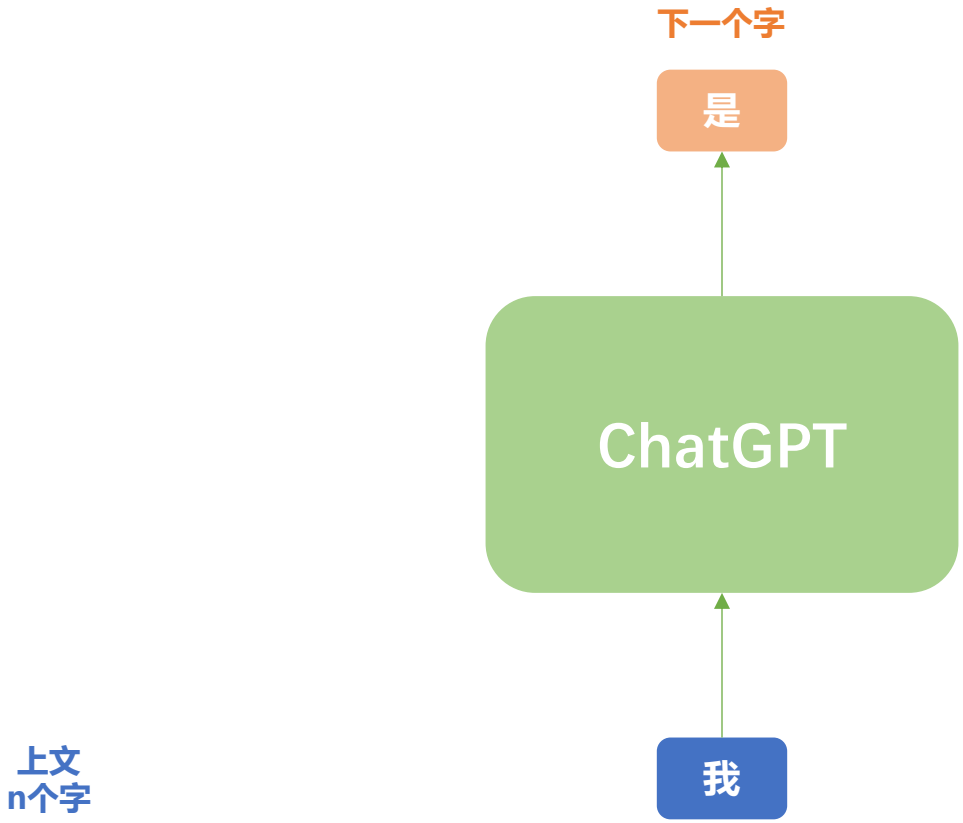
Word Embedding
是什么?

史轩宇

2024.02.24

vicshi94

ChatGPT 的基础原理：单字接龙



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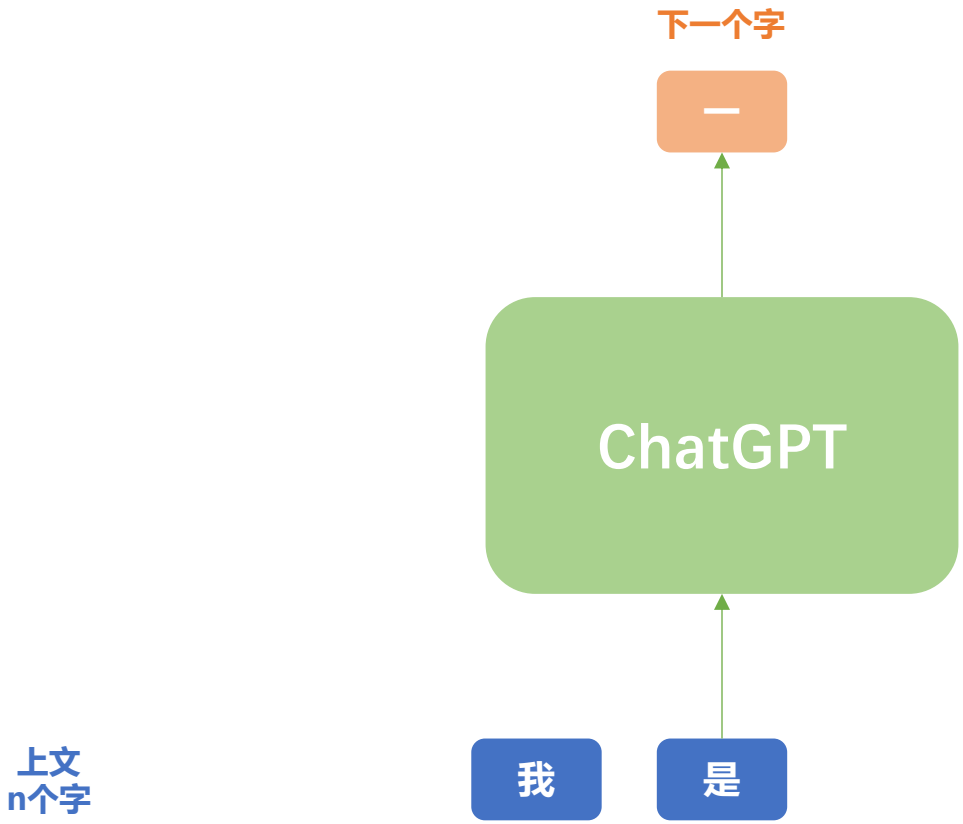

