



دانشگاه اصفهان
دانشکده فنی - مهندسی
گروه کامپیوتر

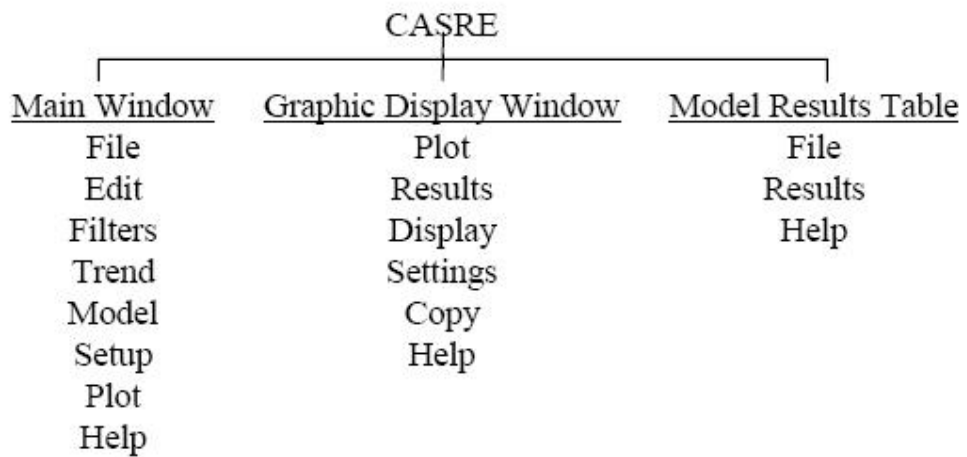
CASRE 3.0 :

CASRE windows

CASRE failures

CASRE

casre



¹ Computer Aided Software Reliability Estimation

casre
failure data

FILE

EDIT
edit

() TBF
Χηανγε δατα τυπε () FC
FC TBF

FILTER

noise

noise

offset scaling factor

noise smoothing (unit time)

