ATTENTION TO SHAKESPEARE !

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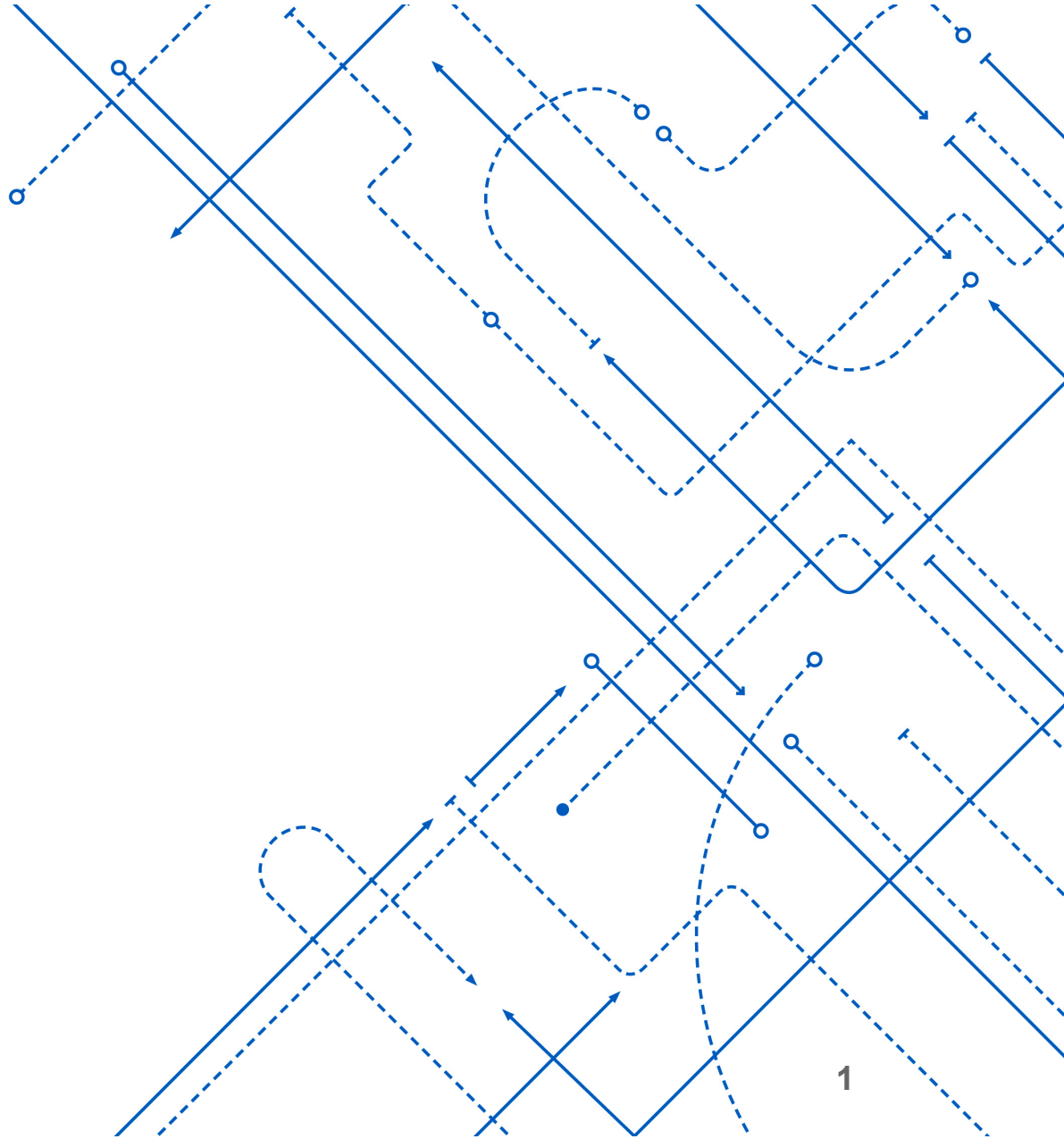
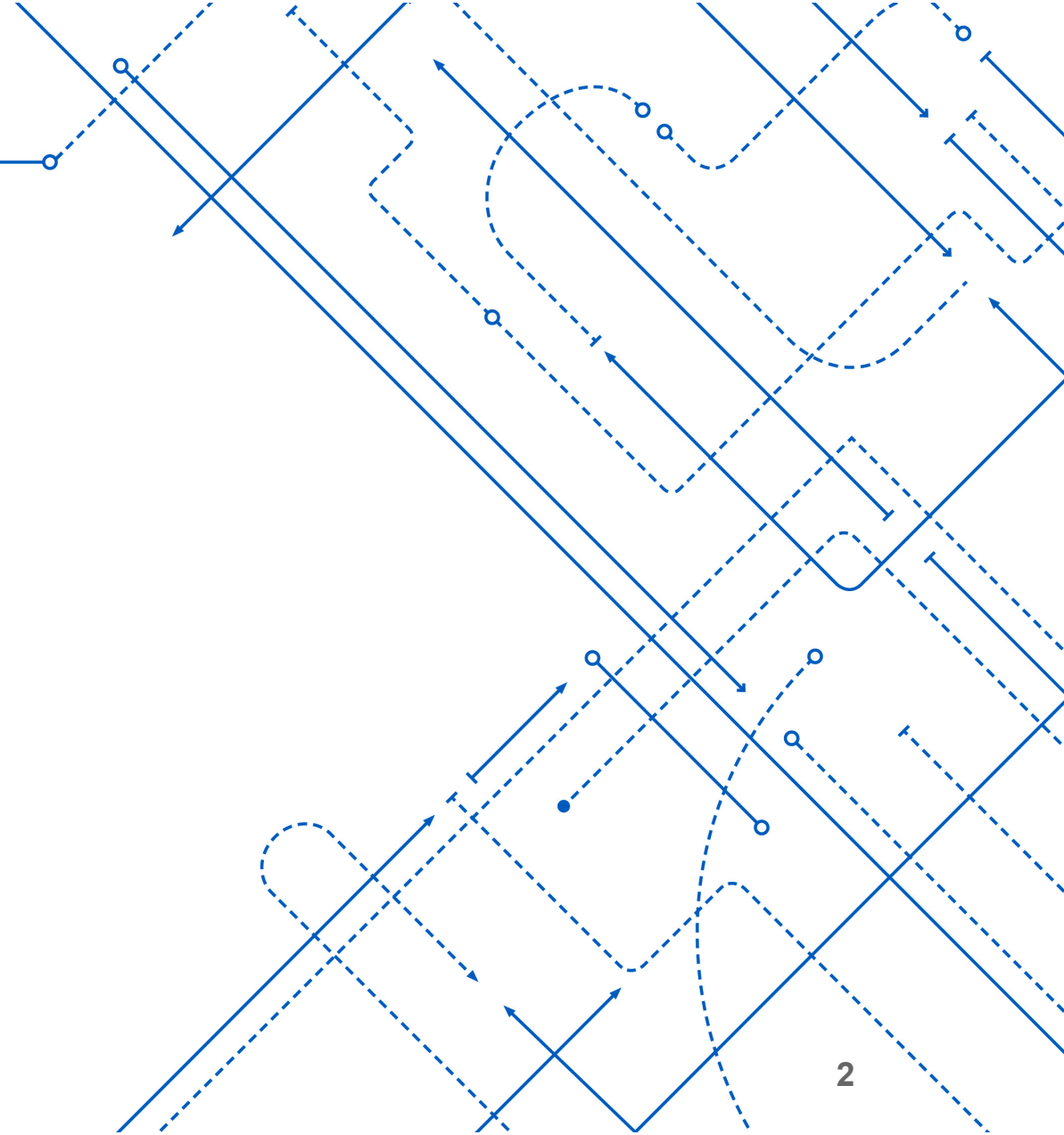




