

Computational Physics II

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Project 4, due April 14, 2021 at 11:55 pm

to be uploaded to <https://moodle.jacobs-university.de>



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4. Discrete Fourier Transform (DFT) [100 points]

Generate a program code for the DFT of one-dimensional data:

1. Test the program by transforming a Gaussian function. Describe differences as well as similarities between input and output function. The Fourier transform should also be of Gaussian shape. Plot your initial data as well as the DFT results.
2. Compare the initial data with the back transform, i.e., do one forward and one backward transformation, for the function

$$f(x) = \sin^2(x) * e^{-(x-\pi/2)^2}.$$

General remarks for all Projects

You will have to (i) analyze the problem, (ii) select an algorithm (if not specified), (iii) write a Python program, (iv) run the program, (v) visualize the data numerical data, and (vi) extract an answer to the physics question from the data.

Which checks did you perform to validate the code? State the results you got for these tests.

For each project you will submit a short report describing the physics problem, your way of attacking it, and the results you obtained. Provide the documented Python code in such a form that we can run the code. A Jupyter Notebook including the code and report is fine but not necessary.