subset data

noise

round

TREND

MODEL

least-squares maximum-likelihood

Δεφινε Χομβινατιονσ

$$\sum_I^n (w_i r_i / \sum_I^n w_i)$$

PLOT

application

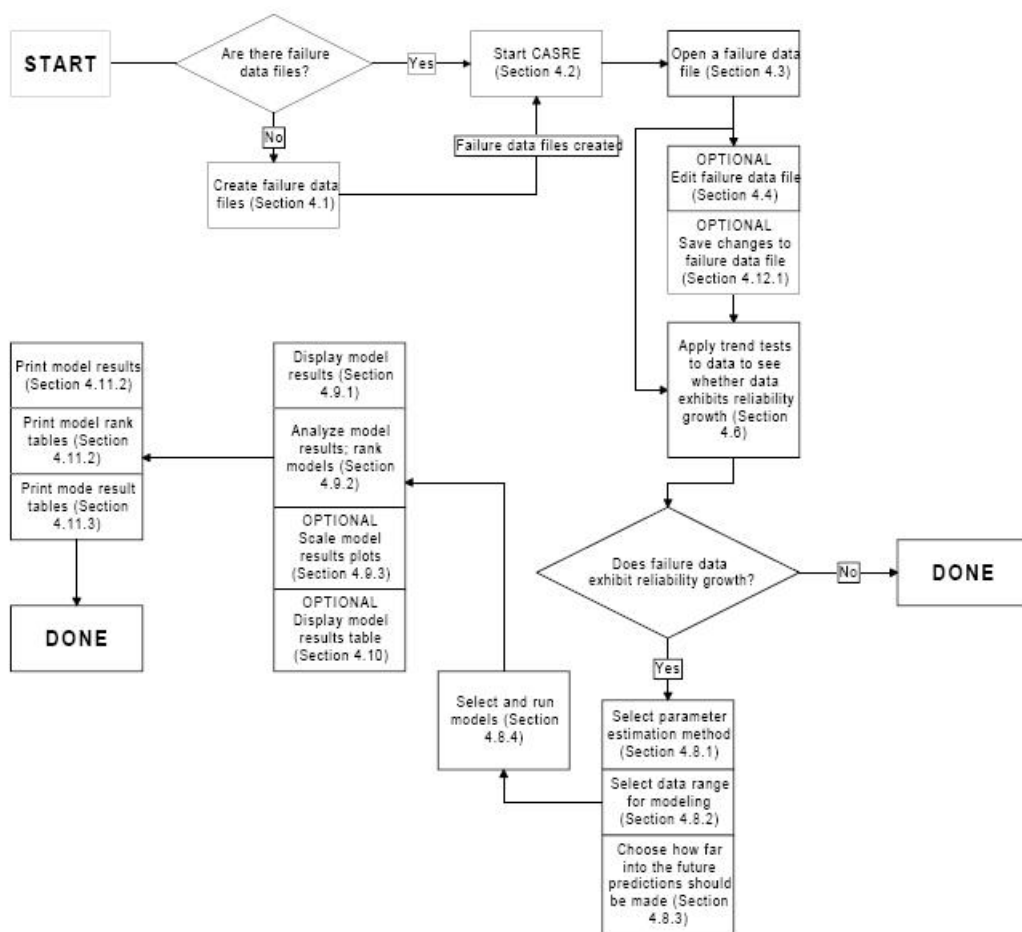
SETUP

setup

CASRE

casre
trend test

casre



OPTIONAL

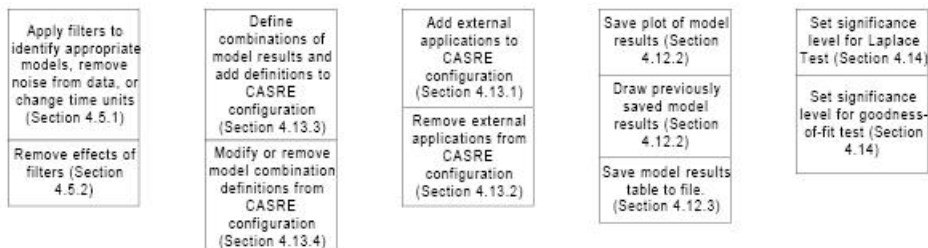
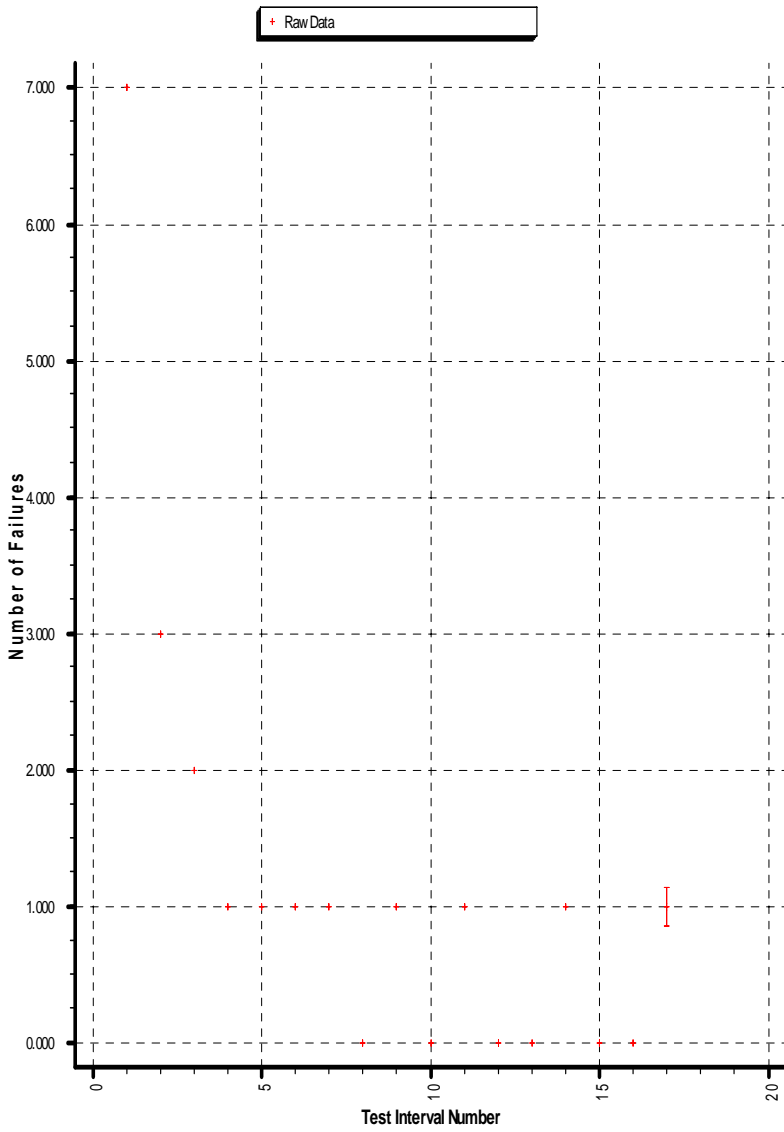
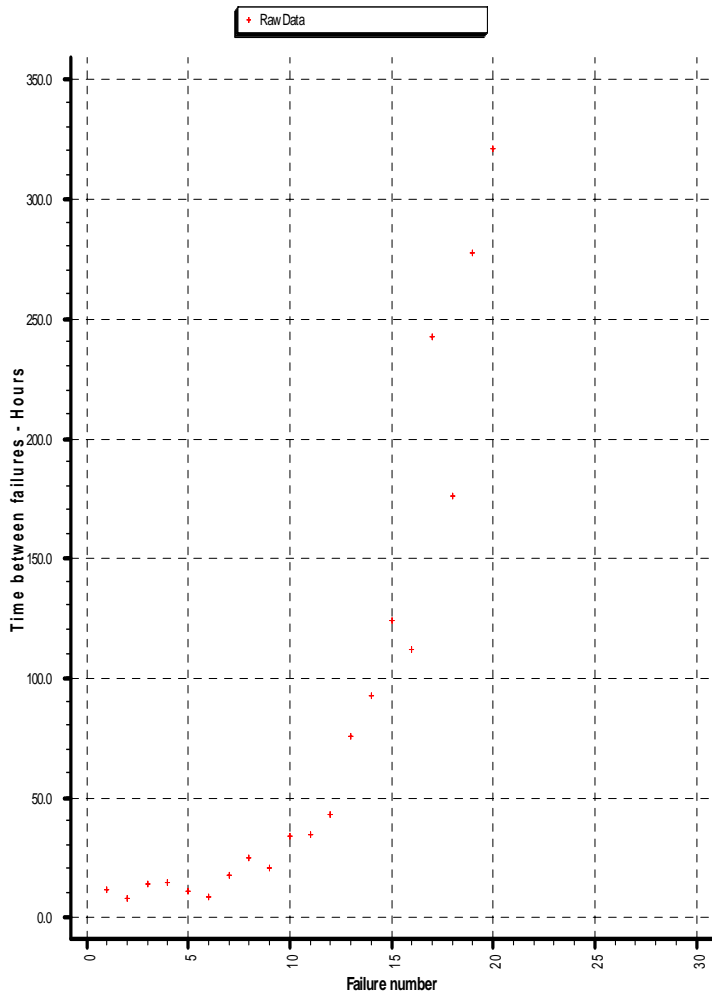


