QUESTION ITU-R 236/3

Use of machine learning methods for radiowave propagation studies

(2023)

The ITU Radiocommunication Assembly,

considering

*a)* that the assessment and the modelling of the characteristics of the propagation radio channel require the identification of several key propagation parameters;

*b)* that in a number of cases the key parameter of the propagation radio channel is difficult to observe directly and must be inferred indirectly (i.e. retrieved) by measuring other observables;

*c)* that the number of observables can be large and the relationship between observables and the parameters of the propagation radio channel can be non-linear and not one-to-one;

*d)* that the uncertainty and the errors of methods used to measure the observables can significantly affect the accuracy of the process used to retrieve the key propagation parameters;

*e)* that in several cases propagation models are required to provide the statistical characterisation of the propagation parameter over a large probability range and for this scope it is required to collect and process large numbers of samples;

*f)* that in a number of cases propagation models use joint statistical distributions of many input parameters;

*g)* that the development of machine learning algorithms and dedicated hardware platforms may provide researchers the possibility to process large amounts of data from very different sources to extract information from measurements;

*h)* that the criteria for applicability of these tools to propagation models need to be studied;

*i)* that to develop propagation models which are statistically representative of all possible conditions of the physical process, the data used for model development and for model testing are required to be different;

*j)* that machine learning algorithms can be used as one of the methods for now-casting, short-term forecasting and prediction of parameters affecting the temporal evolution of the radio propagation channel;

*k)* that machine learning algorithms have been used for many years in developing radiowave propagation prediction methods and with the advances in computer technology there are many machine learning frameworks being made widely available,

decidesthat the following Questions should be studied

1 How to use machine learning techniques as an algorithm for developing radiowave propagation prediction methods?

2 How can state-of-the-art machine learning algorithms and frameworks be utilized for the development and the improvement of radiowave propagation models able to cope with complex scenarios and environments?

3 What are the procedures to ensure that a propagation model developed using machine learning algorithms is representative of all the possible conditions, in particular those not considered in the data set used to develop the model?

4 What are the characteristics of quality of input data to be assessed for the use in machine learning algorithms, in the analysis of measurements?

5 Which machine learning frameworks could be applied for radiowave propagation, with particular regard to the analysis of measurements?

6 Are there already examples of machine learning tools being used for radiowave propagation predictions? Which use cases have been dealt with so far?

further decides

1 that the results of the above studies (in particular for methods and data) should be included in ITU-R Reports, Recommendations and Handbooks, as appropriate;

2 that the above studies should be completed by 2027.

Category: S2