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CS420

10 February, 2023

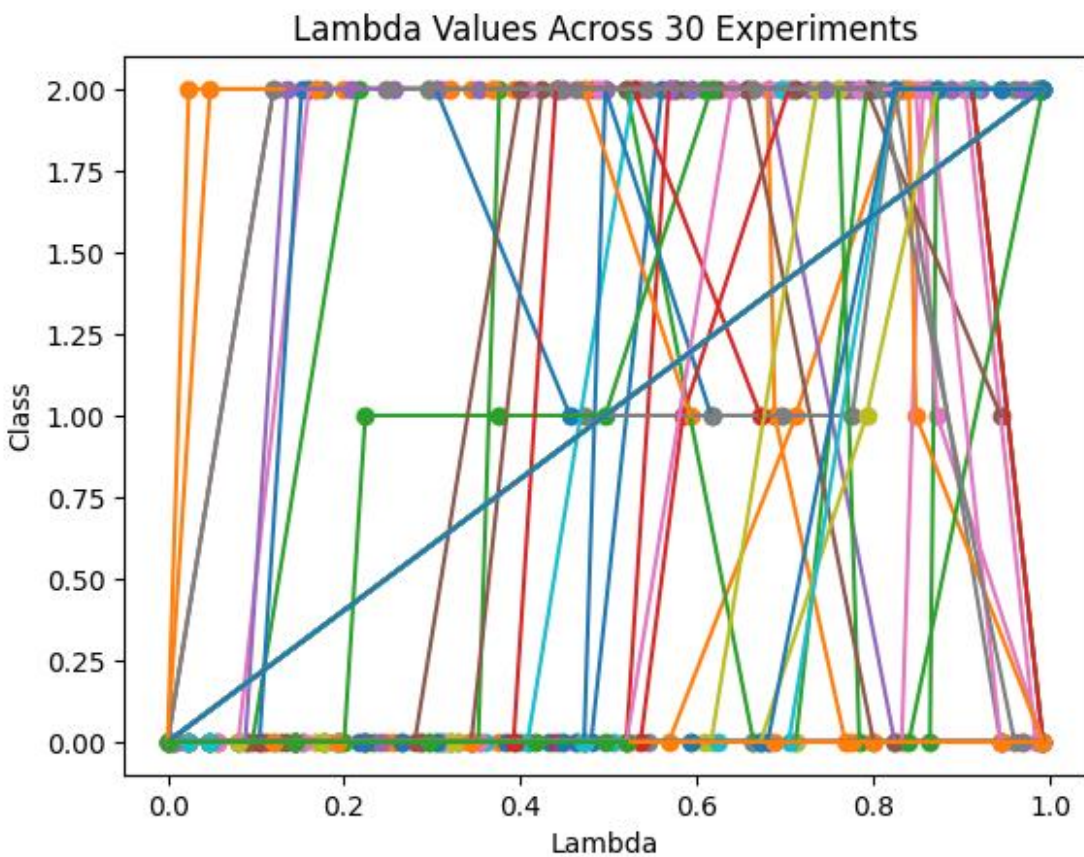