Figure 1 - Typical CASRE work session

casre



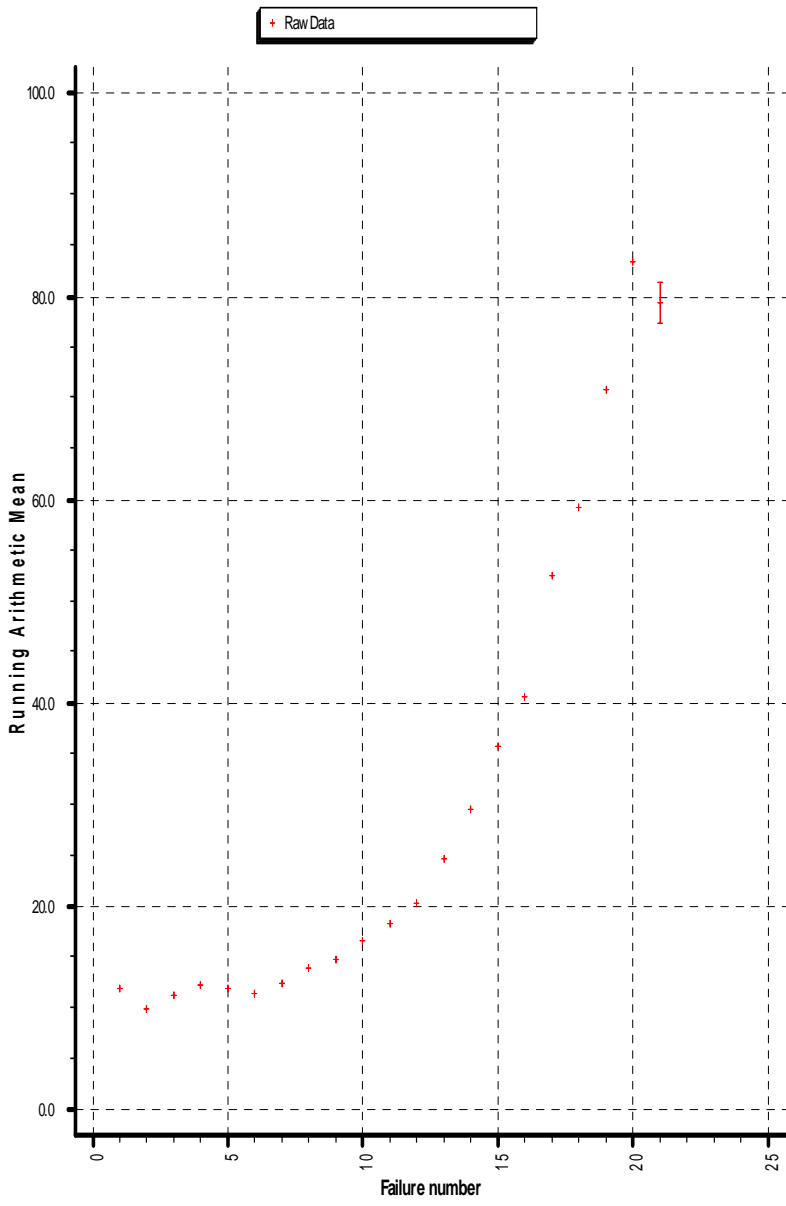


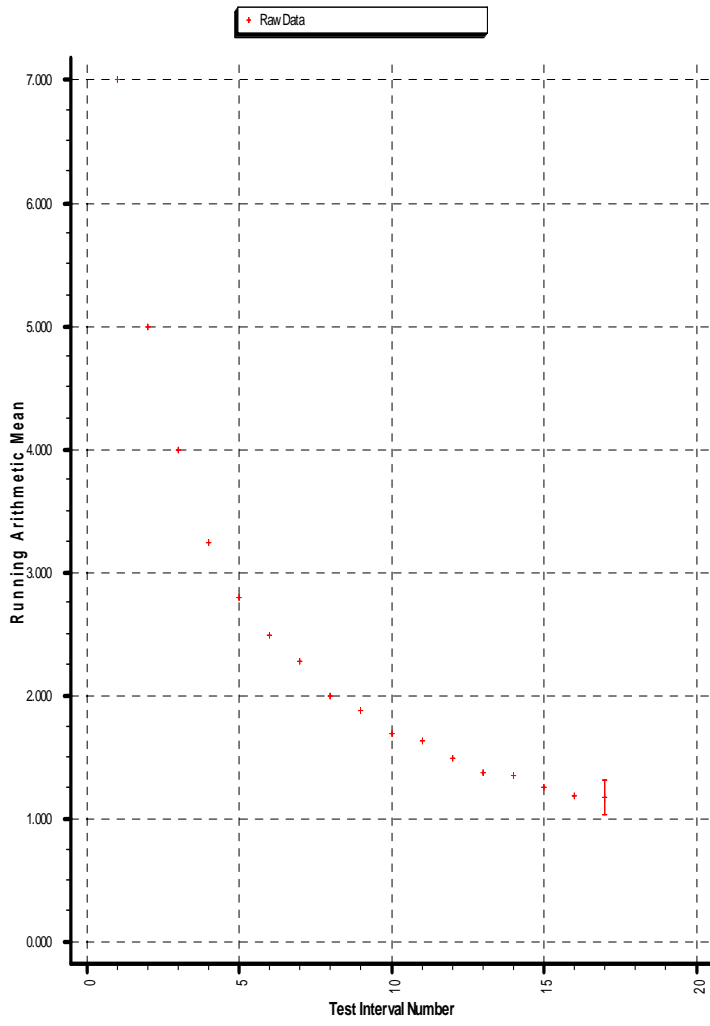
TREND

smoothing edit

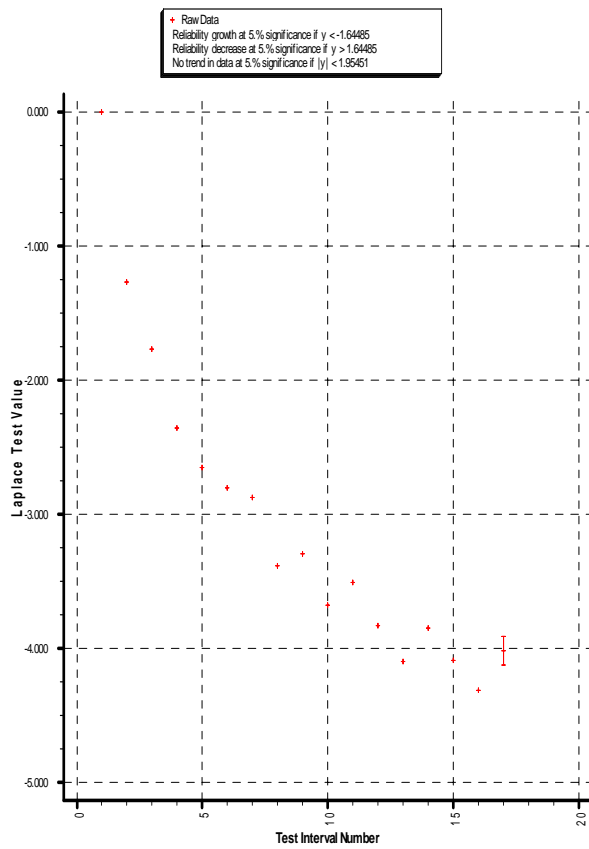
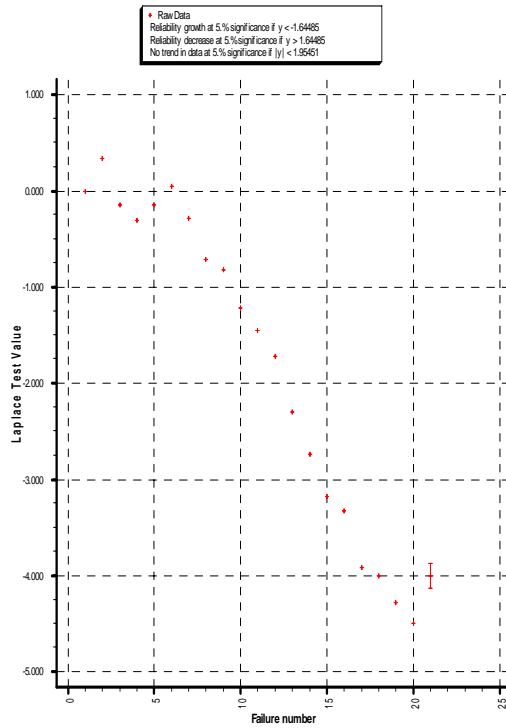
()

()





Running Average



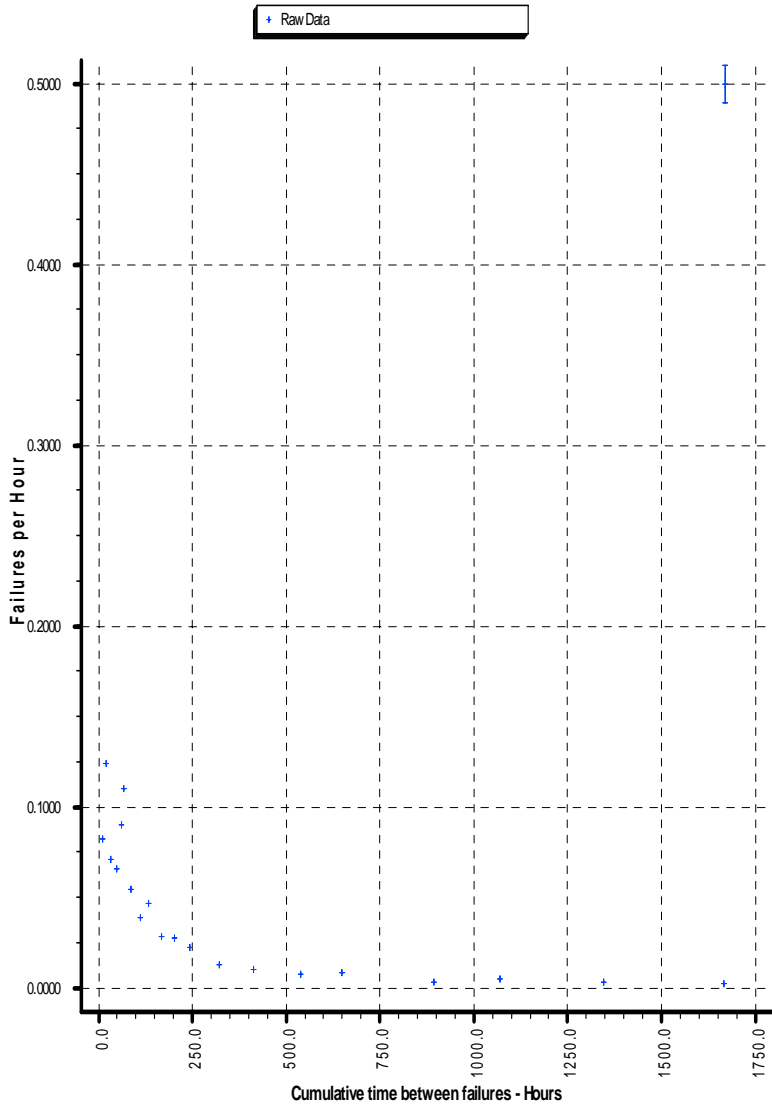
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failure

