A High Accurate Traffic Prediction Based on Bidirectional Recurrent Neural Network and Long Short-Term Memory

Abstract:

Accurate prediction of the future network traffic plays an important role in various network problems (e.g. traffic engineering, capacity planning, anomaly detection…). Measuring all the network traffic is impossible or impractical due to the resource constraint as well as the dynamic of temporal/spatial fluctuations of the traffic. To this end, a common approach is to solve the traffic matrix interpolation using compress sensing and matrices completion. Currently, there are some studies exploiting Deep Learning techniques such as RBM or Recurrent Neural Network to estimate the traffic volume. However, as using simple models, their proposals reveal a poor performance regarding the traffic inference when the measurement data has a high missing rate.

In this paper, we propose a high accurate traffic prediction algorithm by leveraging the advantages of Long Short-Term Memory (LSTM) in the time series estimation and Bidirectional Recurrent Neural Networks (BiRNN) in tuning the samples. We evaluate our model based on the Abilene and GEANT dataset which contains the real traffic matrices. The experiment results showed that the proposed approach can achieve significantly better prediction accuracy in terms of several metrics such as error ratio, normal mean absolute error, root mean square error and R2-score, even when only 30% of the traffic flows in the network are measured.