

Summer School in Nonlinear Dynamics Software and Data Analysis Tools

Center for Cognition, Action & Perception

The applications listed below is provided to you as a participant of the Summer School. You are free to use the software for any purpose during and after completing the workshop, including your own research. However, ***you are not permitted to distribute this software to any other individual.***

Disclaimers

The software is provided "as is", without warranty of any kind, express or implied, including but not limited to the warranties of merchantability, fitness for a particular purpose and non-infringement. In no event shall the authors or copyright holders be held liable for any claim, damages or other liability, whether in an action of contract, tort or otherwise, arising from, out of or in connection with the software or the use or other dealings in the software.

Installation

SAVE THE APPLICATIONS ONTO A FOLDER ON YOUR PC OR MAC. WE DO NOT RECOMMEND RUNNING THE SOFTWARE FROM A USB DRIVE.

In order to use the executable applications, you will need to install the free MATLAB Runtime Component Compiler. You MUST install the specific version listed below, *or the applications will not run.*

PC/Windows: 2014a (8.3) MATLAB Runtime Component Compiler 64-bit

MAC users: 2014b (8.4) MATLAB Runtime Component Compiler 64-bit

Download the corresponding free runtime compiler from Mathworks.com onto the computer on which you plan to run the applications:

<http://www.mathworks.com/products/compiler/mcr/?refresh=true>

Double click the installer and follow the instructions in the installation wizard. On Mac systems, you may need to enter an administrator username and password after you run the installer.

Important note: R2014a-2016a does not support macOS Sierra 10.12. If you choose to run any of these versions of the MATLAB Runtime on this unsupported macOS version, you might need to install a patch to fix an incompatibility issue. Learn more to [determine if this incompatibility impacts you](#). MathWorks strongly recommends that you do not run any version of the MATLAB Runtime older than R2014a on macOS Sierra 10.12.

Data Analysis Applications & Tools

Below is a brief description of the data analysis applications and tools provided in the Nonlinear Methods toolbox. A complete description of these applications and how to use is provided during the course. The applications require the correct MATLAB Runtime Component Compiler to be installed.

ami: This program calculates the average mutual information (in bits)—the amount of information that is shared between data points in a time series separated by a given number of data points. After selecting the file to be analyzed (a single column of ASCII data), the output is a graph of AMI as a function of delay. A common convention is to use the first local minimum in the AMI plot.

autocorrelation: Computes the autocorrelation function for a times series. The input file must be a single column. Outputs the autocorrelation function for the specified number of lags.

fnn: The program calculates the percent of data points that were determined false neighbors when the time series was embedded in a higher number of dimensions. After the selecting file to be analyzed (a single column of ASCII data), you will be asked to provide the delay (e.g., the delay selected based on your AMI function), and the number of embedding dimensions. You could start at 20 embedding dimensions and work your way down. Note that the calculations depend on the delay selected and the number of embedding dimensions used. Therefore, the values may not be identical for a given data set given a different number of embedding dimensions. Output is a graph of % false neighbors as a function of embedding dimension.

Lorenz: Simulates (animates) the Lorene system using user-specified parameters and initial condition settings.

mousemotion: This program will track the horizontal, vertical or circular motion of the mouse as you move the cursor back and forth between the two targets or around a circle. Outputs two single column data files containing the horizontal (x) and vertical (y) mouse position data collected. A figure of the mouse motion time series will also be generated when the task is complete.

plotdata: Creates a 1-, 2- or 3-dimensional plot (i.e., a 3-D scatter plot) of time-series data using three separate files for each data set (each file is an ASCII file with a single column of data).

psr: Generates a plot of the reconstructed phase space of a single time series in up to 3 dimensions (a greater number of embedding dimension can be selected, but not plotted in more than 3-d).

Rossler: Simulates (animates) the Rossler system using user-specified parameter and initial condition settings.

rqa: This program calculates the auto- and/or cross-recurrence measures (e.g., %recurrence, %determinism, entropy, maxline) for categorical or continuous time series data. The program can also be employed to calculate ami and fnn directly from the application and construct the diagonal. The calculated statistics can be output to a summary '.csv' file.

rqalog: This program calculates the % auto- and/or cross-recurrence recurrence for time series data across a range of radius values (i.e., threshold for inclusion as recurring values).

timeestimation: Implements a temporal estimation paradigm. Attempt to replicate e.g., 1 s or $\frac{1}{2}$ s intervals. Collects 1100 trials and saves the results to a txt file.