CSE310 P1 Report

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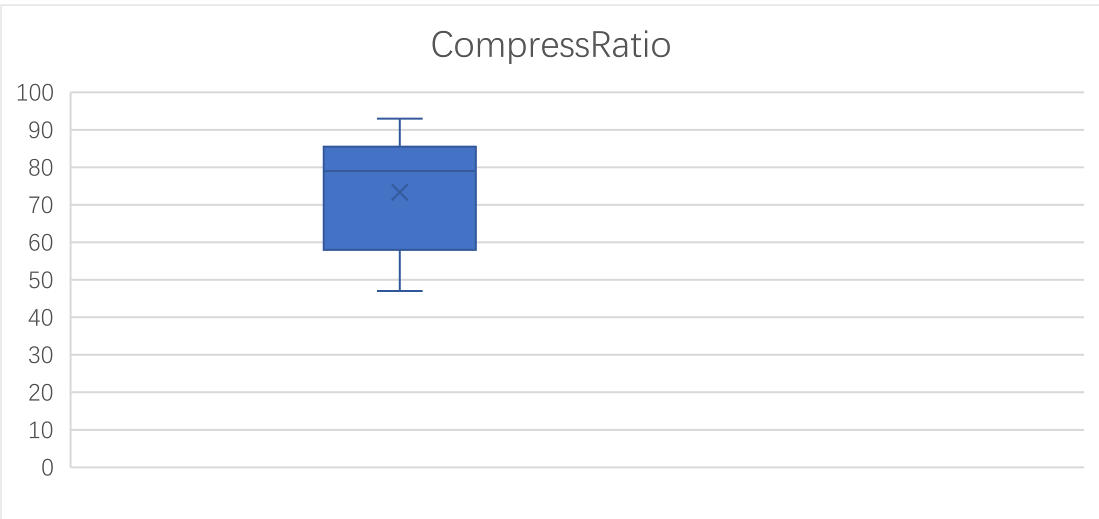
1. The average compression ratio; in addition to the average, compute the minimum, maximum, and standard deviation of the compression ratio. You might consider using a box and whiskers plot for this metric.

She sells sea shells.   n = 9

Index	Symbol	Freq	Encode	ExpectedNumberBits	CompressionRatio
10	\n	1	100	1/9*3=1/3	($\log_2 9$-1/3) /$\log_2 9$*100%≈89
32		3	11	3/9*2=2/3	($\log_2 9$-2/3) /$\log_2 9$*100%≈79
46	.	1	10	1/9*2=2/9	($\log_2 9$-2/9) /$\log_2 9$*100%≈93
83	S	1	01010	1/9*5=5/9	($\log_2 9$-5/9) /$\log_2 9$*100%≈82
97	a	1	01011	1/9*5=5/9	($\log_2 9$-5/9) /$\log_2 9$*100%≈82
101	e	4	000	4/9*3=4/3	($\log_2 9$-4/3) /$\log_2 9$*100%≈58
104	h	2	0100	2/9*4=8/9	($\log_2 9$-8/9) /$\log_2 9$*100%≈72
108	l	4	001	4/9*3=4/3	($\log_2 9$-4/3) /$\log_2 9$*100%≈58
115	s	5	011	5/9*3=5/3	($\log_2 9$-5/3) /$\log_2 9$*100%≈47



2. The time to sort input instances for each type of sort, i.e., for Insertion Sort and for Merge

Sort. Plot the run time as a function of input size on one figure. For this experiment you should run your sorting algorithms outside of the context of the encoding/decoding problem. Do the running times cross each other? Which algorithm is better for sorting smaller instances? Which algorithm is better for sorting larger instances?

Insertion Sort: $O(n^2)$.
Merge Sort: $O(n\log_2 n)$.
Insertion Sort is better for sorting smaller instances.
Merge Sort is better for sorting larger instances.

3. The time to encode and decode input instances. Plot the run time as a function of input size.

4. How do you expect the compression ratio to vary according to n?

   inversely proportional.