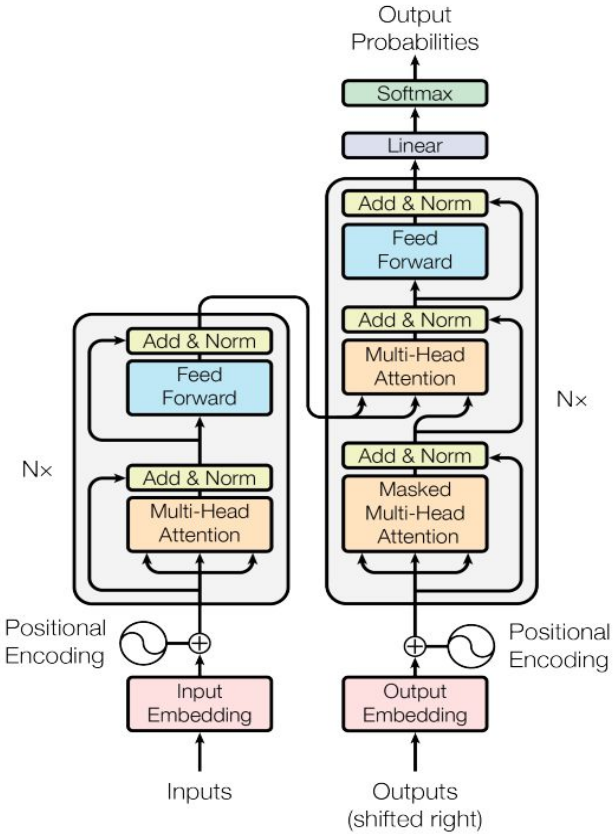
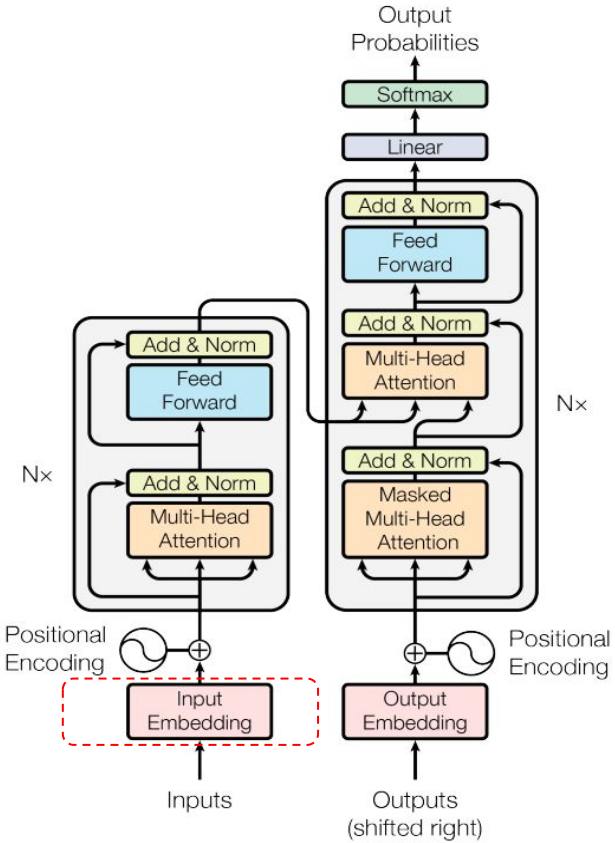
Transformers - Architecture

1. Introduction
2. The Architecture of the Transformer
    - 2.1. Input Embedding
    - 2.2. Positional Encoding
    - 2.3. Multi- Headed Attention
    - 2.4. Self-attention
    - 2.5. Layer Normalisation
    - 2.6. Point-wise feed forward

