SC19 Network Research Exhibition: Demonstration Preliminary Abstract

Traffic Prediction for Network Bandwidth

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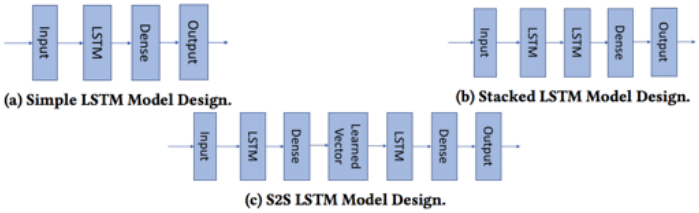
Abstract

Predicting traffic on network links can help engineers estimate the percentage bandwidth that will be utilized. Efficiently managing this bandwidth can allow engineers to have reliable file transfers and run networks hotter to send more data on current resources.

We will develop advanced deep learning LSTM based models as a library to predict network traffic for multiple future hours to predict traffic on network links. The figure below shows the current models we have implemented. For the demo we will be advancing these for processing smaller data sets and achieving better prediction accuracy.



The demo serves a number of purposes: 1) demonstrate a google map style for ESnet network and show red/yellow/green links when predicting future traffic patterns. 2) demonstrate our developed deep learning library which can train on minimum data set and produce future 24 hours traffic predictions as an easy plug-in capability. 3) demonstrate intelligent routing based on predictions rather than traditional network routing approaches.

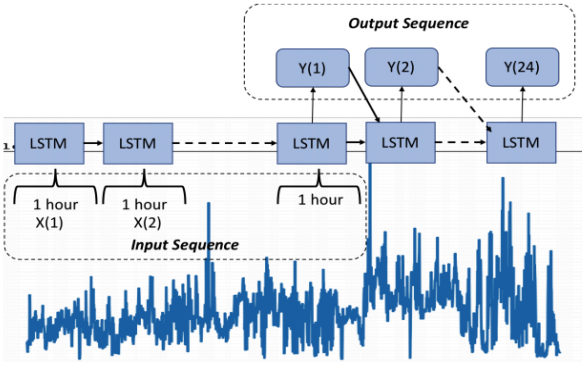


Figure: Machine learning for traffic prediction per link.

Innovation: Our demo findings have a number of implications for network prediction research and engineering community. It yields important decisions for deploying prediction tools with traffic monitoring tools and can have an immediate impact on network utilization of under-used paths. Aiding in dynamic routing decisions, improve traffic load, bandwidth capacity and eventually lead to capacity plans. Currently our methods are being optimized for next-24-hour prediction, and there is potential to extend the prediction period. We will improve the model with LSTM layers and nodes to remember patterns for longer. Deploying this in parallel with current traffic monitoring systems can be useful for decisions.

Goals

We will demonstrate traffic peak predictions multiple hours into the future on complicated network topologies for example ESnet. We will demonstrate how networks can be configured based on traffic rather than shortest possible route calculations and send more flows.

1. Demonstrate a Map style for ESnet network to create traffic patterns for sending flows between source and destination.
2. Attach Deep Learning models (LSTM-based architectures) to train and predict network traffic on limited data per link.
3. Demonstrate number of flows set and using network links to full capacity.
4. Present results for running networks hotter and utilize all current resources without capping bandwidth at 40% as currently done.

Resources

- Internet connection to access real network data. (We can also demonstrate this on live Scinet data if this is available.)
- Python toolkit for GUI and data processing.
- 16-inch Large TV screen to show the demo.

Involved Parties

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