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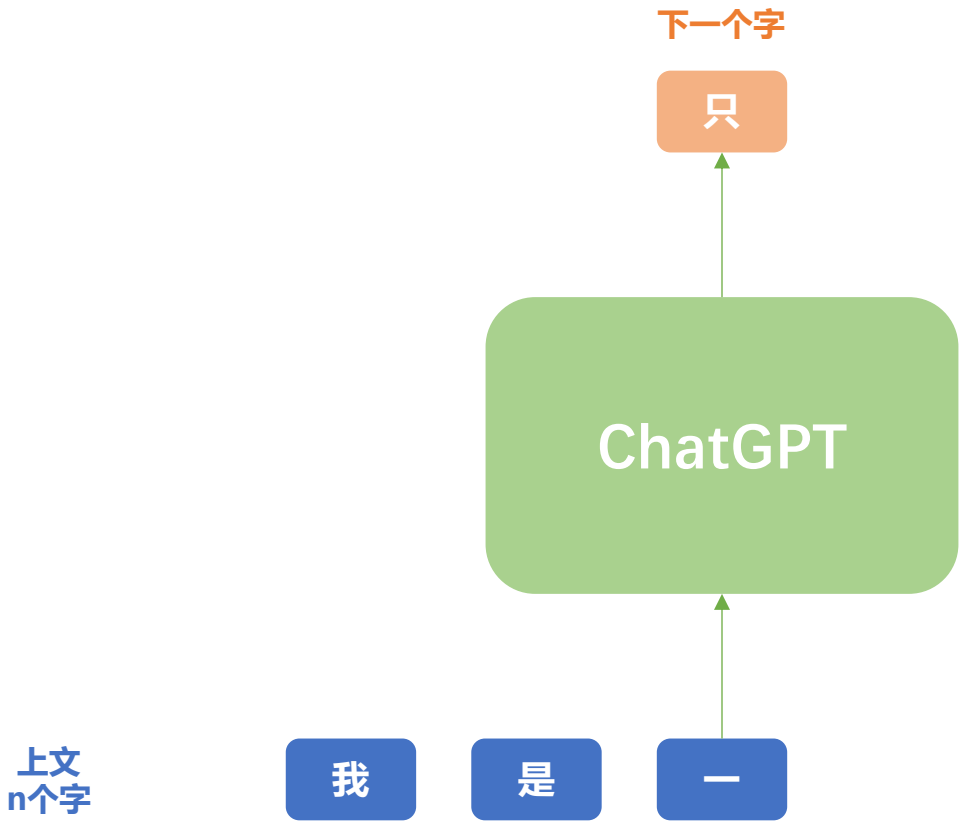

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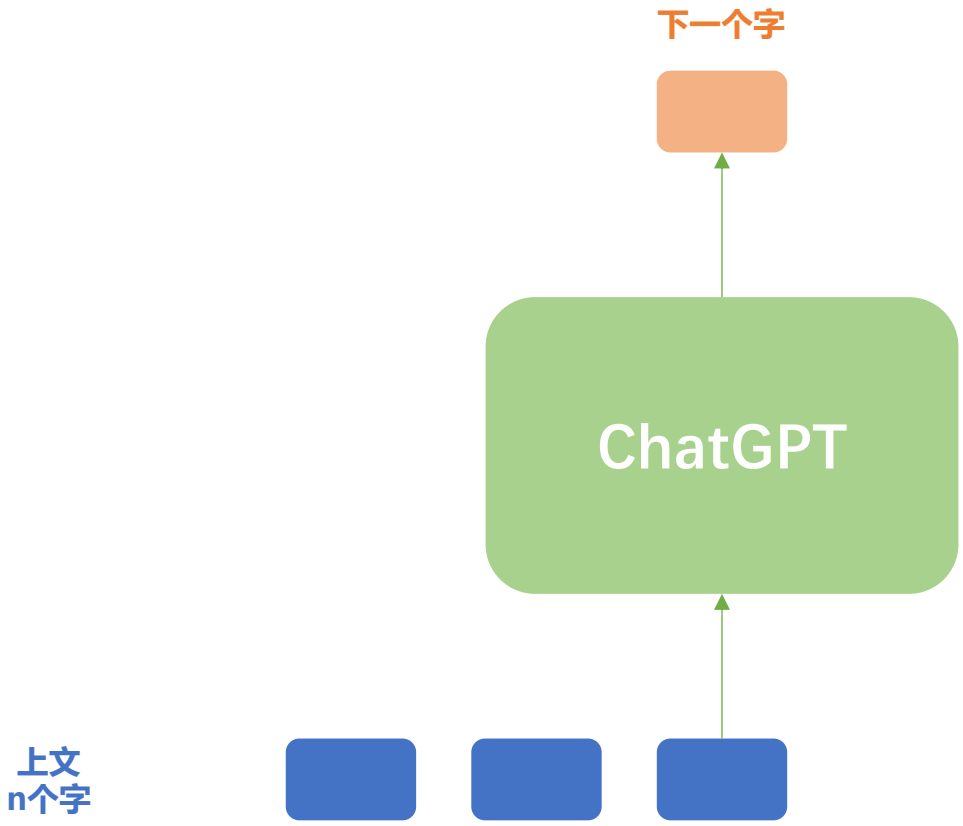

“不同的上文，同一个模型”，

产生对应的回答

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Text as data?

