

Anderson-Darling test for exponentiality of inter-event time

user guide



This Application performs the Anderson-Darling test to study the null hypothesis that the inter-event times of a given series of events are drawn from an exponential distribution, alternatively that they are drawn from a Weibull distribution.



REFERENCES [Document Repository](#)

CATEGORY Collective Properties of Seismicity

KEYWORDS Statistical analysis, Statistical properties of seismicity, Parameter probabilistic distribution

CITATION Please acknowledge use of this application in your work: IS-EPOS. (2017). *Anderson-Darling test for exponentiality of inter-event time* [Web application]. Retrieved from <https://tcs.ah-epos.eu/>

Step by Step

1. The user is now requested to fill the fields shown on Figure 1:

- Use Seismic catalog: The user may click on "change file" button in order to use a seismic catalog data among the ones that are already uploaded in his/hers personal workspace. The program uses the events origin time vector and automatically calculates the inter-event times (after the appropriate catalog filtering as follows below).
- *Select Magnitude column* - The user may click on the small arrow in the respective tab in order to choose among different magnitude scales, in the cases where they are available (e.g. ML, Mw, etc).
- *Mmin range* - The User now is requested to choose the minimum magnitude (completeness level of the catalog). This can be done in two ways. The first is to type a single magnitude value in the empty box, possibly after he/she has performed an individual analysis (see MCE service). The second is to graphically select the minimum magnitude from the Normal or the Cumulative histograms, which are available after clicking on the respective tabs. In both cases there is option to alter the step of the histogram's bars and to choose between linear and logarithmic scale of the Y-axis for the plotting.
- *Time range* - The User may further filter the selected dataset by defining the starting and ending data of the period that he/she wishes to study. A calendar appears on the screen after clicking in the empty boxes next to "Start" and "End" fields. Alternatively, the User may graphically select a time window, after clicking on 'Seismic Activity Plot' tab. A cumulative count of events plotted against time appears and the User can click on certain points of this plot to define the starting and ending time of the time period of interest (Figure 2). Note that this selection is optional. If no dates are entered, the entire dataset remains for the analysis.
- *Significance level* - The User is requested to enter the significance level, α , for the null hypothesis rejection ($0 < \alpha < 1$)
- *Distribution* - the user may click on the small arrow in the respective tab in order to choose between 'exponential' and 'weibull' distribution
- *Monte Carlo Trials* - number of Monte Carlo Trials for distribution parameters confidence intervals evaluation. Should be an integer in the range [100-50,000]

INPUTS

1/1 Catalog	CZORSZTYN_catalog.mat		Locked on file	CHANGE
Select Magnitude column	Mw			
Mmin M range (1.2, 2.4)	2.2	HISTOGRAM	CUMULATIVE HISTOGRAM	
Time range	Start	2014 Dec 13 16:50:18.6	End	2016 Jan 09 23:18:39.5
Significance level	0.05			
Distribution	Exponential			
Monte Carlo Trials	1000			

RUN

Status FINISHED

Figure 1. Input window of Inter-event Time Distribution Analysis.

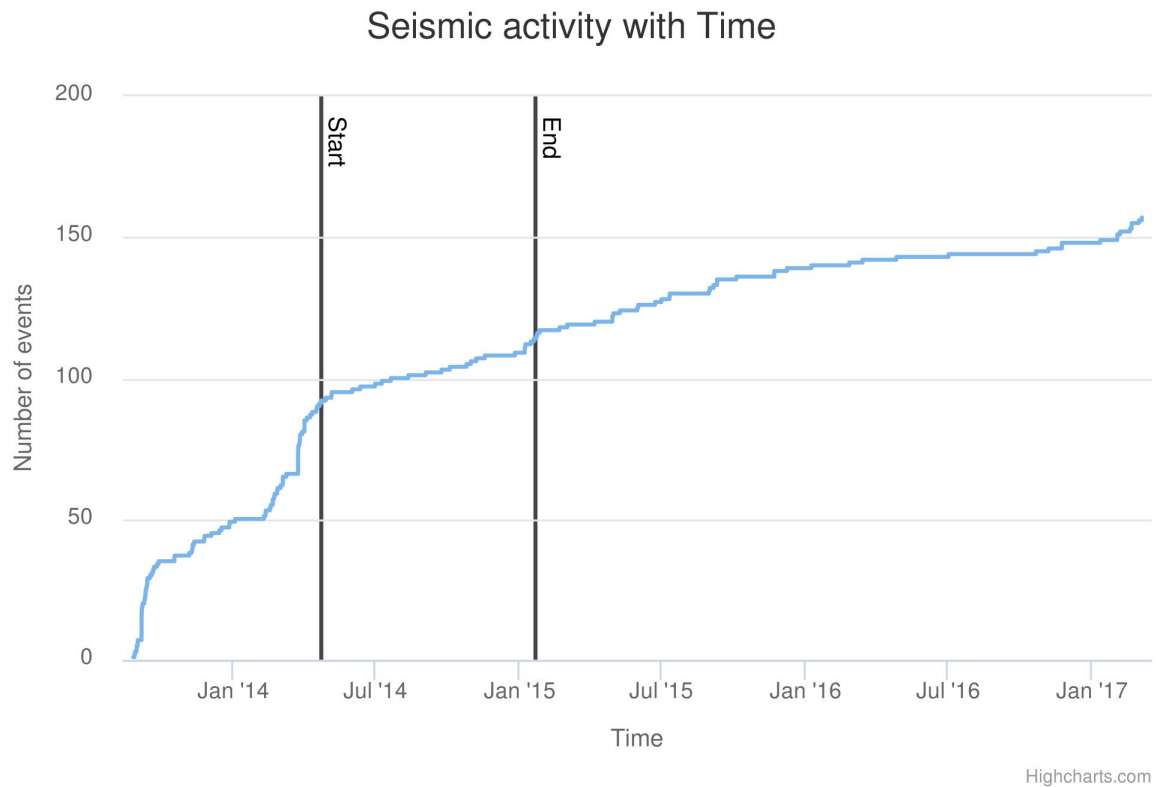


Figure 2 Seismic activity with time plot.

