Throughput Prediction with Support Vector Regression for 5G Network

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The development of 5G technology brings great convenience for human life, especially during the post-COVID period. It is promising to provide large-content, high-speed and low-latency service which can support the large amount traffic generated by the remote work and study, such as GIGA school. In many scenarios, it is essential to ensure the quality for content delivery such as 4K, 8K, VR, AR. Adaptive video streaming is one strategy to realize the quality of service. However, it is sensitive to network dynamics. Therefore, throughput prediction is significant to ensure high QoS/QoE in mobile network. Meanwhile, it can contribute to green and energy-efficient wireless communications by saving energy for content delivery, reducing packet loss and extra energy consumption. In this paper, throughput of 5G network is predicted by using support vector regression (SVR).

In our former work [1], SVR was applied for throughput prediction of LTE by using the historical data. In comparison, this work employs a public 5G dataset in [2] to conduct 5G throughput prediction. The data of historical throughput, RSRP, RSRQ, RSSI, SNR etc. are used to reflect the communication condition and to predict the future throughput. The historical data are input to SVR, and the SVR model is trained to figure out the relationship between the historical data and the future throughput. Then, the constructed model is utilized to predict the throughput. Pearson correlation coefficient of the ground truth value and predicted value are calculated to evaluate the prediction accuracy.

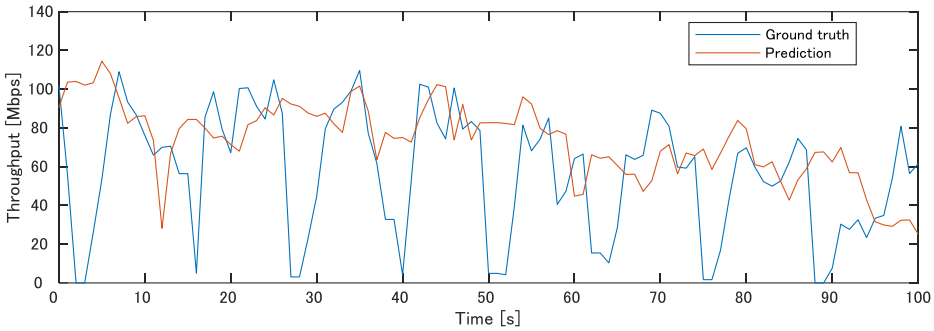

Figure 1. Ground truth throughput and predicted value.

Figure 1 shows one case of the measured throughput when the user is static. It can be observed that the 5G throughput fluctuates even in the static condition. This is considered to be the resource allocation of the base station. And SVR is utilized to predict the future throughput and the prediction result is shown in Figure 1. In this case, the Pearson correlation coefficient is 0.622 which means the predicted value is close to the actual one. It also can be observed that when the throughput changes suddenly, the prediction becomes difficult. Since the physical layer is the direct reflection of the environment change, in the future, more physical layer information will be taken into consideration when developing the prediction and network management technology.

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