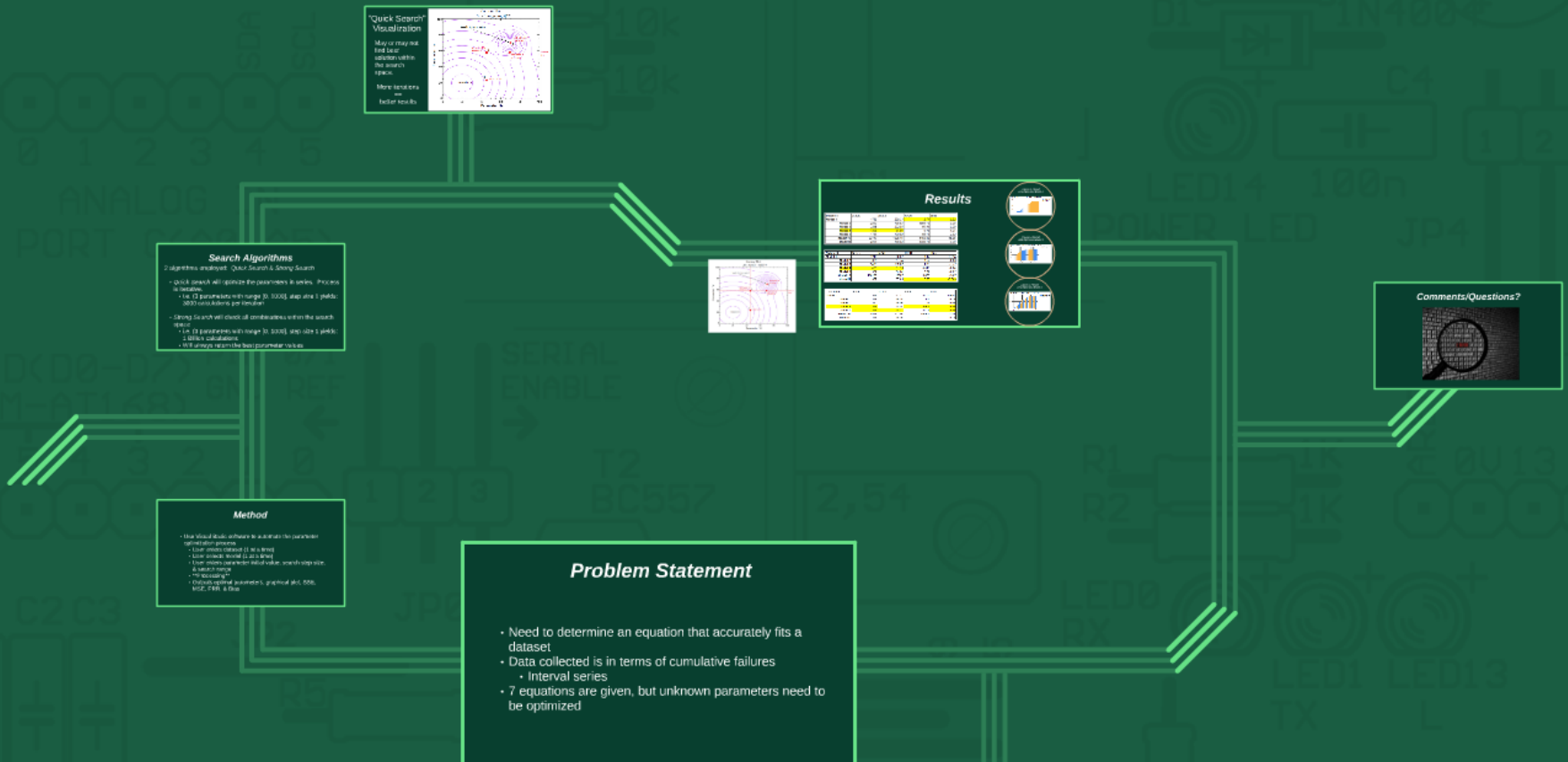
