# Topics

Each of you will create one Jupyter-Notebook with exemplary code that musicologists can copy-paste in the future.

Themen 2 LP

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| Focus Area | Topic | Inhalt |
|  | Import audio files | Import audio files including information on format, number of channels, sample rate, bit depth, and the option of resampling |
|  | Lists | Create, manipulate and display lists, incl. append(), clear(), count(), insert(), index(), pop(), remove(), sort(), reverse(), … |
|  | Arrays | (numpy), creation methods (np.array(), np.zeros(), np.ones(), np.empty(), …), manippulations (transpose, reshape, sort, append, insert, ndim, min, max, clip, total, …) convert lists into arrays |
|  | Read and write CSV files | Export a list or an np.array to a csv file with a desired file path and file name, and optional cell delimiter, import csv file as np.array |
|  | Calculations | Calculate and plot square root, exp, logarithm, sin, cos, tan, cot, acos, asin, atan, sinc, sinh, cos, tanh function |
|  | Plot | Simple plots with Matplotlib and Plotly |
|  | Conditions | >, <, <= , >=, ==, !=, is, is not, or, and, not, if, elif, else, pass, nested statements |
|  | Strings | How to work with strings, filepaths, what are escape sequences, single and double quote, r’, f’, |
|  | Loops | For-loop, while loop, break, continue, range(), nested loops, pass, else |

Themen 8/10 LP

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| Schwerpunkt | Thema | Inhalt |
| Acoustics/  Ethnology | Interval calculation | Calculation of intervals in cents, musical intervals and pitch names in different temperaments (just intonation, Meantone temperament, Pythagorean, Well temperament, Werckmeister temperament, …), for a standard pitch of 440 Hz, |
| Acoustics | Fourier Transform | Calculate and plot Fourier and inverse Fourier transform, windowing functions, frame size |
| Psychology / Music Industry | Basic Statistics | Count frequencies, calculate min, max, arithmetic mean, geometric mean, median, mode, root mean square, harmonic mean, standard deviation, variance, skewness, kurtosis, quartiles, 95th percentile from one or multiple np.arrays and produce a boxplot |
| Psychology | ANOVA | Test of normal distribution, mean values, standard deviation, significance level, effect size, statistical power, Tukey post hoc test including visualizations |
| Psychology | Linear Regression | Least squares fitting and Theil–Sen estimator, calculate and display coefficients, R², visualize functions and scatter plot |
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|  | Plotly | Plot line charts, scatter plots, heat maps, add error bars, legend |
|  | Matplotlib | Plot graphs, scatter plots, bar diagrams, pie charts, define and modify axis labels, tick marks, plot style, markers, text, add a legend |
| Machine Learning | Classifier | Random forest, support vector machine, multi layer perceptron, naïve Bayes, convolutional neural network |

Themen 15/20 LP:

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| Focus Area | Topic | Content |
| Acoustics | Wavelet-Transformation | Mother wavelets (Mexican hat, sinc, Morlet, …) forward and inverse wavelet transform, import audio, plot graphic, arrays, convolution (calcuklate and visualize as Topographical 3D Surface Plot or Heatmap, plot on linear and logarithmic frequency scale, linear and logarithmic amplitudes |
| Acoustics/  Psychology | Psychoaocustic models of roughness | Implement psychoacoustic models of roughness by Aures, Marc Leman, Daniel & Weber |