Lab 1 – “Edge of Chaos” Report

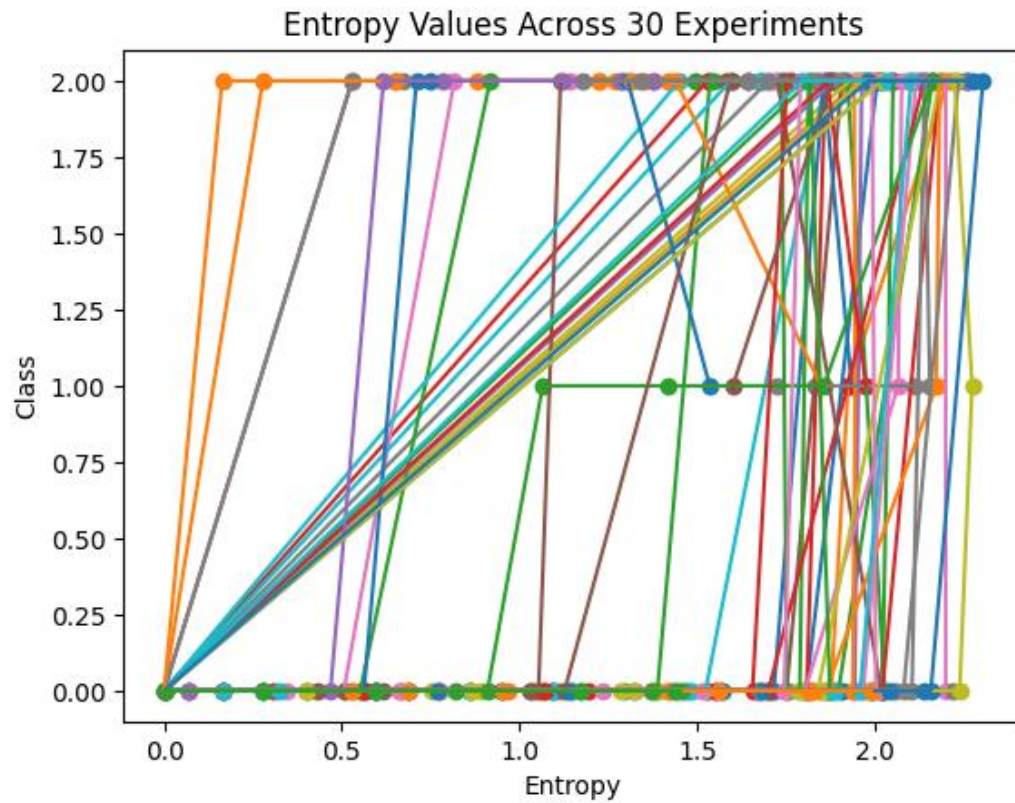
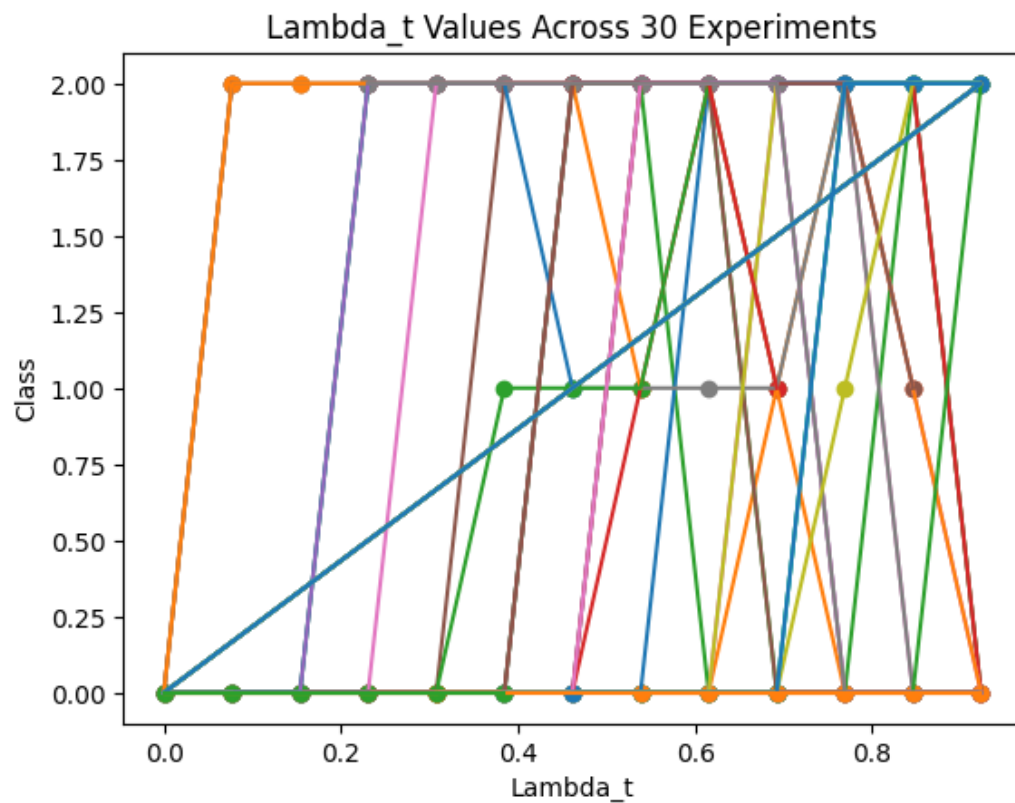
Calculations:

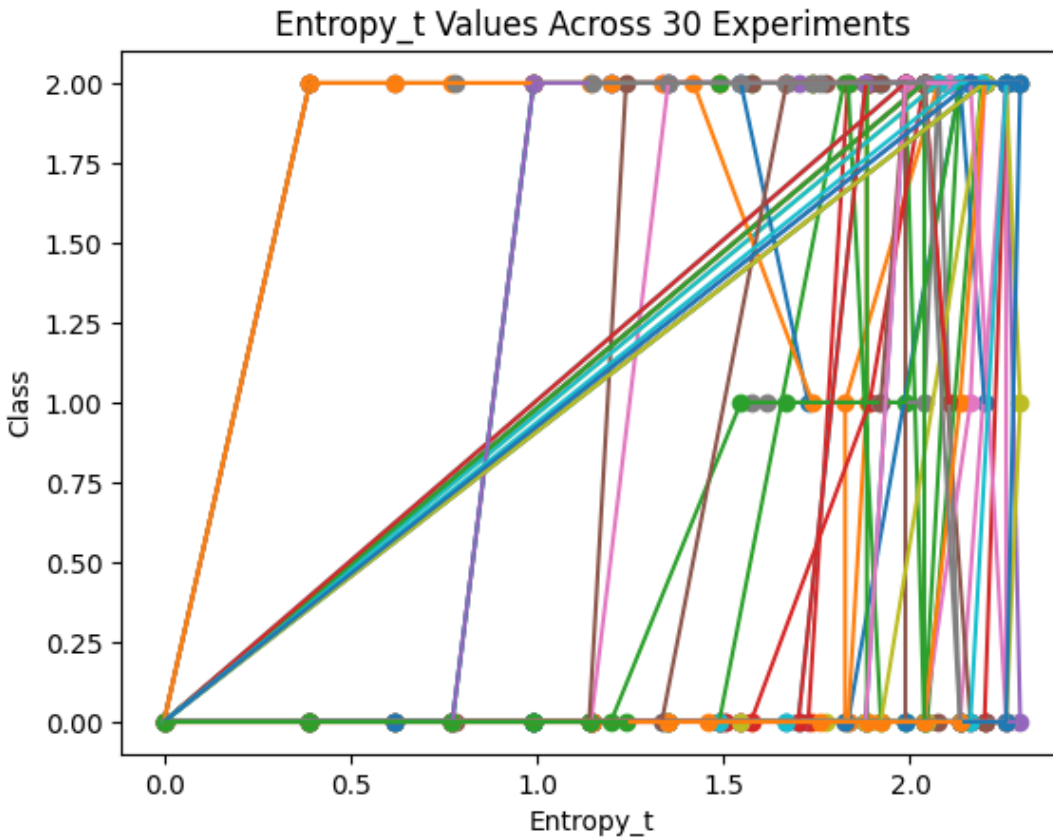
λ	λ_T	H	H_T
AVG: 0.6444 STD: 0.1721	AVG: 0.6423 STD: 0.1403	AVG: 1.9252 STD: 0.2208	AVG: 1.8698 STD: 0.2795

Based on these results, I would assume that the most reliable indicator of class IV behavior is H because it has the lowest ratio of standard deviation to its average, meaning it has the lowest proportional range of values.

Graphs:







Discussion:

Upon viewing the graphs, my first reaction is of how varied the values for classes 1, 2, and 3 are. It seems as if you could not draw any conclusions about these classes based on the parameters that we have computed thus far. For class 4, most of the parameter values seem to be in the upper half of the range of possible values. Additionally, totalistic entropy has the smallest range of values followed by regular entropy, totalistic lambda, and finally Langston's lambda, meaning that totalistic entropy may present a smaller proportional standard deviation over many more iterations.

With that said, the main anomaly (or more generally the main interesting thing) that I noticed throughout my experiments was the fact that class 4s only occurred in the first half of the steps in the experiment, but were never first which I believe is reflected in the graphs. I think that this phenomenon goes back to the name of class 4, "The Edge of Chaos". As class 3 or "chaos" is generally at the beginning, it stands to reason that the edge of chaos would have slightly lower entropy than pure chaos as they begin to form order at a higher step count.

For other classes, I did notice a substantial crossover between the values for classes. I think that the graphs are a bit misleading due to the mixing of 1s and 2s because class 1s are almost entirely in the latter half of steps. However, class 2s generally share the same range of values as class 3s with a slightly lower average. I believe that this fluctuation is just due to the initial rule that is generated before any decimation. Depending on the rule, it is possible to begin with a class 2 or 3 and generally will have more of that class in succession for the first half of the steps.