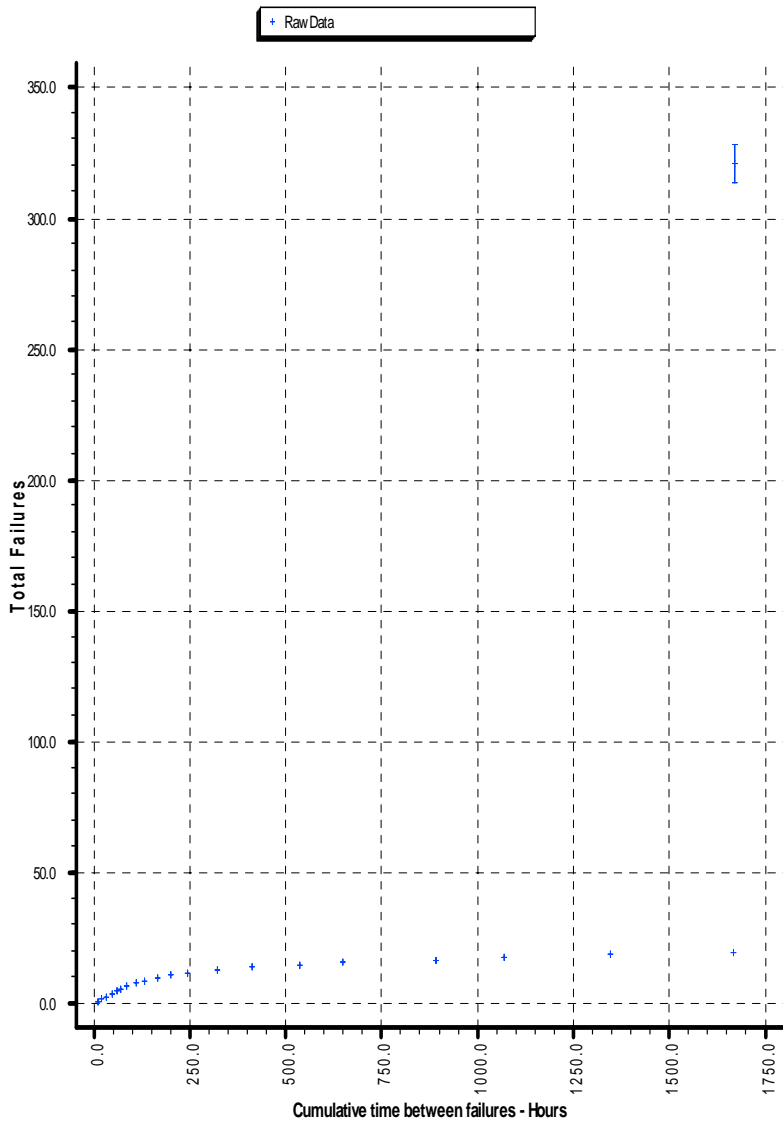
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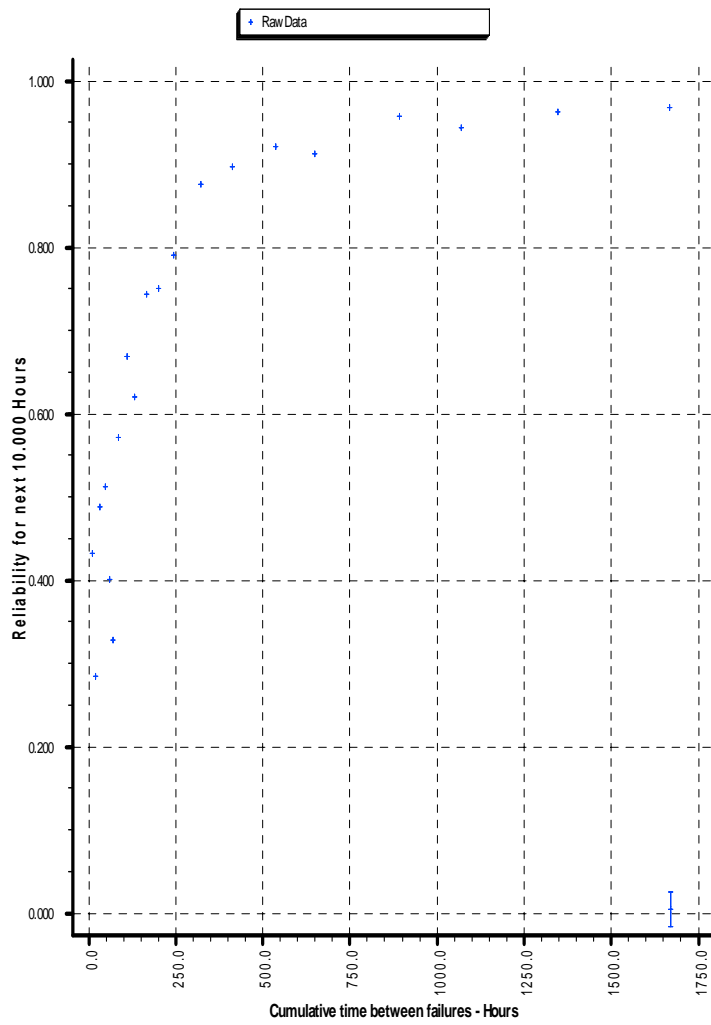
intensity



Cumulative Failure



Reliability



Test interval length Failure Intensity Failure count time between failures
Reliability Cumulative failures