2. After defining the aforementioned parameters, the user shall click on the  button (Figure 1) and the calculations are performed. The output is soon to be created.

The output results include:

- A matlab output file ('statestest_output.mat' - Figure 3) with parameters are displayed on the screen and can be downloaded or used for visualization (click on 'SHOW' tab, Figure 3)
- An ascii report file ('report.txt' - Figure 3) which includes all a summary of input/output data and can be downloaded.
- A plot ('plout_output.mat' Figure 3) of the inter-event time distribution, the best fit curve, and its 2.5 and 97.5 confidence bounds (Figure 4)

Workspace tree

D /

- D Signal download
- D TEST_FOCI
- A CatalogFilter (1)
 - F USCB_GMcatalog.mat
 - F USCB_catalog.mat
- A SSHParameters
- A GMPParametersTool
- D Tetsing_Platform
 - F SONG_TRANH_catalog.mat
 - A InterEventTimeDist (1)
 - F **stattest_output.mat**
 - F plout_output.mat
 - F report.txt

stattest_output

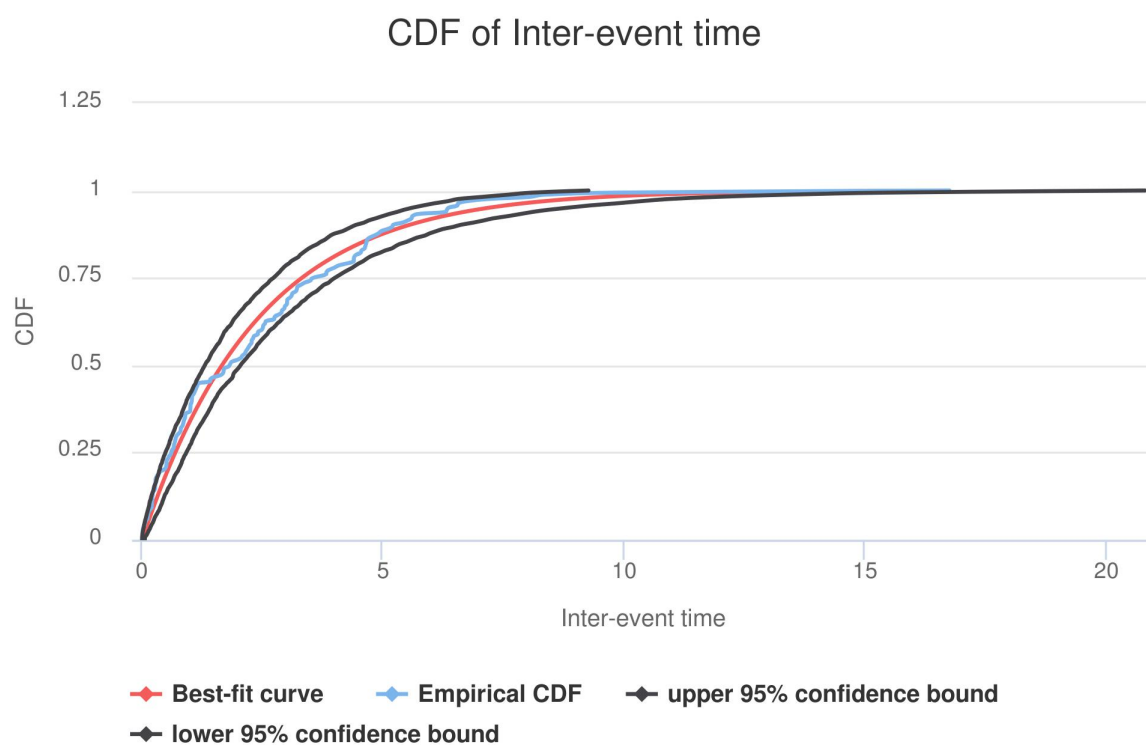
ACTIONS

File

stattest_output.mat

Test decision	H0 is rejected at 0.05 significance
p-value of test	0.0005
Test statistic	40.7512
Critical value	1.3204
Best fitting distribution parameters estimate	0.1861556004674833
Lower bound of 95% confidence intervals for parameters estimate	0.1667936179250076
Upper bound of 95% confidence intervals for parameters estimate	0.209114631171022
Inter-event times	SHOW
Monte Carlo 97.5% confidence upper bound for CDF	SHOW
Monte Carlo 2.5% confidence lower bound for CDF	SHOW

Figure 3. Results of the Inter-event Time. Distribution Analysis.



Highcharts.com

Figure 4. Cumulative Distribution function of the Inter-event Time.

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