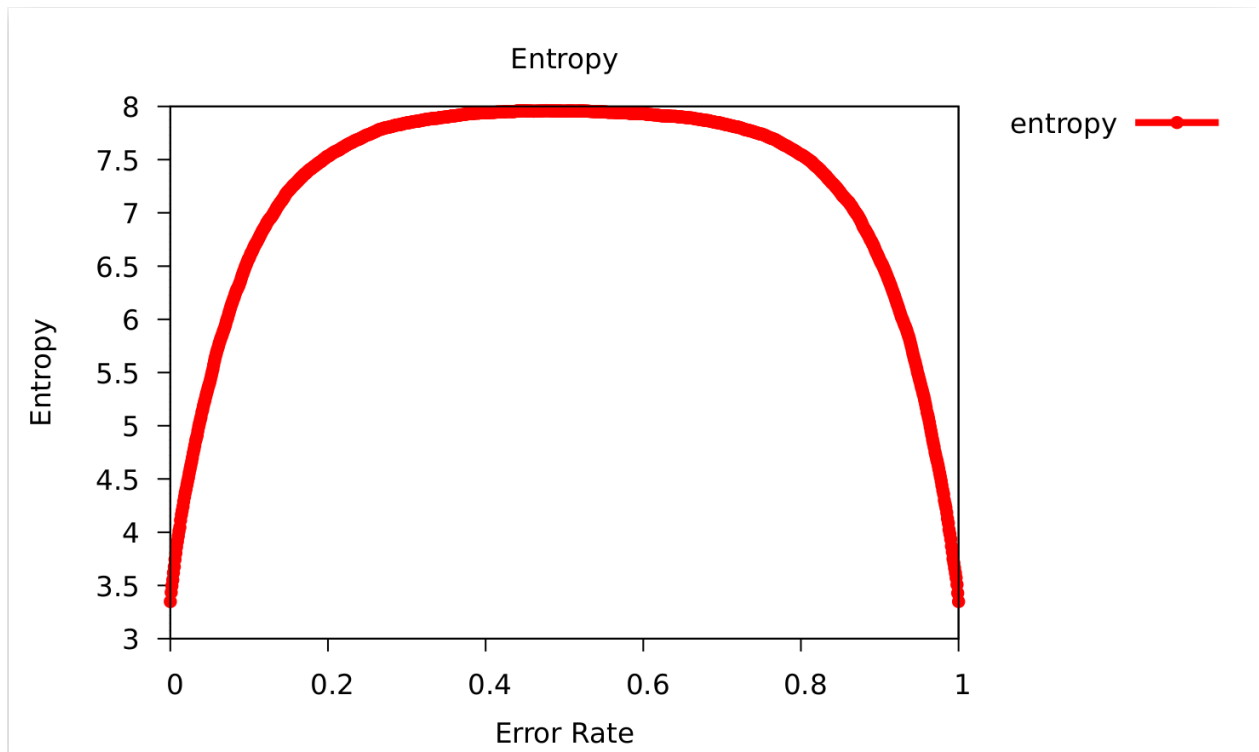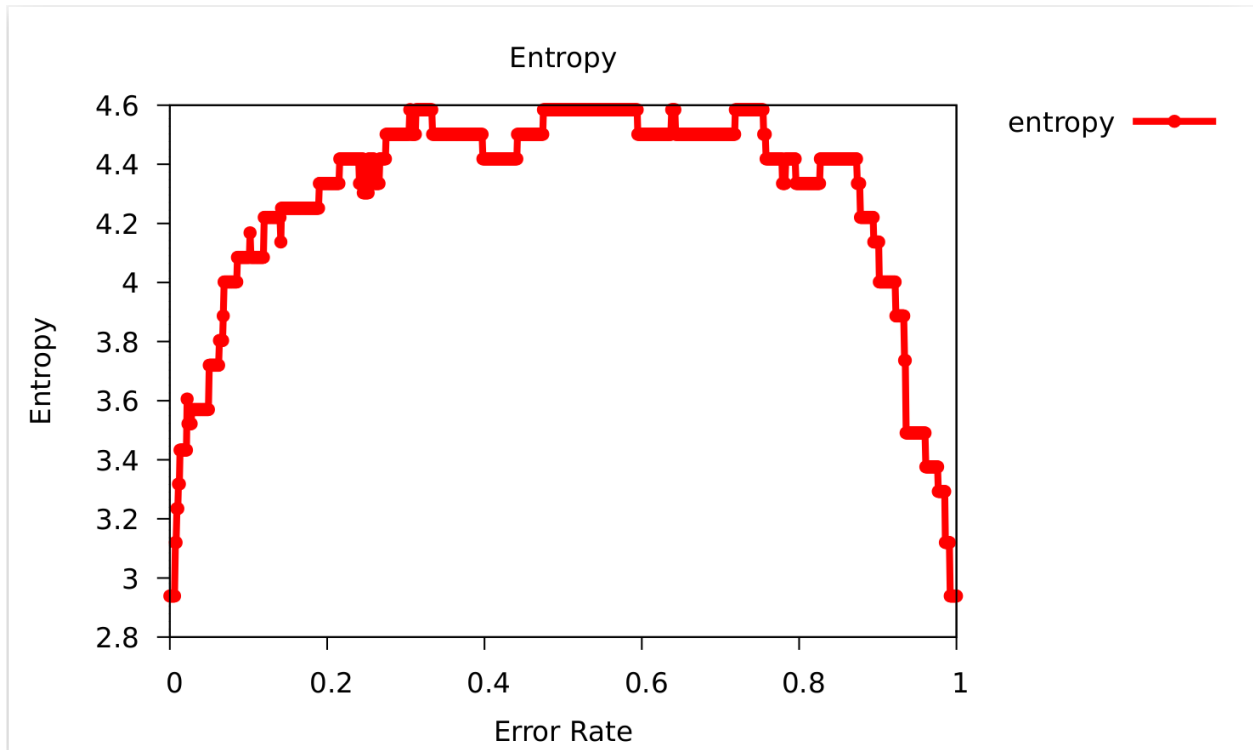Mattiwos Belachew
mbelache@ucsc.edu
5/9/2021