现在，我们有一个简单模型还有一句话：

“Stitch is cute”

One-hot Encoding

word	encoding
Stitch	1
is	2
cute	3

An ordinal relationship in numbers!

我们的模型会误以为 “cute” 大于 “is”

	Stitch	is	cute
Stitch	1	0	0
is	0	1	0
cute	0	0	1

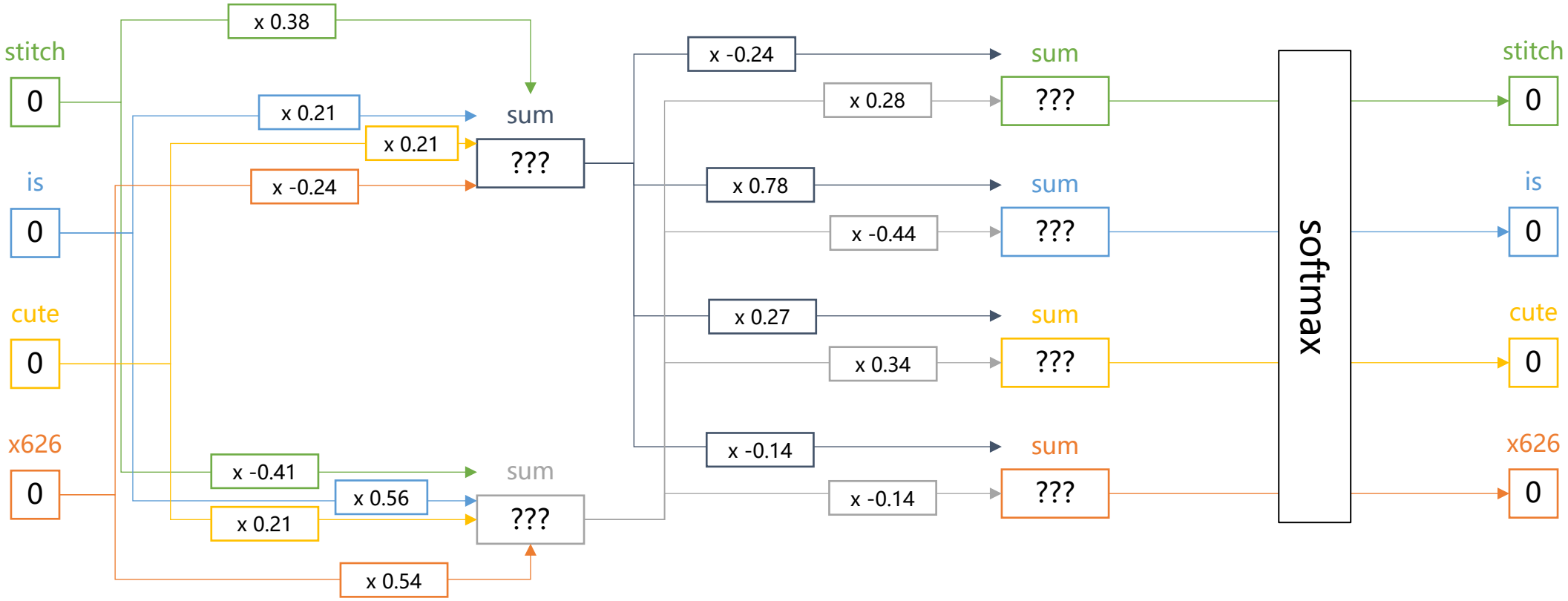
word	one-hot encoding
Stitch	(1,0,0)
is	(0,1,0)
cute	(0,0,1)