t_1, t_2, \dots, t_{i-1}

$f_i(t)$

$$E[t] = \int_0^{\infty} t \tilde{f}_i(t) dt$$

Maximum Likelihood Least Square

$$P(t \leq x) = \int_0^x \tilde{f}_i(t) dt$$

$$Rel(x) = P(t > x) = \int_x^{\infty} \tilde{f}_i(t) dt$$

CASRE

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CASRE

default

ML

LS

ML

CASRE

LS

LS

ML

ML

LS

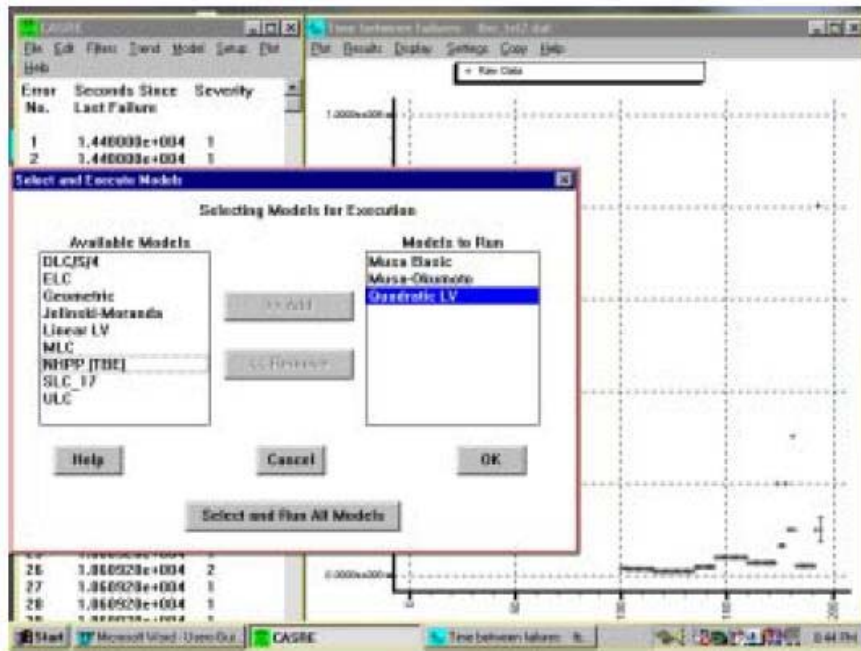
LS

Selected Estimation Method Model Name	Maximum Likelihood	Least Squares
Geometric	ML	LS
Jelinski-Moranda	ML	LS
Littlewood-Verrall Linear	ML	LS
Littlewood-Verrall Quadratic	ML	LS
Musa Basic	ML	ML
Musa-Okumoto	ML	ML
Nonhomogeneous Poisson Process (for time between failures)	ML	ML
Generalized Poisson	ML	LS
Generalized Poisson – user selected interval weights	ML	LS
Shick-Wolverton	ML	LS
Nonhomogeneous Poisson process (for failure counts)	ML	LS
Schneidewind	ML	ML
Schneidewind – Ignore first “s” intervals	ML	ML
Schneidewind – Total failures in first “s” intervals	ML	ML
Yamada S-Shaped	ML	ML

Table 2 – Parameter Estimation Methods

model

mouse



add

Select and run all models

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Times Between Failures (TBF) Models	Failure Counts (FC) Models
Geometric*	Generalized Poisson*
Jelinski-Moranda*	Generalized Poisson – user-specified interval weighting*
Littlewood-Verrall Linear*	Nonhomogeneous Poisson(NHPP)
Littlewood-Verrall Quadratic*	Schneidewind*
Musa Basic*	Schneidewind – ignore first “s-1” test intervals*
Musa-Okumoto	Schneidewind – total failures in first “s-1” test intervals*
Nonhomogeneous Poisson(NHPP)*	Shick-Wolverton*
	Yamada S-shaped

Table 3 – Models for Each Type of Failure Data

failure count

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Round

- Musa Basic - for estimated MTBF
- NHPP (TBF data) - for estimated MTBF
- Generalized Poisson - for estimated failure counts

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- ☒ "A Survey of Software Reliability Modeling and Estimation", prepared by Dr. William H. Farr[NSWC83].
- ☒ Reliability - Measurement, Prediction, Application: by Musa, Iannino, and Okumoto, published by McGraw-Hill in 1987[Musa87]
- ☒ Handbook of Software Reliability Engineering, edited by Michael Lyu, published by McGraw-Hill in 1996 [Lyu96].

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:

- ✓ Dynamically-Weighted Linear Combination (DLC/S/4)
- ✓ Equally-Weighted Linear Combination (ELC)
- ✓ Median-Weighted Linear Combination (MLC)
- ✓ Unequally-Weighted Linear Combination (ULC)

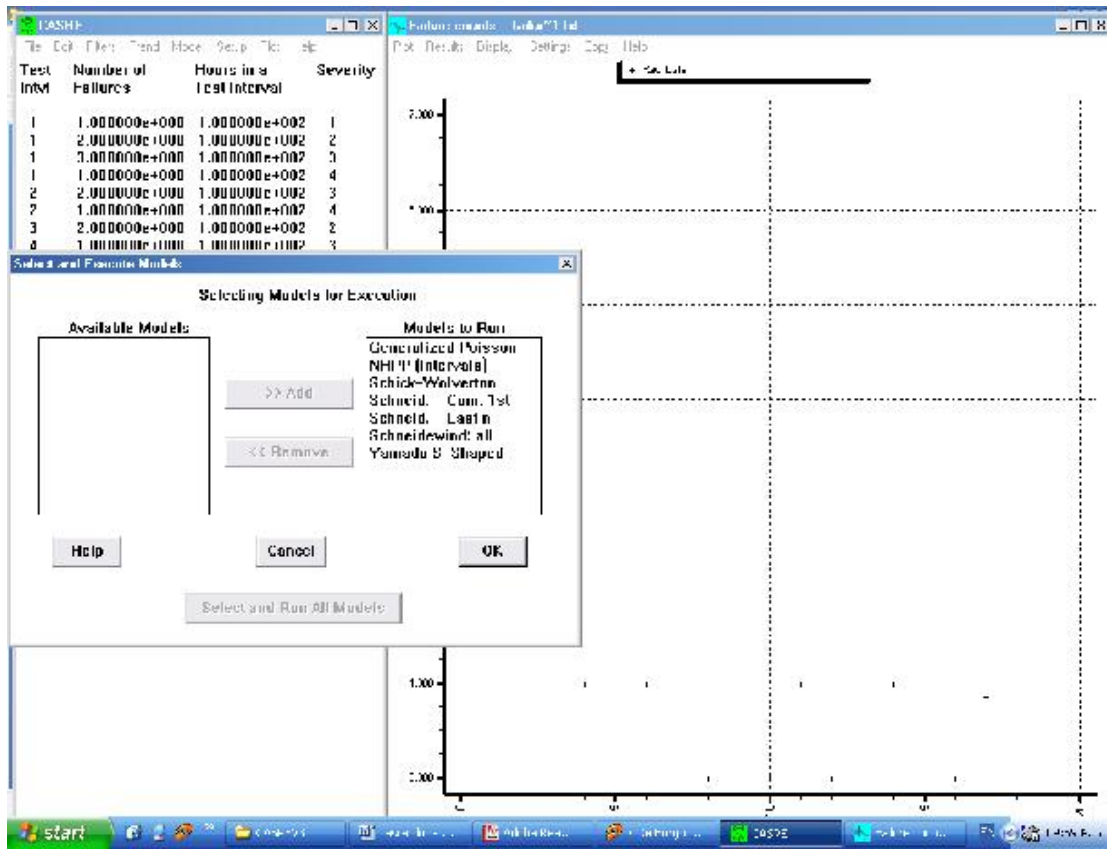
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- Nonhomogeneous Poisson Process (NHPP)
- Musa-Okumoto (MO)
- Littlewood-Verrall Quadratic (LVQ)

