Exercise 2.3: Complex Machine Learning Models and Keras Part 2

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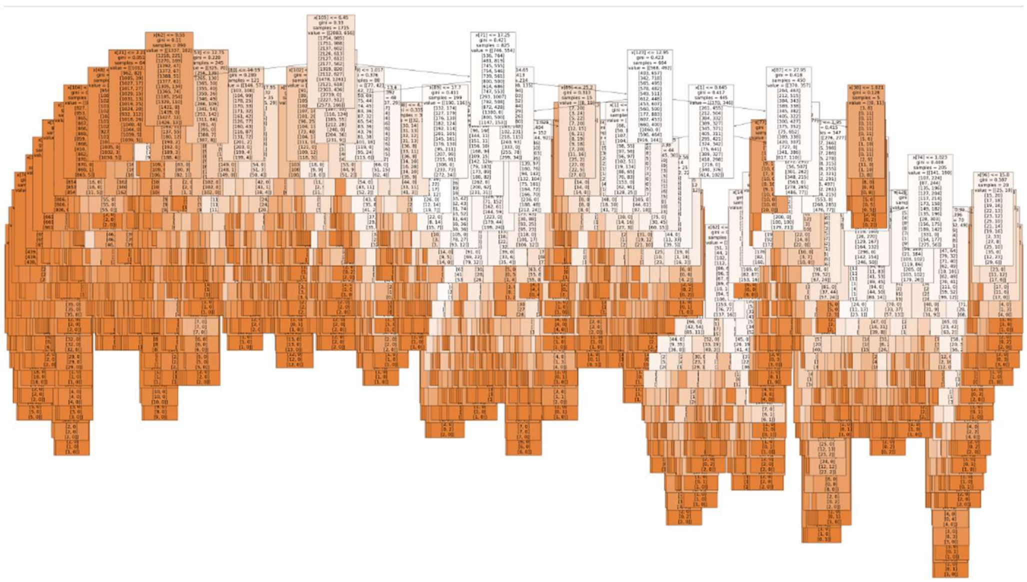
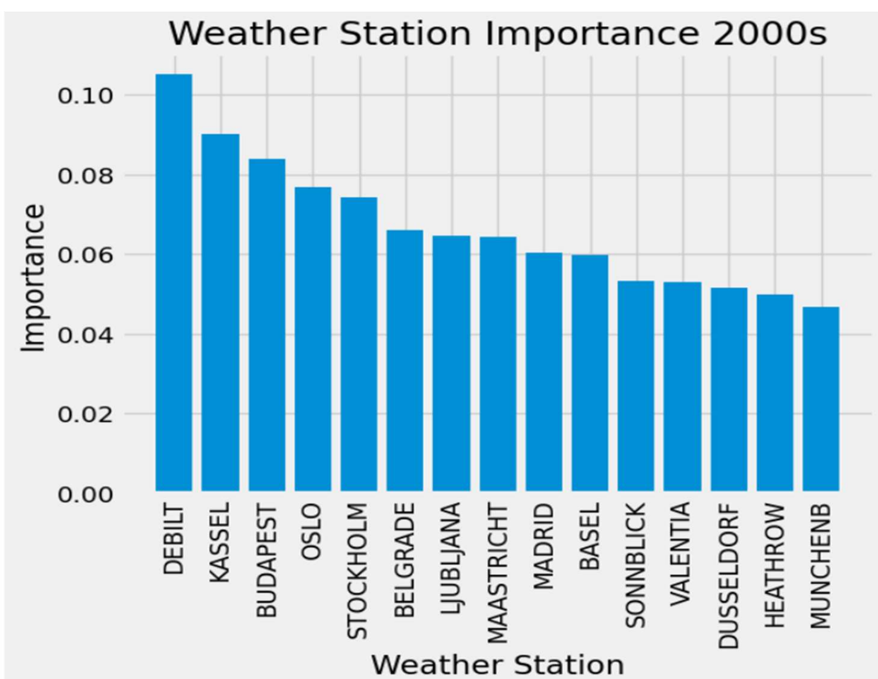
1. Random Forest Model for all the stations

The data was reduced to a single decade: the 2000s. With n_estimators = 100 and automatic max_depth, the accuracy is 37.7%. However, the np.argmax() method was not applied, but all 15 columns in the y array were kept instead. The outcome shows a more complex decision tree.