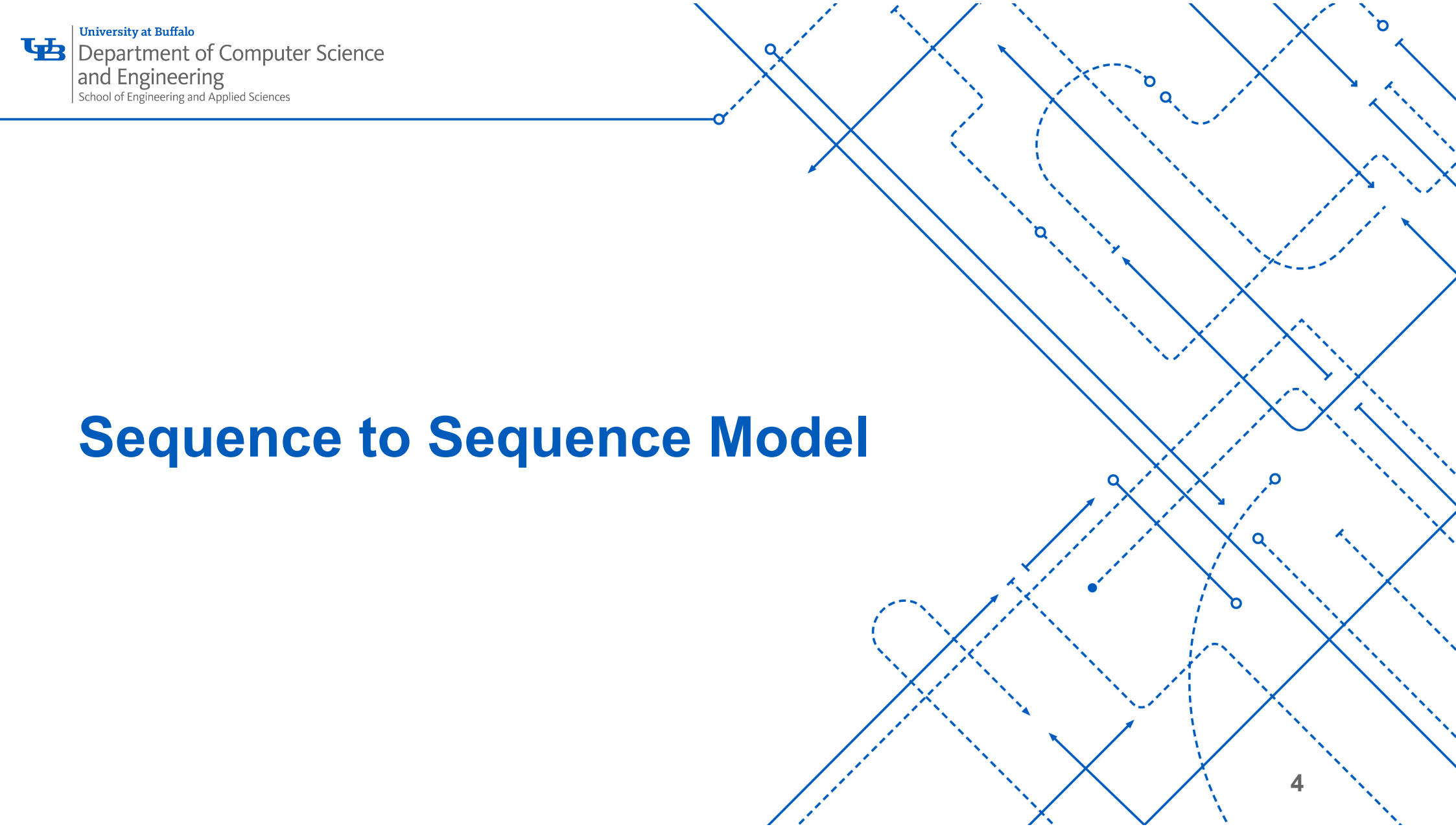
Introduction….

