

PSYC 315 – Introduction to the Analysis of Psychological Signals Winter 2023

Objectives

The objectives of this course are to (1) introduce the student to basic techniques for the quantitative analysis of time-varying signals and (2) teach the student how to apply these techniques using MATLAB, the most commonly used high-level computing language used in science and engineering. Emphasis will be placed on methods appropriate to the psychological research environment. The theoretical background for each technique will be presented briefly, but the major stress will be on the application to various Dates Date

Week 1	No labs	Jan 8, Jan 10	Introduction	Jan 11
Week 2	Matlab basics	Jan 15, Jan 17	1st Matlab lecture	Jan 18
Week 3	Matlab Assignment 1 (Due Feb 2)	Jan 22, Jan 24	2nd Matlab Lecture	Jan 25
Week 4	Matlab Assignment 2 (Due Feb 9)	Jan 29, Jan 31	Basic Statistical Tools	Feb 1
Week 5	Basic Statistical Tools Assignment 3 (Due Feb 16)	Feb 5, Feb 7	Amplitude Structure of Signals	Feb 8
Week 6	Amplitude Structure of Signals Assignment 4 (Due Mar 1)	Feb 12, Feb 14	Frequency Representation of Signals	Feb 15

Week 7	Frequency Representation of Signals Assignment 5 (Due Mar 8)	Feb 26, Feb 28	Filtering
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Probability distributions, probability densities, joint probability distributions; statistical independence; Gaussian distribution and its properties; rectangular, exponential, Poisson, and chi-square distributions; amplitude histograms; identification of distributions.

Frequency Domain Representation of Signals

Periodic signals; Fourier series; discrete Fourier spectra; the Fourier transform; power spectra.

Filtering

Types of noise; lowpass, bandpass, highpass and bandreject filters; Bode plots; cut-off frequency and roll-off; analog filters; digital filters: frequency domain implementations, FIR filters, recursive filters.

Sampling Considerations

Digitization, sampling, and quantization; Shannon-Nyquist sampling theorem; aliasing; Nyquist frequency; quantization theorem; analog

will be provided with data sets that they will analyze and report (using plots, tables and text as appropriate).

In addition to the assignments, each student will complete a final project that will involve the collection, analysis, and evaluation of data using techniques they have learned in the course.

Evaluation

Evaluation will be based on assignments and projects. The assignments will be graded out of 10 and will be worth a total of 80% of the grade. The final project will be worth 20% of the grade.

Note that the assignments for a given week are due at the start of the lecture the following week. The assignment for the coming week will be given out in the lecture.