这样就没有大小关系了，而且每个单词都被映射为向量空间中距离原点 （0,0,0) 的点，且距离原点的欧式距离都是单位距离1。

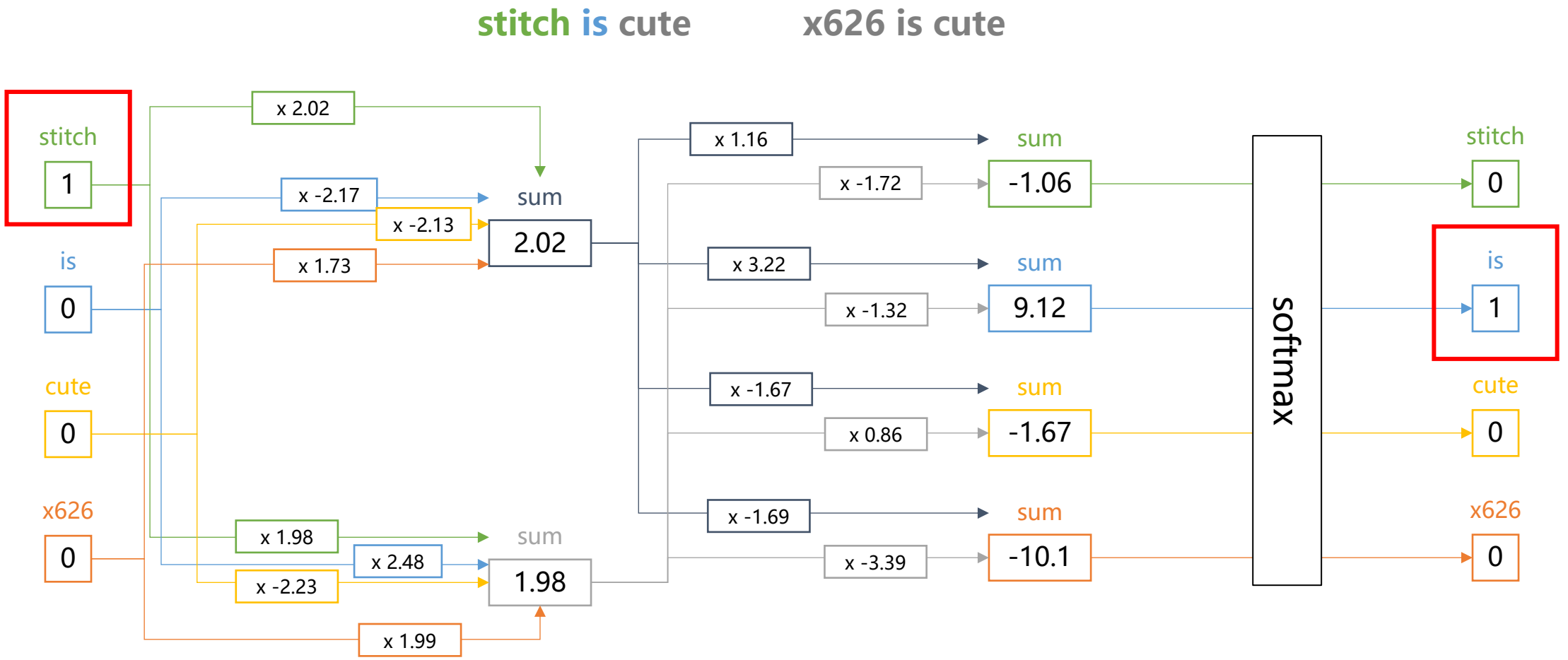
完美！开整！

开始训练超级简单神经网络模型！

我们的training data是两句话：“stitch is cute”，“x626 is cute”



超简单模经过超多轮训练后



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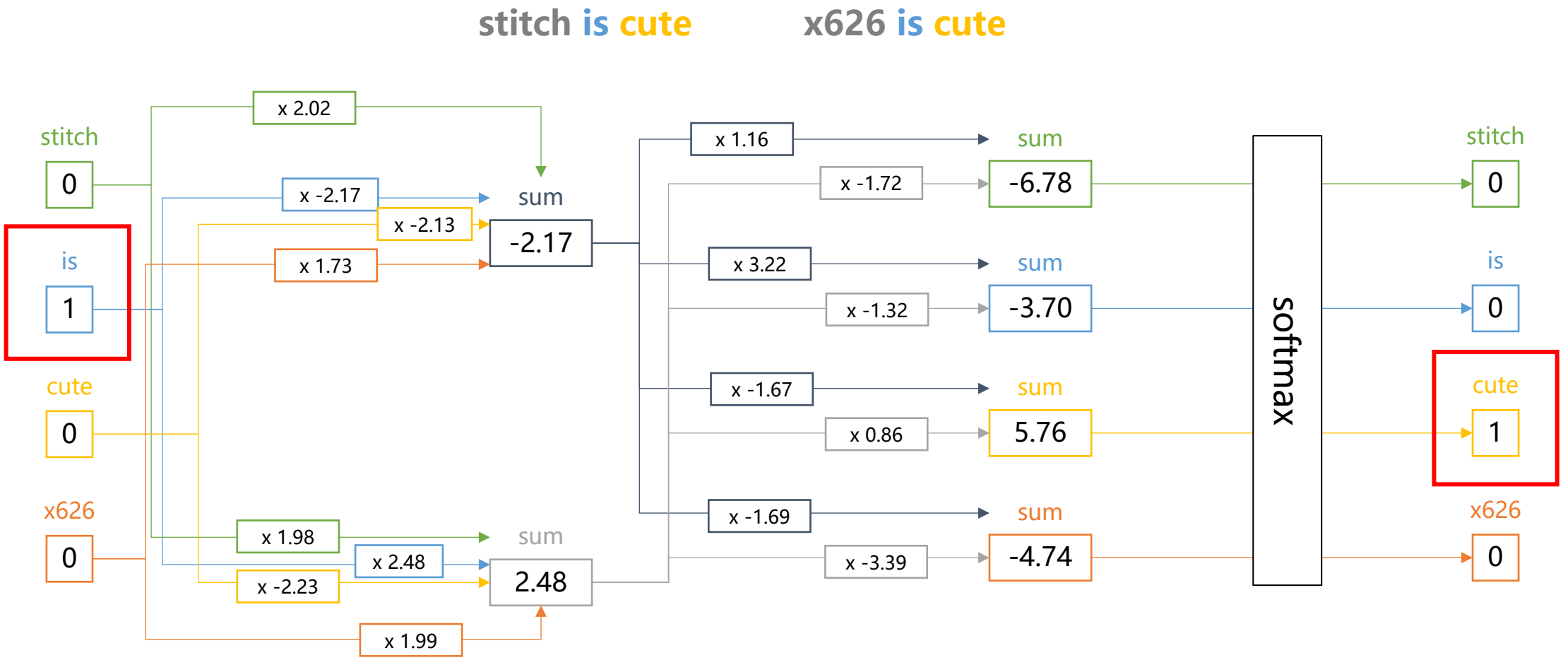

