

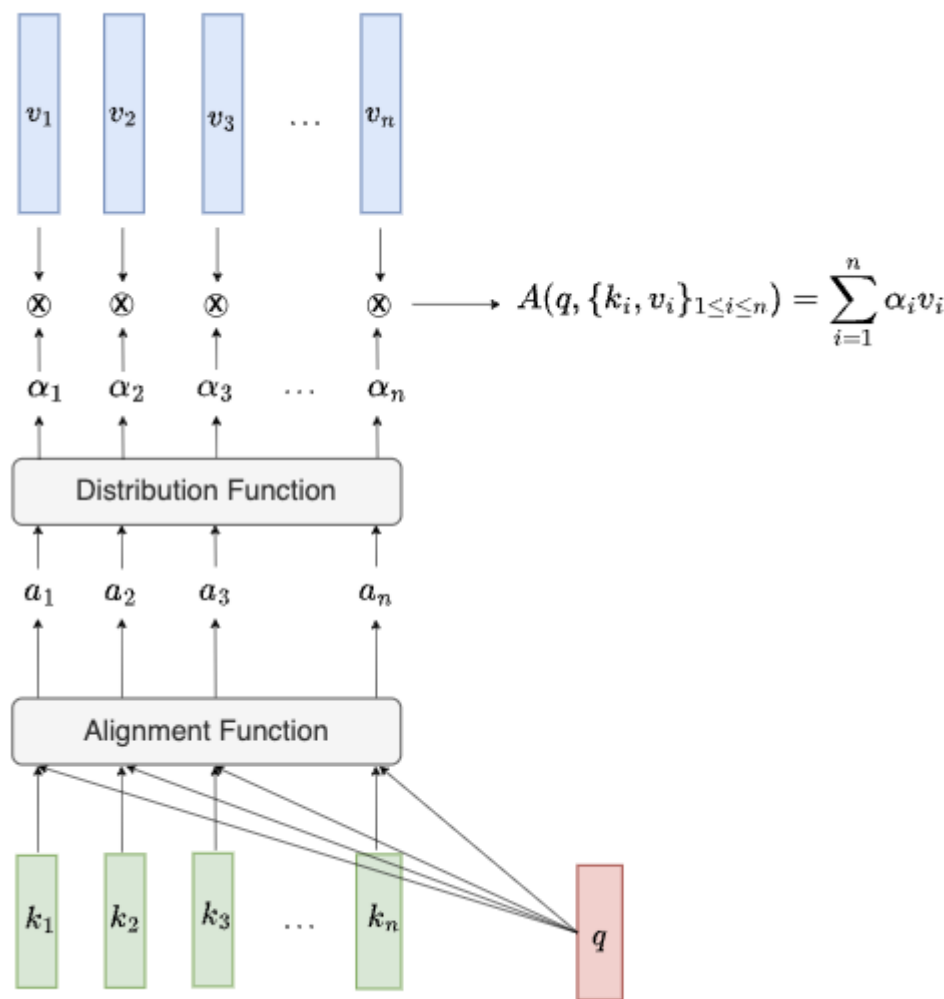
# Quiz 9: Introducing the polysemy problem

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HM

## Soft Query Retrieval Model

The following figure represents the soft query retrieval problem (SQRP)



Let  $d$  be the dimensionality of the queries, keys and values. Consider the following Alignment Function:

$$\forall i \in \{1, \dots, n\} \quad a(q, k_i) = \frac{q \cdot k_i}{\sqrt{d}}$$

If the distribution function is the Softmax function, what is the correct expression of the attention weights:

2 points

$$\forall i \in \{1, \dots, n\} \quad \alpha_i = \frac{\exp(q \cdot k_i)}{\sum_{j=1}^n \exp(q \cdot k_j)}$$

☐ (a)

$$\forall i \in \{1, \dots, n\} \quad \alpha_i = \frac{\exp(\frac{q \cdot k_i}{\sqrt{d}})}{\sum_{j=1}^n \exp(\frac{q \cdot k_j}{\sqrt{d}})}$$

☒ (b)

$$\forall i \in \{1, \dots, n\} \quad \alpha_i = \frac{q \cdot k_i}{\sum_{j=1}^n q \cdot k_j}$$

☐ (c)

What is the dimensionality of the attention vector

2 points

$$A(q, \{k_i, v_i\}_{1 \leq i \leq n})$$

- ☒ d
- ☐ 3d
- ☐ n

### The Self Attention Layer: Introducing the Problem

Consider the following sentence: "Tom a été entarté cet été" (which means: Tom was with a pie this summer")



Let  $D$  be the dimensionality of the embedding vectors. We consider the following embedding vectors associated with the words in "Tom a été entarté cet été".

 $X^1$ 

Tom

 $X^2$ 

a

 $X^3$ 

été

 $X^4$ 

entarté

 $X^5$ 

cet

 $X^T$ 

été

By using pre-trained word vectors like the Word2vec or the GloVe embedding vectors, we have: 2 points

$$X^3 = X^T$$

- ☒ True
- ☐ False

By letting the model learn the parameters of the embedding matrix, we have: 2 points

$$X^3 = X^T$$

- ☒ True
- ☐ False

Which sentence is correct ? 2 points

- ☒ Although the word "été" has two different meanings in the sentence, it has the same embedding vector.
- ☐ The Word2vec/GloVe approach will compute a different embedding vector for the word "été" depending on its position in the sentence
- ☐ An Embedding Layer with a trainable embedding matrix will assign different embeddings to the word "été" depending on the position in the sentence.

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