1 GLMs for Tagging (Part 2)

1.1 Question (time: 2:16, slide: 8)

Consider a set of tags $\mathcal{T} = \{$ DT, V, NN, ADV $\}$ and sentence $x =$ the dog walked to the park.

If a history is defined as $\langle t_{-2}, t_{-1}, w_{[1:n]}, i \rangle$ how many histories are there with $i = 3$?

1.2 Question (time: 4:40, slide: 8)

Given that a history is defined as $h = \langle t_{-2}, t_{-1}, w_{[1:n]}, i \rangle$ and say $n = 10$ which of the following are valid local features?

(a) $g_1(h,t) = \begin{cases} 1 & \text{if } t = \text{VBG and } t_{-1} = \text{IN} \\ 0 & \text{otherwise} \end{cases}$

(b) $g_2(h,t) = \begin{cases} 1 & \text{if } t = \text{VBG and } w_{n-2} = \text{dog} \\ 0 & \text{otherwise} \end{cases}$

(c) $g_3(h,t) = \begin{cases} 1 & \text{if } t = \text{VBG and } t_{-3} = \text{NN} \\ 0 & \text{otherwise} \end{cases}$

(d) $g_4(h,t) = \begin{cases} 1 & \text{if } t = \text{VBG and } t_{-1} = \text{IN and } w_2 = \text{dog} \\ 0 & \text{otherwise} \end{cases}$

2 GLMs for Tagging (Part 3)

2.1 Question (time: 3:45, slide: 12)

Consider a set of tags $\mathcal{T} = \{$ DT, V, NN, ADV, IN$\}$, sentence $x =$ the dog walked to the park, and tag sequence $y =$ DT NN V IN DT NN

Say we define local features

- $g_1(h,t) = \begin{cases} 1 & \text{if } t = \text{NN and } w_i = \text{dog} \\ 0 & \text{otherwise} \end{cases}$
- $g_2(h,t) = \begin{cases} 1 & \text{if } t = \text{NN and } t_{-1} = \text{DT} \\ 0 & \text{otherwise} \end{cases}$

- $g_3(h,t) = \begin{cases} 1 & \text{if } t = \text{NN and } t_{-1} = \text{DT and } w_{i-1} = \text{the} \\ 0 & \text{otherwise} \end{cases}$

What is the global feature vector $f(x,y)$? (Write each value separated by a space e.g. 2 0 0.)

3 GLMs for Tagging (Part 4)

3.1 Question (time: 3:51, slide: 14)

Say we are running the perceptron algorithm for a model with the following local features

- $g_1(h,t) = \begin{cases} 1 & \text{if } t = \text{DT and } w_i = \text{the} \\ 0 & \text{otherwise} \end{cases}$
- $g_2(h,t) = \begin{cases} 1 & \text{if } t = \text{NN and } t_{-1} = \text{DT} \\ 0 & \text{otherwise} \end{cases}$
- $g_3(h,t) = \begin{cases} 1 & \text{if } t = \text{NN and } t_{-1} = \text{DT and } w_i = \text{dog} \\ 0 & \text{otherwise} \end{cases}$

Our current sentence is x_i = the dog walks to the park. The correct tagging is y_i = DT NN V IN DT NN , and the current best tagging is $z_{[1:n_i]}$ = NN NN V IN DT NN.

If the current weight vector is $v = \langle -1, -2, 2 \rangle$, what will the new weight be after the perceptron update? (Write each value in the vector separated by a space, e.g. 0 1 1 0).

A Answers

- 16

  The answer is 16. Since w and i are fixed, we need to consider all values for t_{-2} and t_{-1}. There are 4^2 possible values.

- (a) (b) (d)

  Local features can be based on any of the source words, but may only look at the two previous tags and the current tag. The incorrect local features look at tags outside this range.

- 1 2 2

  The answer is 1 2 2. The global feature vector is formed by summing up the counts of the features over the entire sentence. In this examples g_1 is used once, g_2 is used twice and g_3 is used twice.

- None

  The answer is 0 -1 3. The correct global feature vector is $f(x_i, y_i) = \langle 2, 2, 1 \rangle$. The predicted global feature vector is $f(x_i, z) = \langle 1, 1, 0 \rangle$. Therefore after the update the weight vector $v = \langle 0, -1, 3 \rangle$.