- In this project we address the task of using Neural Machine Translation to apply artistic style transfer.

- *Seq2Seq* model leveraging RNN or LSTM has been used previously to convert modern english language to *Shakespearean* style.

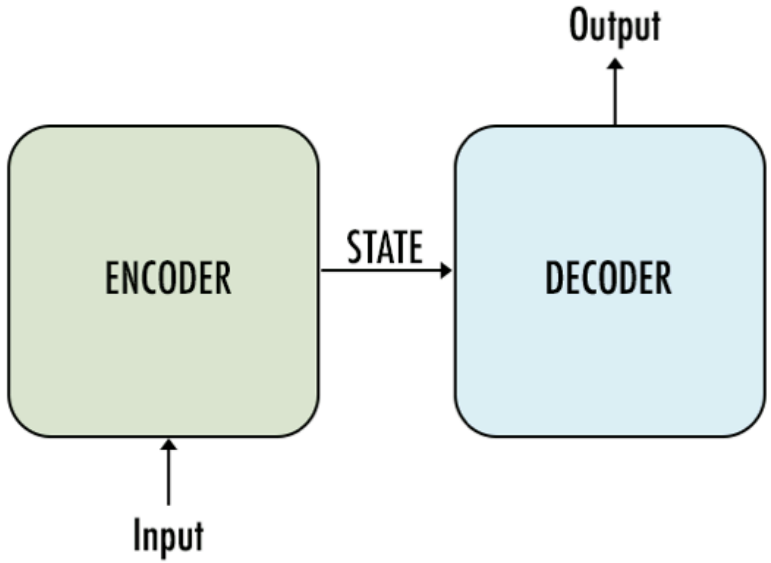
- We aim to further improve the speed and quality of this style transfer using *Transformer* model.

- Lastly we present a slightly modified version of Transformer that we call the 'Pizza' structure and discuss its advantages.



Sequence to Sequence Model

- An encoder component comprising of RNNs like LSTM or GRU encodes the entire input sequence to a hidden state vector.
- This vector aims to encapsulate the information for all input elements.
- The decoder component similarly accepts a hidden state from the previous unit and produces output as well as its own hidden state for the next word.