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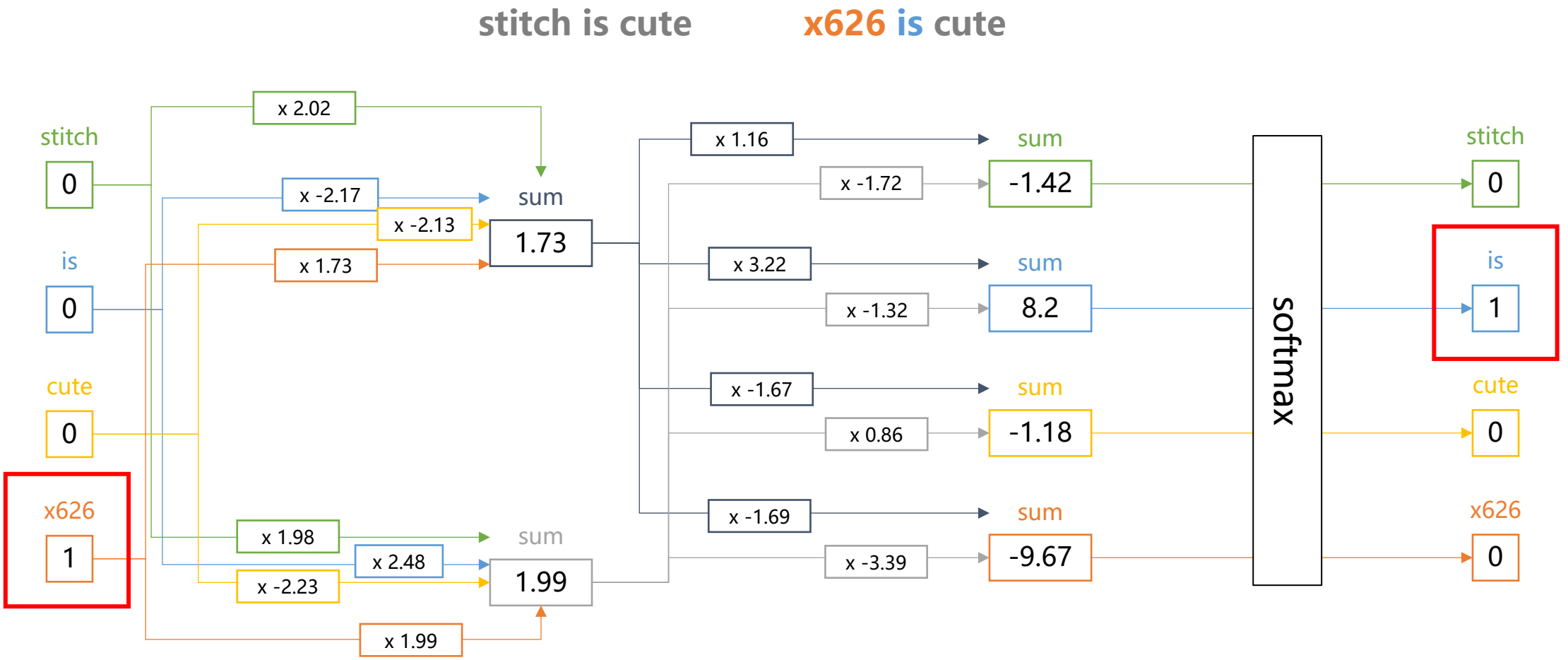

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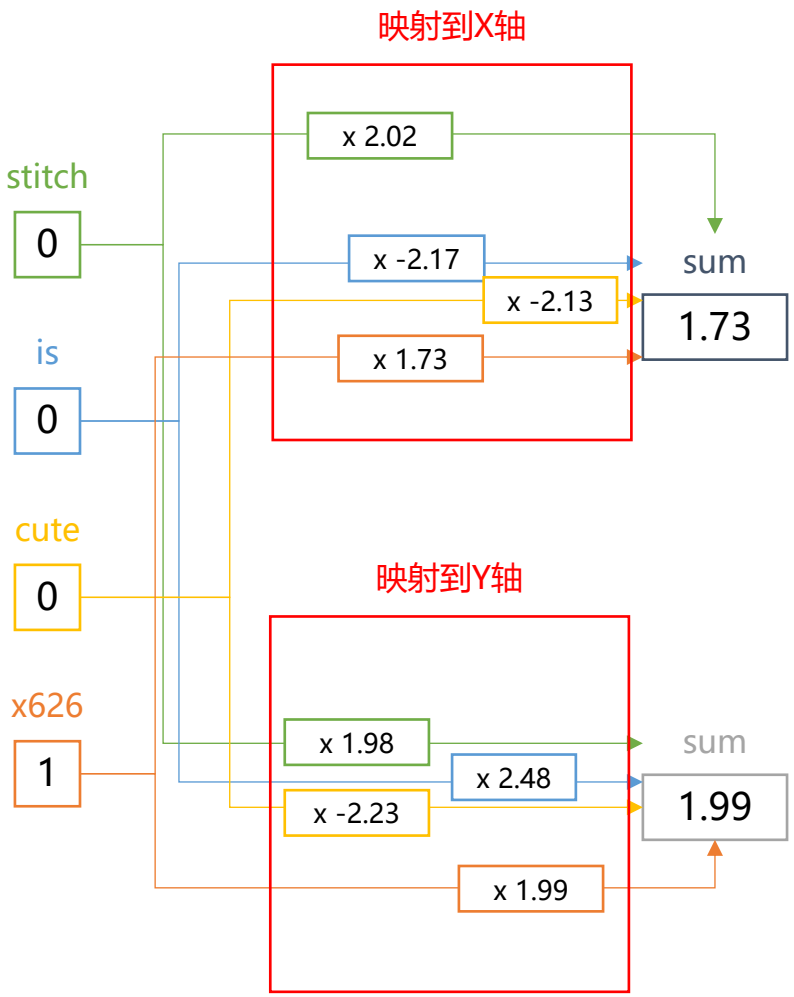