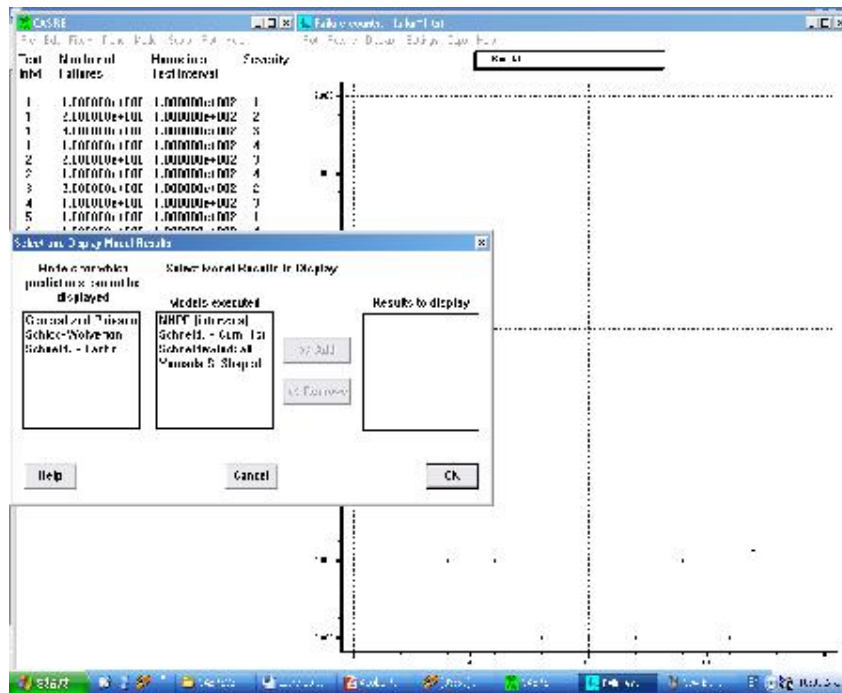
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- $ELC = (1/3)NHPP + (1/3)MO + (1/3)LVQ$
- MLC = whichever model's prediction is between the other two.
- $ULC = (1/6)Pessimistic + (4/6)Median + (1/6)Optimistic$

select and run a model

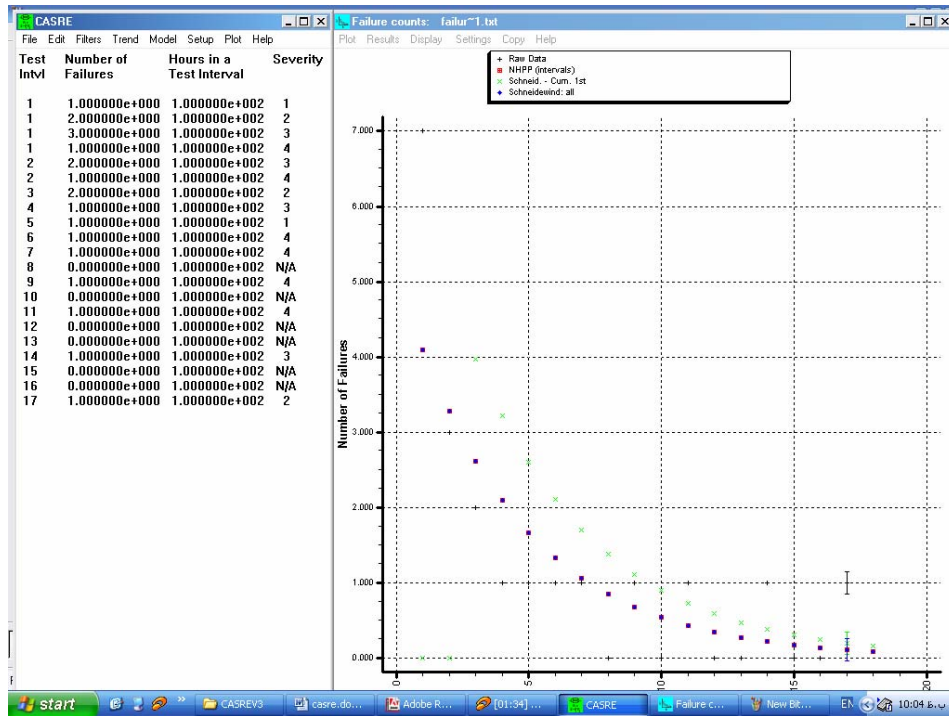


Case .