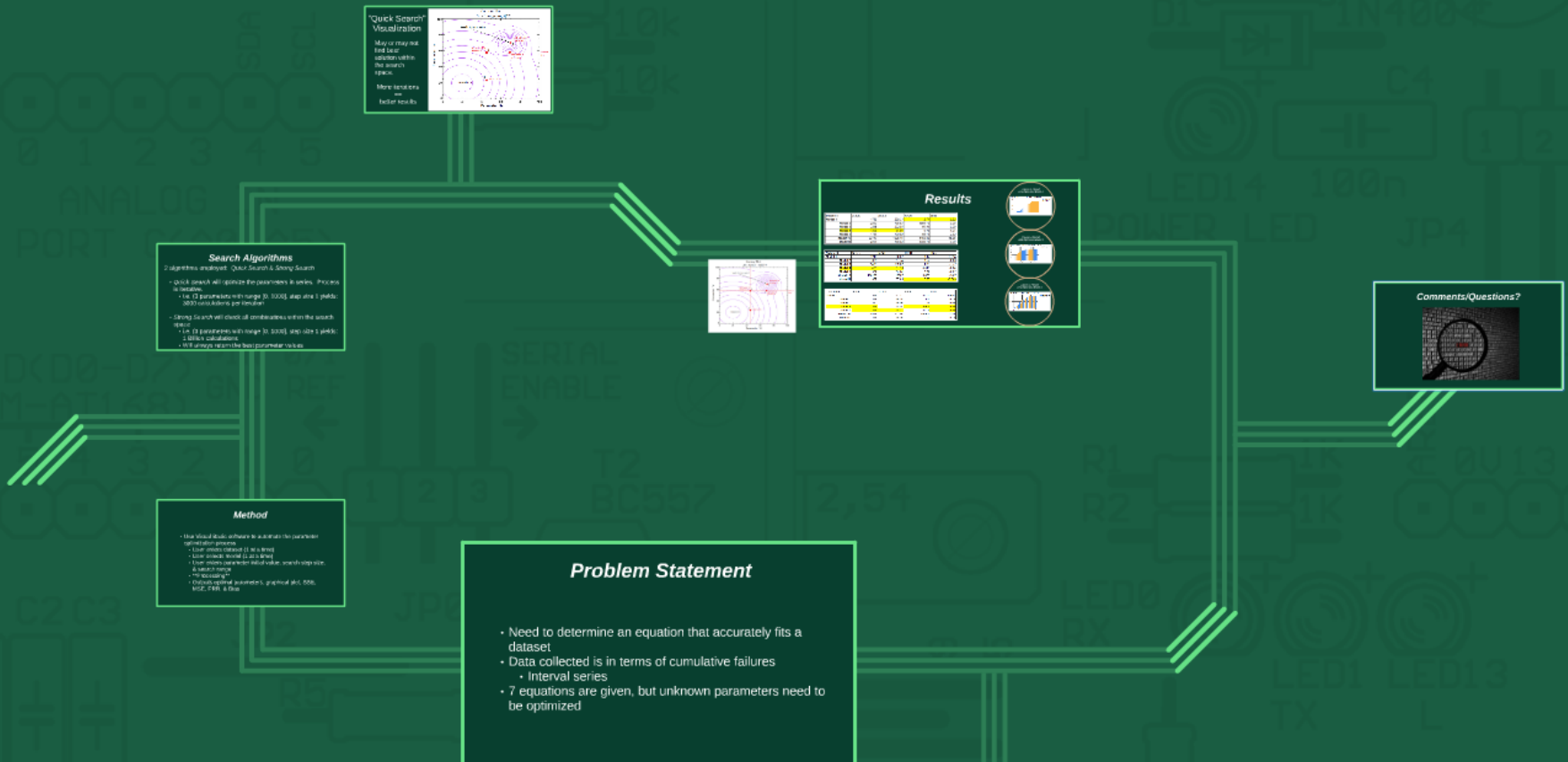


