Quiz 8: Self Attention Layer

Please enter your name: *

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The Self Attention Layer: Description

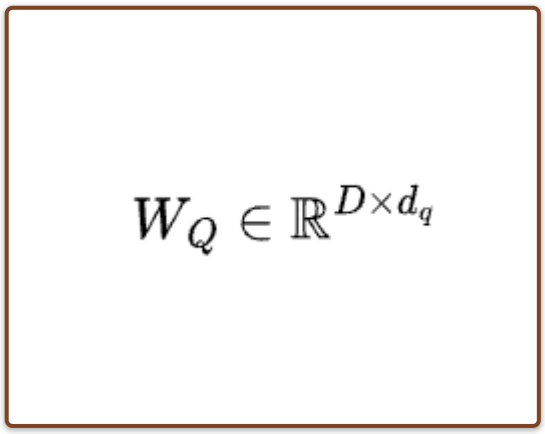
We would like to learn contextual embeddings for the word "été" in the sentences "Tom a été entarté par Jerry" (i.e, "Tom WAS hit with a pie by Jerry")and "Cet été il fera horriblement chaud"(i.e, "This SUMMER it will be unbearably hot")

In order to use the attention mechanism, we define the projections of the embeddings (X^t) onto the d_q-dimensional query space, d_k-dimensional key space and d_v-dimensional value space:

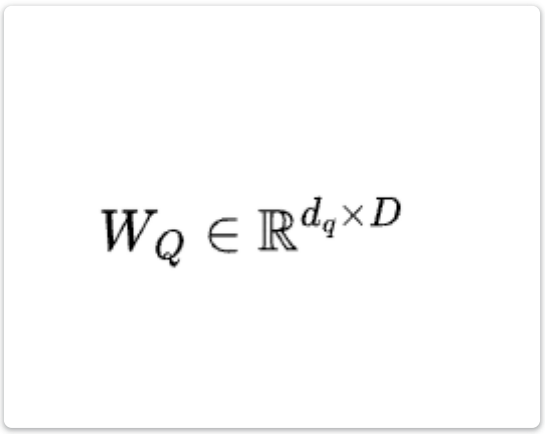
$$\mathbb{R}^{d_q} \ni q^t = W_Q^T X^t$$
$$\mathbb{R}^{d_k} \ni k^t = W_K^T X^t$$
$$\mathbb{R}^{d_v} \ni v^t = W_V^T X^t$$

What is the shape of W_Q

1 point

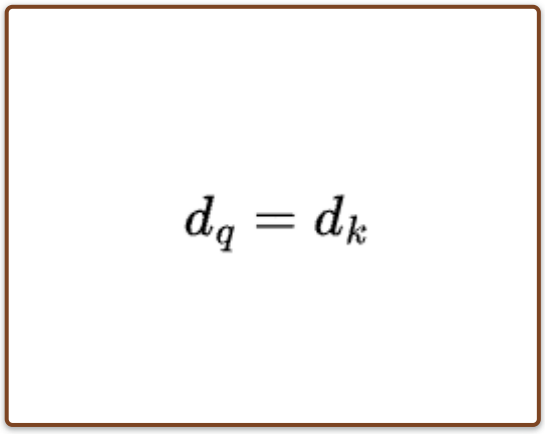


(a)

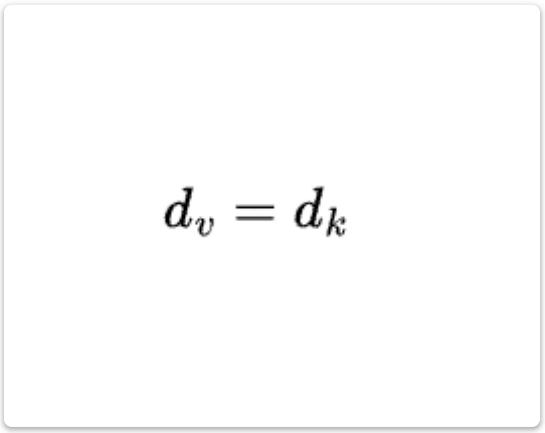


(b)

