

Model of the global distribution of the total electron content based on deep dense convolutional autoencoder

Khristoforov S., Bochkarev V.

Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

© 2018 Institute of Physics Publishing. All rights reserved. Nowadays the prediction of ionospheric parameters is an important and acute problem in the field of ensuring stable operation of radio communication and radio navigation facilities. The network of two-frequency GPS receivers data is used for monitoring the ionospheric condition. Based on these data, a number of laboratories are building global maps of total electron content (TEC). There are strong spatial and temporal correlations in the TEC maps. As a result, in order to successfully solve the problem of TEC prediction, it is advisable to perform preliminary processing of maps data with dimensionality reduction. In this paper, the problem of constructing a low-dimensional model of global distribution of the TEC is solved. In addition, the model of global distribution of the TEC can be useful for the ionosphere dynamics investigation. In this paper, it is proposed to use dense convolutional auto encoders as a base element of the model. This architecture allows us to speed up the neural network learning process and avoid the gradient-vanishing problem in error backpropagation algorithm.

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