Basic forecasting of daily average temperature in Brazil cities

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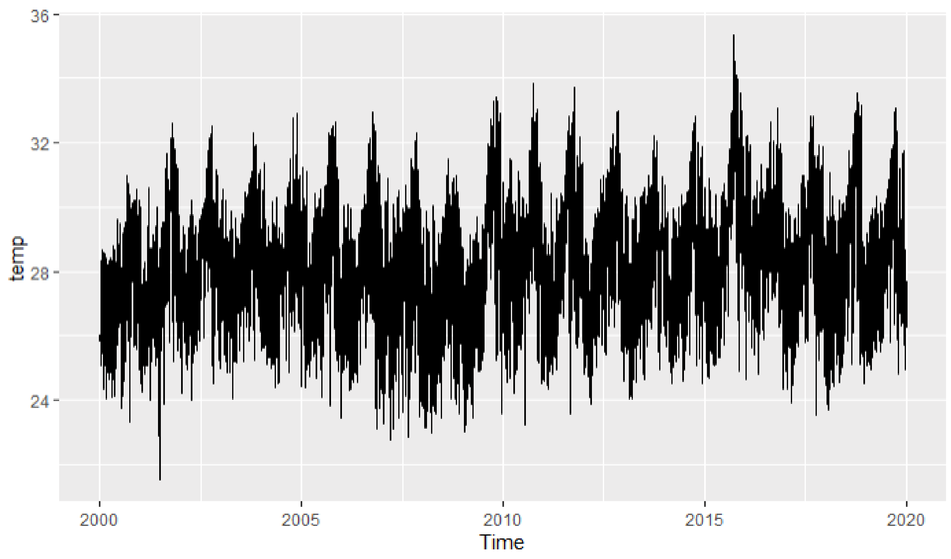
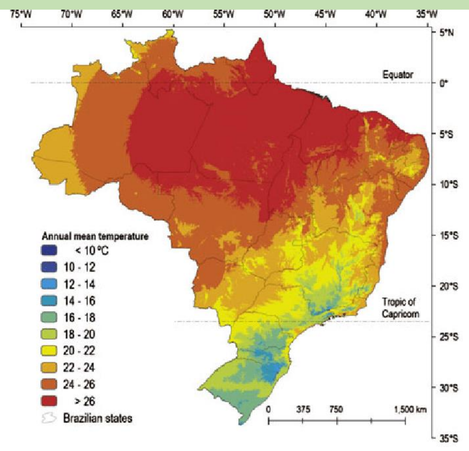


Project Introduction

- Climate change has dramatic impacts on temperature.
- Build basic models to forecast daily temperature based on historical data and other weather elements.
- Daily data from the National Institute of Meteorology - INMET distributed in the Brazilian territory, from 1961-2019.
- Daily temperature of Brazil's cities doesn't depend much on other weather elements.
- Other weather elements depend partially on daily temperature.

Executive Summary

- Global warming has negative influences on temperature-related practices.
- Normal daily temperatures in certain periods are not the same (after 2000 – before 2000)



- Agricultural practices and normal-life practices are affected by temperatures, humidity, atmospheric pressure, wind speed, and cloudiness.
- Measures from different stations have different problems with missing data to deal with.
- Forecasting model built from 1 city in Brazil might be used to forecast for nearby cities only.
- Long-term forecasting is better with deep learning models (RNN or LSTM).
- Short-term forecasting is better with basic forecasting models.
- Among 4 elements – Humidity, Atmospheric Pressure, Wind speed, Cloudiness - Humidity has the largest impact on daily temperature, wind speed has the smallest impact on daily temperature.
- Daily temperature increases slightly through time/
- Temperature doesn't depend strongly on other weather elements.
- More research is needed to find impact factors on daily temperature.

About the data

- The data obtained from INMET is very large and "messy". Data is measured from 265 different stations in different cities and regions in Brazil.
- Every day, data on temperature and weather factors are measured 3 times at 3 time frames.
- Measurements started on January 1, 1961 and ended on December 31, 2019. With 3 measurements per day, 265 stations, the amount of data from the INMET source is really huge.
- The team performed data cleaning by:

-take data every day by the average of 3 measurements per day

-deal with missing data by retrieving data of the same time frame on the previous or subsequent day

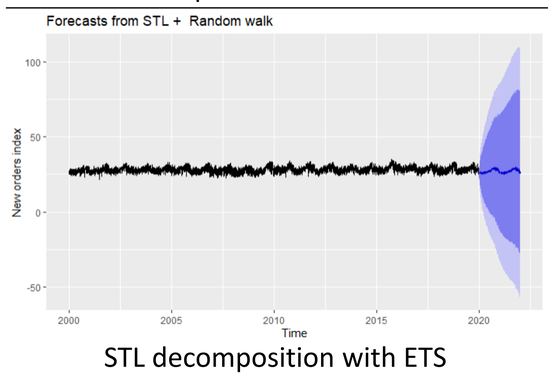
-select data from the most complete measurement station of the day

-handle leap years

-choose a reasonable period to include in training the predictive model

Forecasting results

STL decomposition with random walk



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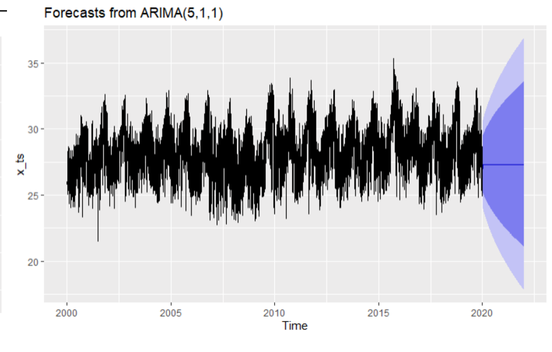
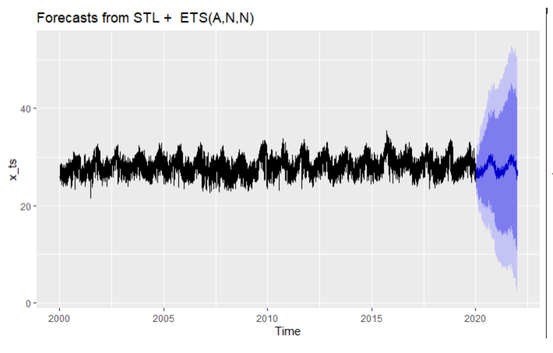


STL decomposition with ETS



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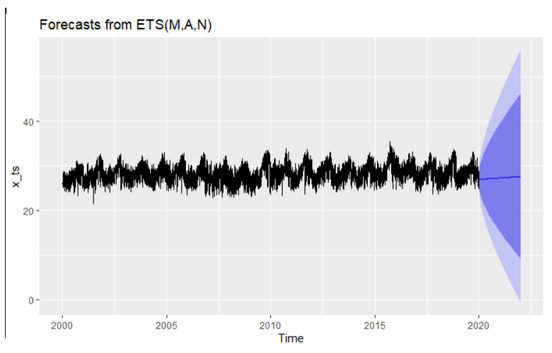

References

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