Predicting Peak Cherry Blossom with Autoregressive Models

Background

The scene of cherry blossom is mesmerizing enough for anyone to fall in love at first sight. Cities around the globe famous for cherry blossom scenery are always anticipating an accurate prediction of the peak blossom of their beloved flowers. Our goal here is to build a simple but effective time series model to make such predictions in the big picture of global warming.

Data

The following elements are taken into consideration when we prepare the data:

- The geolocation of cherry blossom varies. Even cities at the same latitudes across continents could have distinguishing climates. And we all know temperature plays a vital role in cherry blossom. Therefore, we try to build the model based on the historical blossom date and the temperature.
- The temperature and peak blossom date after 1980 are used in model training due to the increasing impact of global warming.
- Even though the temperature data of Vancouver are available, the missing of its blossom date makes the prediction pretty hard. This does not mean the Vancouver residents do not appreciate the beauty of cherry flowers, but because the city has an enormous amount of different cherry flowers. Hence, the "actual peak blossom date" is tough to define. Therefore, we use the very straightforward approach to predict the blossom date by taking the mean of the other three prediction candidates.

The competition provided the historical blossom dates. The average maximum temperature of Spring (January to March) is extracted from the National Oceanic and Atmospheric Administration through the package `rnoaa`.

Method

The model we selected is $AR(3)$ which is defined as:

$$X_t = c + \sum_{i=1}^{3} \phi_i X_{t-1} + \epsilon_t$$

where ϕ_1, ϕ_2, ϕ_3 are parameters, c is a constant, and ϵ_t is the white noise term. The term X_t is the t-th record of blossom date in the time series.
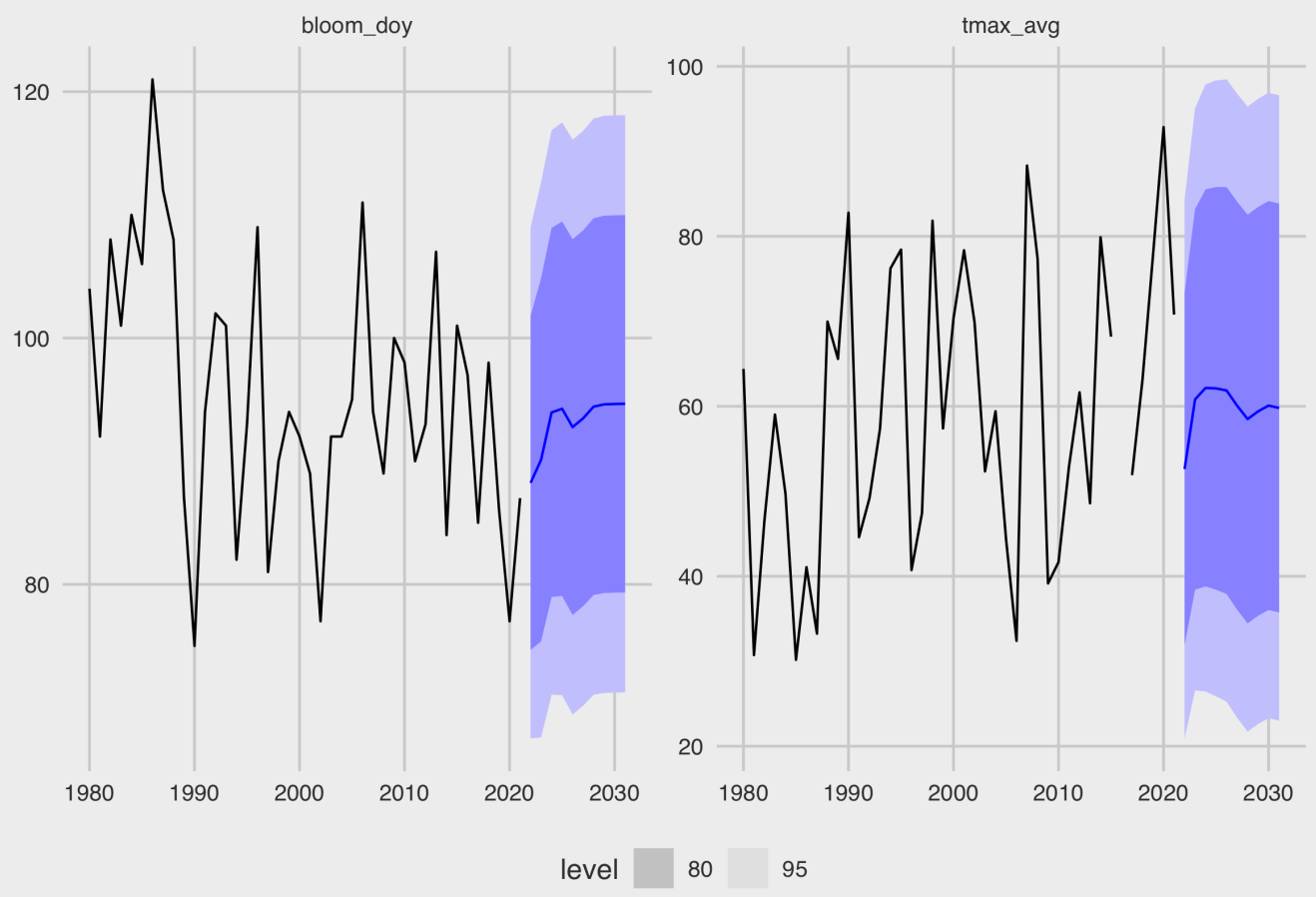
Predictions

