Algorithmic Data Analysis (ADA)
Spring 2024
Coding Assignment #3: Mining temporal data – Transforms
Initial submission on 14.02.24 at 23:59, then revisions weekly on Wednesdays

Please carefully read and follow the general instructions regarding coding assignments. Failing to meet the requirements might lead to penalties. `https://elearn.uef.fi/mod/page/view.php?id=248672`

If you suspect that something is wrong with some task instructions, please contact the lecturer.

If you face persistent issues while working on a task, do ask for help, e.g. during a course meeting or by contacting the lecturer via email.

Task 1. Implement a function to compute the discrete wavelet transform of a time-series.
You should provide functions to compute

- the weights of the decomposition,
- the corresponding matrix of basis vectors,
- the approximated time-series when retaining only a chosen number/fraction of weights with largest normalized values, and
- the corresponding ratio of energy from the original time-series retained in the approximate time-series.

Download some local weather observations, such as air temperature, precipitation intensity, wind speed, cloud amount, etc., from the Finnish Meteorological Institute (`https://en.ilmatieteenlaitos.fi/download-observations#!/`).

Apply your algorithm to compute the discrete wavelet transform of the time-series representing the different weather variables.

Compare to the decomposition obtained with the discrete Fourier transform (computed using the `numpy.fft` package).

Discuss the suitability of either decomposition for the different weather variables, and report on the observed behaviors.