Transformers



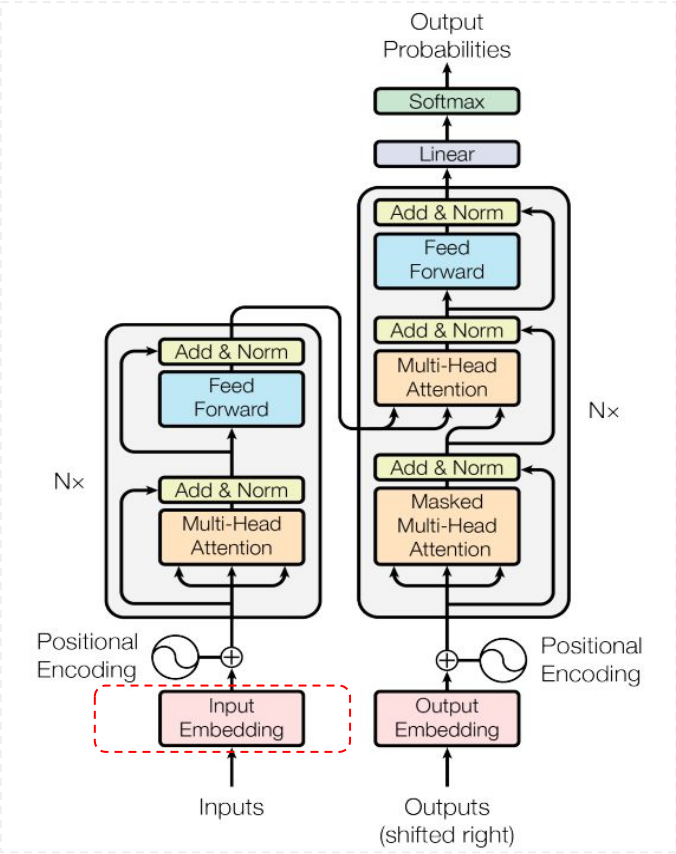
Encoder



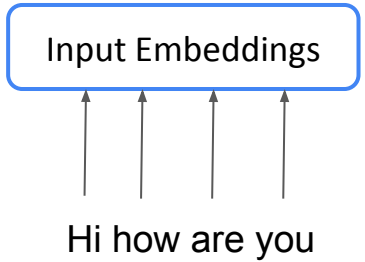
1. Input Embedding

Hi how are you

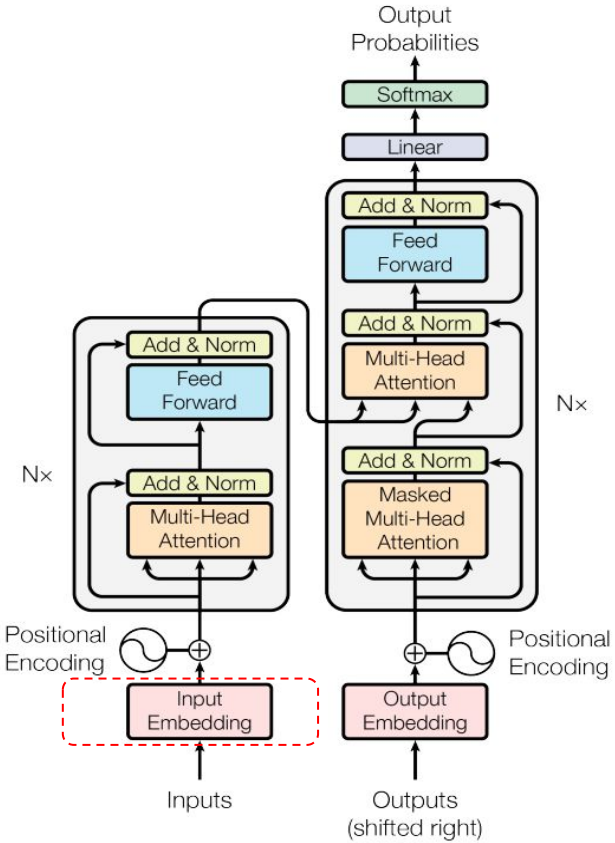
Encoder



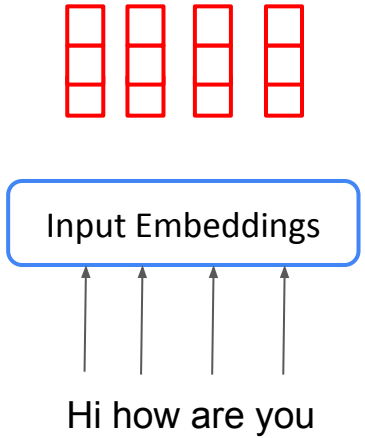
1. Input Embedding



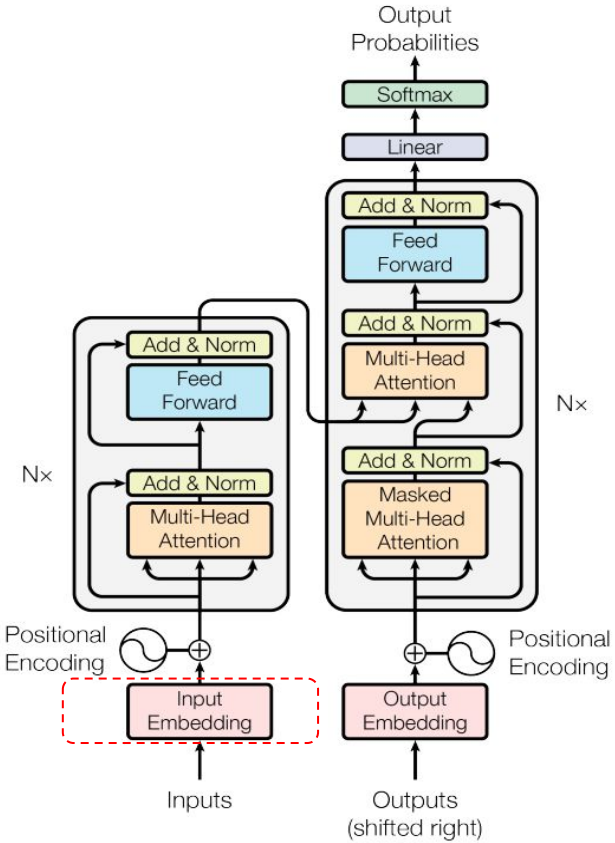
Encoder



1. Input Embedding



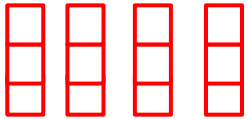
Encoder



1. Input Embedding

Hi =

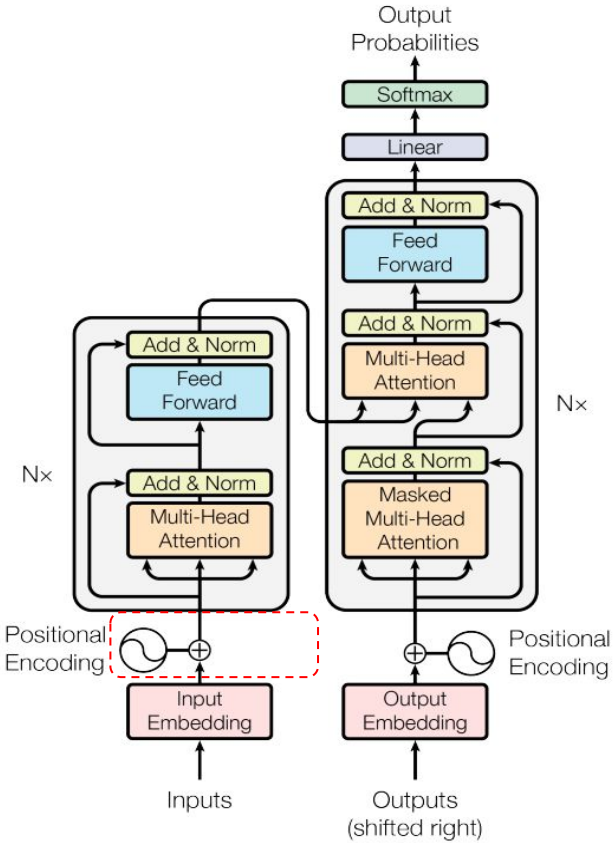
0.1
0.8
0.4



Input Embeddings

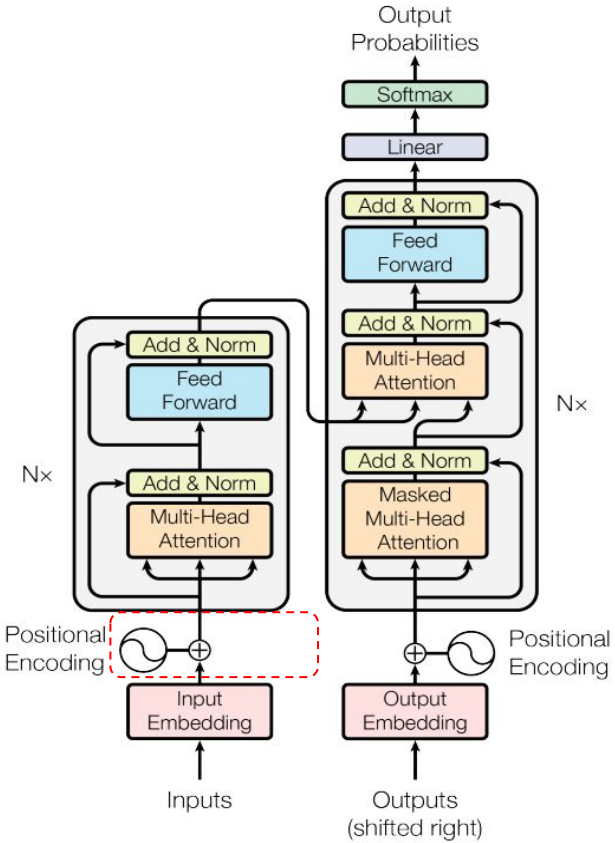
Hi how are you

Encoder

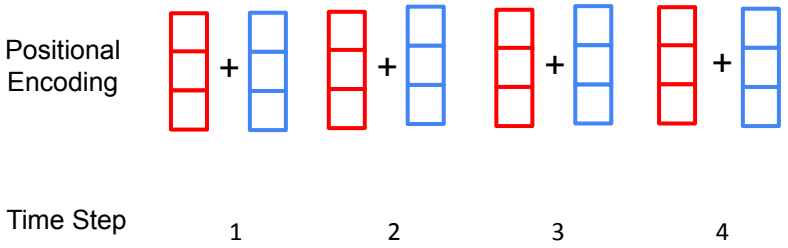


2. Positional Encoding

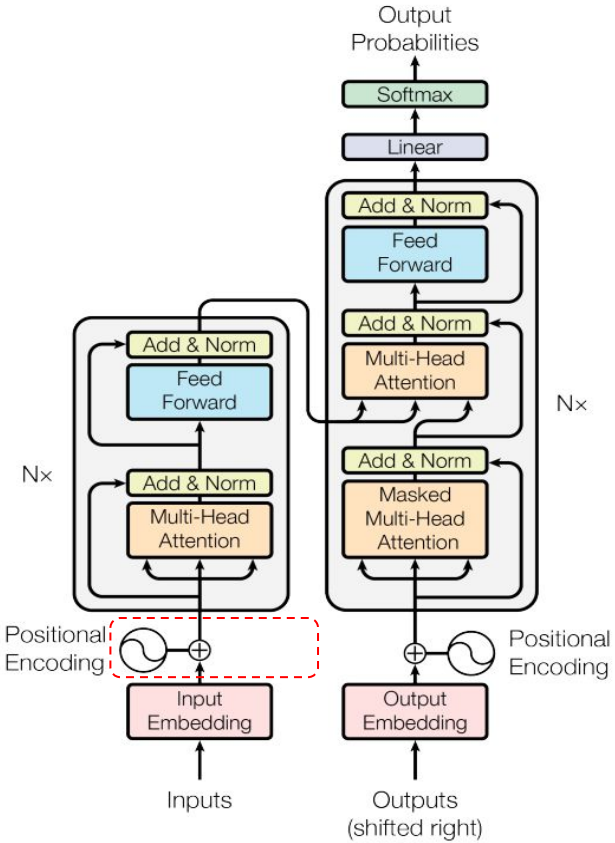