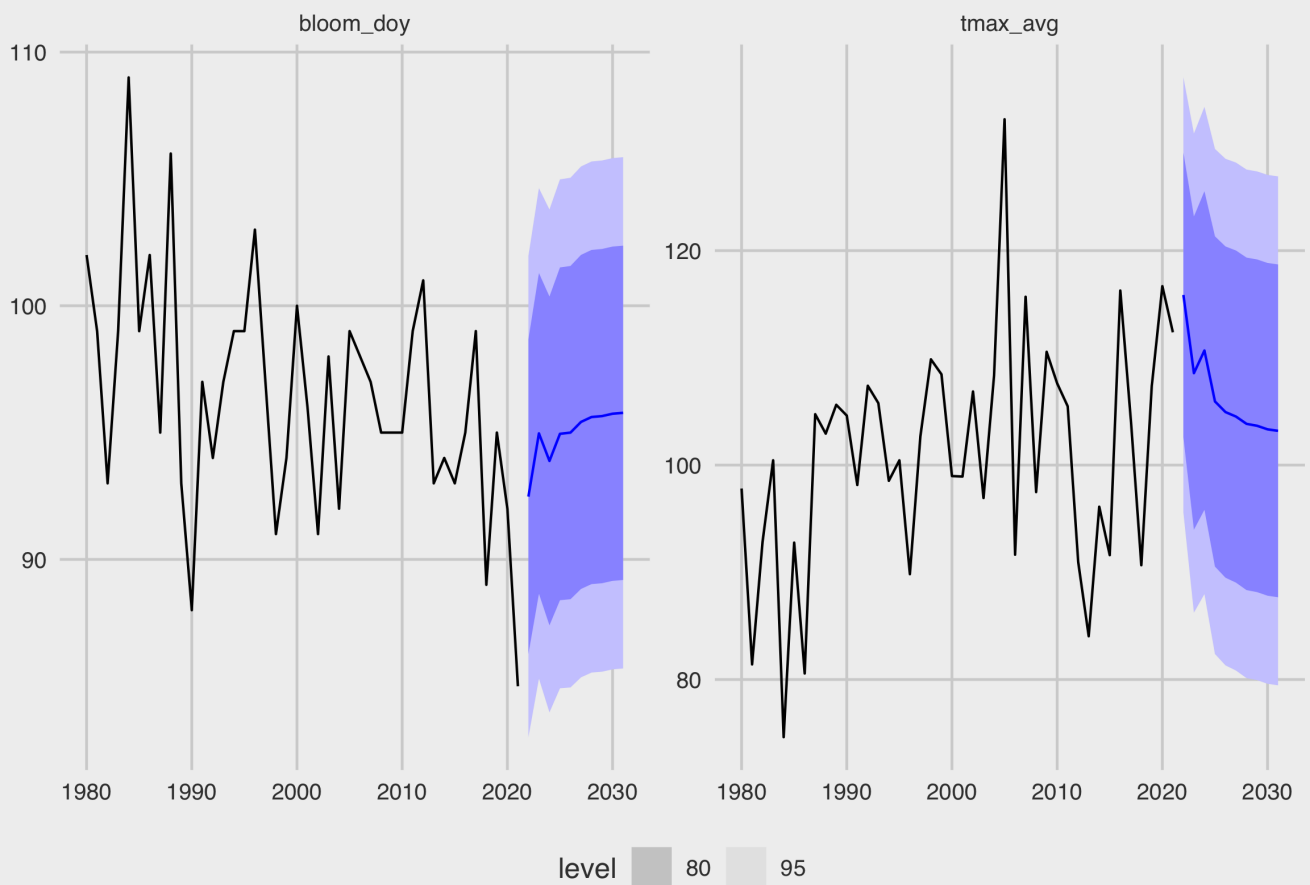After fitting in the model, the predictions are generated almost automatically.

