CS 225: Assignment #2

Due on Thursday, Jaunary 28, 2016

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1 Question 1

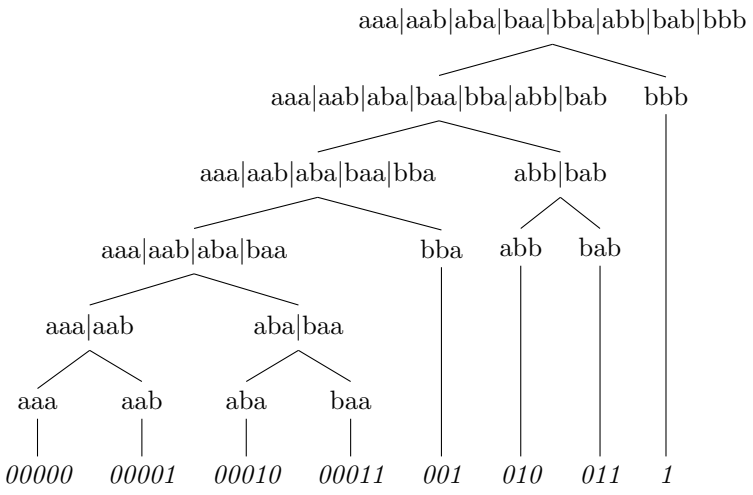
2 Question 2

This question asked us to find the Huffman Coding of X^3 where $\mathcal{X} = \{a, b\}, p(a) = .25, p(b) = .75$. First, we need to know the probability of every string happening. For example, $p(aaa) = p(a) * p(a) * p(a) = .25^3 = 0.015625$ and $p(aab) = p(a) * p(a) * p(b) = .25^2 * .75 = 0.046875$.

The table below outlines all of these probabilities:

$x \in \mathcal{X}^3$	$Pr(x)$
aaa	0.015625
aab	0.046875
aba	0.046875
baa	0.046875
abb	0.140625
bab	0.140625
bba	0.140625
bbb	0.421875
aaa|aab	0.0625
aba|baa	0.09375
aaa|aab|aba|baa	0.15625
abb|bab	0.28125
aaa|aab|aba|baa|bba	0.296875
aaa|aab|aba|baa|bba|abb|bab	0.578125

The tree of the Huffman code can be seen below:



The expected code length is thus:

$$
\begin{aligned}
L(C) &= \sum_{x \in \mathcal{X}} p(x) l(x) \\
&= 0.015625 * 5 + 3(0.046875 * 5) + 3(0.140625 * 3) + 0.421875 * 1 \\
&= 2.46875 \text{ bits}
\end{aligned}
$$

3 Question 3

4 Question 4