Transformers



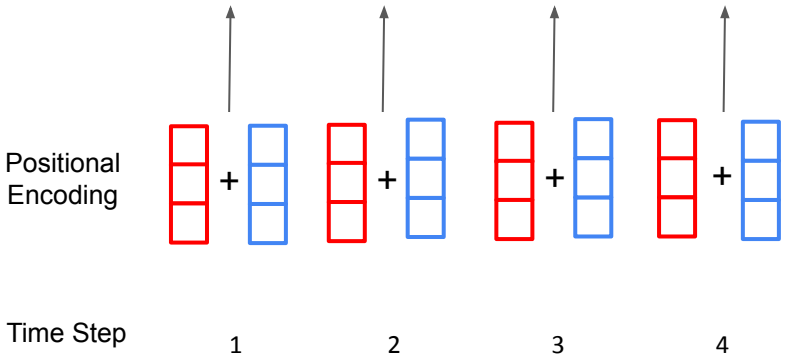
2. Positional Encoding



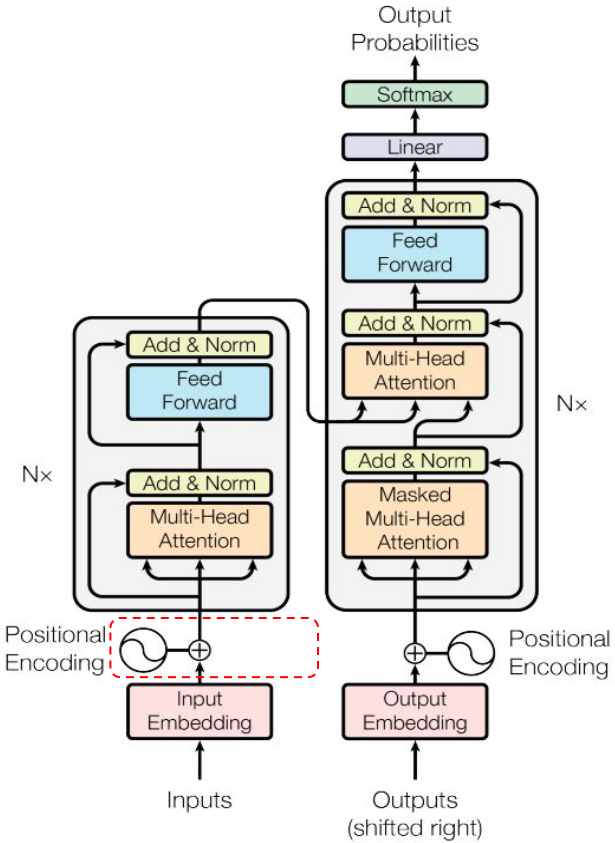
Transformers



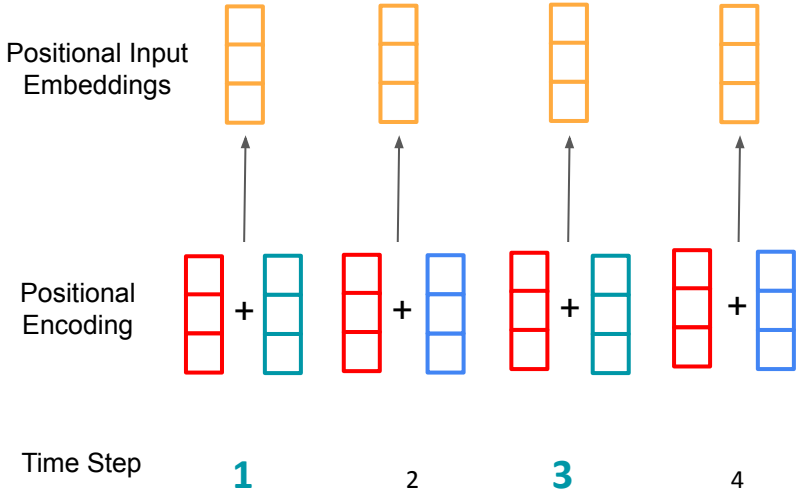
2. Positional Encoding



Encoder

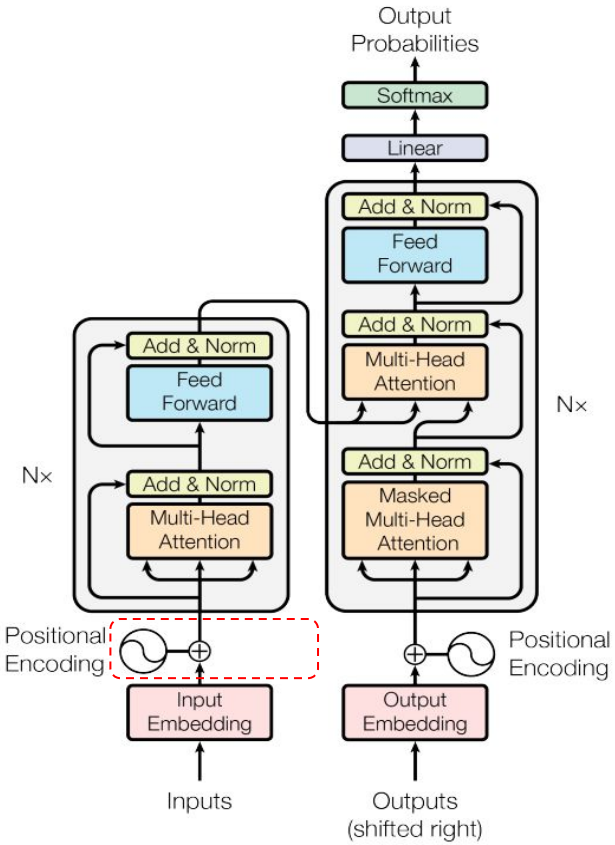


2. Positional Encoding

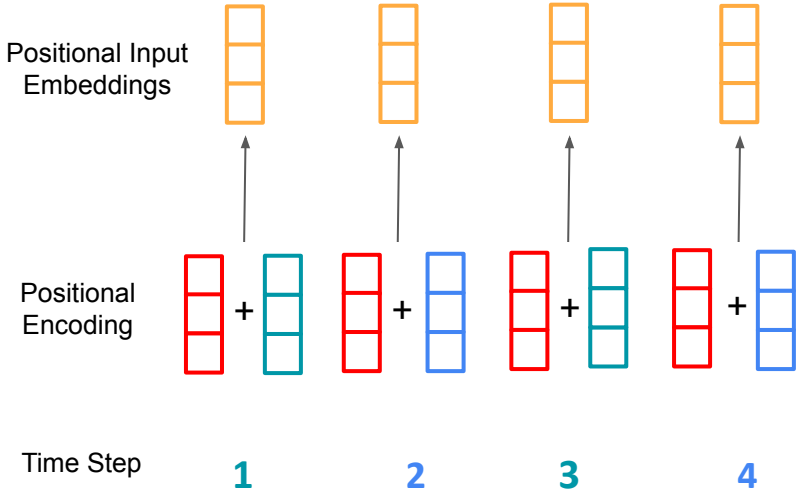


$$PE_{(pos,2i+1)} = cos(pos/10000^{2i/d_{\text{model}}})$$

Encoder



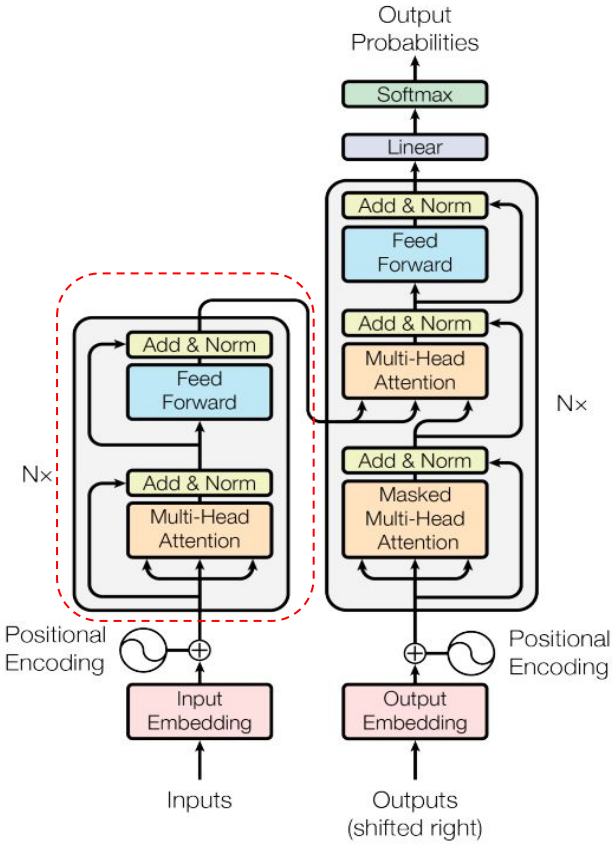
2. Positional Encoding



$$PE_{(pos,2i+1)} = cos(pos/10000^{2i/d_{\text{model}}})$$

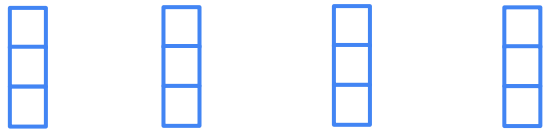
$$PE_{(pos,2i)} = sin(pos/10000^{2i/d_{\text{model}}})$$