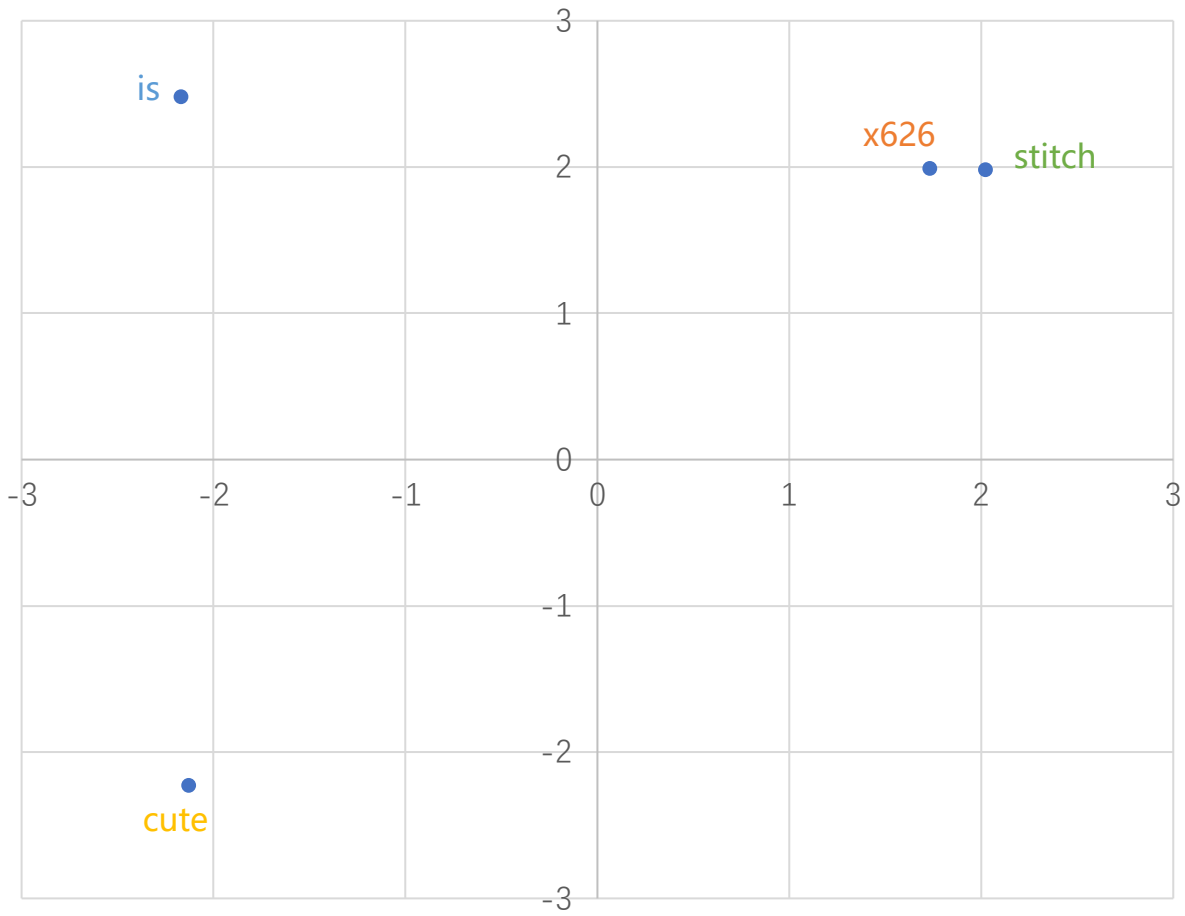

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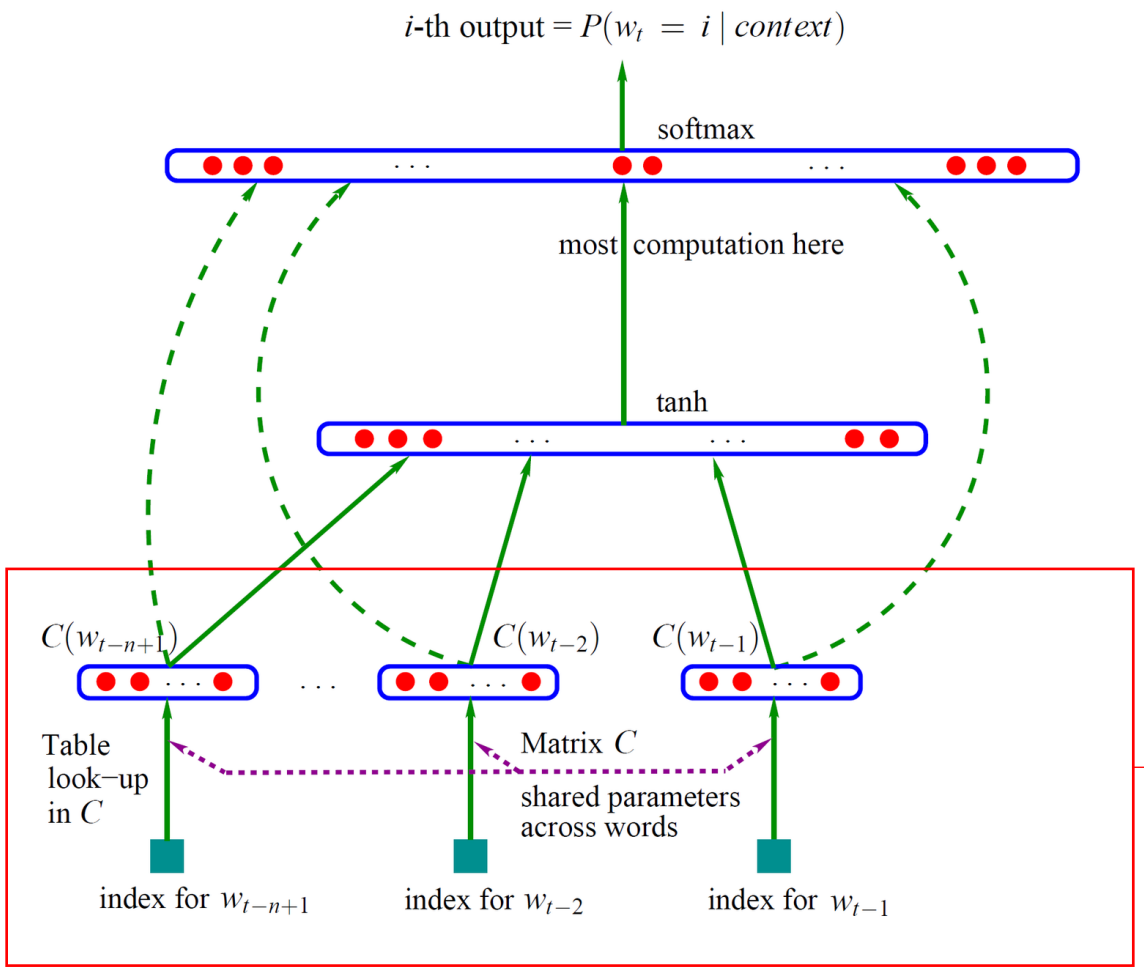
Vectorization



$$w \times C = c$$

$$\underbrace{\begin{bmatrix} 0 & 0 & 0 & 1 & 0 \end{bmatrix}}_{\text{One-hot vector}} \times \underbrace{\begin{bmatrix} 8 & 2 & 1 & 9 \\ 6 & 5 & 4 & 0 \\ 7 & 1 & 6 & 2 \\ 1 & 3 & 5 & 8 \\ 0 & 4 & 9 & 1 \end{bmatrix}}_{\text{Embedding Weight Matrix}} = \underbrace{\begin{bmatrix} 1 & 3 & 5 & 8 \end{bmatrix}}_{\text{Hidden layer output}}$$

