#### Section 3.

7) The two experts classify the same dataset in two different ways: randomly and chronologically. The quantitative analysis of the results, obtained in the two way separately, is expected concerning their influence in some category of bias. 8) The authors list and describe different sources of potential bias observed during the classification. However, this analysis is qualitative, and it is not clear the impact of each category respect the results. 9) An important aspect related to the study of cognitive biases is the validation of strategies for mitigation of their effects in cases when they lead to incorrect judgment. In the manuscript, authors provide strategies for mitigating the negative

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effects of bias but, unfortunately, not for all the categories investigated.

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