Software Failure and Reliability Assessment Tool: Report

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Tab 1: Select, Apply, and Analyze Data

Sample of the updated data ('SYS1') in different formats:

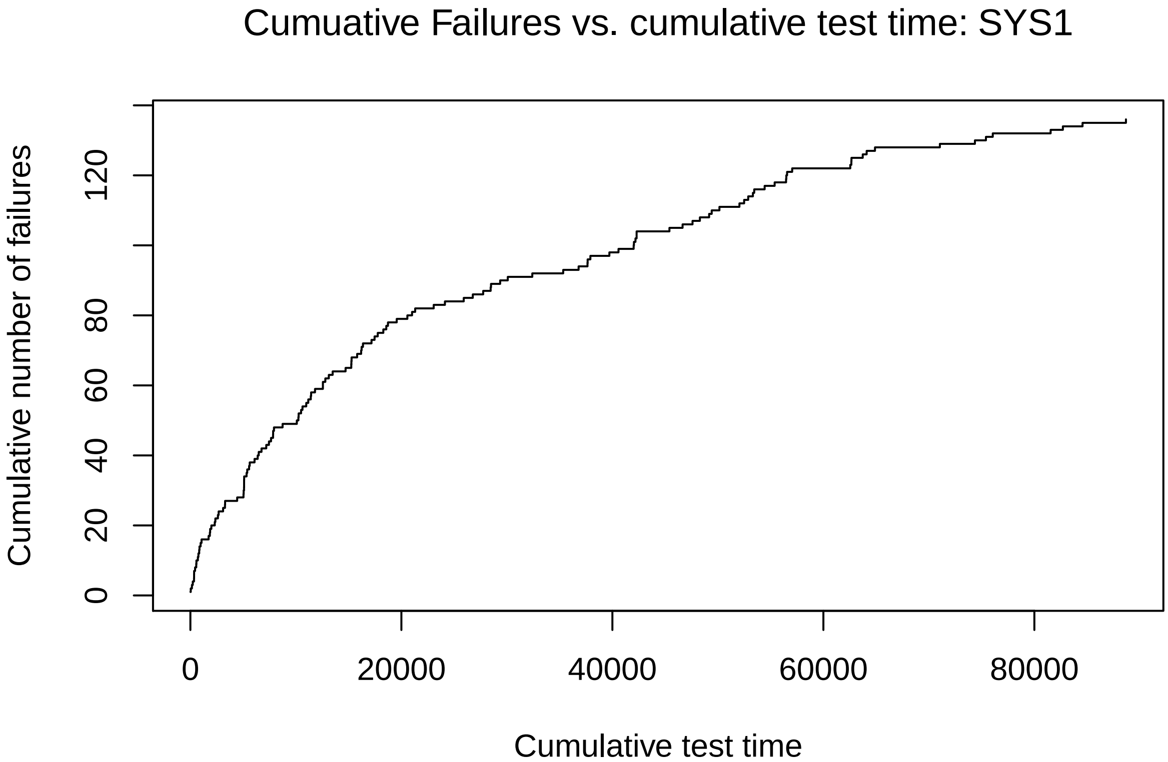
The table below shows the first ten points of the input data SYS1. 'FC', 'CFC', 'FT', 'IF', and 'FN' indicates failure counts, cumulative failure counts, failure times, interfailure times, and number of failures respectively.