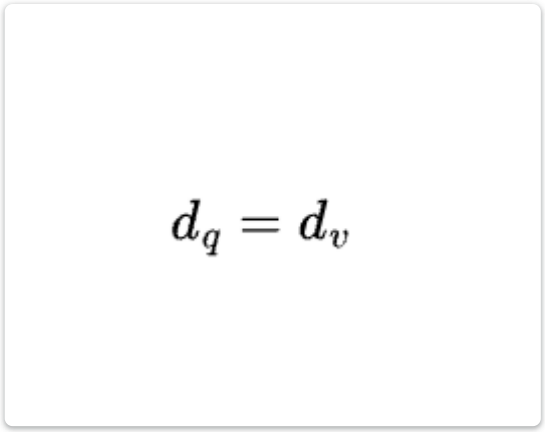
What condition should be satisfied to calculate the scaled dot product alignment function used in Section 1 — 1 point



(a)

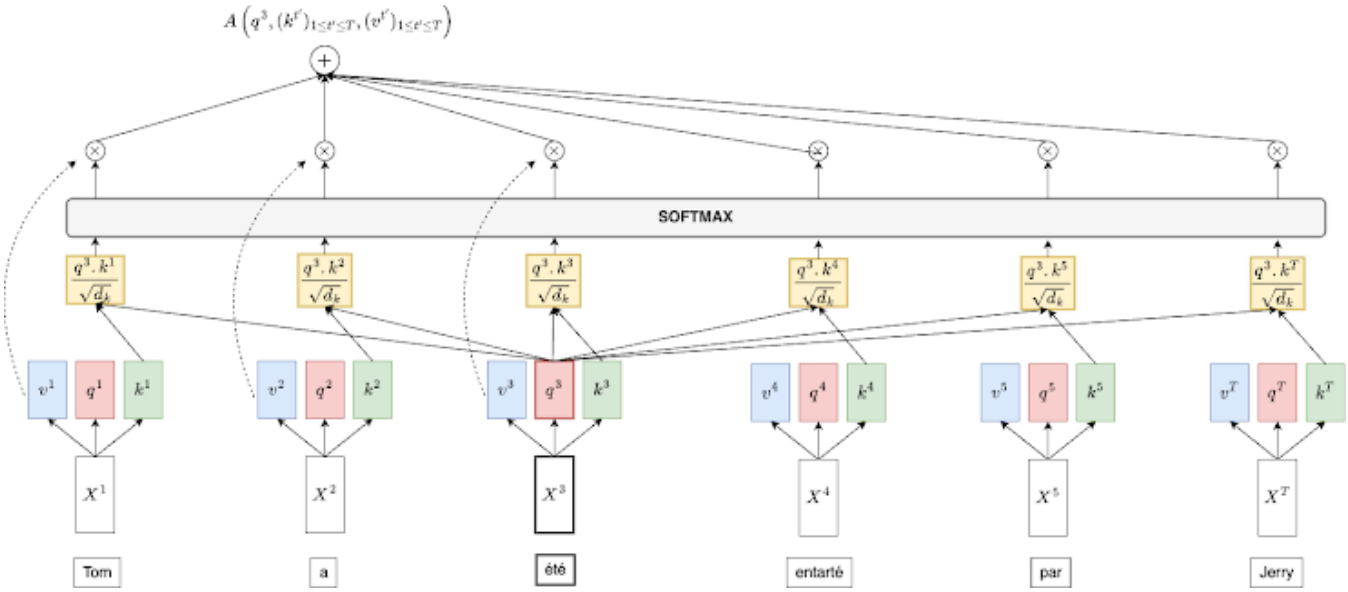


(b)



(c)

Let us focus on the first "été" in "Tom a été entarté par Jerry" (Tom WAS hit with a pie by Jerry).



Which expression is correct if we use the scaled dot product as an alignment function and the softmax as the distribution function ? 1 point

$$A\left(q^3, \{k^{t'}, v^{t'}\}_{1\leq t'\leq T}\right) = \sum_{t=1}^{T} \frac{\exp(\frac{q^3 . k^t}{\sqrt{d_k}})}{\sum_{t'=1}^{T} \exp(\frac{q^3 . k^{t'}}{\sqrt{d_k}})} v^t$$

(a)

$$A\left(q^3, \{k^{t'}, v^{t'}\}_{1\leq t'\leq T}\right) = \sum_{t=1}^{T} \frac{\exp(\frac{q^t . k^t}{\sqrt{d_k}})}{\sum_{t'=1}^{T} \exp(\frac{q^t . k^{t'}}{\sqrt{d_k}})} v^t$$