Software Reliability Model Optimization



Software Reliability Model Optimization



Problem Statement

- Need to determine an equation that accurately fits a dataset
- Data collected is in terms of cumulative failures
 - Interval series
- 7 equations are given, but unknown parameters need to be optimized

Method

- Use Visual Basic software to automate the parameter optimization process
 - User enters dataset (1 at a time)
 - User selects model (1 at a time)
 - User enters parameter initial value, search step size, & search range
 - ****Processing****
 - Outputs optimal parameters, graphical plot, SSE, MSE, PRR, & Bias

Search Algorithms

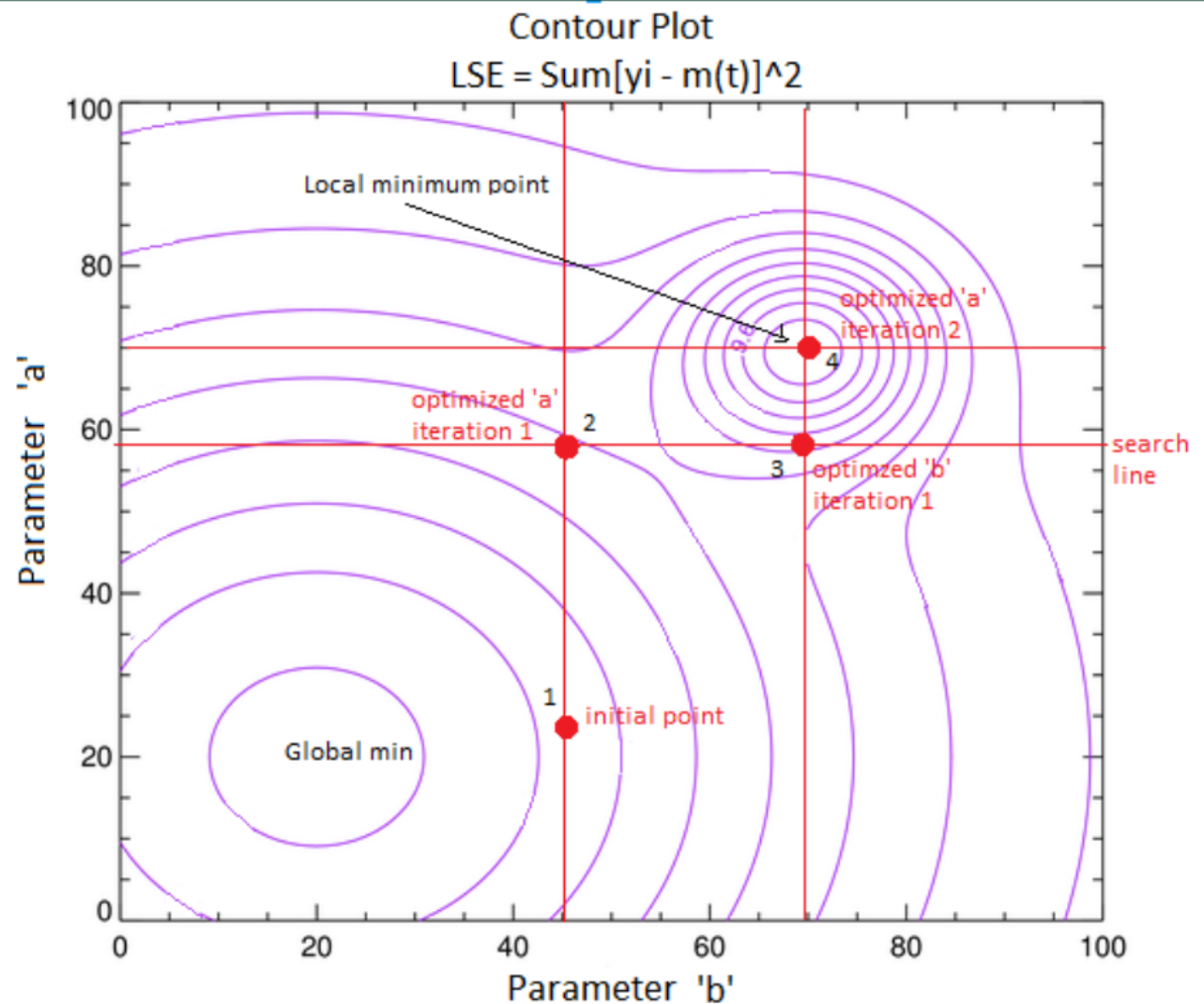
2 algorithms employed: *Quick Search* & *Strong Search*

- *Quick Search* will optimize the parameters in series. Process is iterative.
 - i.e. (3 parameters with range [0, 1000], step size 1 yields: 3000 calculations per iteration)
- *Strong Search* will check all combinations within the search space
 - i.e. (3 parameters with range [0, 1000], step size 1 yields: 1 Billion calculations)
 - Will always return the best parameter values

"Quick Search" Visualization

May or may not find *best* solution within the search space.