Some quick visualizations are plotted for better understanding our predictions:
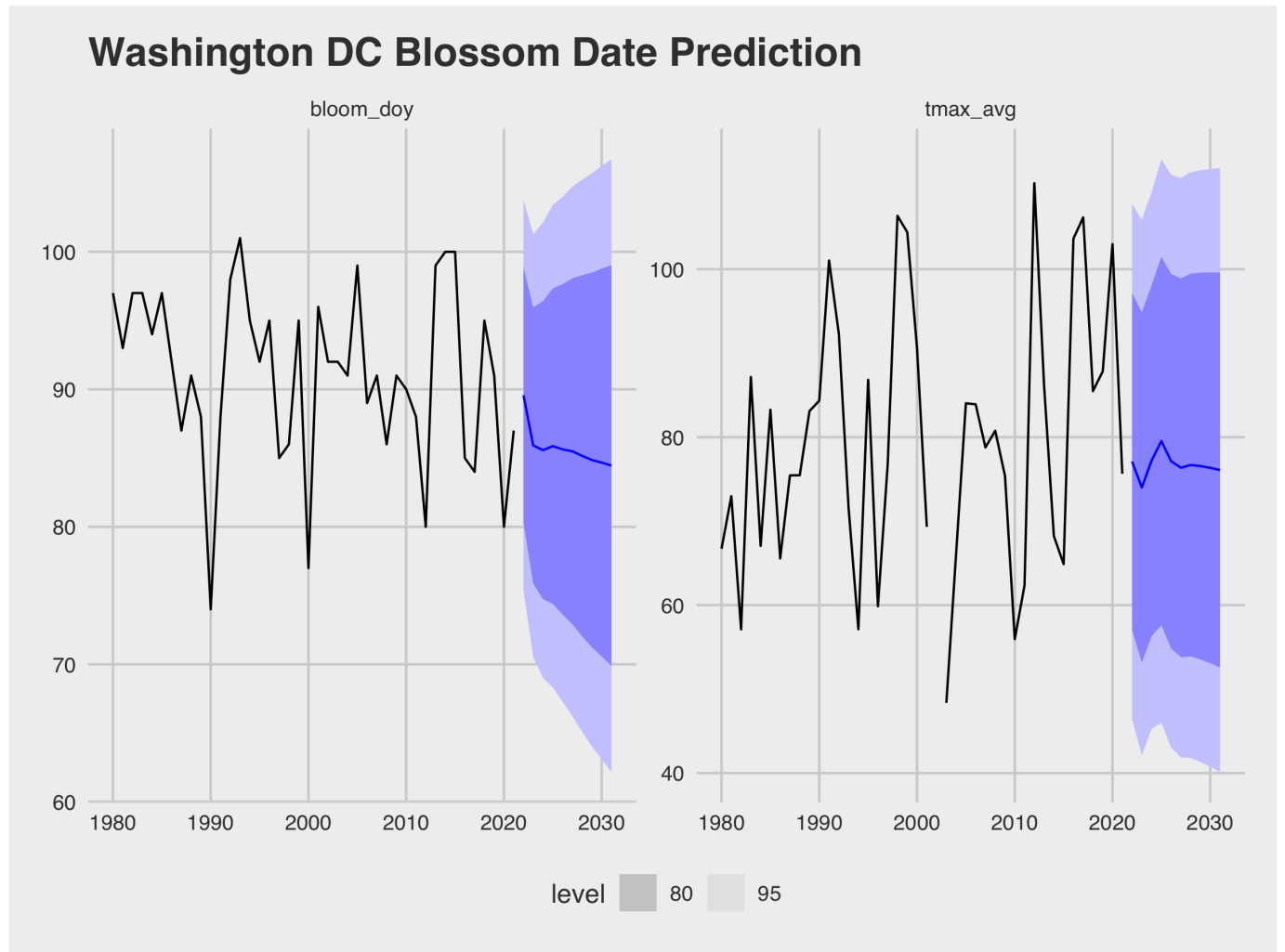
Liestal Blossom Date Prediction

More

The predictions are built upon a straightforward model, and we all know things are much more complicated in this world. Some things could be easily predicted, like tomorrow's rising sun. At the same time, we couldn't foresee everything, like people's misfortune and suffering. We wish there could be no more wars in the world by the next cherry blossom so that everyone could take a moment of peace to appreciate the gift by nature.