

IHLT Exam - 2023

DO NOT USE THIS PAPER TO PROVIDE YOUR ANSWERS
(answers without justification or with a wrong one will be considered wrong answers)

Exercise 1 (3 points)

Given the following morphologically analyzed sentence,

I	saw	bats	yesterday
PRP	VBD	NNS	NN
NN	NN	JJ	ADV
	VBZ		

and a HMM model partially represented by the following matrices,

A	PRP	JJ	NN	NNS	VBZ	VBD	ADV
*	0.4	0.1		0.3			0.1
PRP					0.2	0.3	0.1
JJ			0.8	0.2			
NN			0.2		0.3	0.4	0.1
NNS			0.1			0.5	
VBZ		0.2	0.2	0.3			0.2
VBD		0.1	0.4	0.2			0.2
ADV		0.1	0.1	0.1	0.2	0.3	

B	I	saw	bats	yesterday
PRP	1			
JJ			0.2	
NN	0.1	0.4		0.1
NNS			0.5	
VBZ			0.3	
VBD		0.5		
ADV				1

- Apply Viterbi algorithm to get the best POS-tag sequence. Provide the whole dynamic table with all the information required to achieve the resulting POS-tag sequence.
- Which is the resulting best POS-tag sequence and its probability? The answer must be justified by means of the information of the dynamic table, if not, the answer will be considered wrong.
- Is the resulting POS-tag sequence correct? Justify briefly your answer.

Exercise 2 (4 points)

Given the following sentence with the result of a POS tagger:

Anne	saw	my	mother	eating	with	her	glasses
NNP	VBD	PRP\$	NN	VBG	IN	PRP\$	NNS

NNP: proper noun; VBD: verb, past; PRP\$: possessive pronoun; NN/NNS, singular/plural noun; VBG: verb, gerund; IN: preposition

- We want to learn a CRF model able to recognize noun-phrase chunks. Design one correct feature template useful to recognize more than one noun-phrase chunks occurring in the sentence. Derive one correct and useful feature function.
- Draw the parse trees derived by the following PCFG for the sentence. Which is the best parse tree? What is the result when using CKY algorithm with this grammar? Justify briefly the answers.

S	→	NP VP	(1.0)	NNP	→	Anne	(1.0)
NP	→	PRP\$ NN	(0.5)	NN	→	mother	(1.0)
NP	→	PRP\$ NNS	(0.3)	NNS	→	glasses	(1.0)
NP	→	NNP	(0.1)	PRP\$	→	my	(0.6)
NP	→	NP AP	(0.1)	PRP\$	→	her	(0.4)
PP	→	IN NP	(1.0)	IN	→	with	(1.0)
AP	→	VBG PP	(1.0)	VBD	→	saw	(0.7)
VP	→	VBD NP	(0.4)	VBG	→	eating	(0.3)
VP	→	VP AP	(0.6)				

- c) Consider that the correct meaning of the sentence is the one in which Anne is the owner of the glasses. Now, suppose that we want to learn a mention-pair model for identity noun-phrase coreference resolution and that the sentence is the whole training for simplicity. Enumerate (1) the mentions, (2) the coreference chains and (3) the singletons that must be annotated by hand in the sentence, as well as (4) the resulting positive and negative training examples for best-first strategy.

Exercise 3 (3 points)

Suppose the following morphologically analyzed sentence,

<i>John</i>	<i>saw</i>	<i>bats</i>	<i>ready</i>	<i>to</i>	<i>eat</i>	<i>food</i>
John+NNP	saw+NN	bat+NNS	ready+JJ	to+TO	eat+VB	food+NN
	saw+VB	bat+VB				
	see+VBD	bat+JJ				

NNP: proper noun; VBD: verb, past; NN, singular noun ; NNS plural noun; JJ: adjective; TO: particle *to*; VB: verb, base form

and the following synsets in WordNet:

Bat	S1: (n) bat, chiropteran (nocturnal mouselike mammal with forelimbs modified to form membranous wings) S2: (n) bat, at-bat ((baseball) a turn trying to get a hit) "he was at bat when it happened"; "he got four hits in four at-bats" S3: (v) bat (strike with, or as if with a baseball bat) "bat the ball" S4: (adj) balmy, bats (informal or slang terms for mentally irregular) "it used to drive my husband balmy"
Saw	S1: (n) proverb, adage, saw, byword (memorable saying embodying important fact of experience considered true by many people) S2: (n) saw (hand tool having a toothed blade for cutting) S3: (n) power saw, saw, sawing machine (a power tool for cutting wood) S4: (v) saw (cut with a saw) "saw wood for the fireplace"
See	S1: (n) see (the seat within a bishop's diocese where his cathedral is located) S2: (v) see (perceive by sight or have the power to perceive by sight) "He is blind—he cannot see"
Ready	S1: (adj) ready (made suitable and available for immediate use) "dinner is ready"
Eat	S1: (v) eat (take in solid food) "She was eating a banana"; "What did you eat for dinner last night?" S2: (v) corrode, eat, rust (cause to deteriorate due to the action of water, air, or an acid) "The acid corroded the metal"
Food	S1: (n) food, nutrient (any substance that can be metabolized by an animal to give energy and build tissue)

- Consider Support Vector Machines, Conditional Random Fields and UKB. Which methods are appropriate for learning word sense disambiguation models? Justify briefly your answers.
- Consider the appropriate methods from (a). How many models and what category sets must be learned for disambiguating the senses of every word occurring in the sentence? Justify briefly your answers.
- Apply Lesk algorithm to disambiguate the meaning of word *bats* in the sentence? What is the resulting meaning? Do you need any extra information to get the correct answer? Justify briefly your answers.