More iterations
==
better results



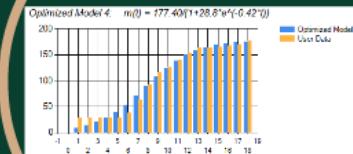
Results

DataSet 1	S.S.E.	M.S.E	P.R.R	Bias
Model 1	4789	299.33	2.71	0.92
Model 2	2222	138.93	1592.15	-3.25
Model 3	3245	202.85	69.94	-0.99
Model 4	1309	81.86	6.46	-1.31
Model 5	1744	109.02	65.14	-2.42
Model 10	23717	1395.16	1463.58	-16.86
Model11	2221	138.83	1386.18	-3.09

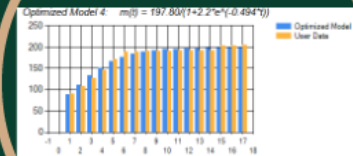
DataSet 2	S.S.E.	M.S.E	P.R.R	Bias
Model 1	1210	80.67	0.17	-0.614
Model 2	866	57.74	0.52	-0.06
Model 3	3489	232.62	1.29	-1.77
Model 4	473	31.58	0.018	-0.04
Model 5	972	64.84	0.07	-0.02
Model 10	166189	10387	8678	-56.7
Model11	867	57.85	0.05	-0.008

DataSet 3	S.S.E.	M.S.E	P.R.R	Bias
Model 1	356	32.37	0.31	0.607
Model 2	169	15.38	1.02	-0.16
Model 3	181	16.46	1.26	-0.09
Model 4	158	14.44	0.08	0.06
Model 5	158	14.37	0.33	-0.06
Model 10	6139	511.65	276.62	-11.81
Model11	169	15.36	1.14	-0.18

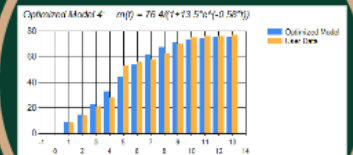
Dataset 1 Plotted with Optimized Model 4