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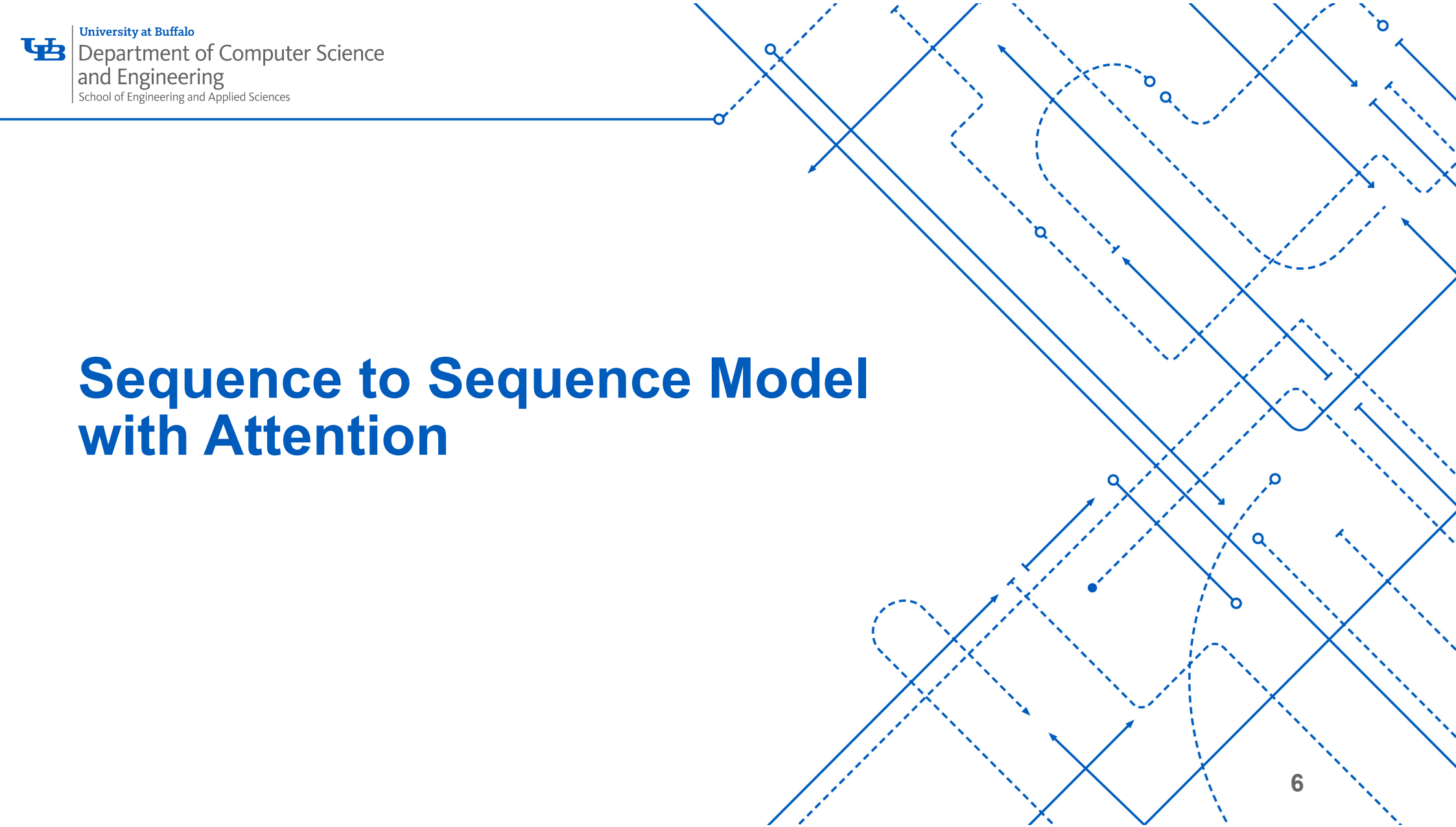
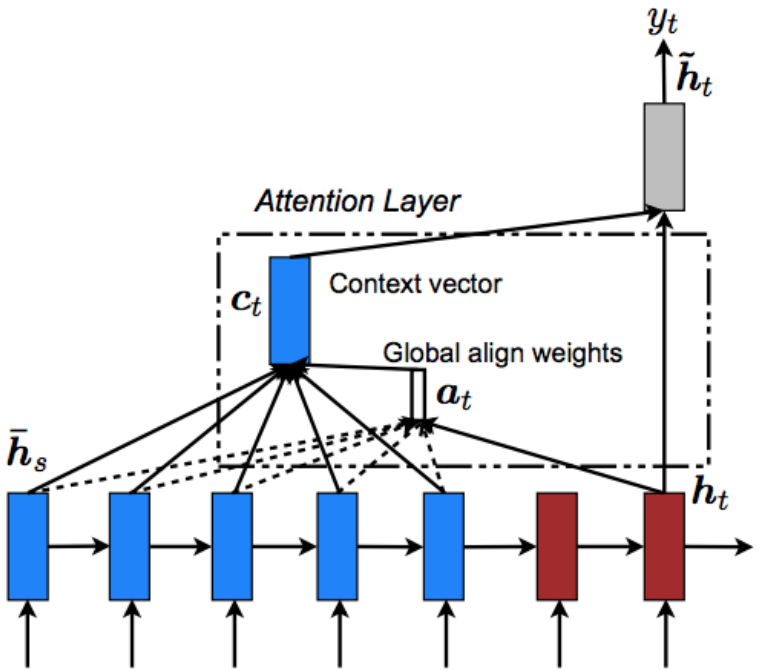


