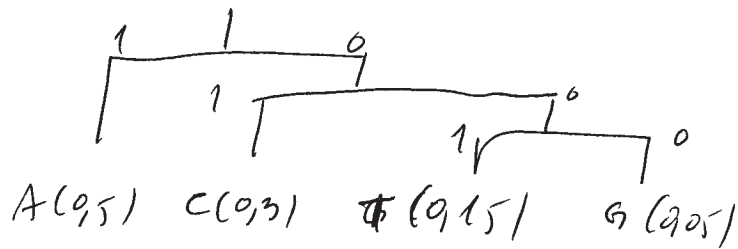


TD /
Ex 1 1) $\{A, C, T, G\}$ over proba $\{0.5, 0.3, 0.15, 0.05\}$

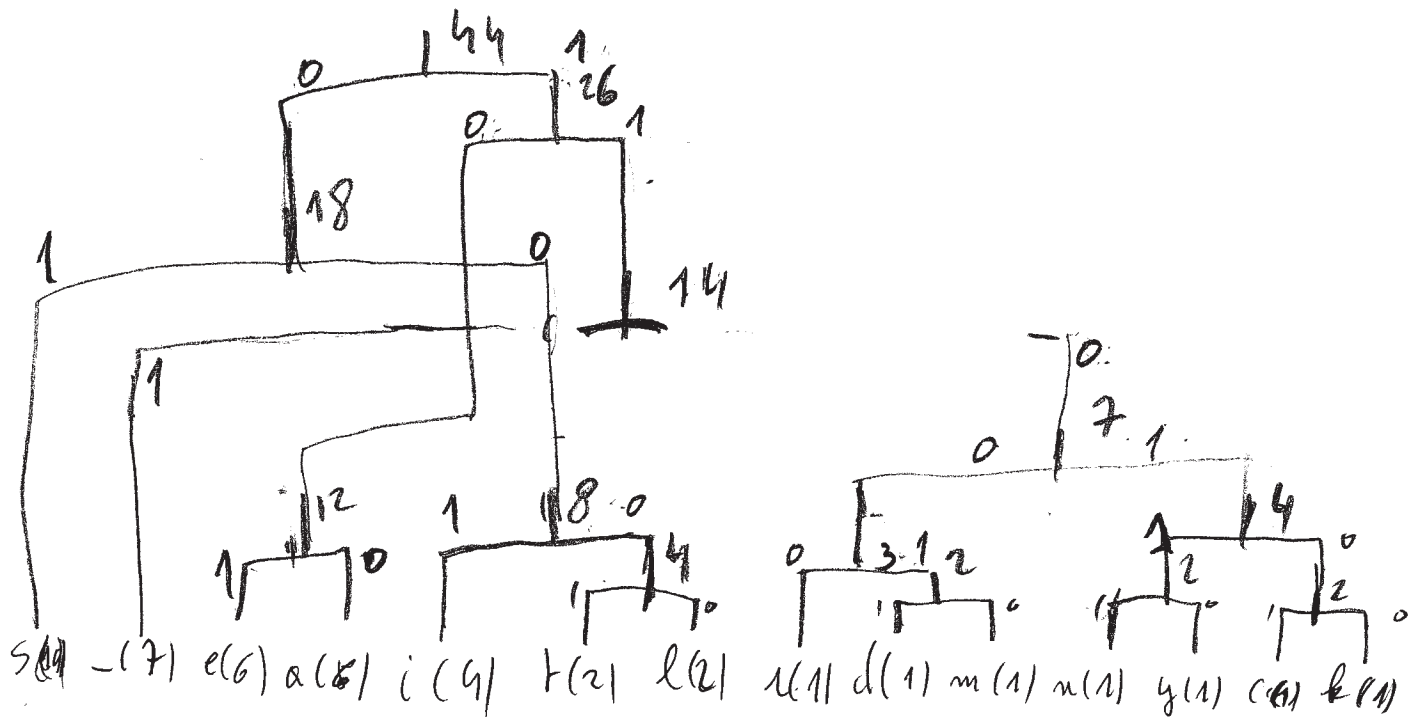
entropy $H = 1.64$.