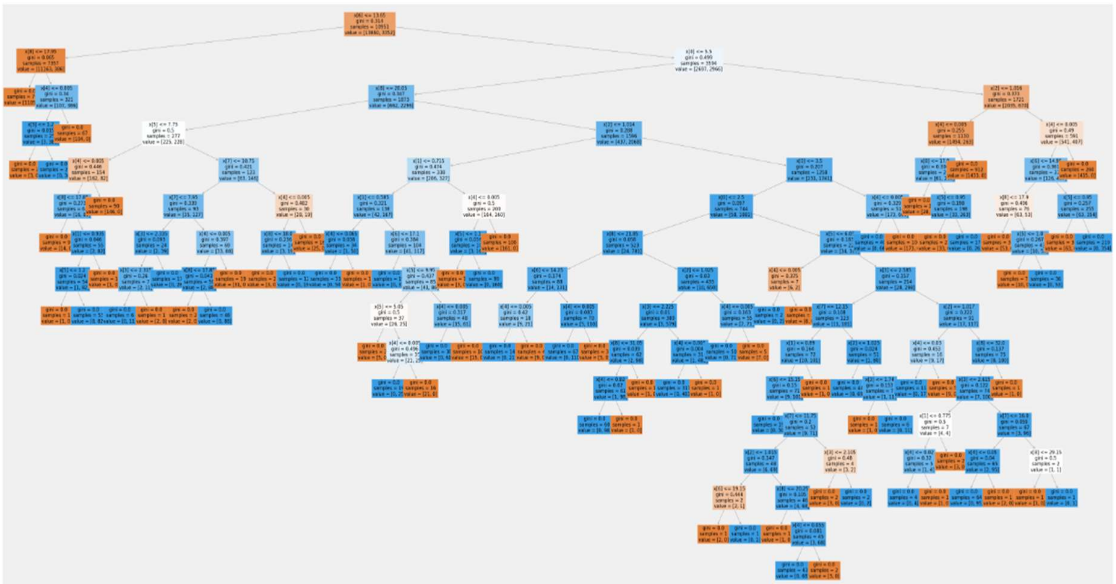


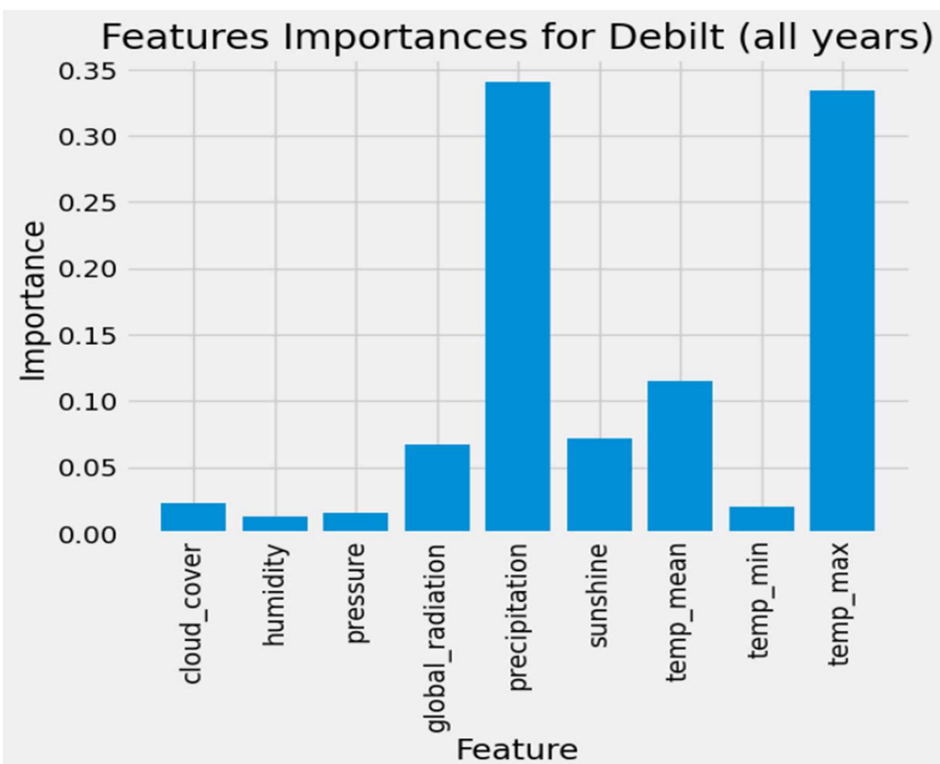


The above chart shows that DEBILT, KASSEL, BUDAPEST, OSLO and STOCKHOLM are the most important futures in the outcome.

2. Thereafter, 3 stations were chosen for another round of random forest model and were created, using data from every year in the observations set.