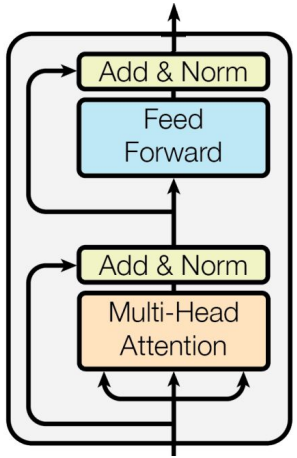
Encoder



2. Encoder Layer

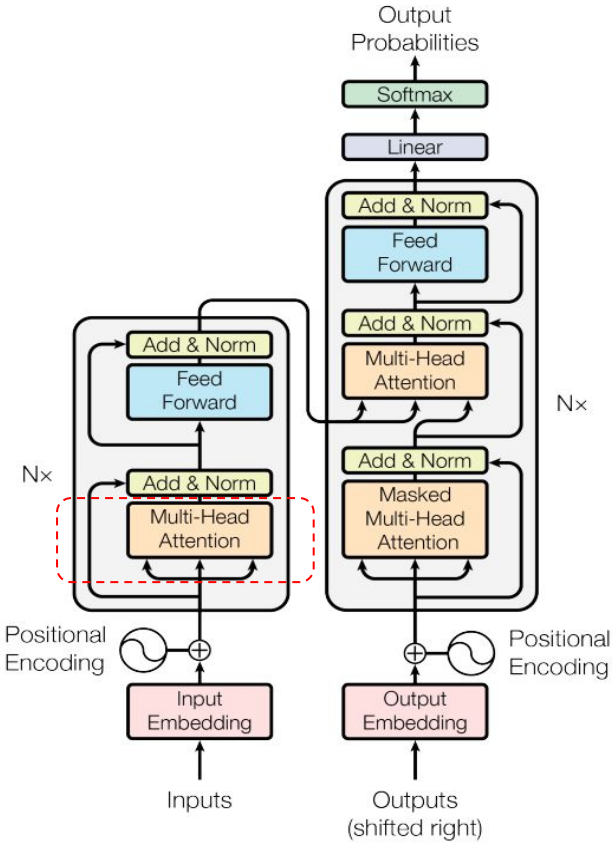
Encoder input Representation





Positional input Embeddings

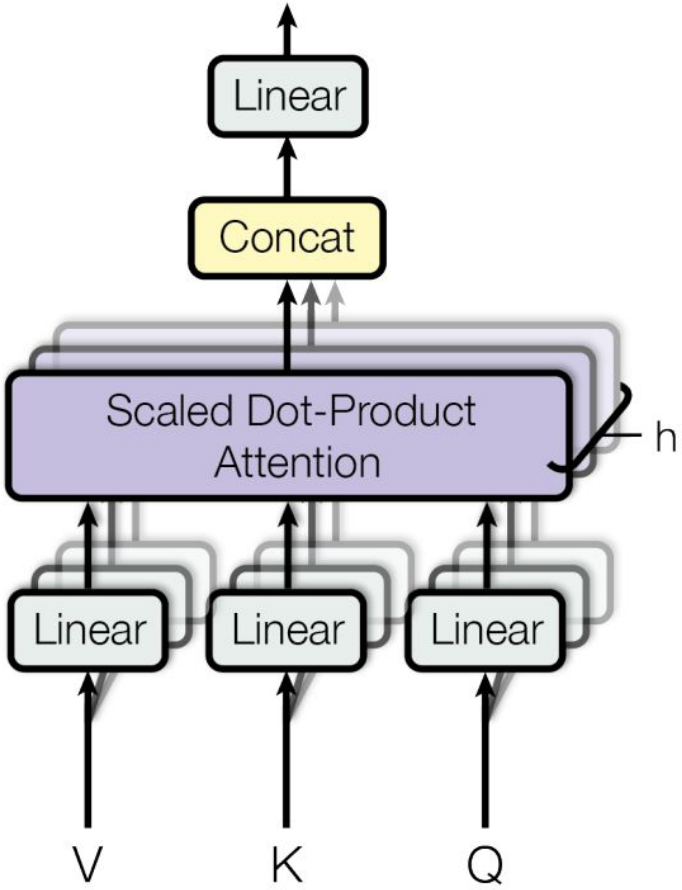
Encoder



3. Multi- Headed Attention

Hi how are you

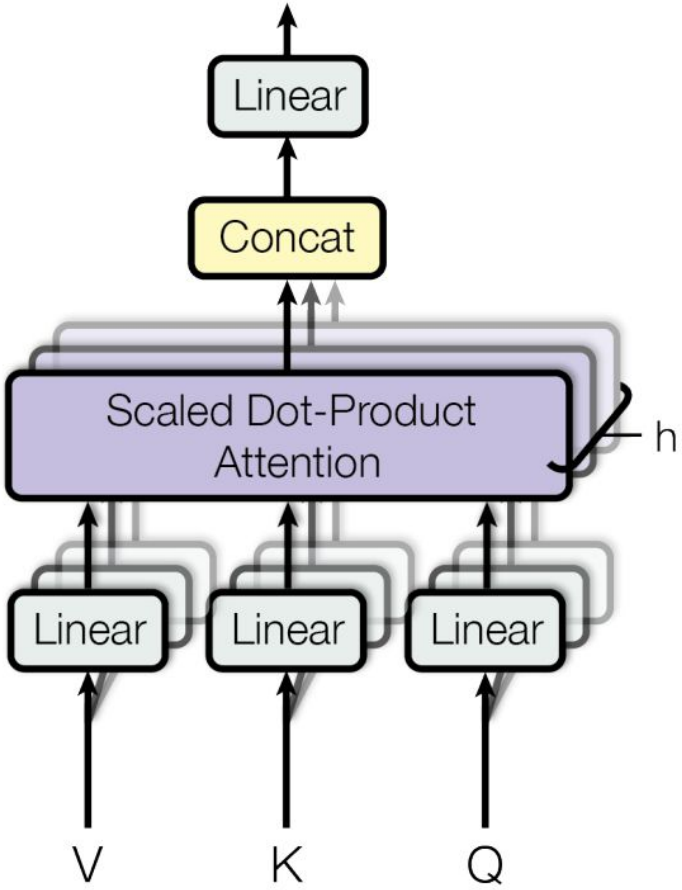
Encoder



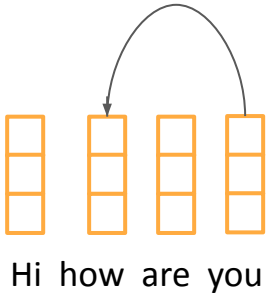
3. Multi- Headed Attention

Hi how are you

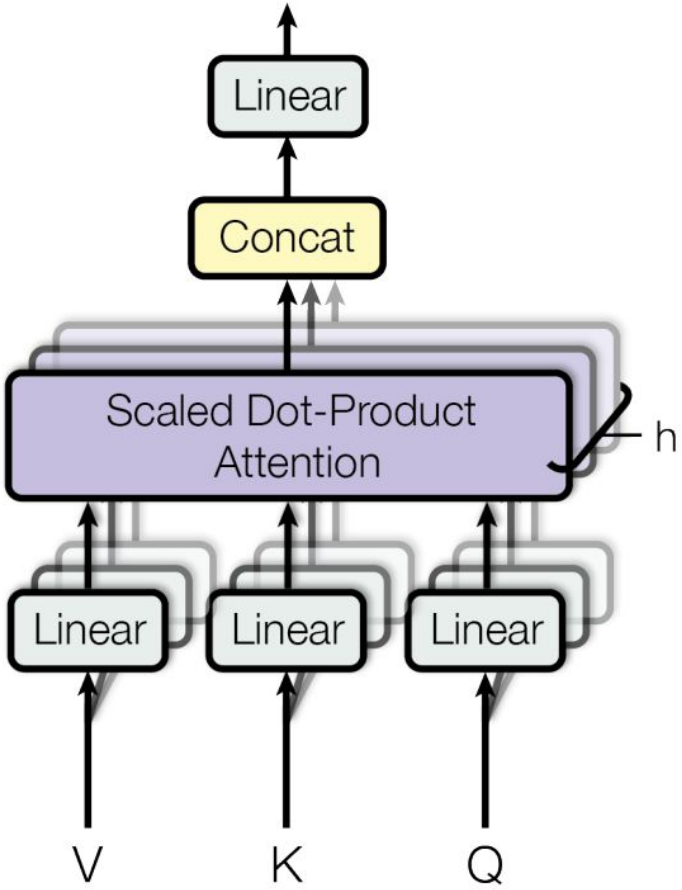
Encoder



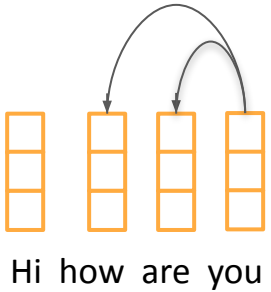
3. Multi- Headed Attention



Encoder



3. Multi- Headed Attention



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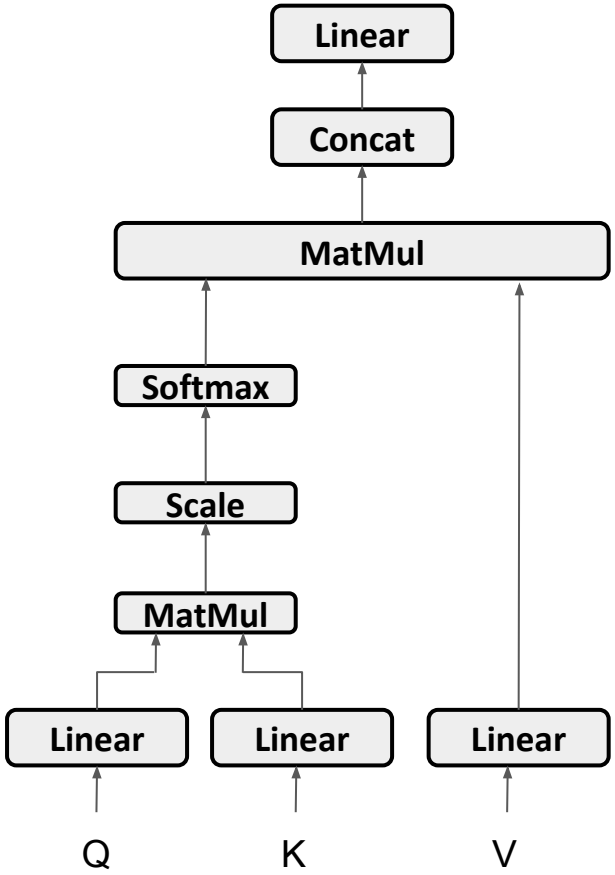
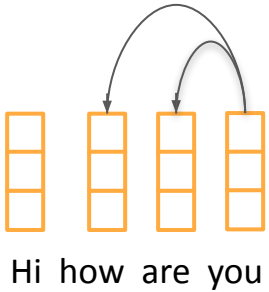
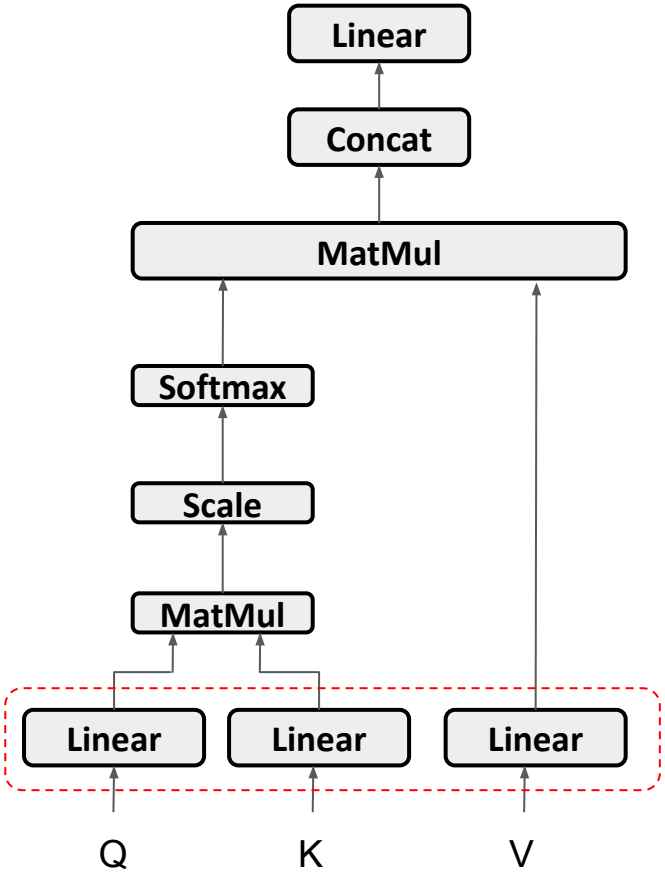


