

Day 1	<p>Numpy, Pandas, & Experimental events</p> <ul style="list-style-type: none"> • Numpy <ul style="list-style-type: none"> – Data structures (arrays, record arrays, matrices) & data types – copying vs. references/views – convenience functions for manipulating arrays (reshape, transpose, concatenate, ...) – loops vs. vectorized functions (focus on functions for descriptive stats and matrix algebra). – broadcasting – Boolean operators – fancy indexing • Pandas <ul style="list-style-type: none"> – Series and DataFrames. – Indexing and selecting – Missing data – Combining and manipulating data sets – Aggregation and grouping, pivot tables – High performance Pandas • Experimental events <ul style="list-style-type: none"> – Finding and reading experimental events – Basic analyses on response data.
Day 2	<p>Analyzing EEG data I</p> <ul style="list-style-type: none"> • Intro to PTSA <ul style="list-style-type: none"> – TimeSeries data structure – loading EEG data – saving and loading TimeSeries (HDF5 files) – filtering and resampling • Conceptual issues <ul style="list-style-type: none"> – referencing schemes – sampling rate and properties of the EEG signal – specific issues for scalp vs. intracranial EEG data – electrode locations • calculating and plotting ERPs <ul style="list-style-type: none"> – What are ERPs? – baseline normalization – signal vs. noise – “famous” ERP components₁ – ERP & basic plotting demos.

Day 3	<p>Analyzing EEG data II</p> <ul style="list-style-type: none"> • Time-frequency decomposition <ul style="list-style-type: none"> – FFT – Power & phase – wavelet transforms – normalizing data – features of the EEG spectrum • parametric univariate stats <ul style="list-style-type: none"> – logic of NHST – <i>t</i>-tests – regression – ANOVA • dealing with multiple comparisons <ul style="list-style-type: none"> – conceptual issues – FWE vs. False discovery rate – Benjamini-Hochberg procedure
Day 4	<p>Practical issues</p> <ul style="list-style-type: none"> • Non-parametric univariate stats <ul style="list-style-type: none"> – randomization tests – bootstrapping – using randomization tests to control the FWE • Plotting <ul style="list-style-type: none"> – vectors vs. bitmaps – basic standard plot types – color maps – topoplots – brain plots • Artifacts <ul style="list-style-type: none"> – artifacts in EEG data – ICA – lab's artifact removal pipeline

Day 5	<p>Introduction to ML</p> <ul style="list-style-type: none"> • conceptual issues <ul style="list-style-type: none"> – supervised vs. unsupervised learning – classification vs. regression – overfitting and regularization • Overview of the sklearn library <ul style="list-style-type: none"> – Data representation in sklearn – Estimator API – Overview of different classification and regression methods • Cross-validation and performance measures <ul style="list-style-type: none"> – conceptual issues – types of CV – measuring classification and regression performance – helper functions in sklearn – interpreting classifier output – stats on classifier outputs
Day 6	<p>Wrap-up and practical issues</p> <ul style="list-style-type: none"> • Summary of bootcamp & any neccessary catch-up <ul style="list-style-type: none"> – brief recap of the material with Q & A – walk through an example analysis pipeline • Overview of MNE <ul style="list-style-type: none"> – Data structures – Helper functions – switching between PTSA and MNE • Advanced issues <ul style="list-style-type: none"> – Phase & dealing with circular data – multi-tapers, mirrored buffers – other types of time series analyses