Table 1: First ten points of the input data

FN	IF	FT
1	3	3
2	30	33
3	113	146
4	81	227
5	115	342
6	9	351
7	2	353
8	91	444
9	112	556
10	15	571

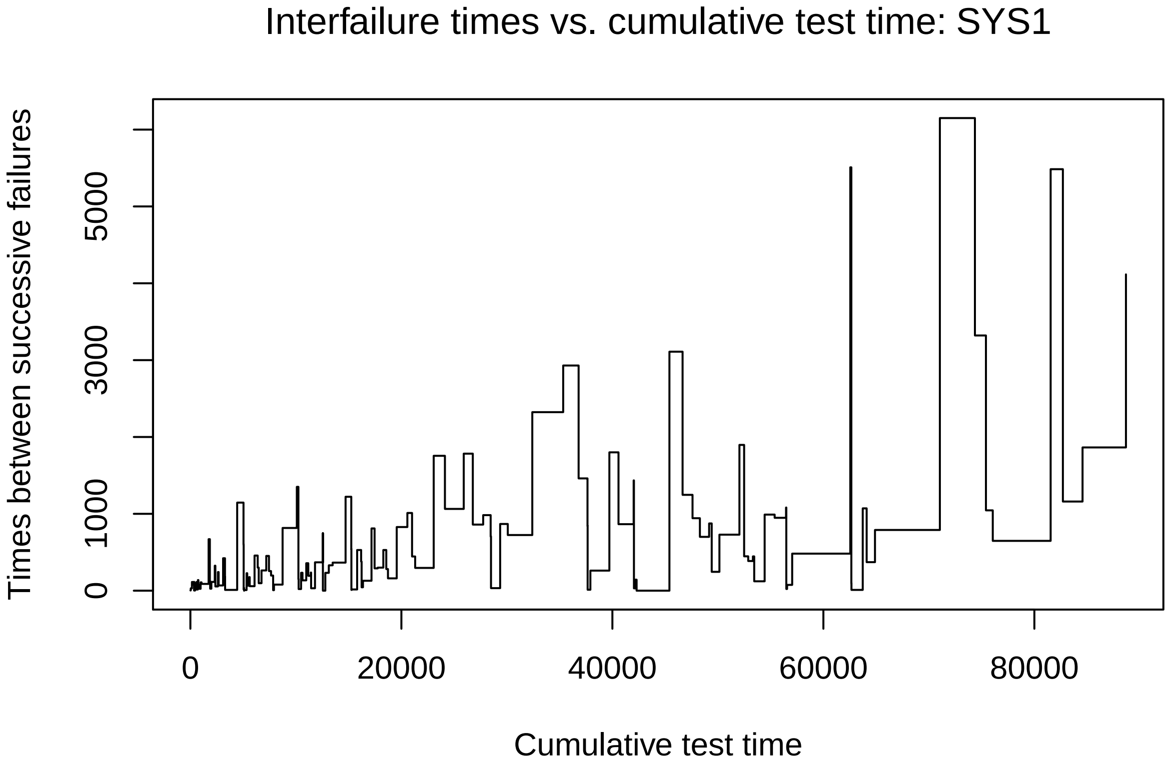
Cumulative failures

Figure below shows the cumulative number of failures as a function a cumulative test time for 'SYS1'. Increasing trend indicates detection of more failures. Ideally, the cumulative failure should converge to a constant value as testing progresses indicating zero number of failures in the software.



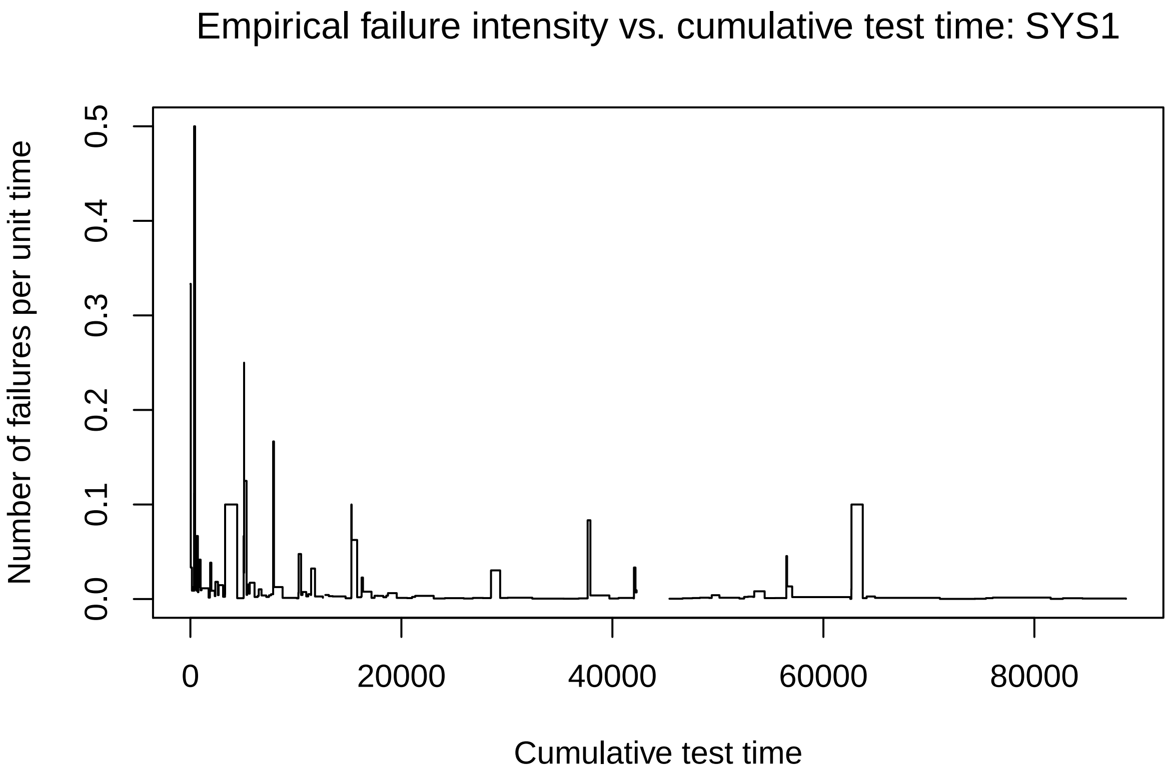
Times between failures/Interfailure times