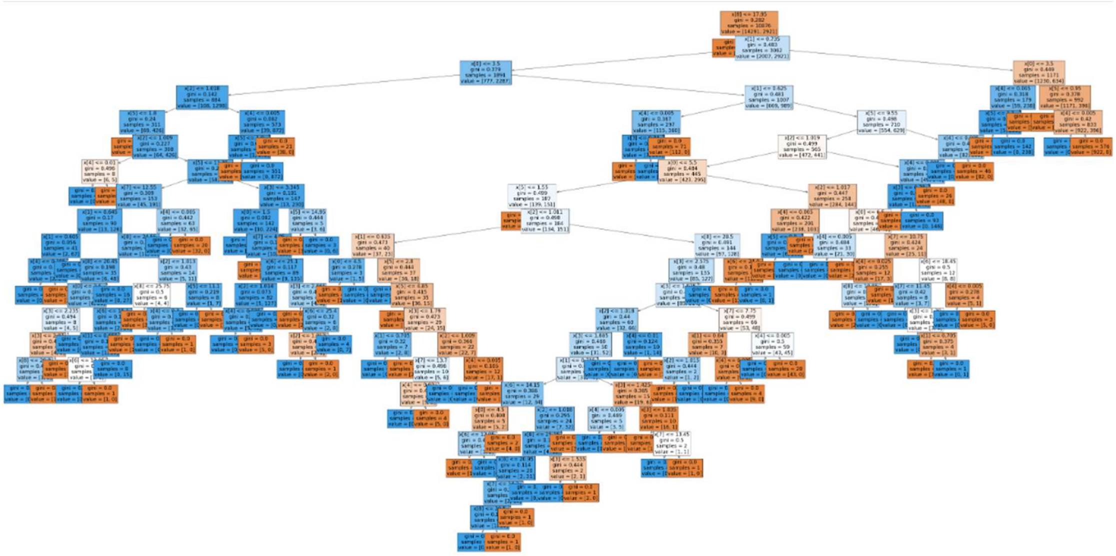
A. DEBILT Results

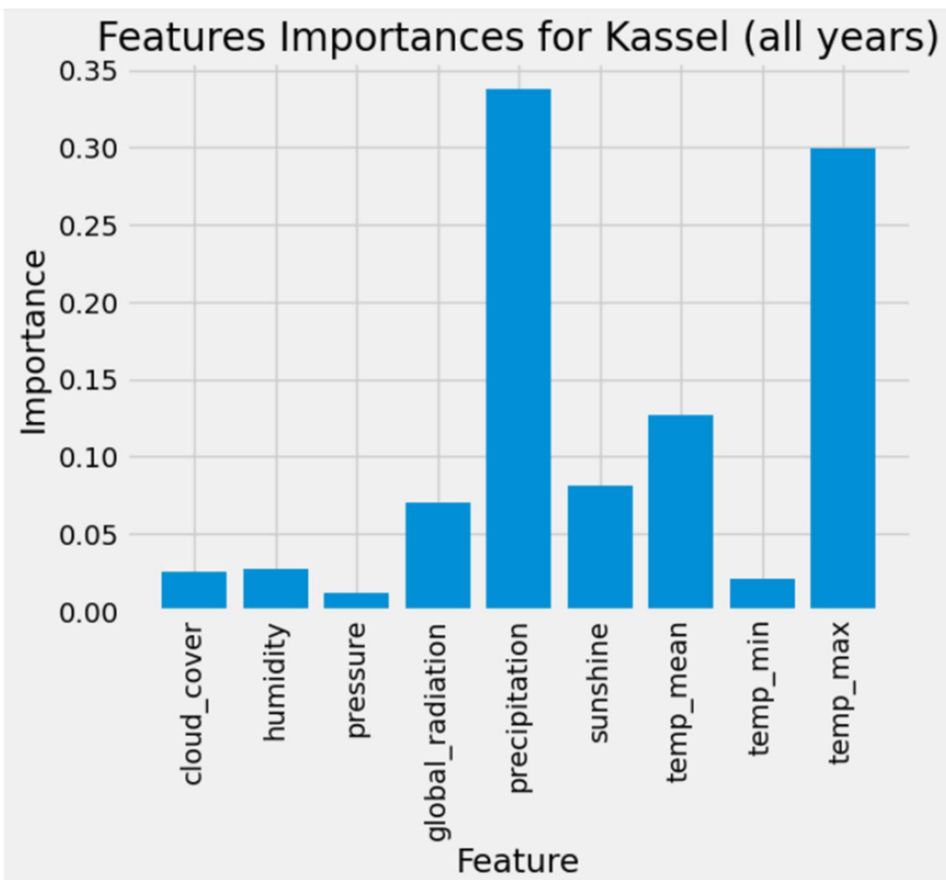




With n_estimators = 100 and automatic max_depth, the accuracy comes out at 100%. The 3 most important indicators are (in descending order): precipitation, temp_max, and temp_mean.