		001
A	1	0
C	01	11
T	001	101
G	000	100



2) Huffman code of "Sun did eat them early trees sea did seeds"
coding:

S(10) i(4) n(1) -(7) d(1) e(6) a(6) t(2) m(1) u(1) l(2)
y(1) c(1) k(1)



codes

s	01
r	111
e	101
a	100
i	001
t	0001
l	0000

l	11 000
d	11 0011
m	11 0010
n	11 0111
g	11 0110
c	11 0101
k	11 0100

Ex2 MTF code with words

1) "The dog on my right is the right dog"

Word	A (before)	A (after add)	Code
The	()	(the/	0 the
dog	(the/	(the dog)	1 dog
on	(dog, the/	(dog the on/	2 on
my	(on dog the/	(on ... the my/	3 my
right	(my on .../	(my ... the right)	4 right
is	(right on .../	(right ... the is)	5 is
the	(is right my on the/	(is ... the)	5
right	(the is right my on dog/	—	2
dog	(right the is my on dog/	—	5

dog right the is my on

2) Decode: 0 the 1 right 2 of 2 3 dog 4 is 5 on 6 dog 6

0 the	the	(the/
1 right	right	(the, right) → (right, the/
2 of	of	(right the of) → (of right the/
2	the	(of right the) → (the of right)
3 dog	dog	(the on right dog) → (dog of right the)

4 is	is	(<u>is</u> is right the is) → (is <u>is</u> right the)
5 on	on	(<u>on</u> on) → (on is <u>on</u> right the)
6 my	my	(<u>my</u> my) → (my on is <u>my</u> right the)
6	right	

Ex 3 a) L2 ~~then~~ coding / "in sid east man easily tears sea sick seas"

search buffer: 10; look ahead 5

	code
sid - s	(0, 0, s)
s - si	(0, 0, i)
si - sid	(0, 0, d)
sid -	(0, 0, -)
sid - e	(4, 2, d)
sid - east	(4, 1, e)
sid - eastma	(0, 0, a)
sid - eastman	(10, 1, t)
sid - eastman - e	(0, 0, m)
sid - eastman - ea	(4, 1, n)
sid - eastman - easi	(8, 4, i)
sid - eastman - easily - te	(0, 0, l)
sid - eastman - easily - tea	(0, 0, g)
sid - eastman - easily - tears	(7, 1, t)
sid - eastman - easily - tears -	(8, 3, e)
sid - eastman - easily - tears - sea	(10, 1, -)
sid - eastman - easily - tears - sea - s	(4, 2, a)
sid - eastman - easily - tears - sea - sick	(4, 2, i)
sid - eastman - easily - tears - sea - sick - se	(0, 0, c)
sid - eastman - easily - tears - sea - sick - sea	(0, 0, k)
sid - eastman - easily - tears - sea - sick - sea -	(9, 4, l)
sid - eastman - easily - tears - sea - sick - sea - l	

Ex 3 b) L278 "in red eastman easily tears new rich reds" (3)

Dict	code	Dict	code
0 -		15 -t	(4, t)
1 s	(0, s)	16 e	(0, e)
2 i	(0, i)	17 a	(8, a)
3 n	(0, n)	18 es	(16, s)
4 -	(0, -)	19 -n	(4, s)
5 ni	(1, i)	20 ea	(16, a)
6 d	(0, d)	21 -ni	(19, i)
7 -e	(4, e)	22 c	(0, c)
8 a	(0, a)	23 k	(0, k)
9 st	(1, t)	24 -ne	(19, e)
10 m	(0, m)	25 al	(8, l)
11 am	(8, m)		(1, *)
12 -ea	(4, a)		
13 ril	(5, l)		
14 y	(0, y)		

Ex 3 c/12 W code of "in red common easily known sea side roads"