Ideally, times between failures should increase over time.



Failure intensity

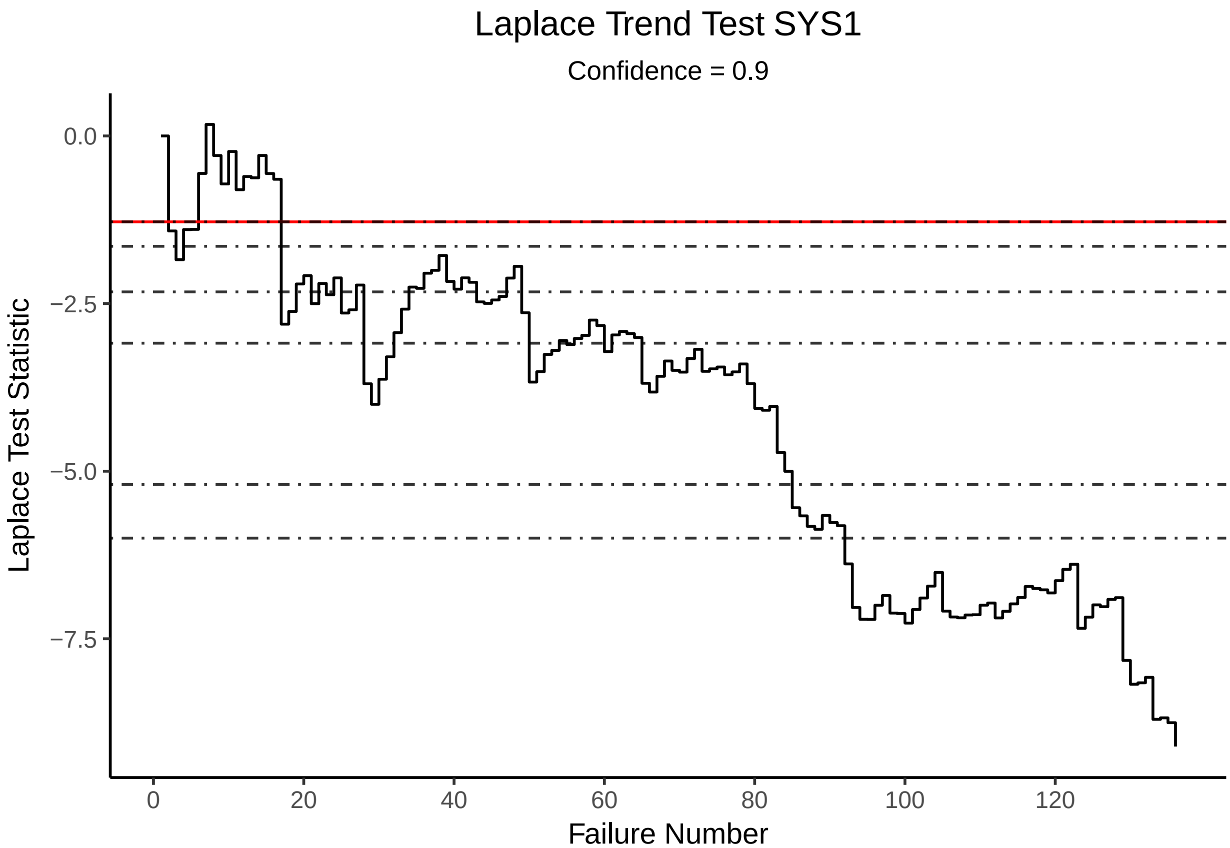
Decrease in failure intensity indicates increase in reliability of the software subjected to testing. Ideally, failure intensity should go to zero.



