

③ [15 pts] Consider the following sentence:

they mournfully bark at the fair light moon

and an order-1 HMM for Part-of-Speech tagging with the following parameters (not exhaustive, but no missing information to solve the question):

they: Pron: $2.1 \cdot 10^{-5}$

mournfully: Adv: $3.2 \cdot 10^{-5}$

bark: N: $2.5 \cdot 10^{-5}$, V: $1.4 \cdot 10^{-5}$

at: Prep: $3.7 \cdot 10^{-5}$

the: Det: $4.5 \cdot 10^{-5}$

fair: Adj: $3 \cdot 10^{-5}$, Adv: 10^{-5} , N: $2 \cdot 10^{-5}$

light: Adj: $5 \cdot 10^{-5}$, N: $3 \cdot 10^{-5}$, V: $7 \cdot 10^{-5}$

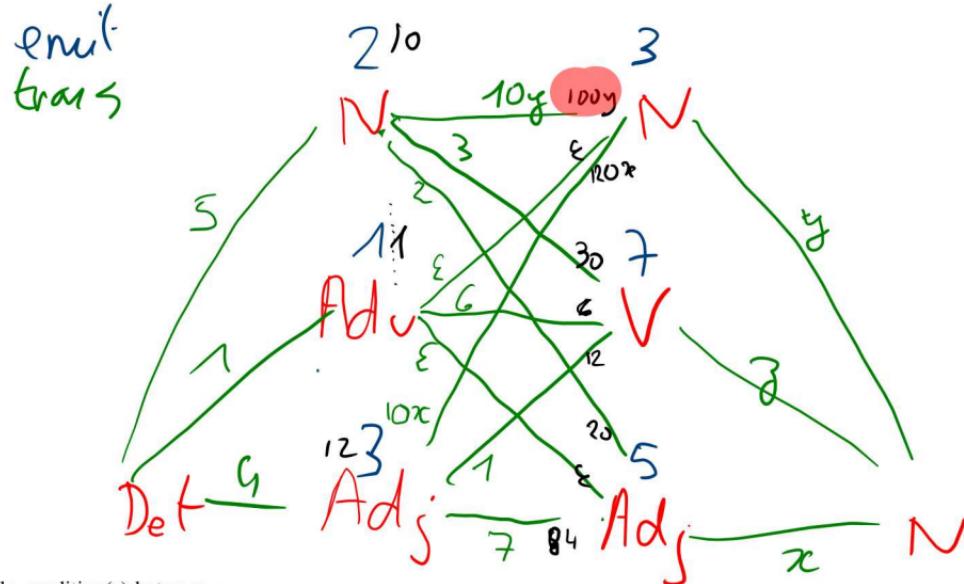
moon: N: $1.6 \cdot 10^{-5}$

	Adj	Adv	Det	N	Prep	Pron	V
Adj	0.7	0.02	0.01	x	0.04	0.03	0.1
Adv	0.002	0.08	0.09	0.001	0.07	0.06	0.6
Det	0.4	0.1	0	0.5	0	0	0
N	0.2	0.05	0.02	y	0.15	0.08	0.3
Prep	0.1	0.06	0.4	0.18	0	0.16	0.1
Pron	0.1	0.3	0	0.2	0	0	0.4
V	0.14	0.16	0.13	z	0.15	0.11	0.12

(a) [10 pts] Assume that $5y > 6x$. Provide the tightest possible condition(s) between x , y and z so that the tag of "light" in the most probable sequence of tags for the above sentence is N.

(b) [5 pts] If these conditions are fulfilled, what is the most probable sequence of tags for the above sentence?

Fully justify your answers (most of the points are for the justifications.)



CBOW

$$P(w_i | w_{i-k} \dots w_{i-1} w_i w_{i+1} \dots w_{i+k})$$

skip gram

$$P(w_{i-k} \dots w_{i-1} w_{i+1} \dots w_{i+k} | w_i)$$

$$\prod_j P(w_{i-j} | w_i)$$