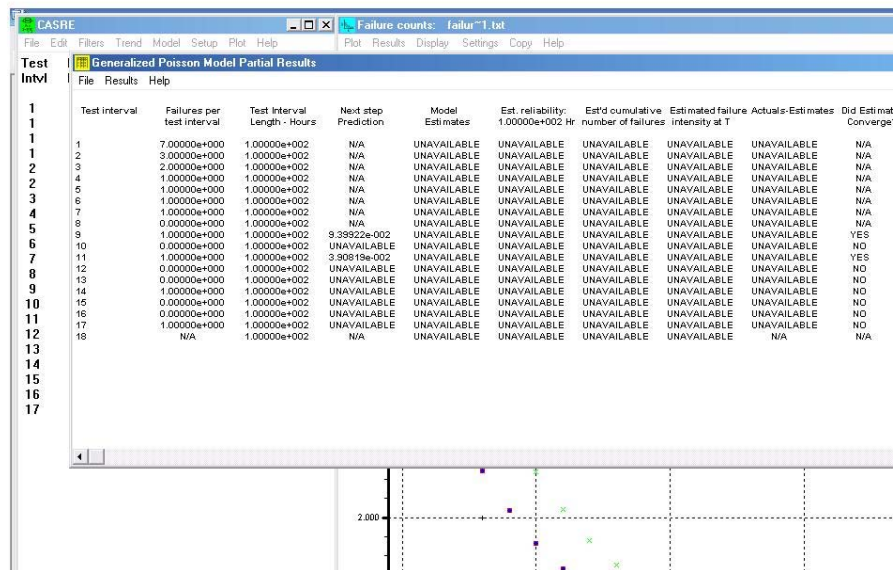


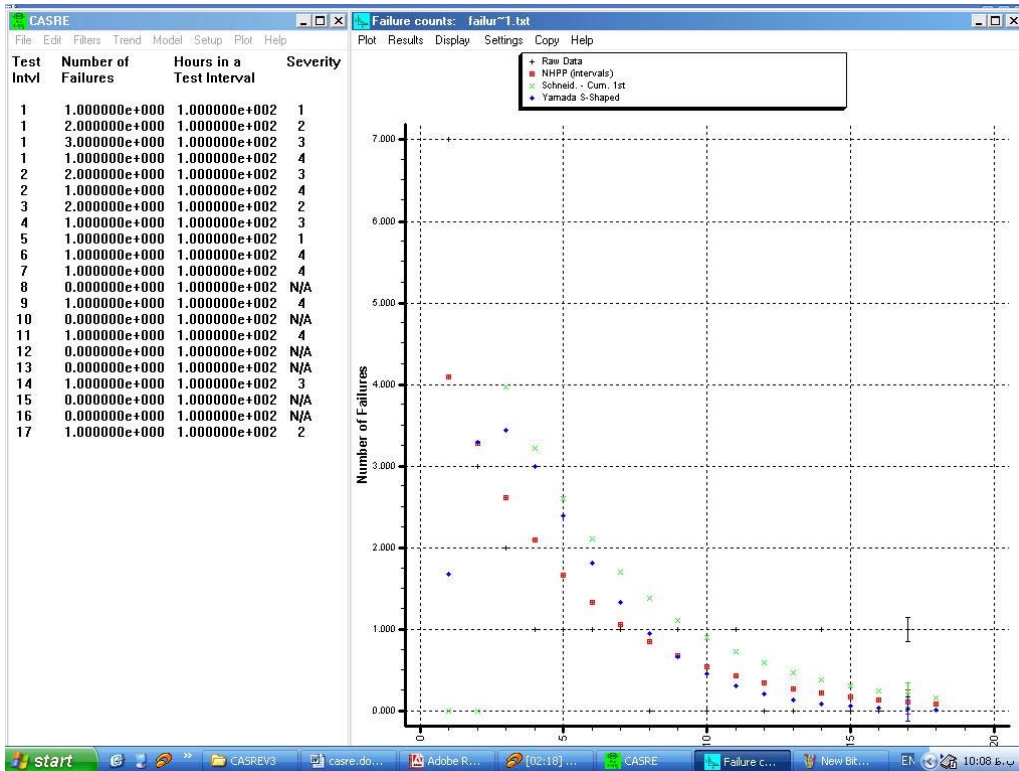
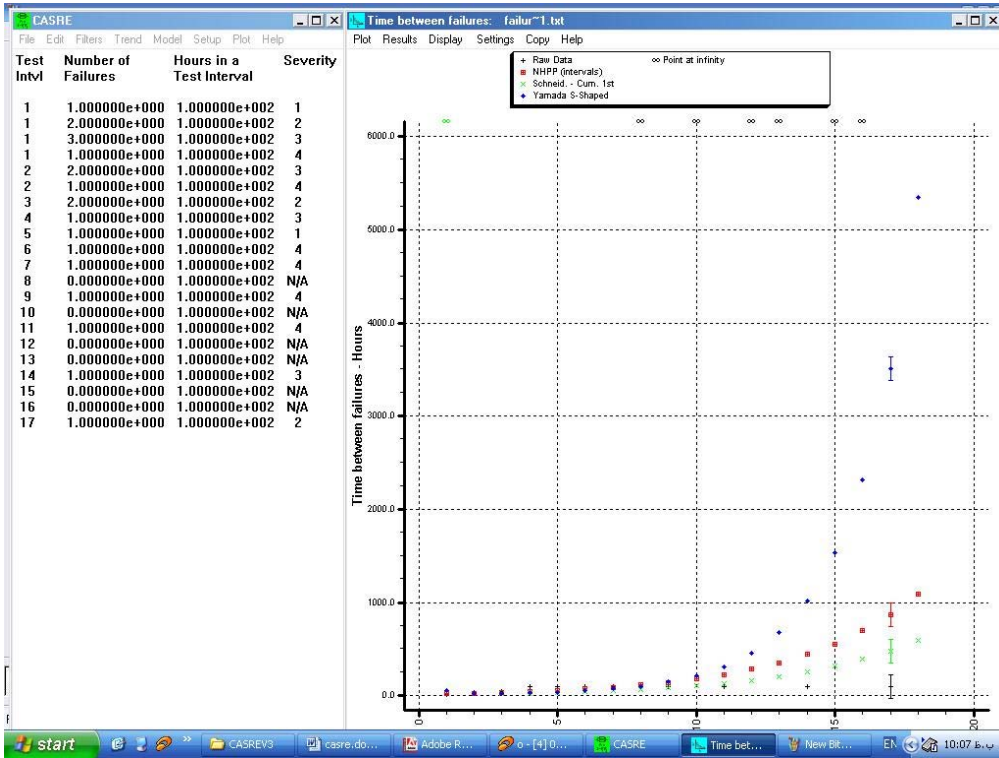
Schnidewind

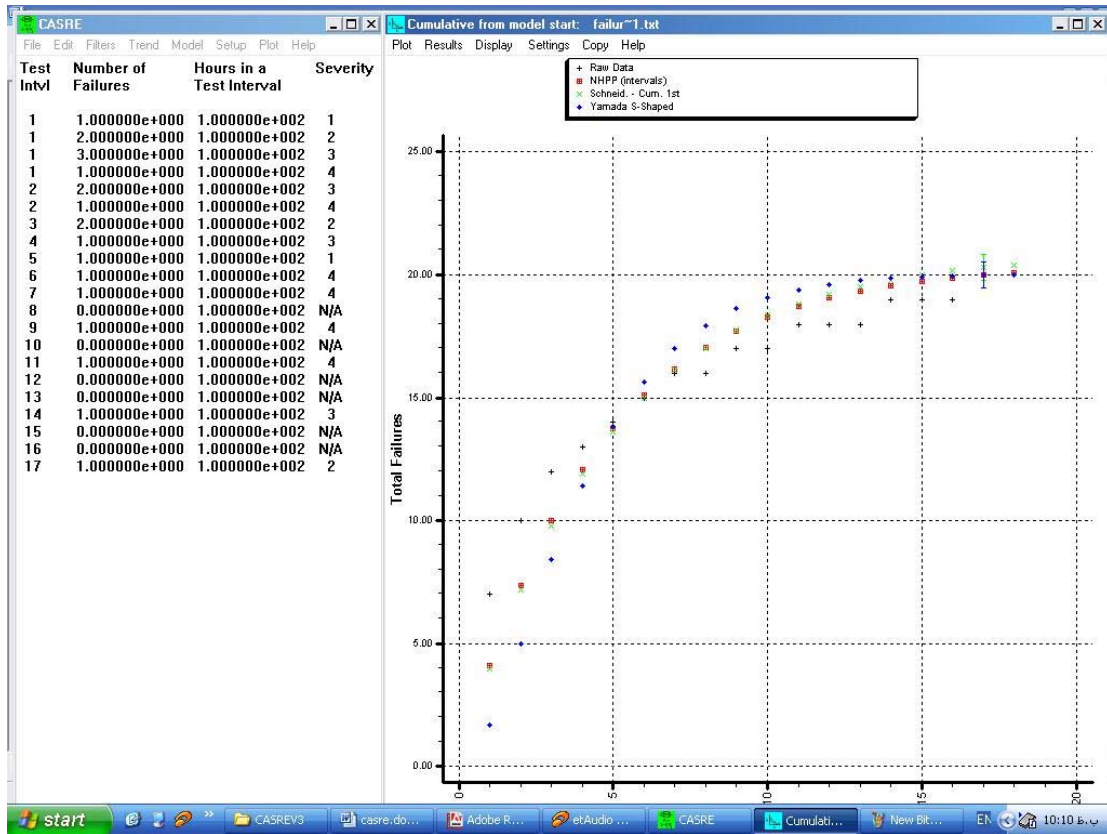
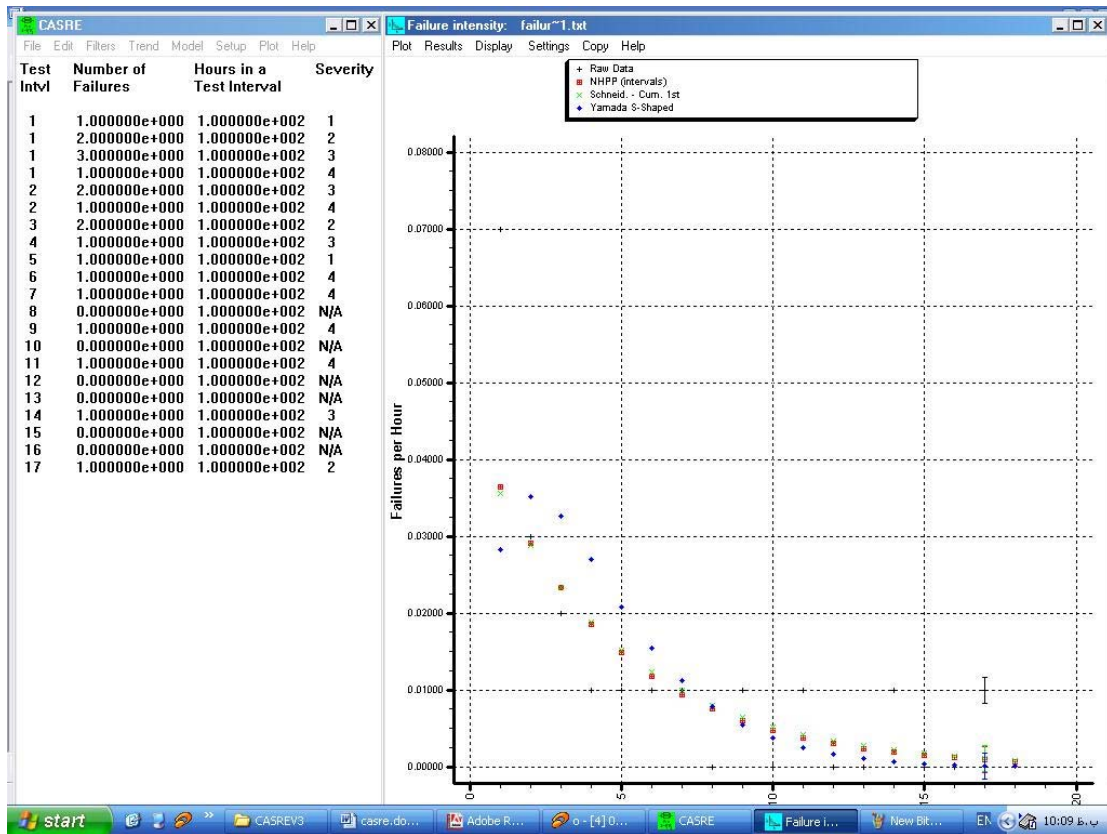
Yamada NHPP