Laplace Trend Test

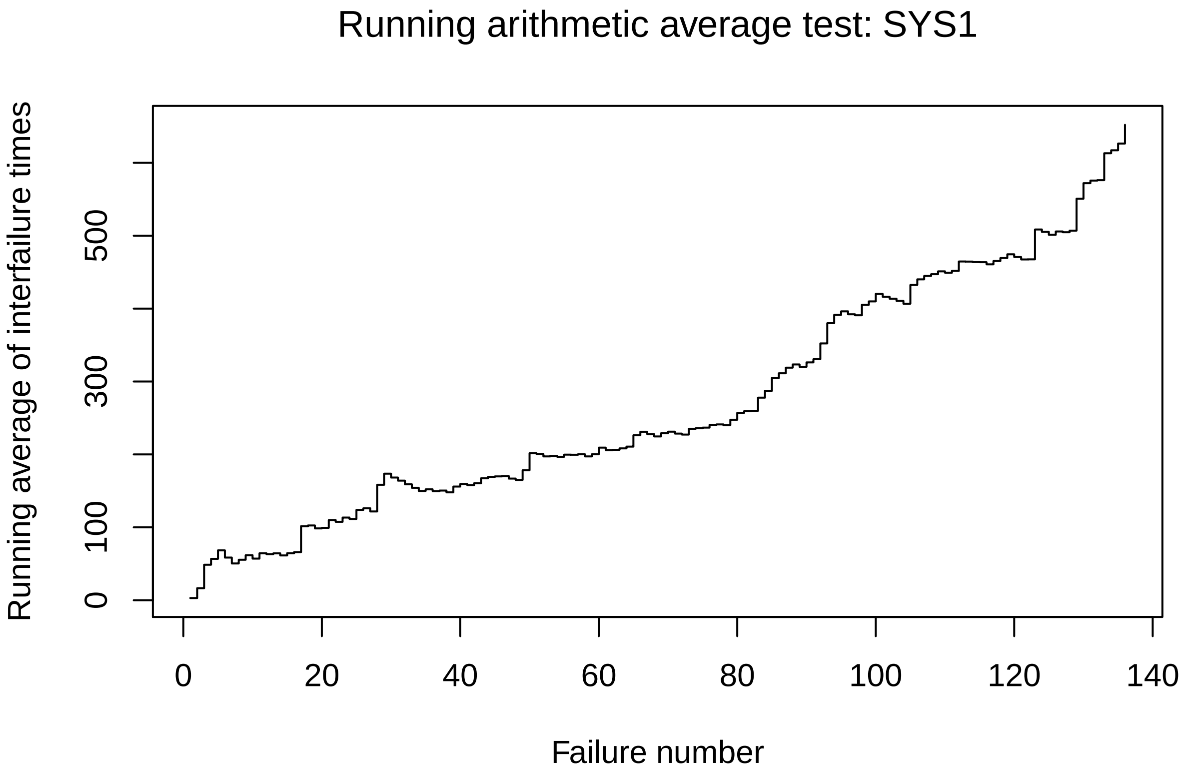
The red horizontal line in the figure indicates the specified confidence level of 90%. Additional default levels in black include 90, 95, 99, 99.9, 99.9999, and 99.999999. Values below these lines indicates that the data exhibits reliability growth with the specified level of statistical significance and it is therefore suitable to apply software reliabity models.

If the Laplace test statistic increases above the horizontal red line, this indicates that the data does not exhibit reliability growth. Thus, it is unlikely that a model can be applied successfully because the results may be inaccurate.