ASCII codes - 0 - 255

	Dec	New entry	Code	asci	n	New	Code
	y					271 asi	Code 26
si	n	256 si	115 (s)	il	y	272 il	105
i	y			l	y		
ia	n	257 ia	105 (i)	ly	n	273 ly	108
a	y			y	y		
a-	n	258 a-	114 (a)	y-	n	274 y-	121 (y)
u	y			-t	y		
u-	n	259 u-	32 (-)	-t	n	275 -t	32
o	y			t	y		
ni	y			te	n	276 te	116
rid	n	260 rid	256	e	y		
d	y			ea	y		
d-	n	261 d-	100	ea	y		
-	y			ea	y		
-e	n	262 -e	32 32	ea	y		
e	y			ea	y		
ea	n	263 ea	97 1	ea	y		
a	y			ea	y		
as	n	264 as	97	ea	y		
a	y			ea	y		
at	n	265 at	115	ea	y		
t	y			ea	y		
km	n	266 km	116	ea	y		
m	y			ea	y		
ma	n	267 ma	109	ea	y		
a	y			ea	y		
am	n	268 am	97	ea	y		
m	y			ea	y		
m-	n	269 m-	110	ea	y		
-	y			ea	y		
-e	y			ea	y		
-ea	n	270 -ea	262	ea	y		
a	y			ea	y		
as	y			ea	y		

	new	Code
k	y	
k-	m	286 k-
-	y	
-s	y	
-se	y	
-sea	n	287-sea
a	y	288
al	m	288 al
l	y	
ls	n	289 ls
s	y	108
Scd	n	2
		115

23 d/ Deode 1272 - 5/ 1278

(0,0) -a

(0,0,h) h

(0,0,1) 1

(3,1,e) aa

(5,1,c) ac

(7,1,d) ad

(1,1,a) da

(10,1) h raa *

(0,a) a

(1a) aa

(0,h) h

(3,a) ha

(4a) haa

(5,a) haaa

(4,h) hah

Di co

1 a

2 aa

3 h

4 ha

5 haa

6

6) Decode LZW of: 97 108 102 32 101 97 115 105 108 121

259 97 116 115 32 256 102 271 97

code	Deco
a	256 al
l	257 lf
f	258 f-
-	259 -e
e	260 eu
a	261 as
s	262 si
i	263 il
l	264 lg
g	265 g-e
-	
e	

code	Deco
a	266 -ea
t	267 at
s	268 ts
-	269 s-
a	270 -al
l	271 alf
f	
g	
g	
r	
a	

4) Arithmetic code { A, C, T, G }

Entropy $H = 1.64$

(5)

Prob 0,5 0,3 0,15 0,05

A C T A G C

intervals: $\overset{A}{\left[1, 0,5\right]} \overset{C}{\left[0,5, 0,8\right]} \overset{T}{\left[0,8, 0,95\right]} \overset{G}{\left[0,95, 1\right]}$

init low = 0, high = 1

$$A \quad L \quad 0 + (1-0) \cdot 0,5 = 0,5$$

$$H \quad 0 + (1-0) \cdot 1 = 1$$

$$C \quad L \quad 0,5 + (1-0,5) \cdot 0,2 = 0,6$$

$$H \quad 0,5 + (1-0,5) \cdot 0,5 = 0,75$$

$$T \quad L \quad 0,6 + (0,75 - 0,6) \cdot 0,05 = 0,6075$$

$$H \quad 0,6 + (0,75 - 0,6) \cdot 0,2 = 0,63$$

$$A \quad L \quad 0,6075 + (0,63 - 0,6075) \cdot 0,5 = 0,61875$$

$$H \quad 0,6075 + (0,63 - 0,6075) \cdot 1 = 0,63$$

$$G \quad L \quad 0,61875 + 0,01125 \cdot 0 = 0,61875$$

$$H \quad 0,61875 + 0,01125 \cdot 0,05 = 0,6193125$$

$$C \quad L \quad 0,61875 + 0,0005625 \cdot 0,2 = 0,6188625$$

$$H \quad 0,61875 + 0,0005625 \cdot 0,5 = 0,61903125$$

Code: 6188625 (23 bits)

Decoding: $L_0 = 0,61903125 \in [1, 0,5] \Rightarrow \text{symbol } A$

$$\Rightarrow L_1 = (L_0 - 0,5) / 0,5 = 0,237725 \in [0,5, 0,2] \Rightarrow C$$

$$\Rightarrow L_2 = (L_1 - 0,2) / 0,3 = 0,12575 \Rightarrow T$$

...