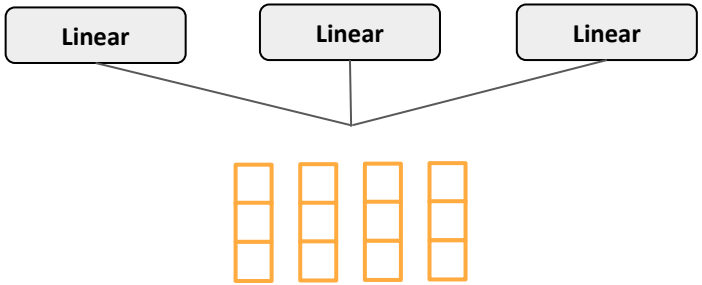
3. Multi- Headed Attention



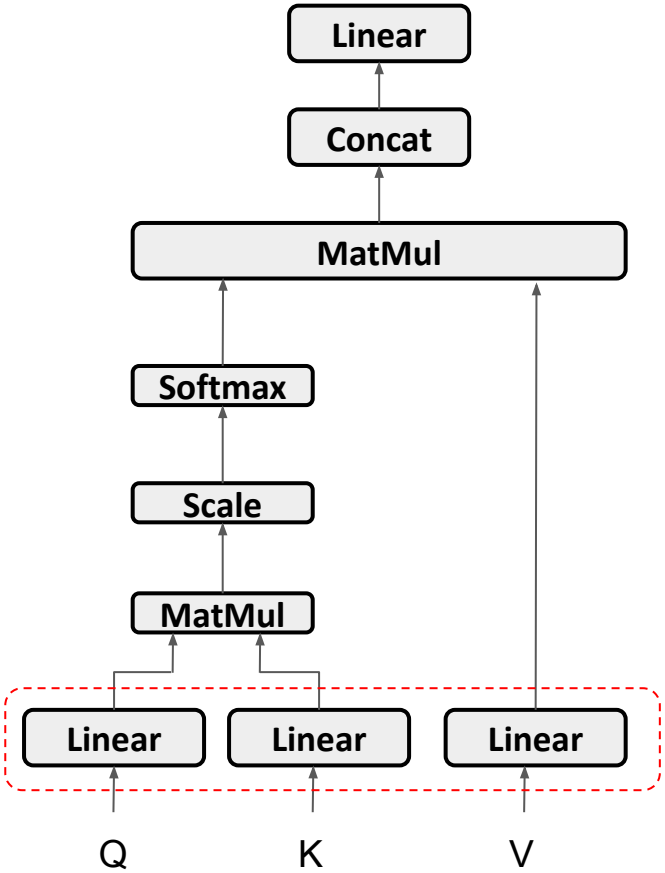
Encoder



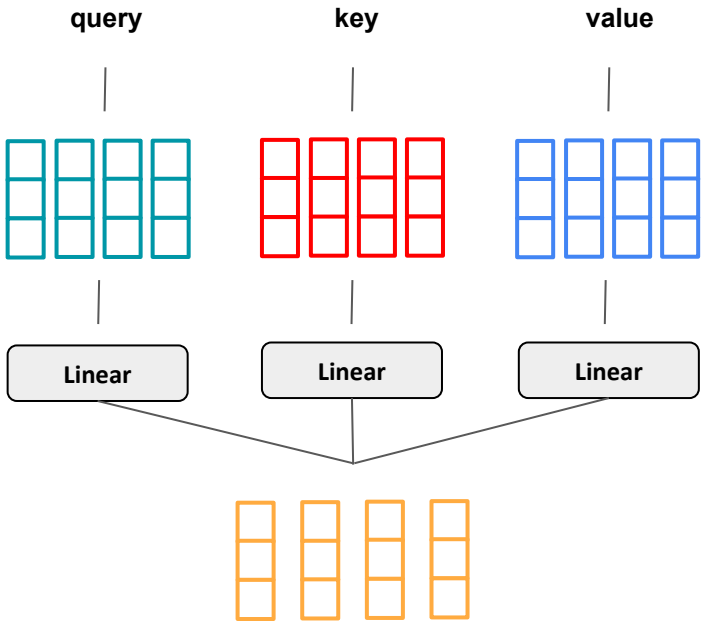
3. Multi- Headed Attention



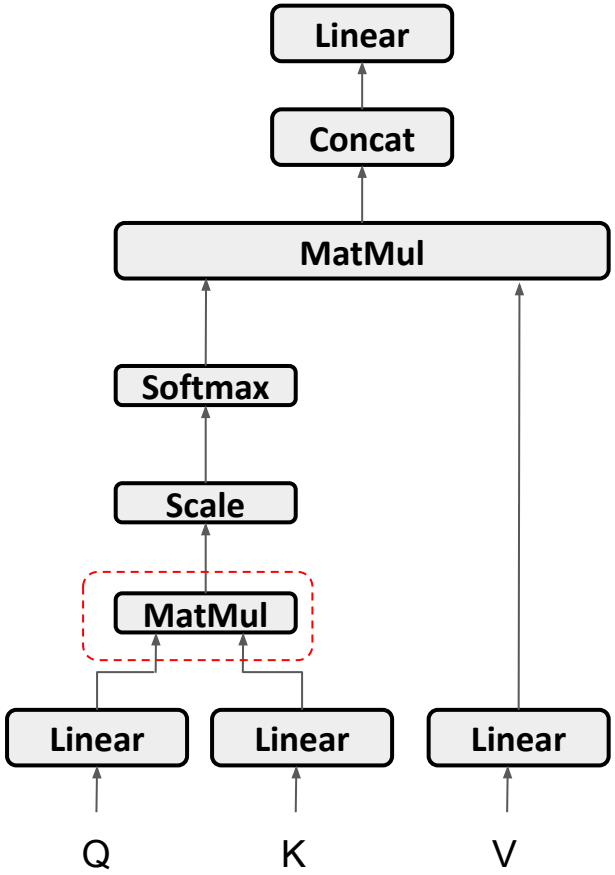
Transformers



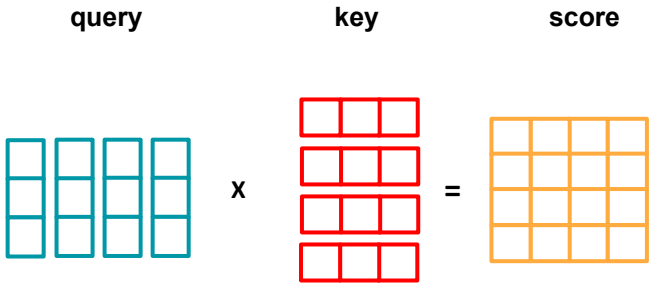
3. Multi- Headed Attention

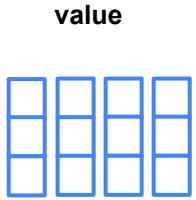


Transformers

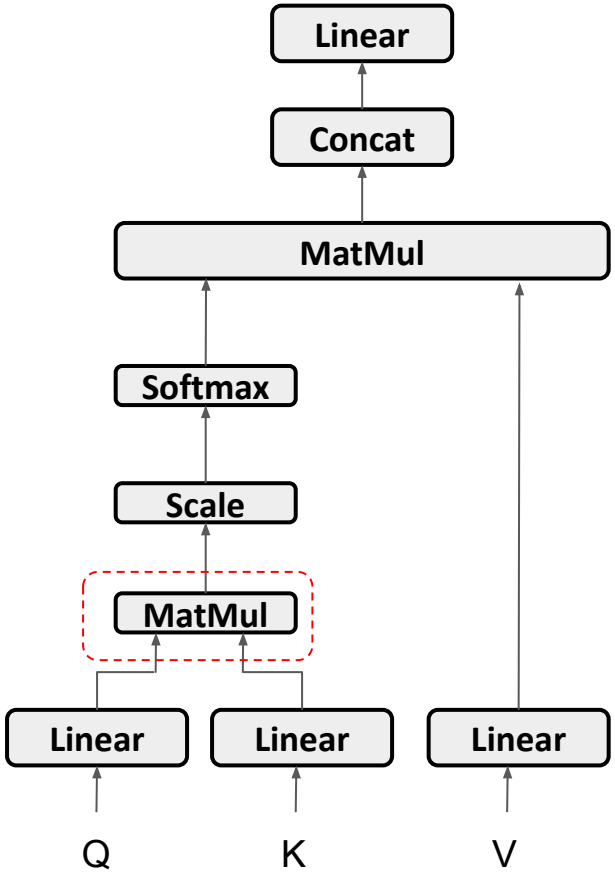


3. Multi- Headed Attention





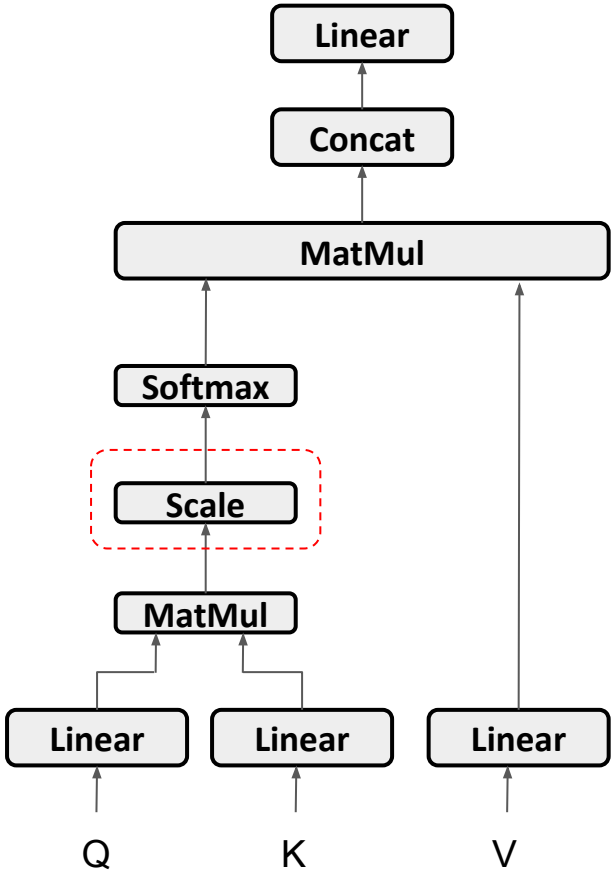
Encoder



3. Multi- Headed Attention