Running arithmetic average

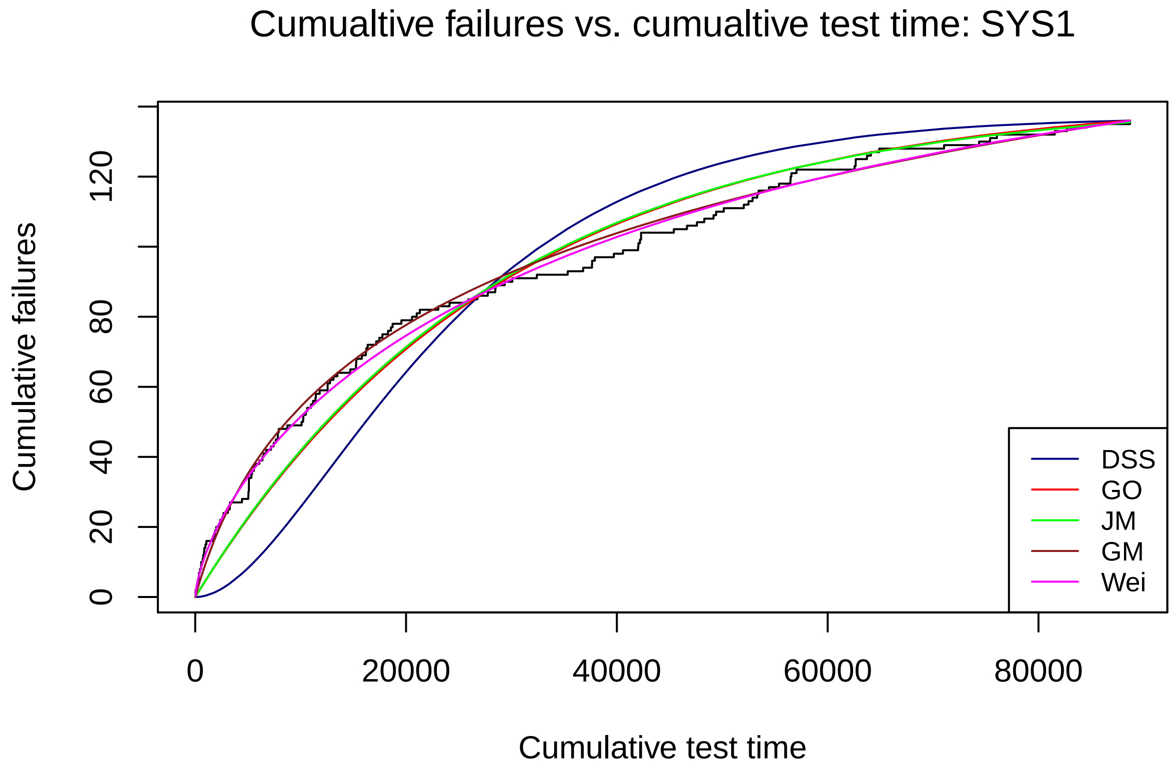
The running arithmetic average, computes and plots a running average of the times between failures. Intuitively, if the time between failures increases then the running arithmetic average increases, indicating system reliability is improving. A decreasing running arithmetic average indicates reliability deterioration.



