Attention Is All You Need

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Abstract

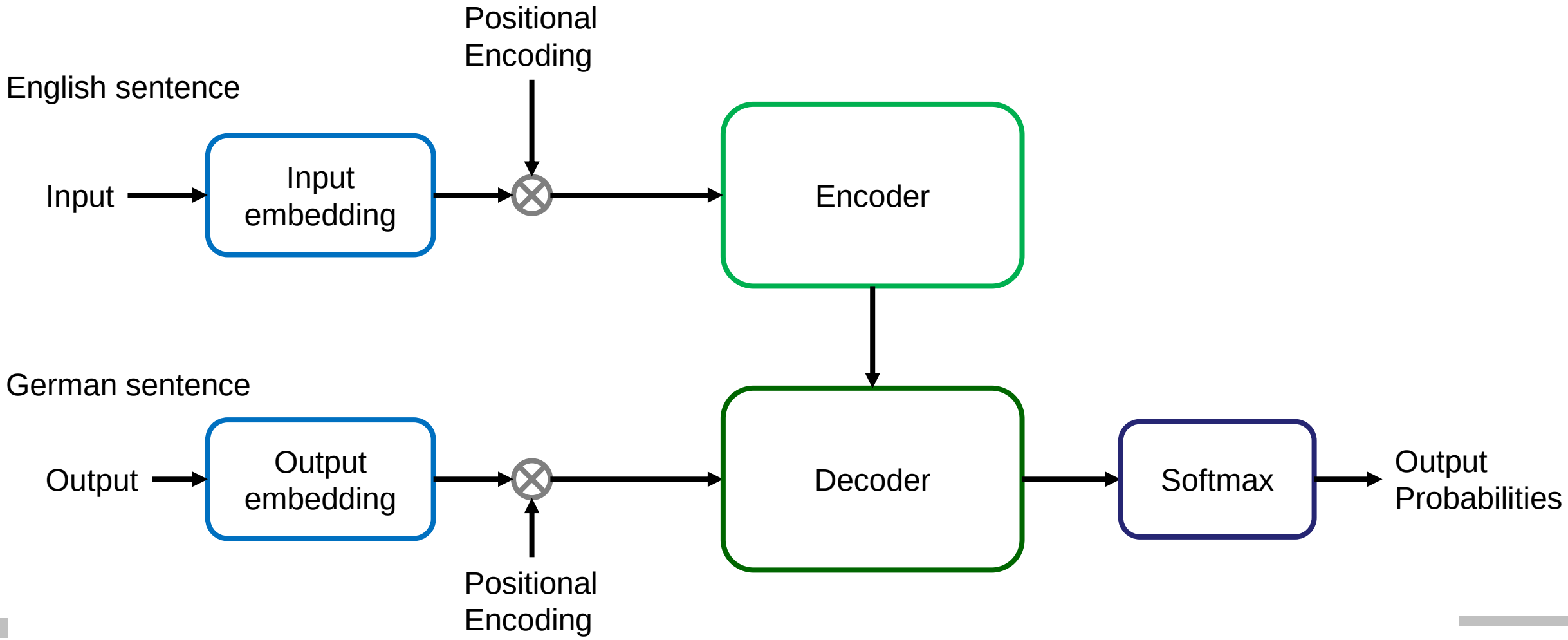
- Purpose : Sentence translation tasks between two different language
- Example :

