

Interactive comment on “Soil parameters estimation over bare agriculture areas from C-band polarimetric SAR data using neural networks” by N. Baghdadi et al.

Anonymous Referee #1

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This paper demonstrates the use of artificial neural networks for retrieving soil moisture or soil roughness information instead of using well known backscattering models. In the exercise, it is investigated whether a priori information on soil wetness state or roughness condition may improve the retrieval. I enjoyed reading the paper and only have some minor comments. It is not completely clear to me why the authors opted for neural networks: what was the reason not to work with classical backscatter models such as the IEM? Such reasoning should be included in the paper. An innovative aspect of the paper is that it tries to include a priori information on the soil condition (being moisture content or roughness state). However, previous works also tried to

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include such information in the retrieval (using soil moisture info (e.g. Mattia et al. (2006), or soil roughness (e.g. Satalino et al. 2002, Verhoest et al. 2007)). The paper could refer to such previous work and document how the approach of this paper differs from the other papers. Other minor comments:

doesn't sound good (soil parameters estimation): maybe rephrase to "Estimation of soil parameters over bare agricultural areas ..."?

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- Sometimes the volumetric moisture content is written as cm^3/cm^3 (e.g. line 16), in other places it gets no units (e.g. line 18), please make it consistent throughout the paper.
- Line 16: mention that surface roughness concerns the rms height.
- Line 23: an RMSE

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- Line 2: IEM: also add Fung et al. (1992)

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- Line 10: IEM: also add Fung et al. (1992)

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- Equations 1 to 3: are these newly derived for this paper, or are they taken from Baghdadi et al.? If new, then please provide some statistics with respect to their fit.

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- Lines 1-14: please give some information on the error that is expected
- Line 8: dependent (typo)
- Line 19: Levenberg-Marquardt (not Marquart) (typo)

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- Case 2: an overlap of 10% is found between both classes, not 5%. Is two classes sufficient, or wouldn't it be better to have had three classes (dry, intermediate and wet)?
- Case 3: an overlap of 1 cm is found between both classes, not 0.5 cm. The smooth class includes roughness up to 2 cm: can this still be considered as smooth? On the contrary, the rough class includes roughnesses of 1 cm, which is quite smooth. . .
- Lines 24 and equation 4: bias is not equal to mean absolute error. Equation 4 now defines the bias. For the mean absolute error, one should take the absolute value of $E_i - M_i$.

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- Line 3: please rephrase "slightly behind": it is unclear what is exactly meant (underestimating?)
- Line 6: an intermediate (typo)
- Line 9: up till now, it is not clear how the a priori information is being fed to the neural network.

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- Lines 25 and 26: overestimation and underestimation (instead of resp. overestimate and underestimate)

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- Line 23: an RMSE

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- Line 1: an RMSE
- Line 24: an NDVI

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- It is unclear to me why the last sentence (lines 19 to 21) is stated: although it is true, the link with the paper seems to lack. If this sentence is really needed in the conclusion, then please better frame it such that it fits the research that was presented.

References:

Fung, A. K., Z. Li, and K. S. Chen (1992), Backscattering from a randomly rough dielectric surface, *IEEE Transactions on Geoscience and Remote Sensing*, 30, 356–369.

Mattia, F., G. Satalino, L. Dente, and G. Pasquariello (2006), Using a priori information to improve soil moisture retrieval from ENVISAT ASAR AP data in semi-arid regions, *IEEE Transactions on Geoscience and Remote Sensing*, 44, 900–912.

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Satalino, G., F. Mattia, M. W. J. Davidson, T. Le Toan, G. Pasquariello, and M. Borgeaud (2002), On current limits of soil moisture retrieval from ERS-SAR data, *IEEE Transactions on Geoscience and Remote Sensing*, 40, 2438–2447.

Verhoest, N. E. C., B. De Baets, F. Mattia, G. Satalino, C. Lucau, and P. Defourny (2007), A possibilistic approach to soil moisture retrieval from ERS synthetic aperture radar backscattering under soil roughness uncertainty, *Water Resources Research*, 43, W07435, doi:10.1029/2006WR005295.

Interactive comment on *Hydrol. Earth Syst. Sci. Discuss.*, 9, 2897, 2012.

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