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An empirical model of the Earth's bow shock based on an artificial neural network

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All of the past empirical models of the Earth's bow shock shape were obtained by best-fitting some given surfaces to sets of observed crossings. However, the issue of bow shock modeling can be addressed by means of artificial neural networks (ANN) as well. In this regard, here it is presented a perceptron, a simple feedforward network, which computes the bow shock distance along a given direction using the two angular coordinates of that direction, the bow shock predicted distance RF79
(provided by Formisano's model (F79)) and the upstream alfvénic Mach number Ma.
After a brief description of the ANN architecture and training method, we discuss the results of the statistical comparison, performed over a test set of 1140 IMP8 crossings, between the prediction accuracies of ANN and F79 models.