  English -> German

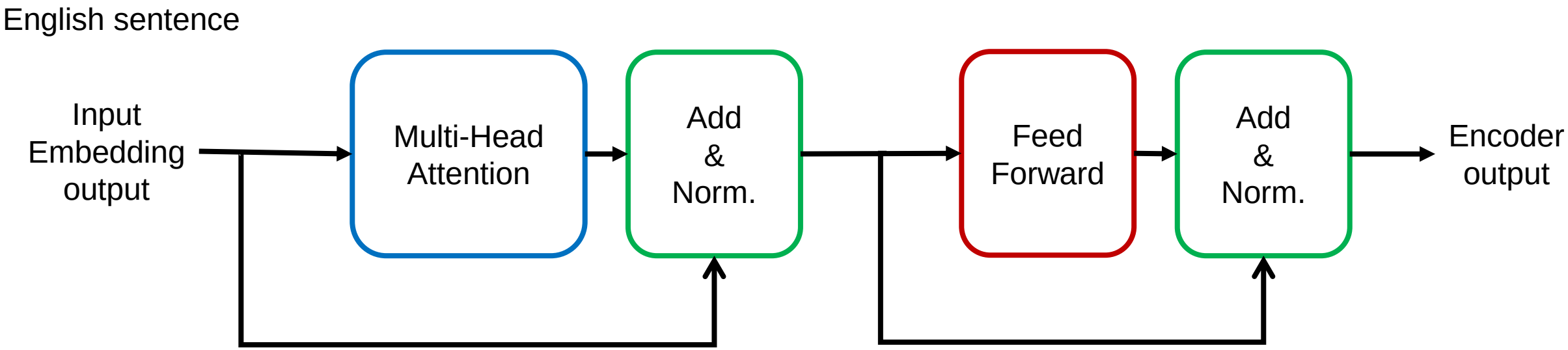
    this is a book -> das ist ein Buch

    Dictionary : {the feature of English word: the feature of German word}

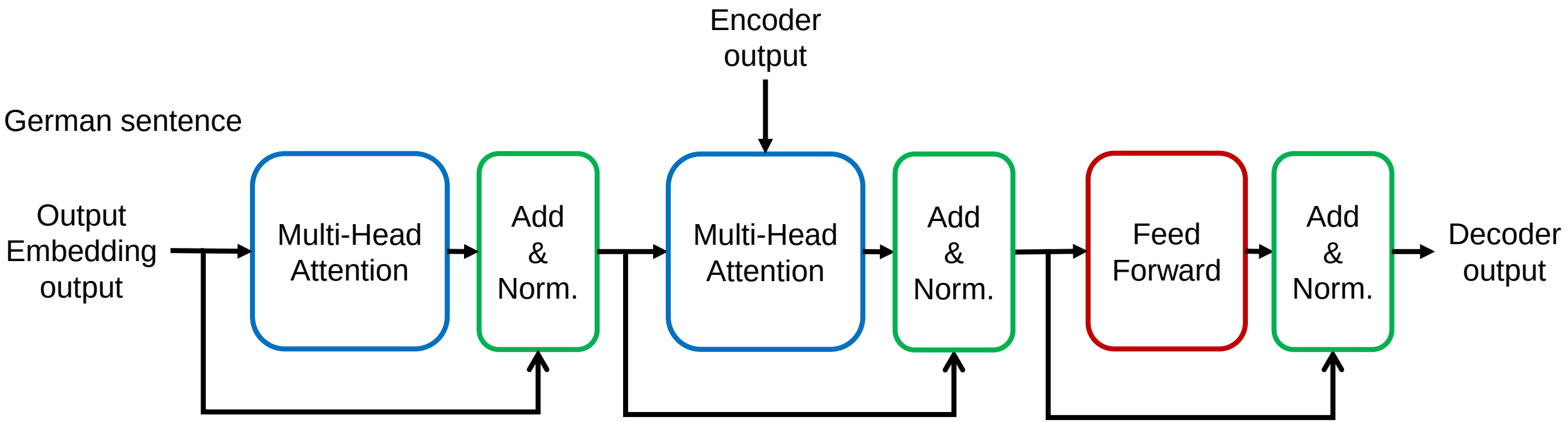
Model


Positional
Encoding
English sentence
Input
Input
embedding
Encoder
German sentence
Output
Output
embedding
Decoder
Softmax
Output
Probabilities
Positional
Encoding