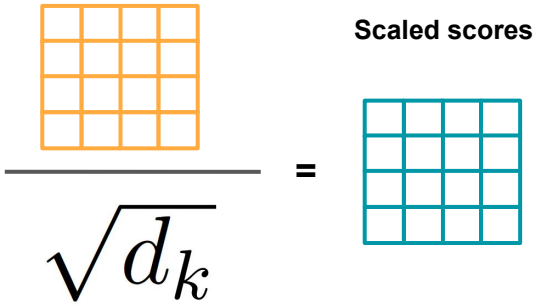
	Hi	how	are	you
Hi	96	25	8	10
how	25	87	29	65
are	8	29	89	52
you	10	65	52	90

Transformers

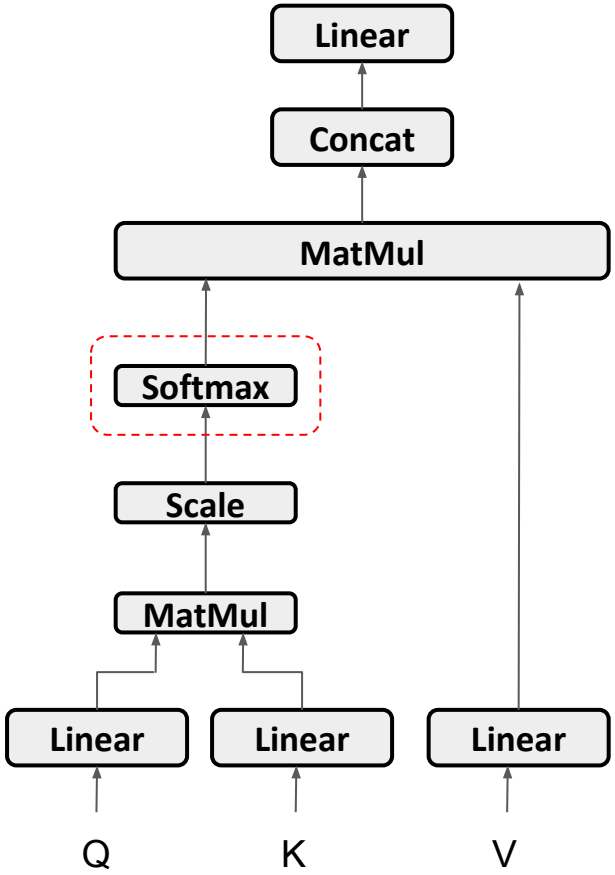


3. Multi- Headed Attention

3.1 Self-Attention



Encoder



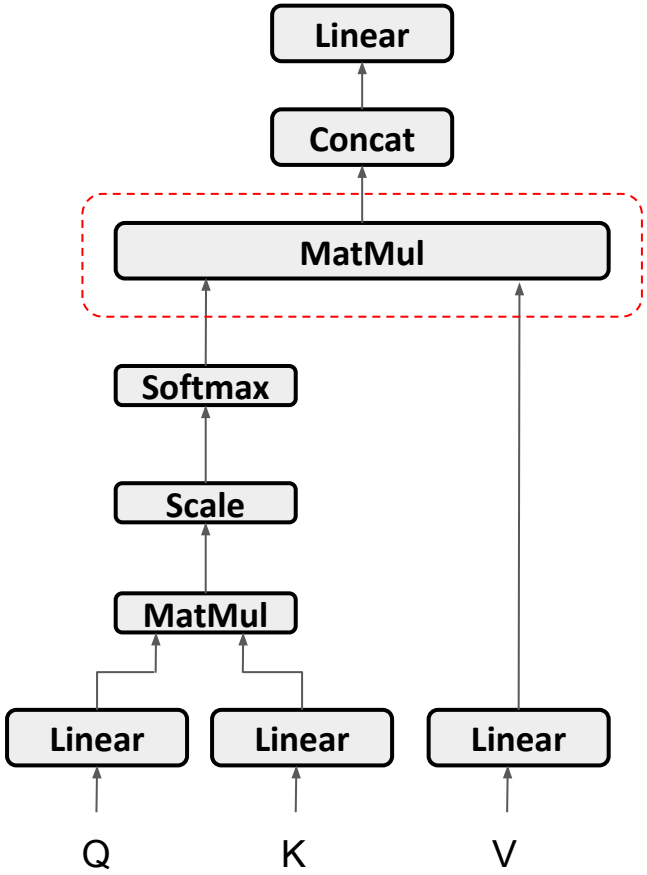
3. Multi- Headed Attention

$$\text{Softmax}\left(\boxed{}\right) =$$

attention weights

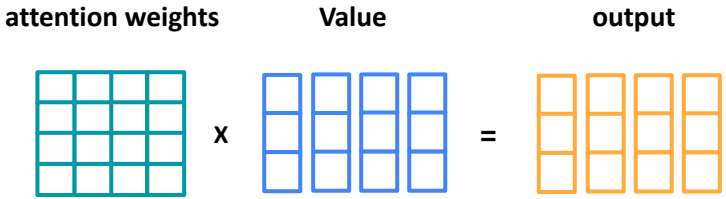
	Hi	how	are	you
Hi	0.7	0.1	0.1	0.1
how	0.2	0.5	0.1	0.2
are	0.1	0.2	0.6	0.1
you	0.1	0.2	0.4	0.3

