

## Exercise Sheet 12 @‘Applied AI Using R’

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This is the last exercise sheet of the semester. We work with timeseries and again very hands-on.

### Exercise 48.

Do the exercise on slide 20 of Unit 11, i.e. forecast one ATM with classical decomposition and linear trend plus seasonality.

### Exercise 49.

Use the `vic_elec` dataset of the `{tsibbledata}` package and look up the documentation for it.

1. Keep only the data from 2014 to 2015.
2. Plot the autocorrelation function. How do you interpret the ACF? What periodicity  $k$  would you guess?
3. Compute the classical decomposition with the chosen seasonality (use `classical_decomposition(Demand ~ season(123))` for a seasonality of 123 time points) and plot it.
4. Use a linear model for trend and season and forecast the demand for 336 time steps.

### Exercise 50.

Download the cinema sales time series from <https://ufile.io/4fq1gwx6> and parse it into R.

1. Plot the autocorrelation function and guess the periodicity of the seasonality.
2. Read up on the documentation: What would the argument `type = "multiplicative"` for `classical_decomposition()` do?
3. Compute the classical decomposition for the additive and the multiplicative model. Which one would you prefer?

### Exercise 51.

Answer the following simple questions.

1. How can we transform a multiplicative decomposition model into an additive decomposition model?
2. Discuss the potential impact of outliers in the time series on the classical decomposition.

3. In what scenarios might a multiplicative decomposition model be preferred over an additive model?
4. How would you interpret the autocorrelation function regarding short-term vs. long-term dependencies?