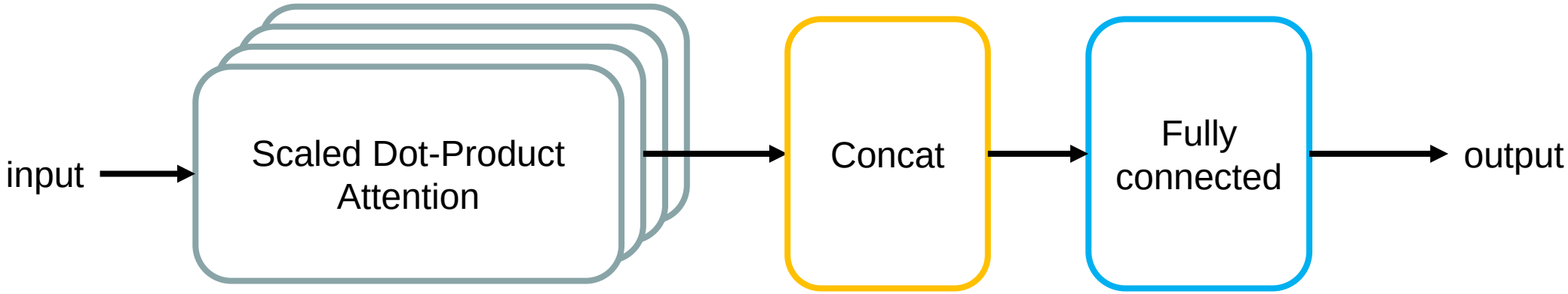
Encoder


English sentence
Input Embedding output
Multi-Head Attention
Add & Norm.
Feed Forward
Add & Norm.
Encoder output

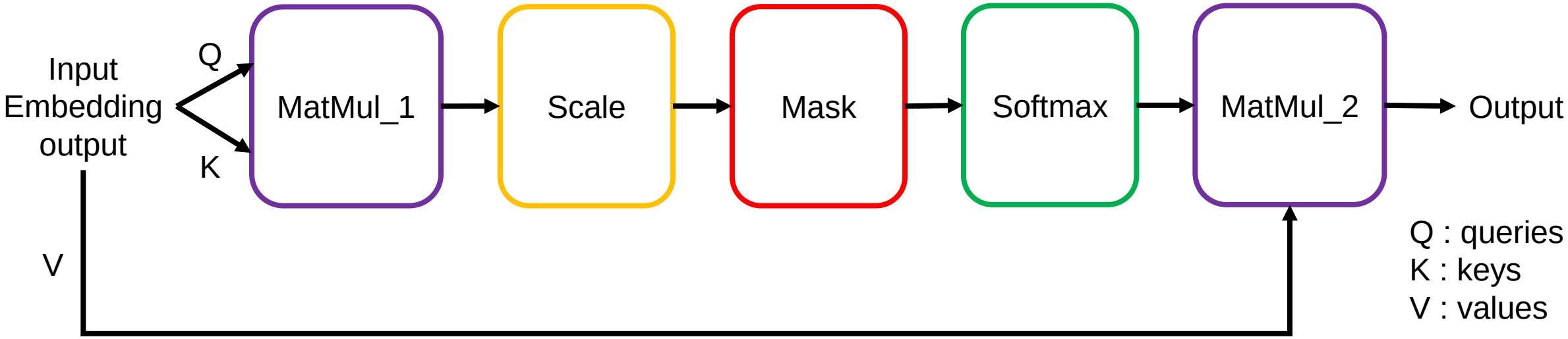
Decoder


Encoder
output
German sentence
Output
Embedding
output
Multi-Head
Attention
Add
&
Norm.
Multi-Head
Attention
Add
&
Norm.
Feed
Forward
Add
&
Norm.
Decoder
output

Multi-Head Attention



Scaled Dot-Product Attention



MatMul_1 : $Q * K^T$

Scale : $\frac{Q*K^T}{\sqrt{\frac{d_{model}}{h}}}$

Attention output = $softmax\left(\frac{Q*K^T}{\sqrt{\frac{d_{model}}{h}}}\right)v$

h : the number of attention layers

d_{model} : dimension of all sub-layers in model

Result of paper

	N	d_{model}	d_{ff}	h	d_k	d_v	P_{drop}	ϵ_{ls}	train steps	PPL (dev)	BLEU (dev)	params $\times 10^6$
base	6	512	2048	8	64	64	0.1	0.1	100K	4.92	25.8	65
(A)				1	512	512				5.29	24.9	
				4	128	128				5.00	25.5	
				16	32	32				4.91	25.8	
				32	16	16				5.01	25.4	
(B)					16					5.16	25.1	58
					32					5.01	25.4	60
(C)	2									6.11	23.7	36
	4									5.19	25.3	50
	8									4.88	25.5	80
		256			32	32				5.75	24.5	28
		1024			128	128				4.66	26.0	168
			1024							5.12	25.4	53
			4096							4.75	26.2	90
(D)							0.0			5.77	24.6	
							0.2			4.95	25.5	
								0.0		4.67	25.3	
								0.2		5.47	25.7	
(E)	positional embedding instead of sinusoids									4.92	25.7	
big	6	1024	4096	16			0.3		300K	**4.33**	**26.4**	213