Encoder

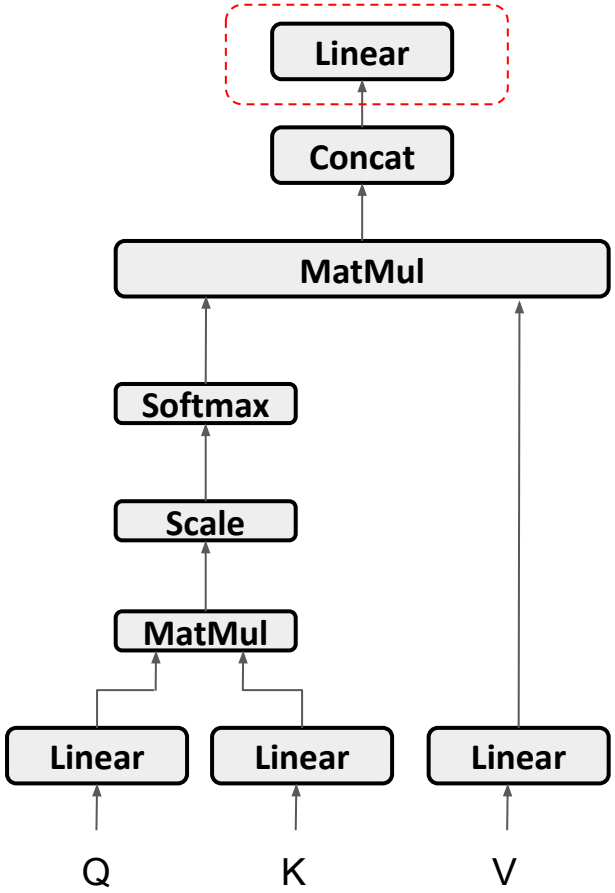


3. Multi- Headed Attention

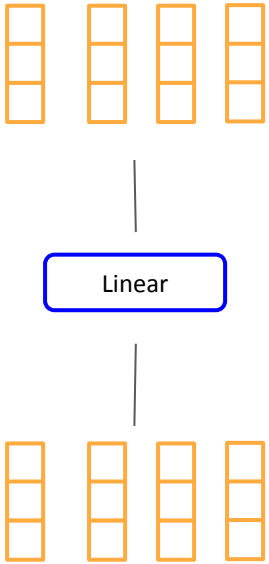
3.1 Self-Attention



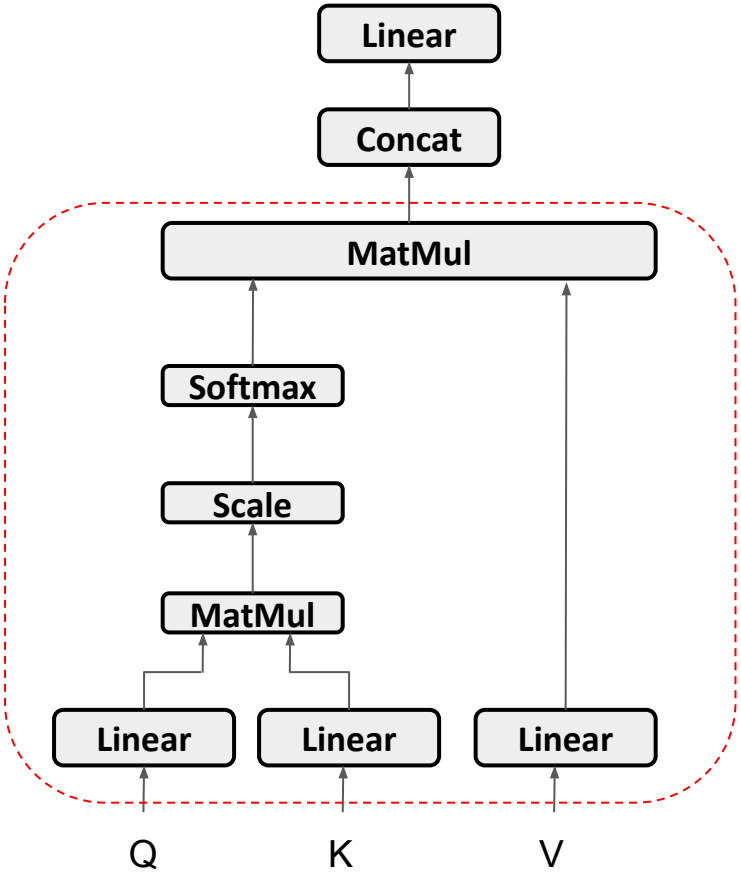
Encoder



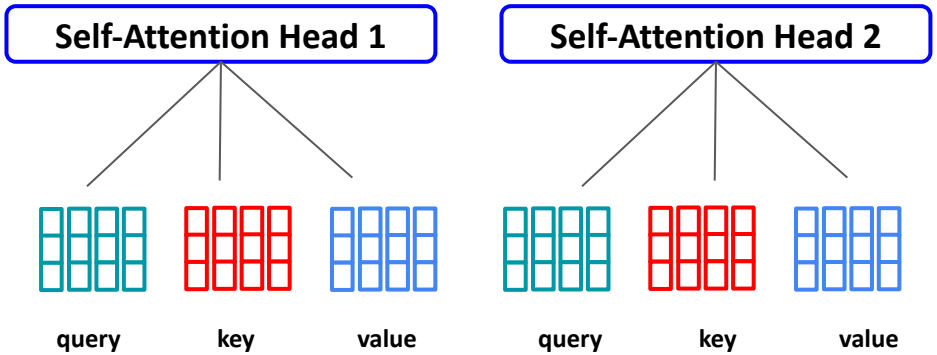
3. Multi- Headed Attention



Encoder

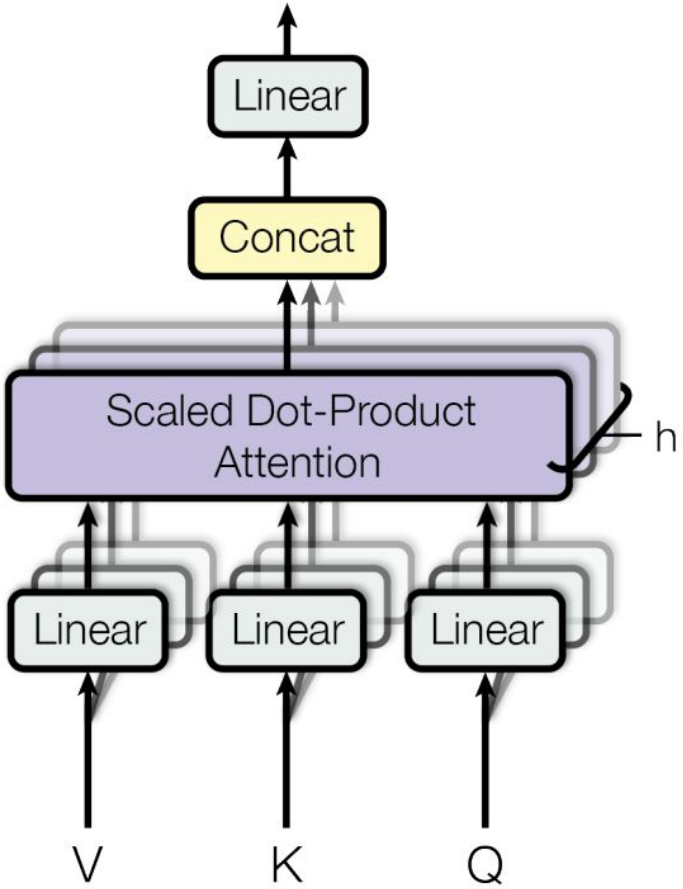


3. Multi- Headed Attention

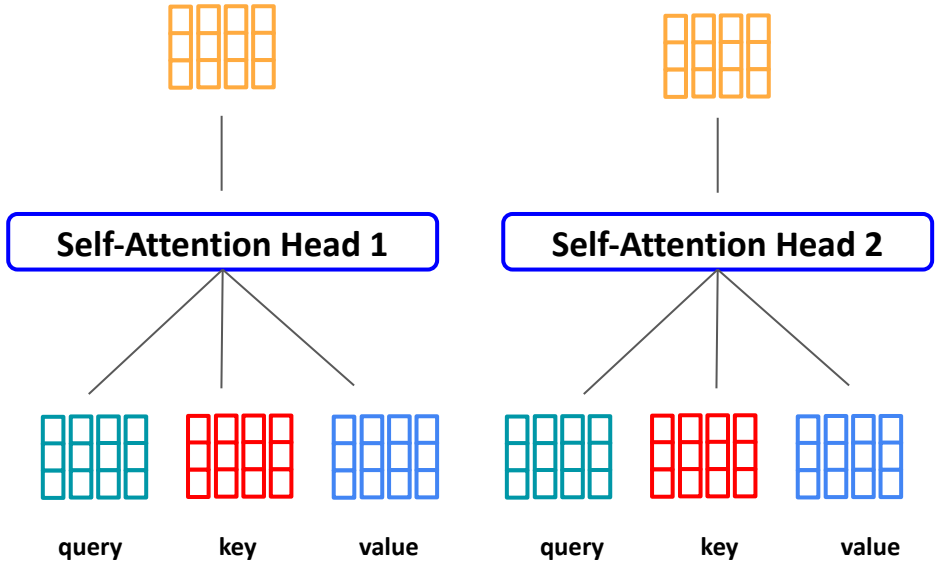


N = 2

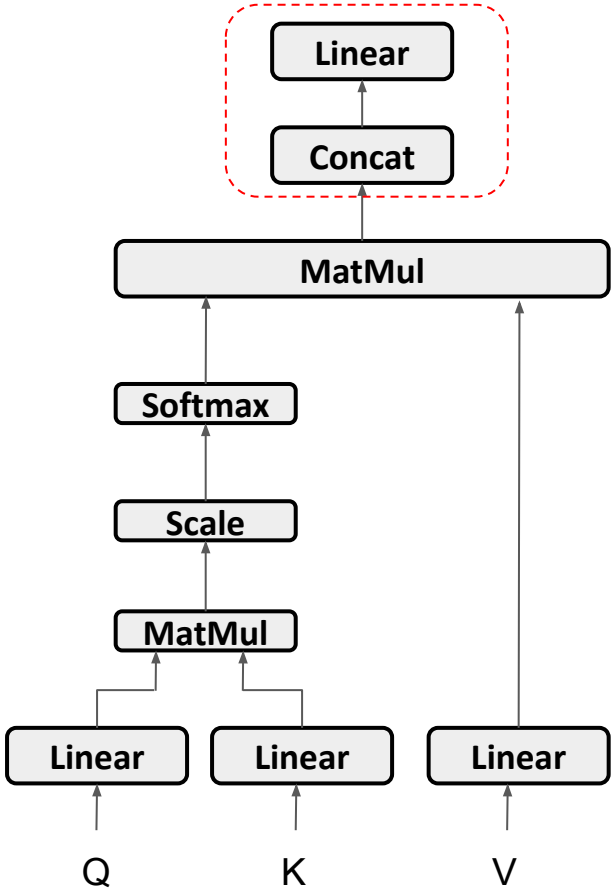
Encoder