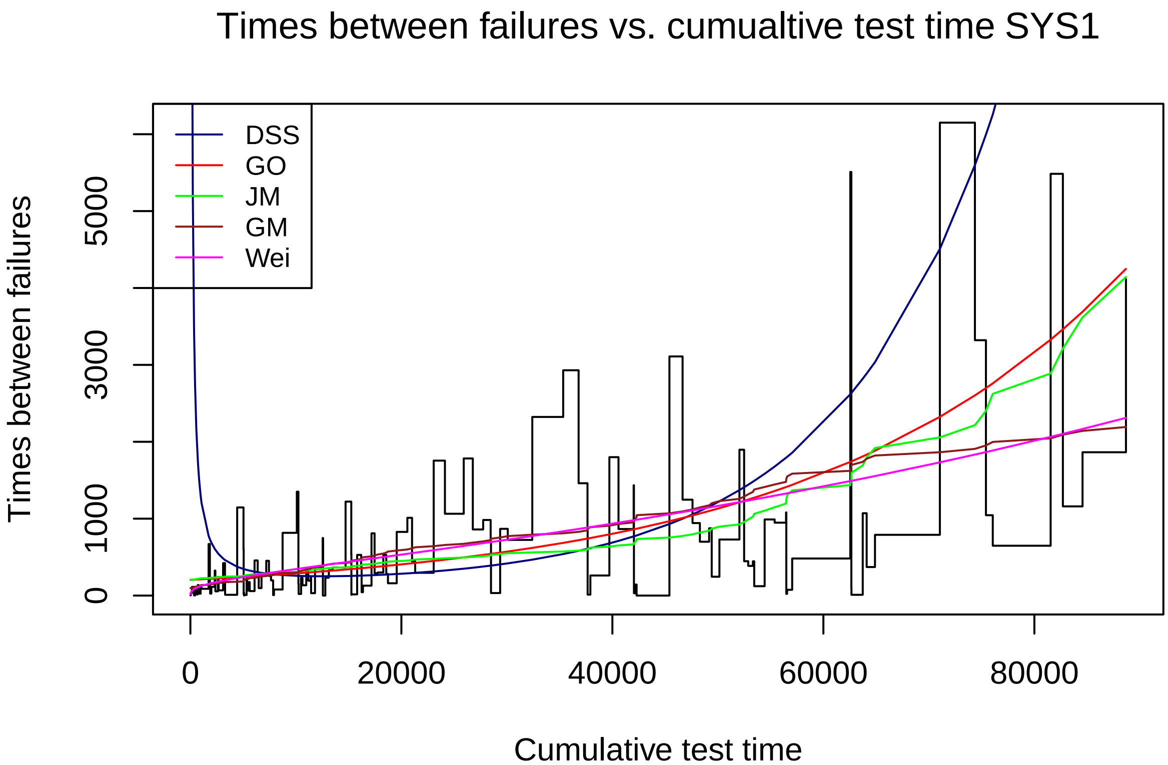
Tab2: Set Up and Apply Models

Cumulative failures

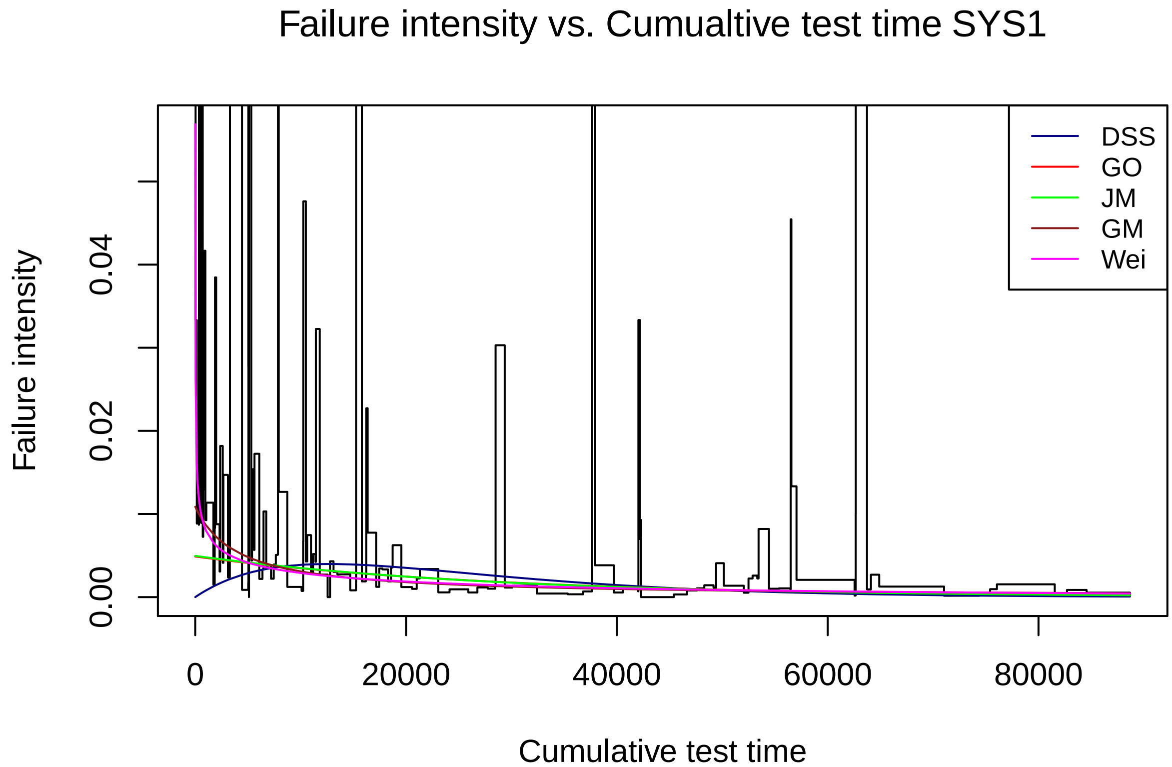
The figure show model result plots for the input data SYS1. Models DSS, GM, Wei, GO, JM are applied.



