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Solid Earth Discussions

# *Interactive comment on* "Prediction of seismic p-wave velocity using machine learning" *by* Ines Dumke and Christian Berndt

**Anonymous Referee #2**

Received and published: 15 July 2019

The manuscript, " Prediction of seismic p-wave velocity using machine learning", is a well-written description of a machine learning method –Random Forests – to predict seismic p-wave velocity as a function of depth for any a generic marine location. This manuscript is suitable for Copernicus, but the manuscript needs to be revised before it can be accepted. I have some suggestions here.

1 Introduction.

Page 2:

L24: You make the statement that the most widely used machine learning methods are ANNs, SVMs, and RFs. It is hard to convince people that these three algorithms are the most widely used. For specific problems, some algorithms may be more common



than the other algorithms. You may say that the most widely used machine learning includes ANNs, SVMs, and RFs.

L31: You mentioned that RF has been repeatedly found superior to other machine learning methods. You need to specify the particular problems that RF has been found superior to "other machine learning methods" in the text. And what other machine learning methods do you mean here? Please specify in the text.

2 Methods

Page 3, section 2.1.2:

L25: How do you come up with these 38 predictors? Could you specify the reason why you choose these 38 predictors in this section?

Page 4, section 2.2:

L14: How do you define "performance"? I saw you mentioned performance in the later section 2.3. But it is better to define that when you first mention that. In addition, why do you choose 1000 trees? what is the maximum depth of each tree? How does the number of trees and depth affect the bias and variance of the prediction?

3 Results

Page 6, section 3.1:

The performance of an algorithm should be shown by both bias and variance. I only see the comparison of errors and percentage of boreholes with scores 2 and 3 in Fig. 3 and 4. How does the number of predictors and data smoothing affect the variance of the prediction?

Since you only have 333 boreholes, 2% change due to different model runs only change scores of $\sim$7 boreholes. I am curious about the location distributions of those boreholes which changed their scores, and why their scores changed by changing the number of predictors or data smoothing.

4 Discussion

Page 10:

L1-5: You made a strong statement about performance of RF. As I suggested in your introduction section, the performance of a machine learning algorithm really depends on situations.

5 Conclusion

Page 10:

L15: RF is hard to extrapolate to data outside the range they have been seen. I doubted that RF can be used for geophysical modeling in areas lacking v_p(z) from boreholes or seismic data.

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