CSE 13s Spring 2021
Assignment 5:
Hamming Codes
Writeup Document
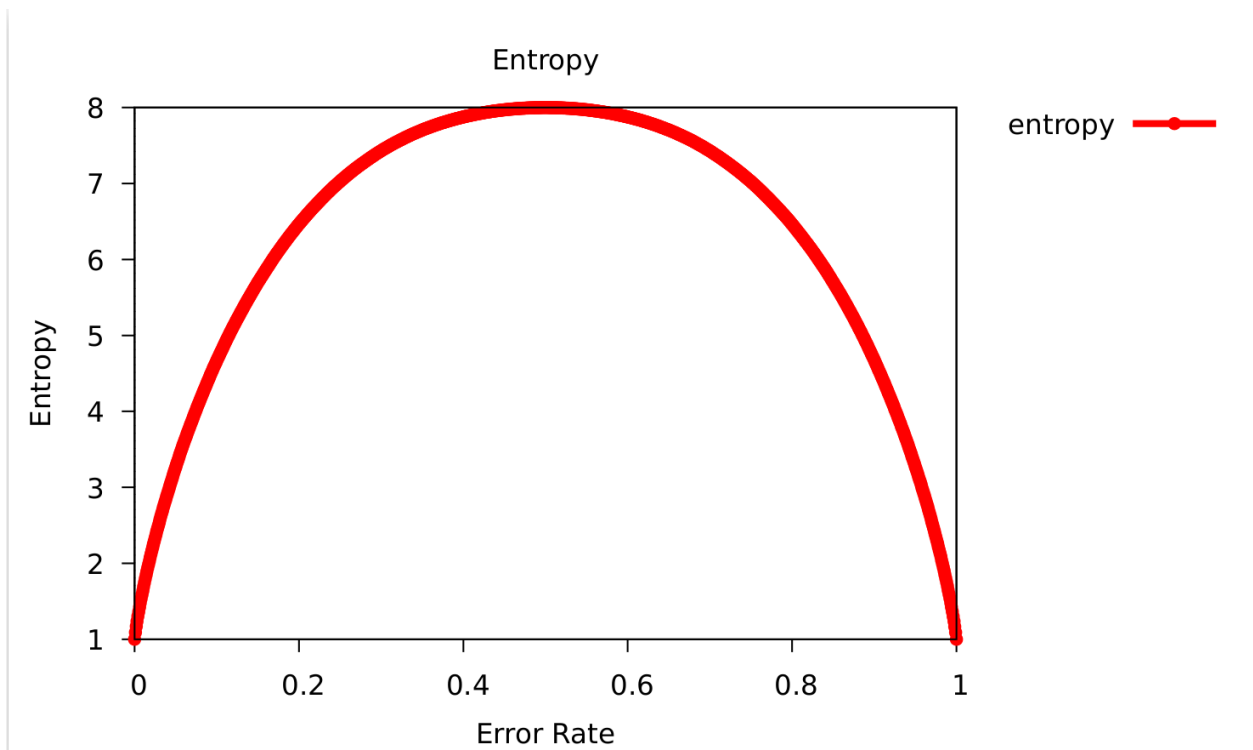
• Graphs showing the amount of entropy of data before and after encoding it.

- Entropy of my README.md. After being encoded and as the error rate increases it creates a bell curve.

- Entropy of txt file containing "hello world". After being encoded and as the error rate increases it creates a bell curve.

- Entropy of txt file containing all "a". After being encoded and as the error rate increases it creates a bell curve. We can see it starts at 1 meaning its highly predictable == low entropy. As error is being injected the entropy increases.

The first thing I noticed is that the entropy looks like a bell curve when the characters are unique to one another however when it's predictable it looks like a horizontal line with dips at certain points but then returns to its original height. One of the reasons why I think is because entropy detects the predictability of a data and its consecutive values. So when we have similar characters such as "aaaa" we know automatically what the value will be since we know it will be "a", which results in low entropy. In other words, the higher the entropy I believe means that it's harder to decode a message since there are a higher number of choices that you can choose from in order to decode the message. In other words, the higher the randomness of the data the higher the entropy and the lower the randomness the lower the entropy.

The reason the entropy looks like a bell curve is because as the error injection rate increases, the bits are being flipped and after some point such as the maximum height on the graph. It becomes a new message. In other words at some point when it's injecting error to the data it becomes an entirely new message. This causes the curve to go back down causing a bell curve to appear.