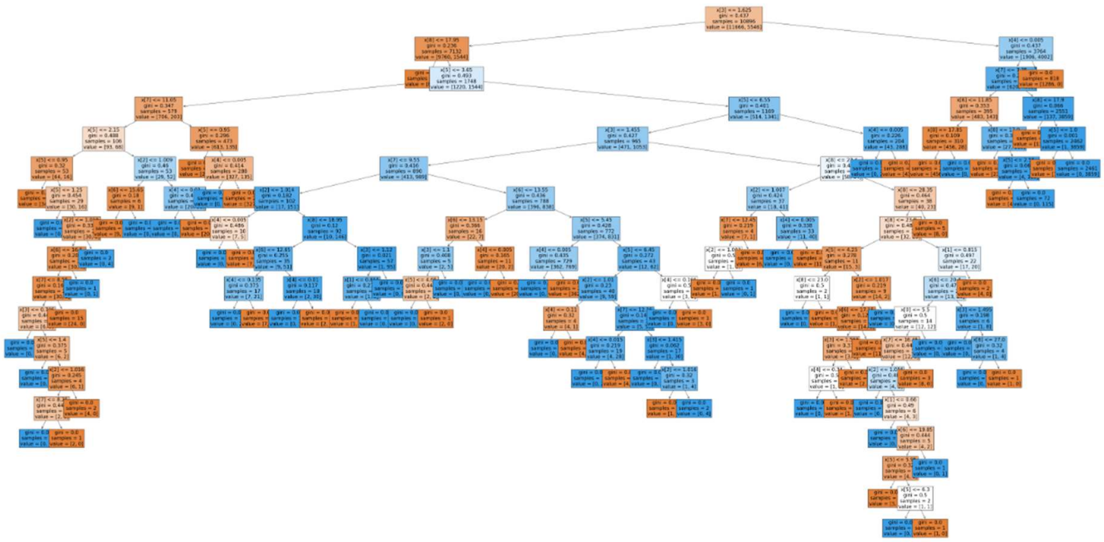
B. KASSEL Results

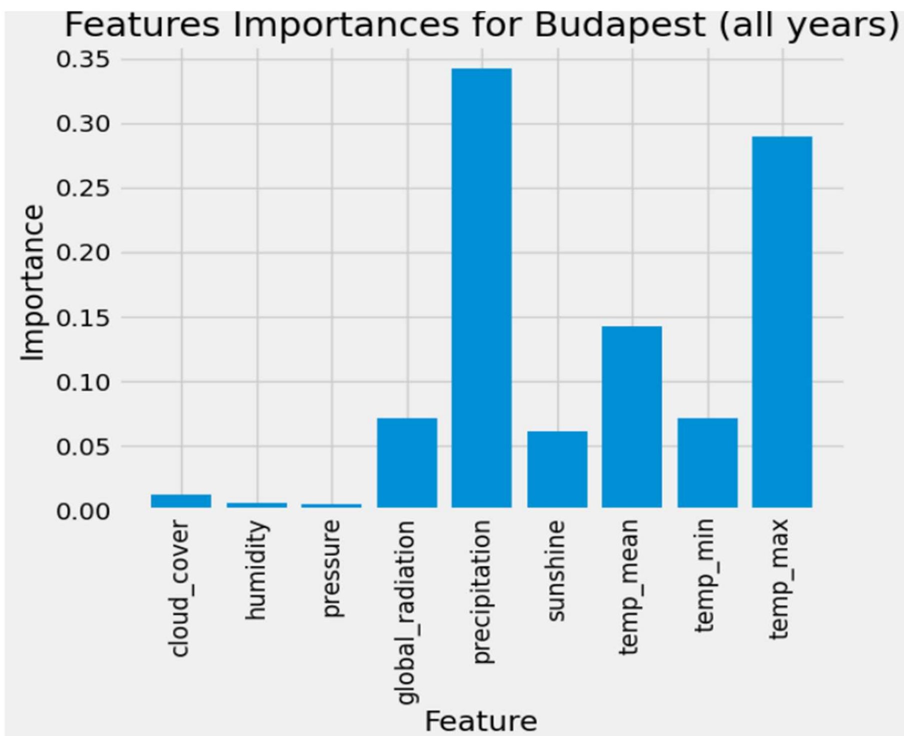




With n_estimators = 100 and automatic max_depth, the accuracy comes out at 100%. The 3 most important indicators are (in descending order): precipitation, temp_max, and temp_mean.

C. BUDAPEST Results





With n_estimators = 100 and automatic max_depth, the accuracy comes out at 100%. The 3 most important indicators are (in descending order): precipitation, temp_max and temp_mean.

Conclusions

The persistent significance of precipitation and maximum temperature across all analysed weather stations indicates that these factors will be crucial in forecasting and adapting to future climate variability. Furthermore, given the increasing trend in average temperatures over time, which corresponds with global climate change, it is imperative to prioritise temperature-related indicators such as temp_max and temp_mean in conjunction with precipitation. We expect increased frequency and intensity of elevated maximum and average temperatures as global temperatures rise, impacting not only heat waves but also other meteorological events like droughts, storms, and changes in precipitation patterns. Indeed, increasing temperatures may exacerbate precipitation events in certain areas while diminishing rainfall in others, rendering precipitation monitoring crucial for comprehending local effects. Consequently, investing in climate-tracking instruments for monitoring temperature and precipitation is essential for ensuring readiness for changing weather patterns.