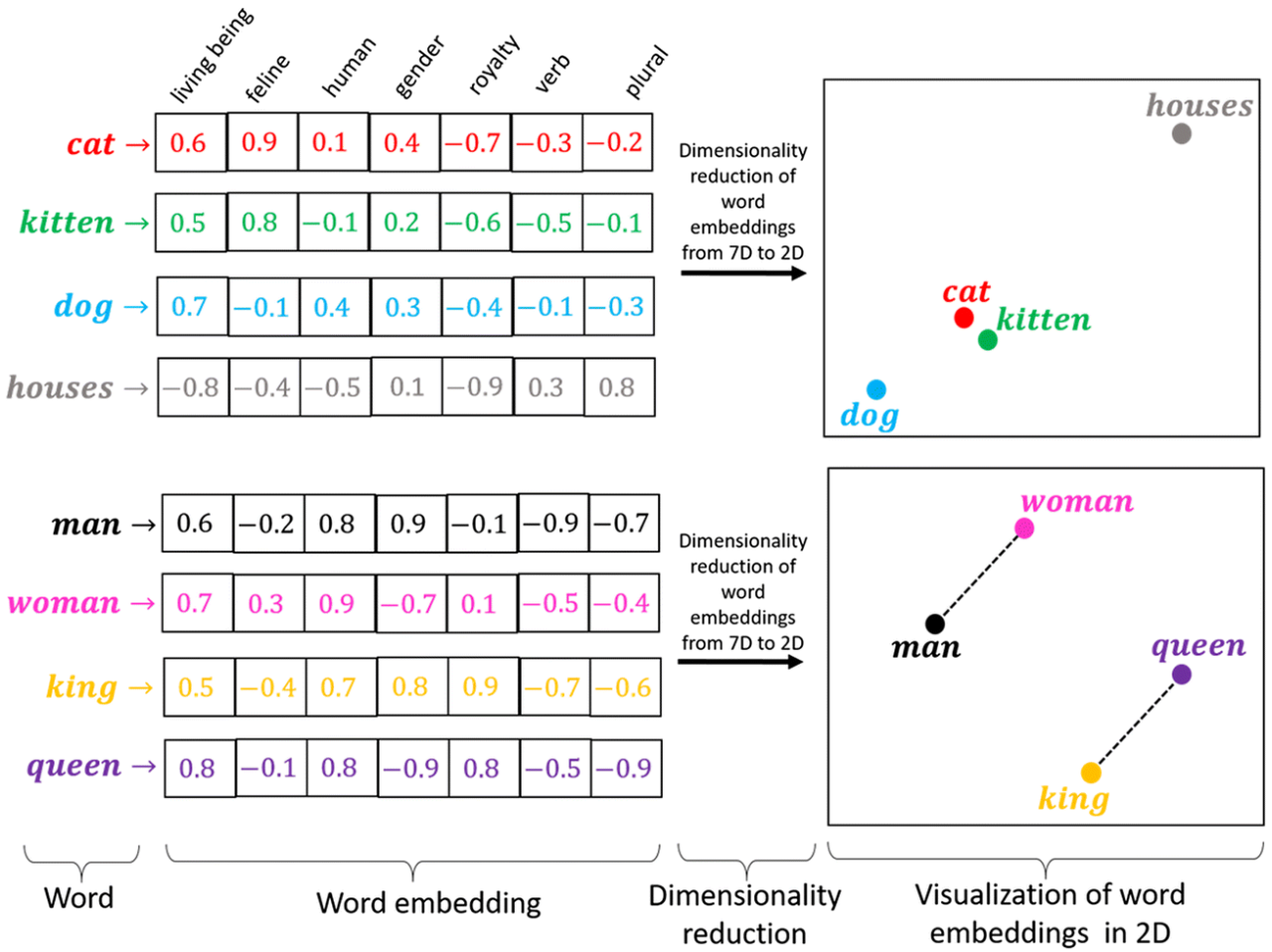
独热编码主要缺点：

1. 维度太多
2. 太稀疏（n^2-n个0）

通过word embedding转换为词向量后明显改善了这两点，且方便了下游任务

Bengio, Y., Ducharme, R., Vincent, P., & Jauvin, C. (2003). A neural probabilistic language model. *Journal of Machine Learning Research*, *3*(6), 1137–1155. https://doi.org/10.1162/153244303322533223

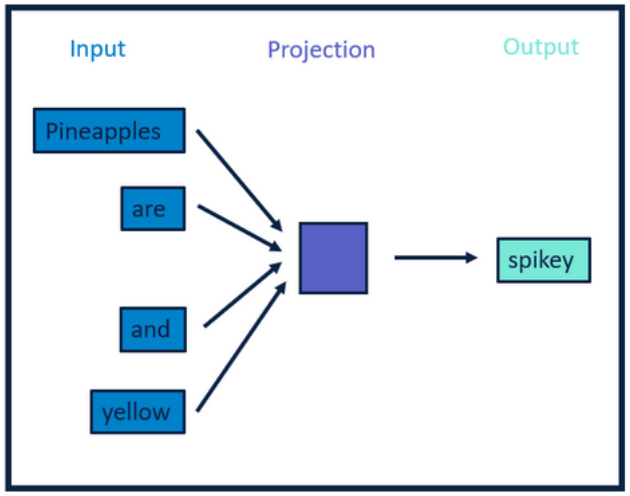
Word Embedding Application



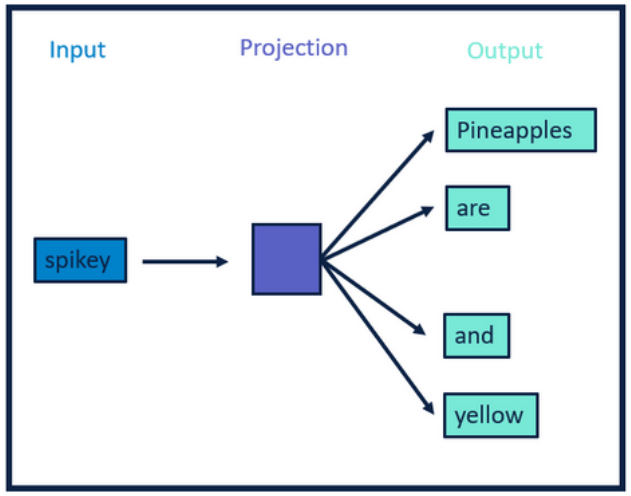
and TM、Supervised ML……

为了强化对于矩阵C的训练

Word2Vec



CBOW



Skip-gram

GloVe

简单来说，更强调全局的共现频率，而非仅捕捉相邻的几个词

图片来源：https://community.alteryx.com/t5/Data-Science/Word2vec-for-the-Alteryx-Community/ba-p/305285

Tutorial: text2vec in R