

Forschungspraxis, Bachelor's Thesis

# Capacity Bounds for Time and Bandwidth Constraint Transmissions

In Shannon's paper [1], where the sphere packing bound is introduced, it is outlined how to calculate the finite block length capacity for a Gaussian channel if the required parameters are known. However, the transmit waveform is allowed to have infinite duration. We want to examine what happens when we introduce constraints on the energy concentration of the waveform, i.e., most of its energy is concentrated in a time interval  $T$  and a bandwidth  $W$ . The problem of the maximal energy concentration was solved in [2]. We want to find upper and lower bound for the finite block length capacity with these constraints.

[1] C. Shannon, "Probability of error for optimal codes in a Gaussian channel", The Bell System Technical Journal, 1959

[2] D. Slepian, H. O. Pollack, H. J. Landau, "Prolate Spheroidal Wave Functions, Fourier Analysis and Uncertainty I-V", The Bell System Technical Journal, 1961-1978

## Prerequisites

- Digital Communications, Digital Communications II
- Information Theory
- Python/MATLAB

## Contact

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## Advisors

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