

* ASSIGNMENT-2 *

Q1. Define self information

→ Shannon defined a quantity called self information, suppose we have an event A, which is set of outcomes of some random experiment.

→ If $P(A)$ is probability that A will occur, then self infoⁿ is,

$$i(A) = \log_b \frac{1}{P(A)} = -\log_b P(A)$$

If,

$b = 2$ unit is bits

$b = e$ unit is nats

$b = 10$ unit is hartley.

Q2. Define average length of code

→ Average length of code is the average no. of bits occupied by any code-word.

$$L = \sum_{i=1}^n P(a_i) n(a_i)$$

$n(a_i) \rightarrow$ length of cw a_i

$n \rightarrow$ no. of sym

Q3.

Define Redundancy

→ Measure of efficiency of code is its redundancy.

→ Difference between entropy & average length.

Q4.

Given probability, find real valued tag for sequence $a_1 a_1 a_3 a_2 a_3 a_1$

$$a_1 = 0.2$$

$$a_2 = 0.3$$

$$a_3 = 0.5$$

→

$$C(a_1) = 0.2$$

$$C(a_2) = P(a_1) = 0.5$$

$$C(a_3) = P(a_1) + P(a_2) = 0.7$$

$$\text{let } w = u - l$$

$$\text{and } u = 1 \quad l = 0$$

$$l^i = l^{i-1} + w^{i-1} * C(a_i)$$

$$u^i = l^{i-1} + w^{i-1} * C(a_i)$$

$$u^i = l^{i-1} + w^{i-1} * C(a_i)$$

$$\text{For } a_1 \quad w = 1 - 0 = 1$$

$$u = 0 + 1 * 0.2 = 0.2$$

$$l = 0 + 1 * 0 = 0$$

$$\text{For } a_1, \quad w = 0.2$$

$$l = 0 + 0.2 * 0 = 0$$

$$u = 0 + 0.2 * 0.2 = 0.04$$

then a_3 ,

$$w = 0.04$$

$$j = 0.02$$

$$u = 0.04$$

then a_2 ,

$$w = 0.02$$

$$j = 0.024$$

$$u = 0.03$$

then a_3 ,

$$w = 0.006$$

$$j = 0.027$$

$$u = 0.03$$

then a_4 ,

$$w = 0.003$$

$$j = 0.027$$

$$u = 0.0276$$

$$\boxed{\text{Tag}} = (L+R)/2$$

$$= \underline{\underline{0.0273}}$$

A sequence using L277 algo. Given

$$C(a) = 1 \quad C(t) = 4$$

$$C(b) = 2 \quad \text{decode sequence}$$

$$C(r) = 3 \quad SB = 10 \quad LAB = 10$$

SB LAB

$\langle 0, 0, 3 \rangle$

r

$\langle 0, 0, 1 \rangle$

ra

$\langle 0, 0, 4 \rangle$

rat

$\langle 2, 8, 2 \rangle$

rat

atatatatb

ra

tatatatatb

$\langle 3, 1, 2 \rangle$

ra

tatatatatb

ab

$\langle 0, 0, 3 \rangle$

ratat

tatatatatbabr

$\langle 6, 4, 4 \rangle$

ratat

atatatatbabr

atbat

ratatatata

tbabr atbat

$\langle 9, 5, 4 \rangle$

ratatatata

tbabr atbat

babrat

ratatatata tbabr

tbabr atbat

A sequence is encoded using LZw & initial dictionary is :

Index entry

1	B
2	a
3	h
4	o
5	s
6	t

Output of LZW encoder:

6, 3, 4, 5, 2, 3, 1, 6, 2, 9, 11, 16, 12, 4, 20, 10, 8, 23, 13

Decode sequence

→ From 6, 3, 4, 5, 2, 3, 1, 6, 2 we decode this as hBta and new entry in table are:

7	th
8	hi
9	is
10	sa
11	ah
12	hB
13	Bt
14	ta
15	a--

→ next entry is 9 thus,

15 ai
16 ais --

→ Now, entry is 11, 30

16 isa
17 ab

→ And 30, 00

17 abi
18 ish
19 hbi
20 bis
21 sah
22 hib

sequence is,

thisahbta is ab isa hbi bis sa hib