Sequence to Sequence Model with Attention

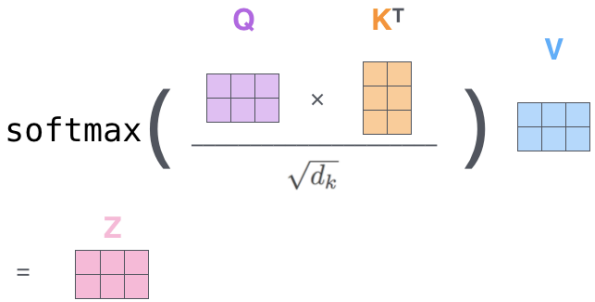
- When decoding a sentence, we want the model to pay *attention* to only a part of the sentence and not the entire one.
- **Soft** Attention: the alignment weights are learned and placed "softly" over all patches in the input.
- **Hard** Attention: only selects one patch of the input to attend to at a time.



Transformer !

Key Points

- Dispenses any sequential neural networks like RNN or CNN.
- Multi-layered encoder and decoder.
- Consists only of Self-Attention and Feed-Forward Neural Network.
- Multi-headed Attention: the one with 8 heads !
- The *Masked* multi-headed attention prevents the decoder to look at the future input tokens when decoding a certain word.
- Self-attention is the method the Transformer uses to bake the understanding of other relevant words into the one being currently processed.