Dataset 2 Plotted with Optimized Model 4

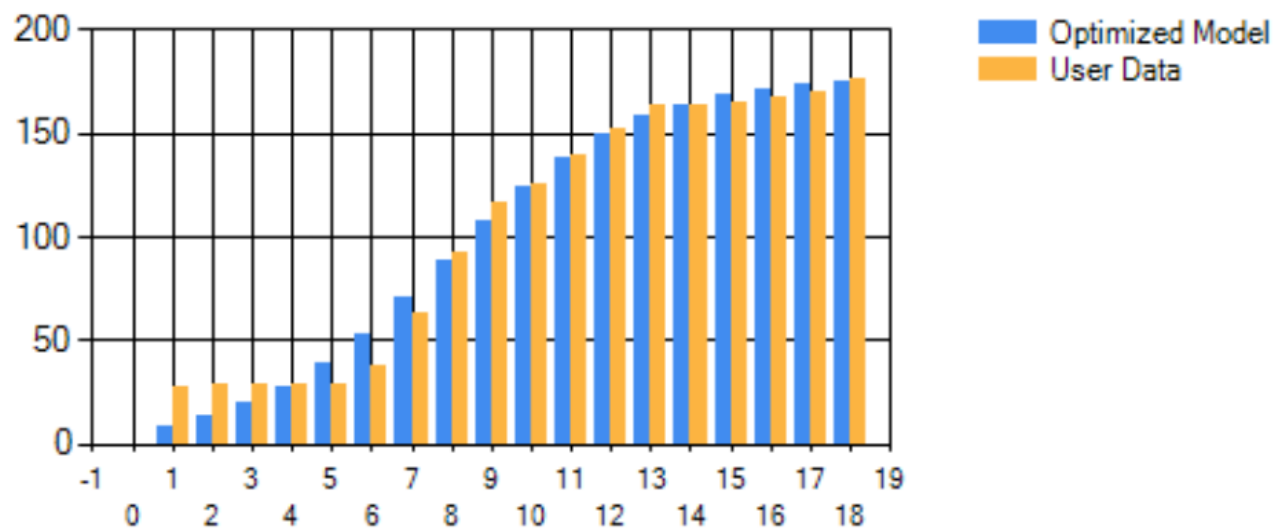


Dataset 3 Plotted with Optimized Model 4

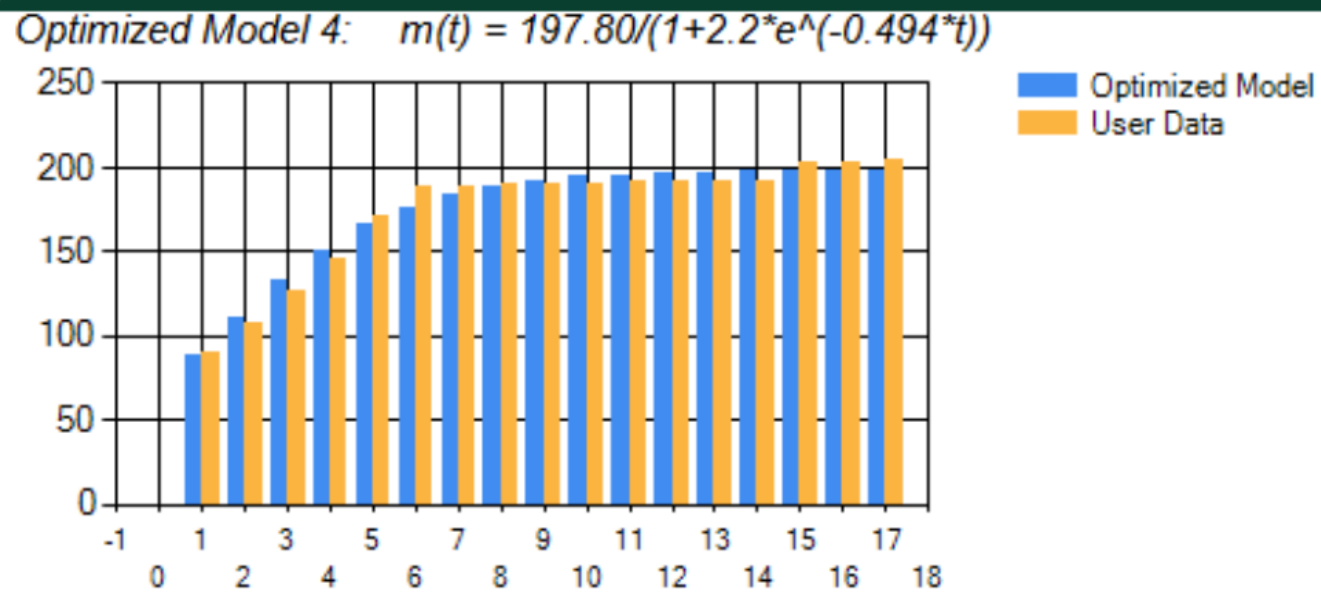


Dataset 1 Plotted with Optimized Model 4

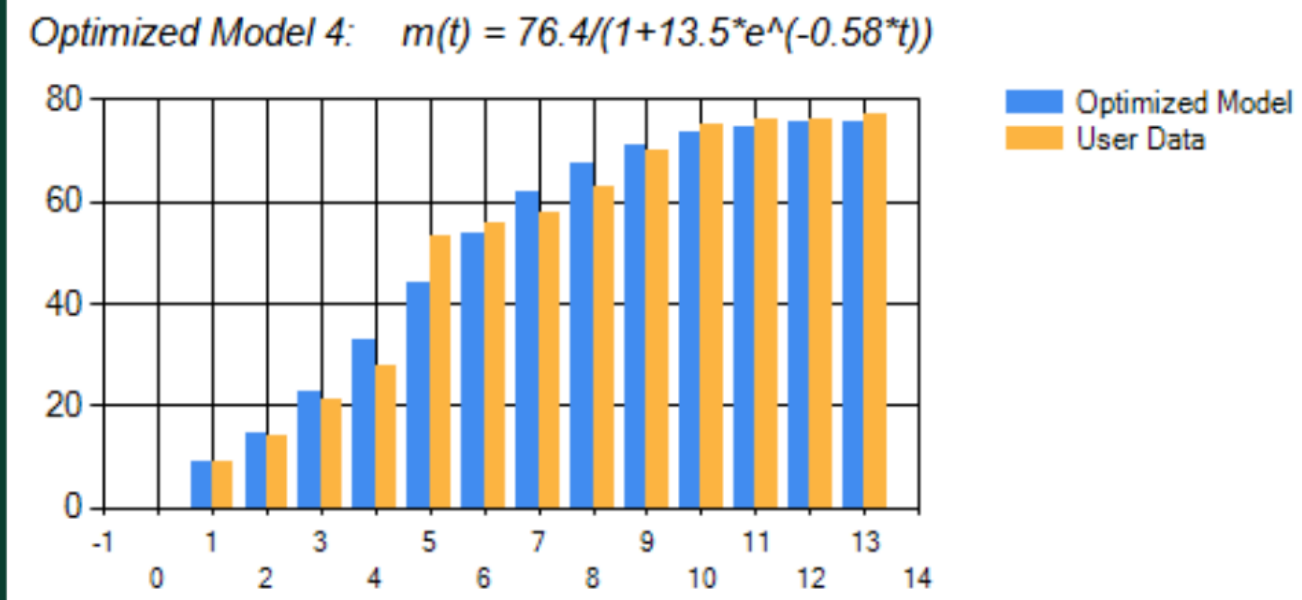
Optimized Model 4: $m(t) = 177.40/(1+28.8 \cdot e^{(-0.42 \cdot t)})$