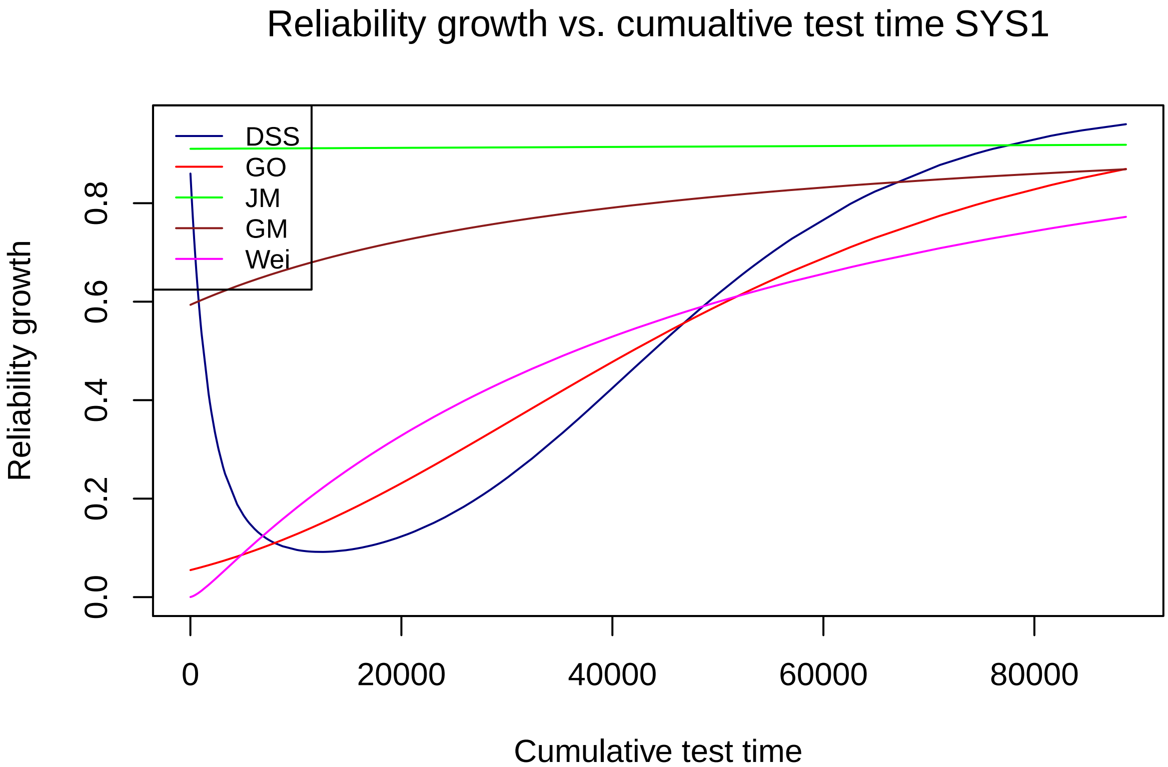
Times between failures



Failure intensity



Reliability growth



Tab3: Query Model Results

The plots and tabular displays of model results can provide a good overview of what the different models predict for the future failure behavior of the system being analyzing. However, there are some details that are difficult to see in the plots and tables, so the SFRAT allows detailed queries of the models to answer the following questions:

How many more failures will be observed in a given amount of time?

How long will it take to observe a given number of failures?

How much more testing time will be needed to obtain a given reliability for a specified operating time?

	Time to achieve specified reliability	Expected number of failures	Expected time to N failure
DSS	R = 0.9 achieved	0.246856262199799	NA
GO	8263.13681952821	0.903615409906593	10040.3808618466
JM	91142.2377161945	0.85612548252314	10742.5403828383
GM	153028.269493869	1.87747308675807	4390.88656760035
Wei	66732.9968495319	1.72595369956707	4793.97740413222

Tab4: Evaluate Models

After applying one or more models to a set of failure data, the user can assess which model or models produce better predictions. This version of the SFRAT includes two methods to evaluate the performance of the models to identify those that will provide better predictions – the Akaike Information Criterion (AIC) and Predictive Sum of Squared Error (PSSE).

	Akaike Information Criterion (AIC)	"Predictive sum of squares error (PSSE)" ~ 0.9
DSS	2075.15	296.35
GO	1953.61	23.07
JM	1950.53	*19.6
GM	*1937.03	84.33
Wei	1938.16	74.94

Smaller values of AIC and PSSE values are preferred.