(b)

$$A\left(q^3, \{k^{t'}, v^{t'}\}_{1\leq t'\leq T}\right) = \sum_{t=1}^{T} \frac{\exp(q^t . k^t)}{\sum_{t'=1}^{T} \exp(q^t . k^{t'})} v^t$$

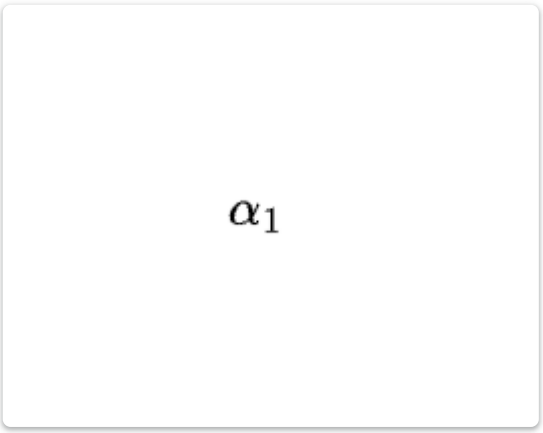
(c)

What is the interpretation of the attention vector: 1 point

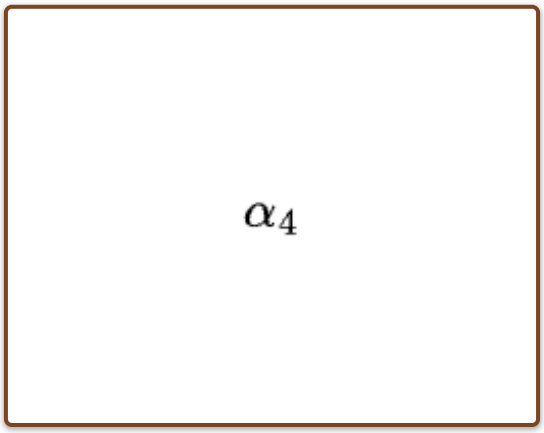
$$A\left(q^3, \{k^{t'}, v^{t'}\}_{1\leq t'\leq T}\right)$$

- It represents the contextual embedding of the word "été" in the first sentence
- It represents the contextual embedding of the word "été" in both sentences

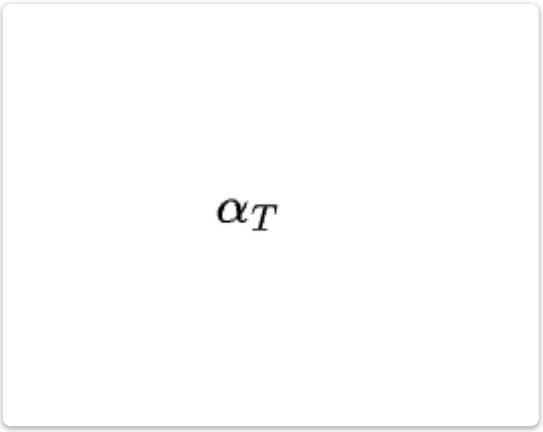
Suppose the query q^3 represents the question "What happened to Tom ?". Which attention weight will have the highest value ? 1 point



(a)



(b)



(c)

Suppose the query q^3 represents the question "Who hit Tom with a pie ?". Which attention weight will be the highest ? 1 point

α_1

(a)

α_4

(b)

α_T

(c)

Let N be the batch size. After applying the Self Attention Layer to the whole batch, what is the change in the tensor shape ? 1 point

$(N, T, D) \rightarrow (N, T, d_q)$

(a)

$(N, T, D) \rightarrow (N, T, d_v)$

(b)

$(N, T, D) \rightarrow (N, d_k)$

(c)

The Learning Process

What are the parameters of the previous layer ? 1 point

W_Q, W_K, W_V

(a)

$\{q^t, k^t, v^t\}_{1 \leq t \leq T}$

(b)

What is the total number of parameters ? 1 point

$D(d_q + d_k + d_v)$

(a)

$d_q + d_k + d_v$

(b)

Does the Self Attention Layer take into account the sequentiality of the data ? 1 point

Yes

No

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