CSE565 Reliability Prediction Tools

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I. Tool 1: SFRAT

1. The Software Failure and Reliability Assessment Tool (SFRAT) is a software reliability modeling tool designed to estimate and predict the reliability of a software system. It creates reliability growth curves and provides tools for visualization and modeling to aid decision-making.

2. SFRAT accepts the following input

   i. Inter-failure Times: Failure Number (FN), Interval Time (IF), and Total Time (FT). It is applicable to models such as Moranda's Geometric Model and Jelinski-Moranda Model.

FN	IF	FT
1	3	3
2	30	33
3	113	146
4	81	227
5	115	342

   ii. Failure Counts: Test Time (T), Failures in Interval (FC), and Cumulative Failures (CFC). It is applicable to models such as Inflection S-Shape Model.

T	FC	CFC
1	6	6
3	1	7
4.5	1	8
6	0	8
7	1	9

3. SFRAT analyzes failure data trends and applies data to various reliability models for failure predictions and evaluating model performance.

4. All models provided by SFRAT are reliability growth models, which assume that fixing defects

improves reliability over time without introducing new issues. Some other models, like Jelinski-Moranda Model, assume that the number of errors is fixed.

II. Tool 2: SMERFS Cubed

1. SMERFS Cubed is the newest evolution of Statistical Modeling and Estimation of Reliability Functions for Systems. It allows the user to do hardware, software, and/or total systems reliability analyses.

2. SMERFS includes 11 models, of which six models use the time between error occurrences as input data and five models use the number of errors detected per testing period. SMERFS Cubed adds 6 models for Hardware Reliability Analysis and 2 models for System Reliability Assessment.

3. SMERFS provides preliminary model analysis to identify suitable candidate models, and can also perform model fitting and assess model adequacy.

4. Similar to SFRAT, many models assume that failure rates are homogeneous or follow specific trends over time.

III. Using tool: SFRAT

1. Goel-Okumoto model assumes that fixing defects improves reliability over time without introducing new issues, while the Jelinski-Moranda model assume that the number of errors is fixed.

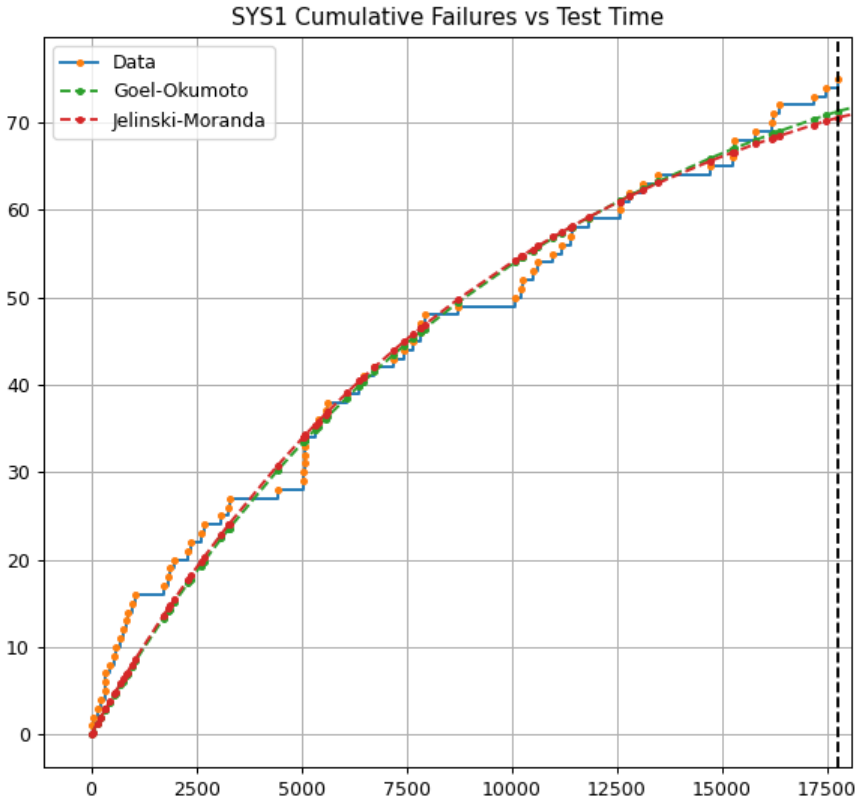
2. Input data

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
11	138	709
12	50	759
13	77	836
14	24	860
15	108	968
16	88	1056
17	670	1726
18	120	1846
19	26	1872
20	114	1986
21	325	2311
22	55	2366
23	242	2608
24	68	2676
25	422	3098

FN	IF	FT
26	180	3278
27	10	3288
28	1146	4434
29	600	5034
30	15	5049
31	36	5085
32	4	5089
33	0	5089
34	8	5097
35	227	5324
36	65	5389
37	176	5565
38	58	5623
39	457	6080
40	300	6380
41	97	6477
42	263	6740
43	452	7192
44	255	7447
45	197	7644
46	193	7837
47	6	7843
48	79	7922
49	816	8738
50	1351	10089

FN	IF	FT
51	148	10237
52	21	10258
53	233	10491
54	134	10625
55	357	10982
56	193	11175
57	236	11411
58	31	11442
59	369	11811
60	748	12559
61	0	12559
62	232	12791
63	330	13121
64	365	13486
65	1222	14708
66	543	15251
67	10	15261
68	16	15277
69	529	15806
70	379	16185
71	44	16229
72	129	16358
73	810	17168
74	290	17458
75	300	17758

3. Result



Model	Time for R = 0.9 (mission length 300)	Failures for next 300 time units	Failure Number	Expected Time Until Failure N
Goel-Okumoto	15104.326	0.449	76	3678.953
Jelinski-Moranda	21099.706	0.566	76	744.838

Model	AIC	PSSE 90% Data
Goel-Okumoto	964.53	48.166
Jelinski-Moranda	962.157	72.247

IV. References

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