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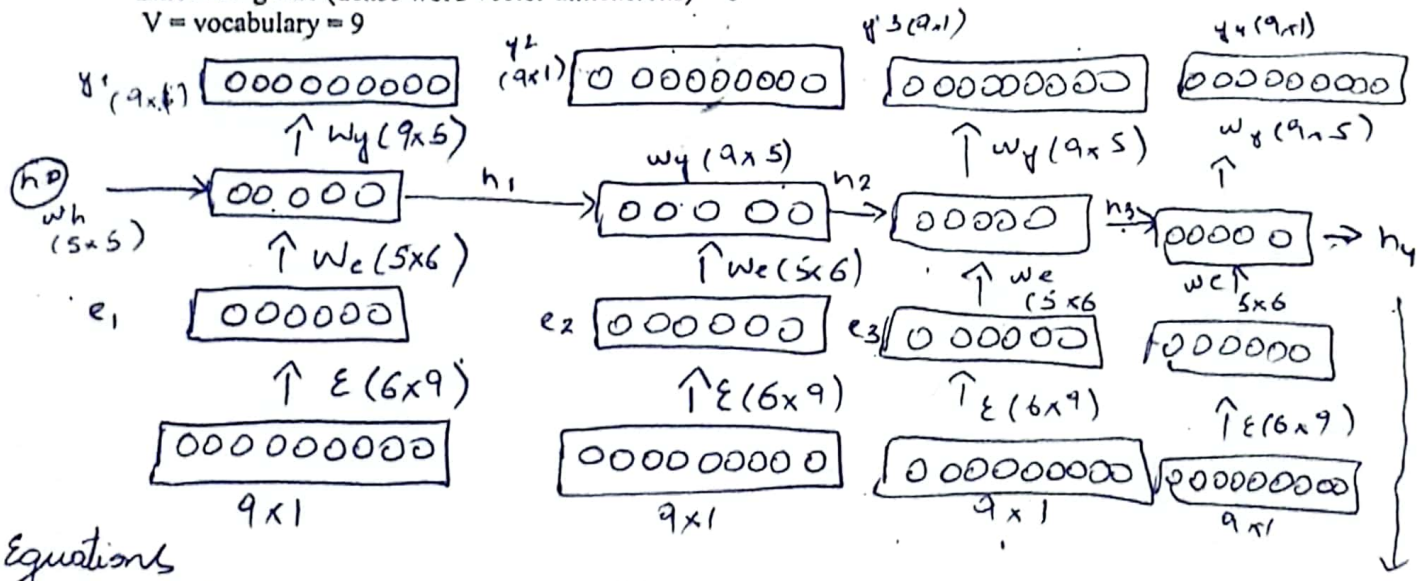
National University of Computer and Emerging Sciences, Lahore Campus

Course:	Natural Language Processing	Course Code:	CS 4063
Program:	BS(Data Science)	Semester:	Fall 2024
Duration:	20 Minutes	Total Marks:	15
Paper Date:	14-March-2024	Weight	
Section:	8B	Page(s):	2
Exam:	Quiz 2 v1		

Q1)

a) Draw RNN architecture diagram and write equations along with dimensions of all layers and weight matrices for the following. Suppose the input words are one hot encoded vectors. [5 Marks]

input sequence of length 4 (lets say 4 words).
Hidden layer units are 5
Embedding size (dense word vector dimensions) = 6
V = vocabulary = 9



Equations

$a_t = W_x x_t + W_h h_{t-1}$ (Hidden Node)

$h_t = \tanh(a_t)$ (Output at hidden)

$y_t = \text{softmax}(W_y h_t)$ (Prediction at time t)

Same last layer as previous layers

5

b) What are total number of parameters for the above architecture? [2 Marks]

$(6\times9) + (5\times6) + (9\times5) + (5\times5) = 154$

c) What are total number of parameters if the number of input words increases to 10? You do not need to draw architecture for 10 words, you can answer using informaiton from the above question. [2 Marks]

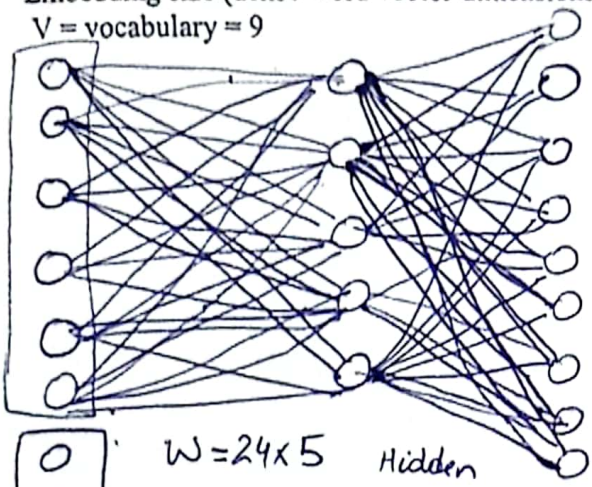
154

2

Name: _____ Reg #: _____ Section: _____

Q2) (a) Draw neural network (for the task of neural language model) architecture diagram and write equations along with dimensions of all layers and weight matrices for the following. Suppose the input words are one hot encoded vectors. [5 Marks]

Input sequence of length 4 (lets say 4 words).
Hidden layer units are 5.
Embedding size (dense word vector dimensions) = 6
V = vocabulary = 9



W = 24x5 Hidden = 1x5 W = 5x9 1x9

1x4d
1x4(6)
= 1x24

5

b) What are total number of parameters for the above architecture? [2 Marks]

(24x5) + (5x9) = 165 ✓ 2

c)What are total number of parameters if the number of input words incrases to 10? You do not need to draw architecture for 10 words, you can answer using informaiton from the above question. [2 Marks]

(60x5) + (5x9) = 345 ✓ 1