SERA Magnitude Complexity Toolbox:
Application: App_2A_v2: 'ADTestMag_V2_8'

[pval,mmin,NN,P,S,bval]=**ADTestMag_V2_8**(vector,EPS,MTdistribution,Mmin,Mmax,trials)

COMPATIBLE with Matlab version 2017b or later

APPLICATION DESCRIPTION

Script to Run: ***"ADTestMag_wrapper.m"***

This Application performs the Anderson-Darling test for testing whether a given random variable (e.g. a set of magnitudes), follows the exponential or Weibull distribution. The analysis is performed for a variety of minimum parameter thresholds defined by the User. The Application is performed as a series of steps and the input arguments are defined by the User in the wrapper script, ***"ADTestMag_Wrapper.m"***. The input arguments are 1) any vector corresponding to a random variable, which can be uploaded e.g. from an ASCII file, and 2) selected parameter values for data filtering and analysis. These arguments are set by the User in the wrapper script ***ADTestMag_Wrapper.m*** and are used as input to the main **ADTestMag** function. Once these parameters are set and the Wrapper script runs, the Application is performed without any interruption. NOTE that any vector ('vector') can be introduced and used as input data.

STEP 1. DATA upload: The User is requested to select an input vector, found in an ASCII file, located in the 'Sample_Data' directory. The user may modify the lines 13-14 of the Wrapper Script in order to import any vector that he/she wishes to analyze *[argument vector]*.

STEP 2. Minimum Parameter Value Selection: The User is requested to select the minimum input vector value (e.g. magnitude) to be assumed as data completeness threshold *[argument Mmin]*.

STEP 3. Maximum Parameter Value Selection: The User is requested to select the maximum input vector value (e.g. magnitude) to be assumed as data completeness threshold *[argument Mmax]*.

STEP 4. Input Vector Round-off Interval: The User is requested to select the input vector (e.g. Magnitude) round-off interval (data accuracy) to be used for the iterations *[argument EPS]*.

STEP 5. Define number of Trials: The User is requested to select the Number of trials to be performed for each iteration process *[argument trials]*.

STEP 6. Distribution Selection: The User is requested to define the selected parameter distribution for which the null hypothesis is to be tested *[argument MTdistribution]*.

STEP 7. Run 'ADTestMag' function

STEP 8. Visualization: Plotting results (optional, the User may activate/deactivate this option).

Input DATA and PARAMETERS Information: The User is requested to select input arguments for the Input Data vector distribution analysis (run 'ADTestMag' function):

Parameter	Variable	Type	Format	Possible Values	Default
Input data vector (e.g. magnitude)	vector	Vector	Double	-	-
Minimum input data vector value	Mmin	Scalar	Double	min(M)≤Mmin≤max(M)	Min(M)
Maximum input data vector value	Mmax	Scalar	Double	mMin≤Mmax≤max(M)	Max(M)

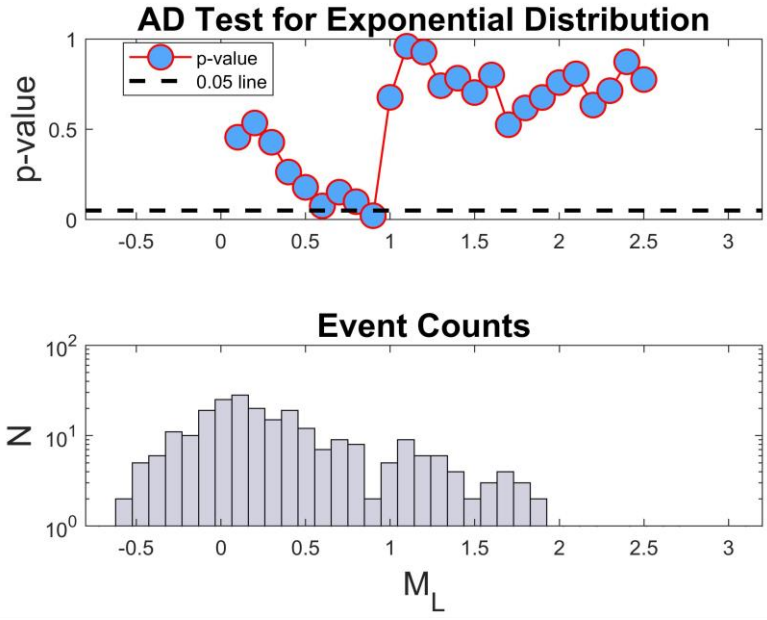
Input data vector Round-off interval	EPS	Scalar	Double	≤input data values range, Recommended: 0.1	0.1
Input data values distribution to be tested	MTdistribution	String	String	*'exp', 'weibul'*	'exp'
Number of trials	trials	Scalar	Integer	Recommended: 10<m<10000	100

Outputs: After the analysis is performed by the system and the following output results are produced and stored in the directory "Outputs_EXP".

Output Parameters	Type	Format	Comments
pval	Structure		Structure with the vectors of p-values obtained by the defined number of trials for each minimum input parameter value (field 'pval.p'). It also contains parameters 'P' and 'mmin' [see below].
mmin	Vector	Double	Vector of selected parameter cutoff values
NN	Vector	Double	Number of events with M greater or equal to each 'mmin'
P	Vector	Double	The average of the p-values obtained by the defined number of trials performed (also exists within the output structure 'pval')
S	Vector	Double	The corresponding standard deviation of the p-values obtained by the defined number of trials
bval	Vector	Double	b-value corresponding to each set defined by the aforementioned mmin values

Report: "REPORT_ADTestMag.txt" is generated and stored, including a summary of the input parameters and data considered, as well as the results obtained from the analysis for different M_{min} (number of events, b-value, p-value and test decision).

FIGURE: Request for a figure to be created as in the standalone version of the application: "ADTestMag_Output.jpg" is generated and stored showing the p-value (significance) of the null hypothesis (exponential or Weibull distributed input parameter values) as a function of M_{min}. The histogram of number of events within specified data bins is demonstrated as well. (see figure below). – See also function: *"ADTestMag_Plot(M,mmin,P,EPS,MTsistribution)"*


AD Test for Exponential Distribution
p-value
0.05 line
p-value
1
0.5
0
-0.5
0
0.5
1
1.5
2
2.5
3
Event Counts
N
10^2
10^1
10^0
-0.5
0
0.5
1
1.5
2
2.5
3
M_L