2020 ICCEM
24-26 August 2020
Singapore

A Wireless Propagation Model Based on Artificial Intelligence

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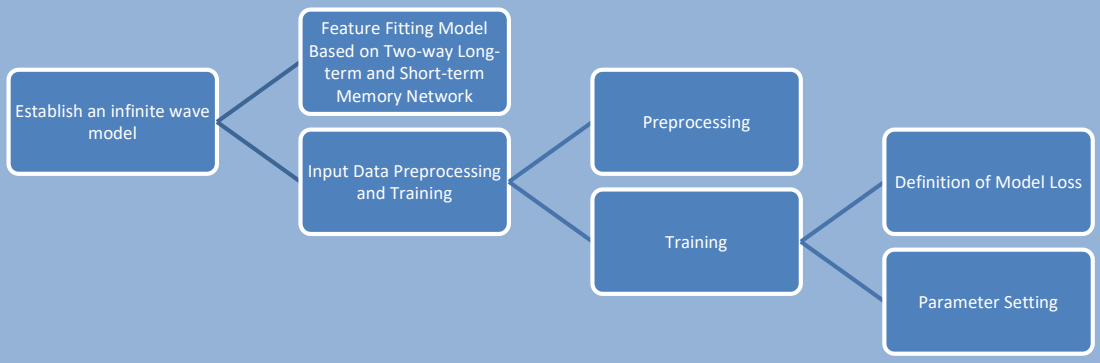
Abstract—with the rapid development of artificial intelligence (AI), machine learning technology also has the ability to perform online operations. Since electromagnetic waves are greatly affected by environmental factors during the propagation process, the existing wireless propagation models need to be further corrected by using a large amount of collected engineering data in practical applications, so a wireless propagation model based on machine learning need to be built, and the problem of the rational deployment of base stations can be solved.In order to obtain the propagation model that accords with the actual environment of the target region, this paper collects a large amount of additional measured data, engineering parameters and electronic maps to correct the propagation model after learning which is based on the traditional wireless propagation model .BiLSTM-based wireless propagation model is used to train and tune ,the RSRP of different geographical locations is predicted.

Introduction

The establishment of the propagation model can be regarded as a function fitting process . In the big data driven era of artificial intelligence (AI), the correction of the propagation model can be regarded as a supervised learning problem in machine learning. Therefore, how to use the large amount of data generated by the vast users by the method of machine learning to build a wireless communication model has great practical significance. Not only it is more in line with the target area, but it can reduce the network construction cost.

Establish an infinite wave model

This model designs and selects a number of related features for the prediction of RSRP values. It aims to find the implicit relationship between multiple features and RSRP to predict the RSRP value of unknown regions. The model mainly uses the selected multiple features as input, and uses a layer of bidirectional long-term and short-term memory (Bi-LSTM) network to capture the connection between input features. The final prediction result can be obtained through a layer of fully connected layers.



Training result

The results of the final verification set show that the three losses continue to decrease, and the effect of the model continues to increase, eventually reaching the optimal value of the model. The model predicted result is that the value of PCRR is 0.2371 and the value of RMSE is 10.4855.

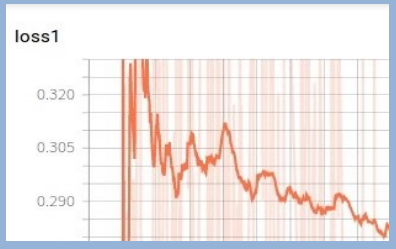


Figure 1 $loss_P$ with iteration change graph

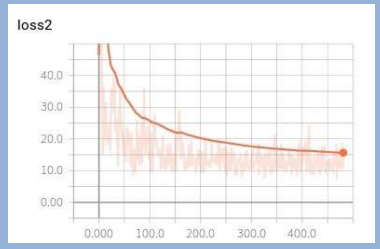


Figure 2 lossR with iteration change graph

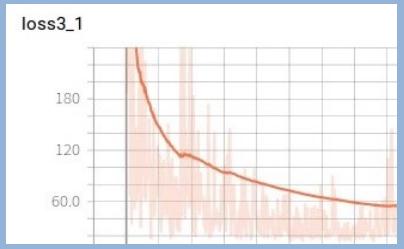


Figure 3 loss with iteration change graph

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