SoSe 2020
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Optimization and Data Science
2. Homework exercises

Programming exercise 1:
The file dax_data.txt contains the daily DAX (German stock index) opening value from 10.04.2001 to 09.04.2020.

a) *Use DFT and iDFT to approximate these data using one, five and ten (of the biggest) Fourier coefficients and plot these three approximations together with the DAX data.*

b) *Determine how many (of the biggest) Fourier coefficients you have to use to approximate the DAX data so that the absolute difference between the approximation and the data averaged over all days is at most one hundred.*

c) *Plot the five periodic signals resulting from the five biggest Fourier coefficients togehter with the DAX data.*

Programming exercise 2:
The file easter.png contains an image in png format.

a) *Use DFT and iDFT to approximate this image using 10%, 1 % and 0.1% of the (biggest) Fourier coefficients and plot the three resulting approximated images.*

b) *Determine how many (of the biggest) Fourier coefficients you would use to get a good compromise between a low number of coefficients and a still recognizable picture.*

You may use a library routine for DFT and iDFT and do not need to implement them by yourself. It is recommended to use the programming language Python with the packages NumPy, SciPy and Matplotlib. However, you can also select another language.

The solutions of the theoretical exercises will be discussed on 20. April 2020.