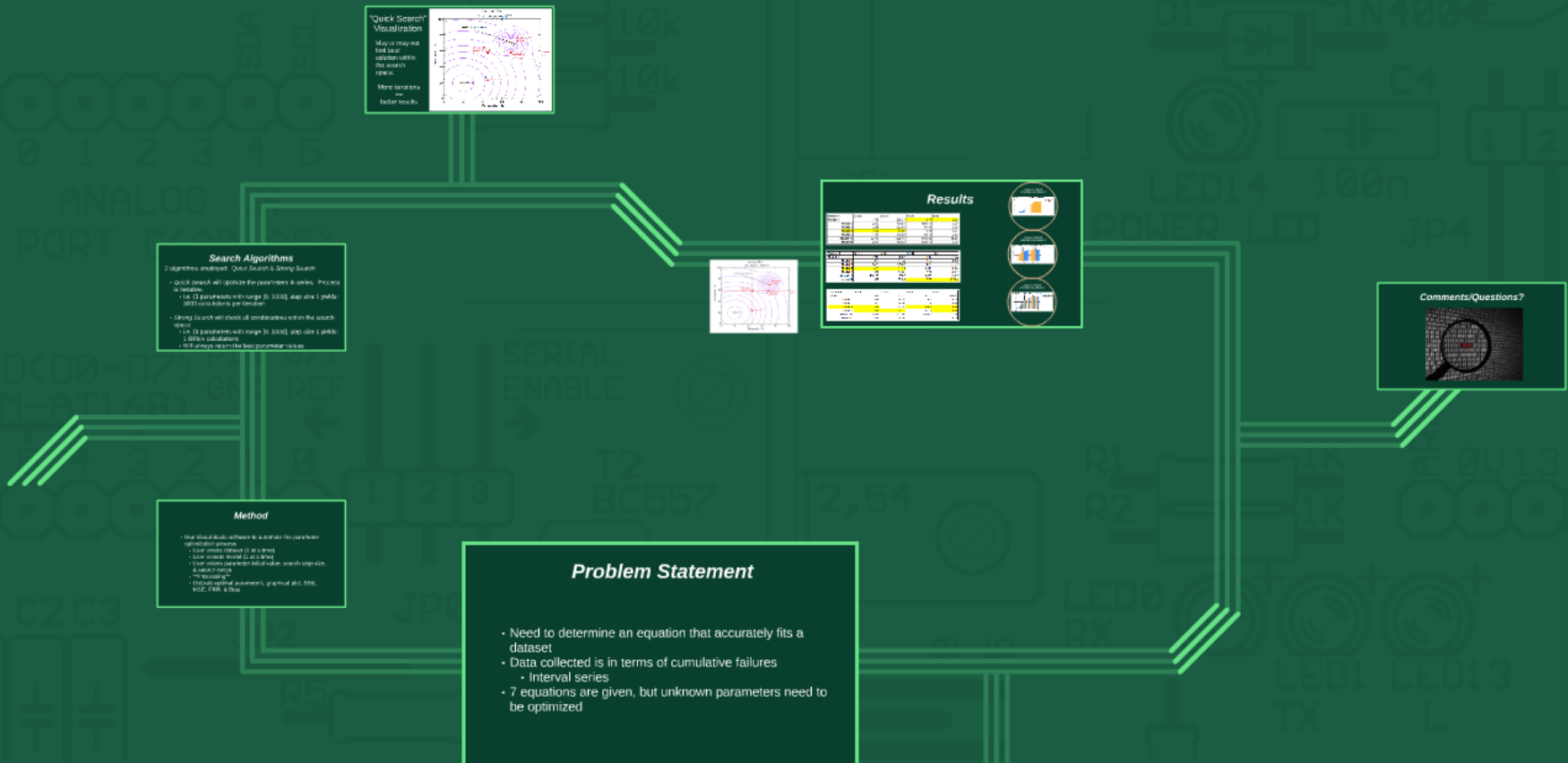
Dataset 2 Plotted with Optimized Model 4



Dataset 3 Plotted with Optimized Model 4



Software Reliability Model Optimization



Comments/Questions?