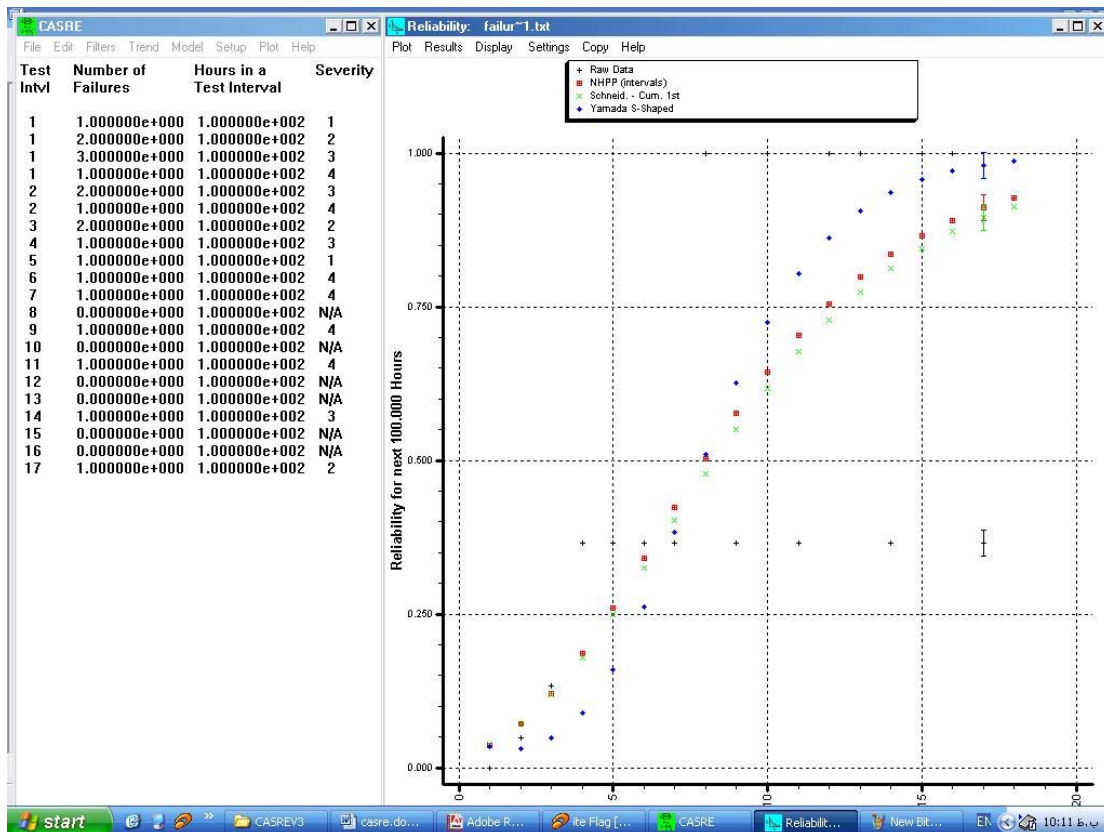
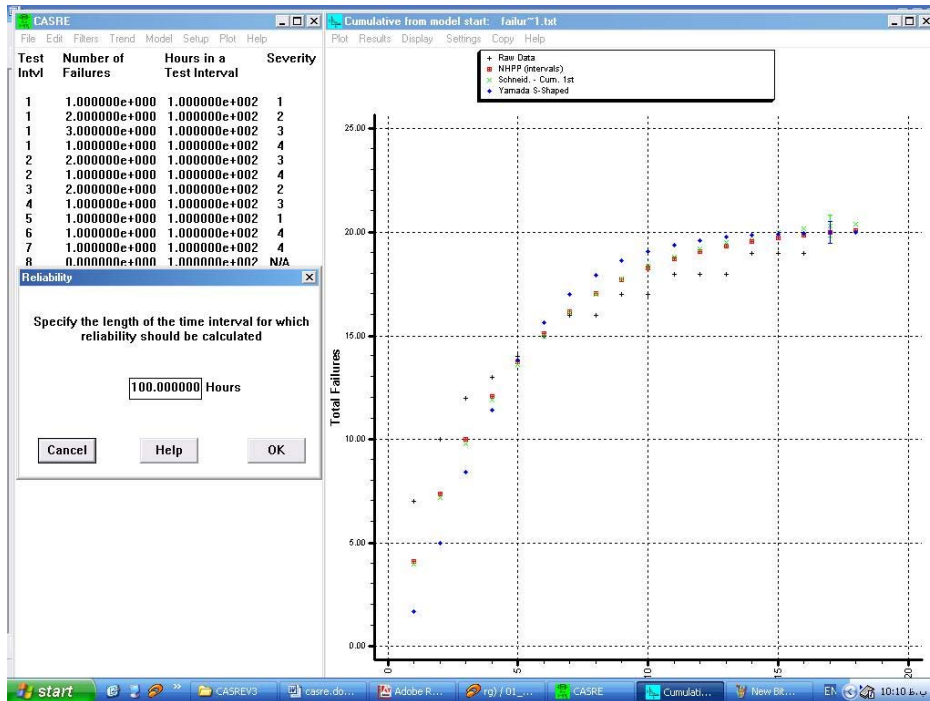


Model Results Table









FailureData.txt
Hours

FailureCount.txt

Hours

1	1	100	1
1	2	100	2
1	3	100	3
1	1	100	4
2	2	100	3
2	1	100	4
3	2	100	2
4	1	100	3
5	1	100	1
6	1	100	4
7	1	100	4
8	0	100	0
9	1	100	4
10	0	100	0
11	1	100	4
12	0	100	0
13	0	100	0
14	1	100	3
15	0	100	0
16	0	100	0
17	1	100	2