Deep Learning Method in Forecasting

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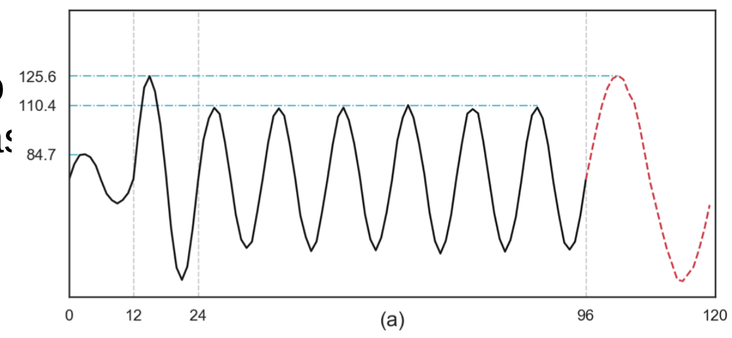
Project Overview

Forecasting is a common statistical task in business, where it helps to inform decisions about the scheduling of production, transportation and personnel, and provides a guide to short-term operations and long-term strategic planning. The goal is to predict the future as accurately as possible, given all the information available. Although locality and accuracy are two things we have to consider when using Machine Learning methods, because we have to deal with multiple and large data sources, scalability is also a challenge for us.



The project is to explore and implement deep learning methods in time series forecasting. It is part of **Forecasting Application Toolkit**, which will be a tool available to any IBMer in the product team via a public repository.

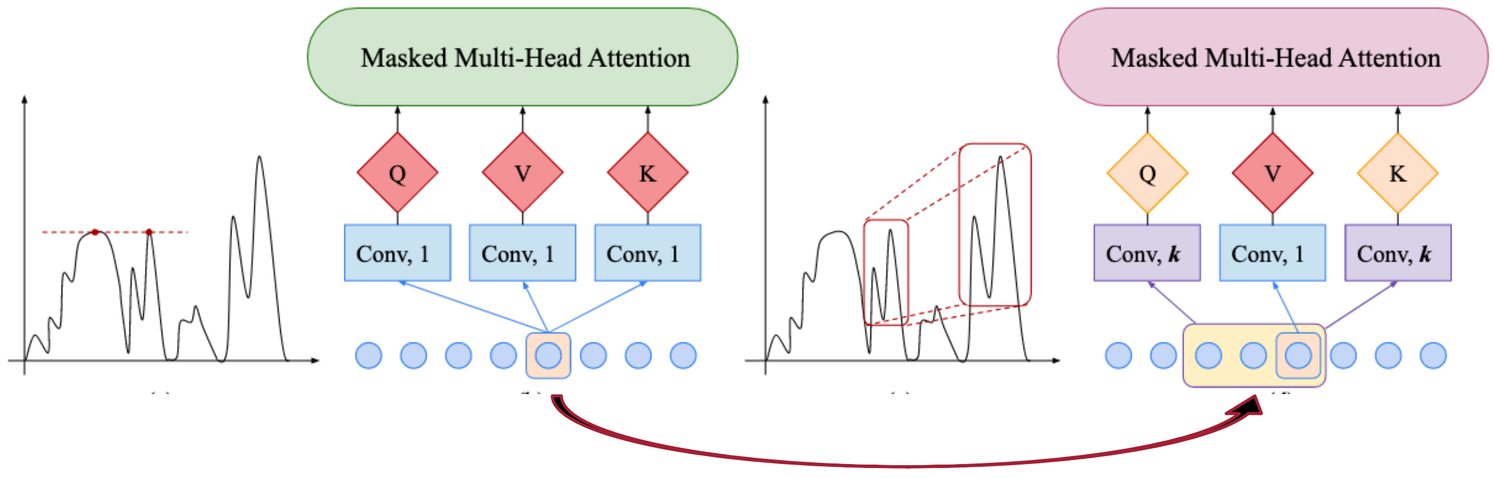
Relevant Link
1. https://otexts.com/fpp2
2. For the repository, please contact Brian Quanz, Slack: @blquanz

Current progress

We already implemented two deep learning methods: Temporal Convolutional Network with leveled initialization and Enhanced Transformer model.

TCN with leveled initialization:

The structure of TCN combined the advantages of Causal Convolution, Dilated Convolution and Residual Connections. It outperforms LSTM and GRU in lots of time series dataset. It can also save lots of memory.



Enhanced Transformer:

Compared to the old model, the locality can be captured

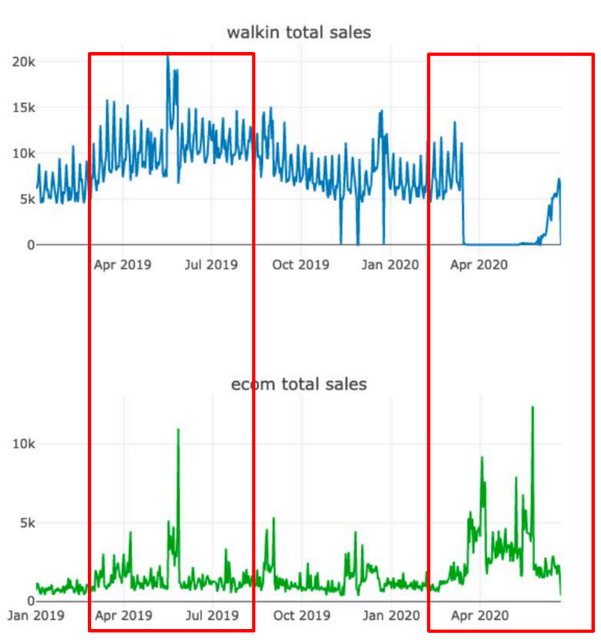
Relevant Papers
1. Think Globally, Act Locally: A Deep Neural Network Approach to High-Dimensional Time Series Forecasting, R. Sen, H. Yu, I. Dhillon.
2. Enhancing the Locality and Breaking the Memory Bottleneck of Transformer on Time Series Forecasting, S Li, X Jin, et al

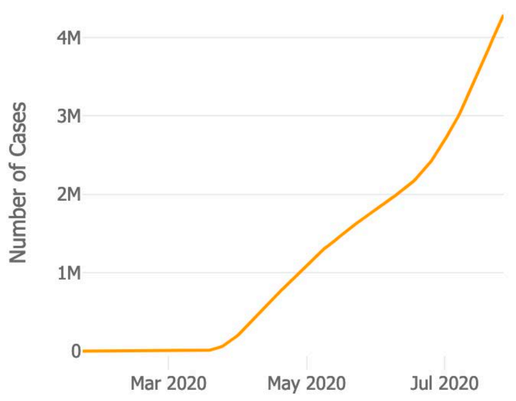
Open questions and future vision

Our next step is to apply our implemented methods and other deep learning methods to the real-world data, and record the predictive performance, for different setups.

The data we used:

- Sales data (in store/ online) in different location
- COVID case data
- other exogenous data like weather data.





COVID19 Cases

Source: https://coronavirus.jhu.edu/data/cumulative-cases

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