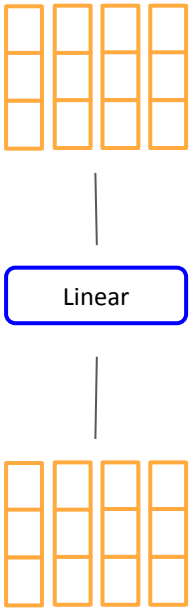
3. Multi- Headed Attention



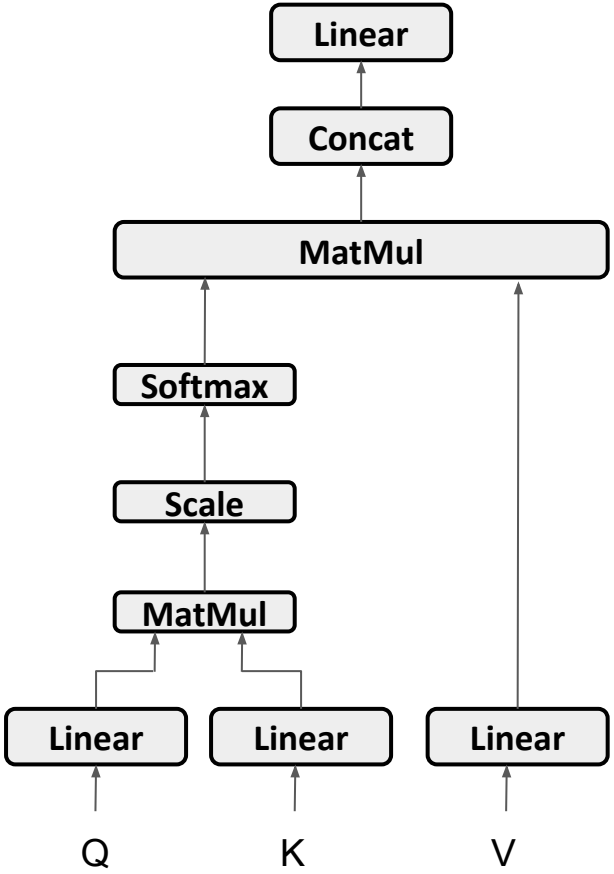
Encoder



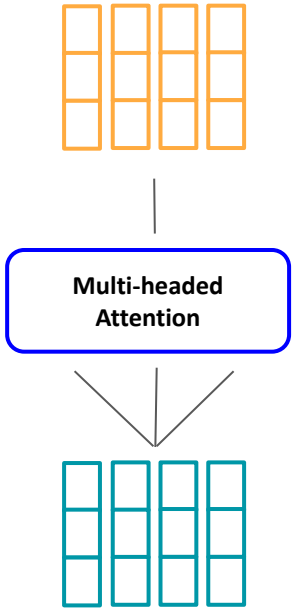
3. Multi- Headed Attention



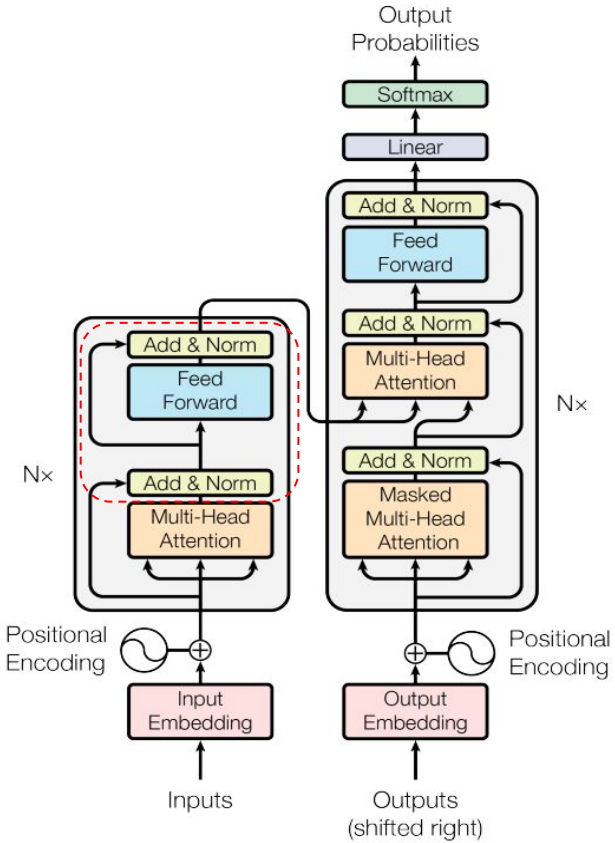
Encoder



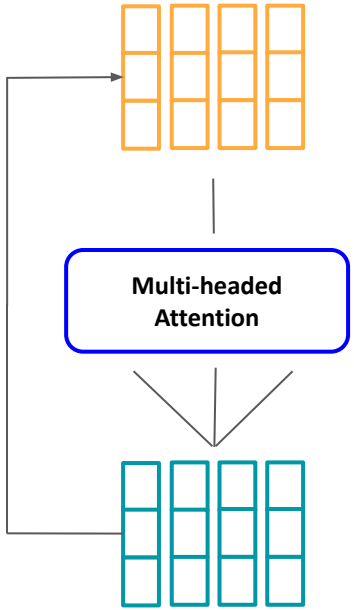
3. Multi- Headed Attention



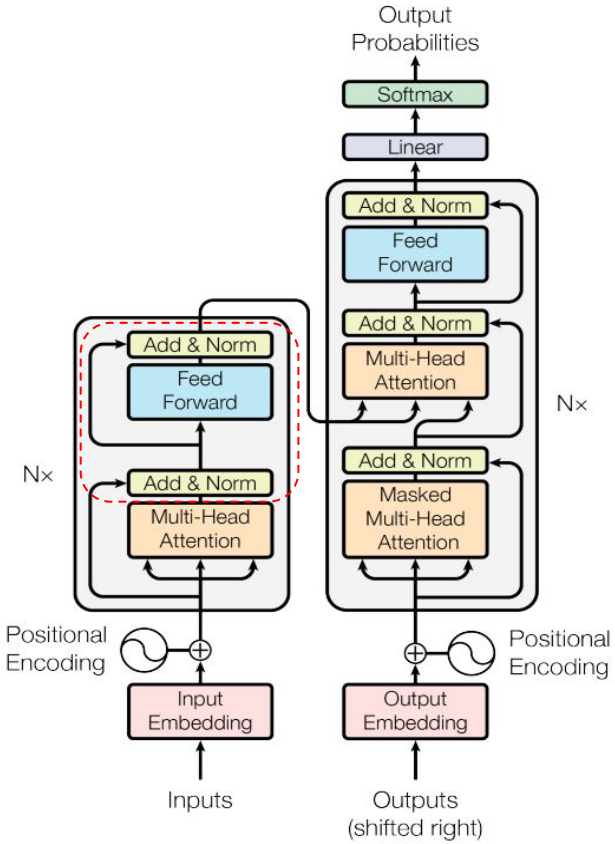
Encoder



4. Residual Connection



Encoder



5. Layer Normalisation and Point-wise feed forward