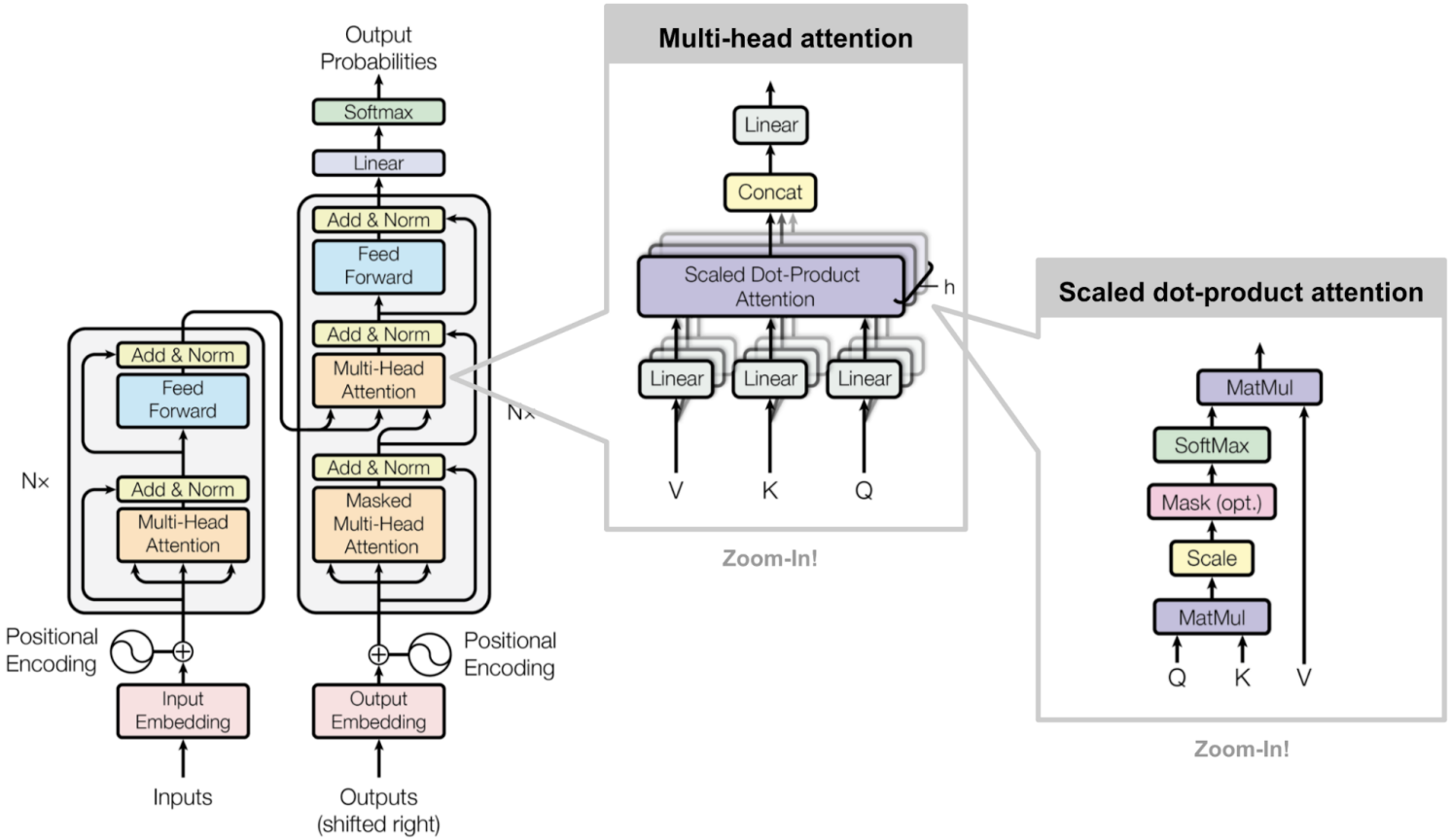
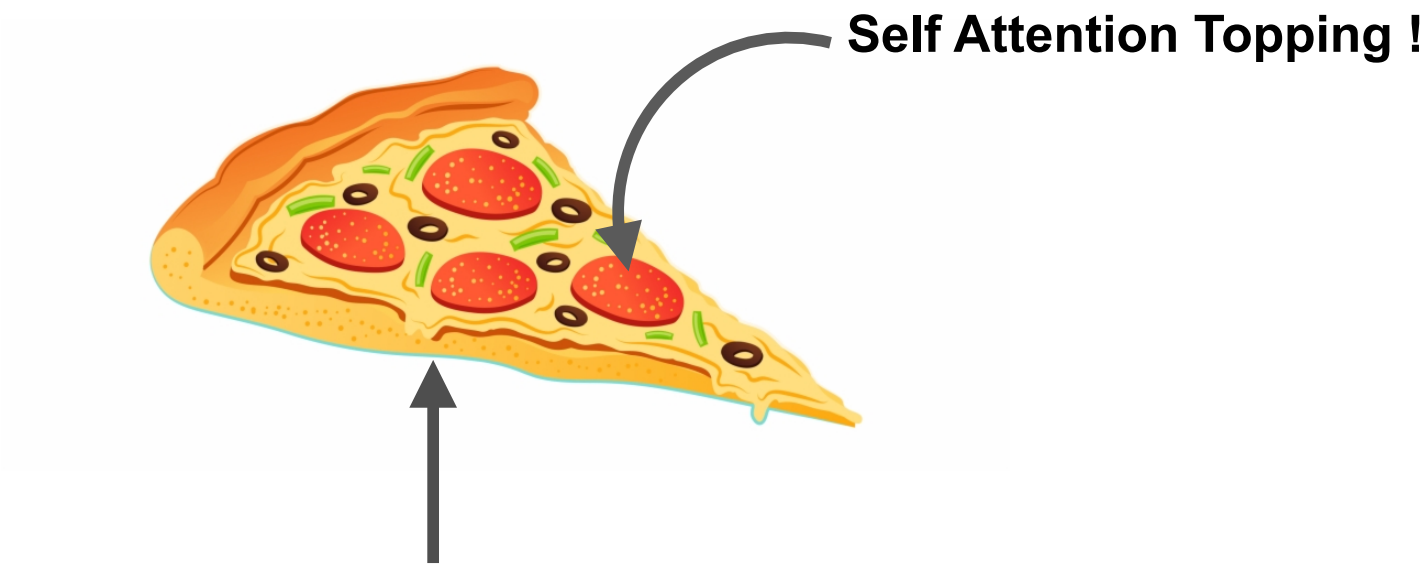


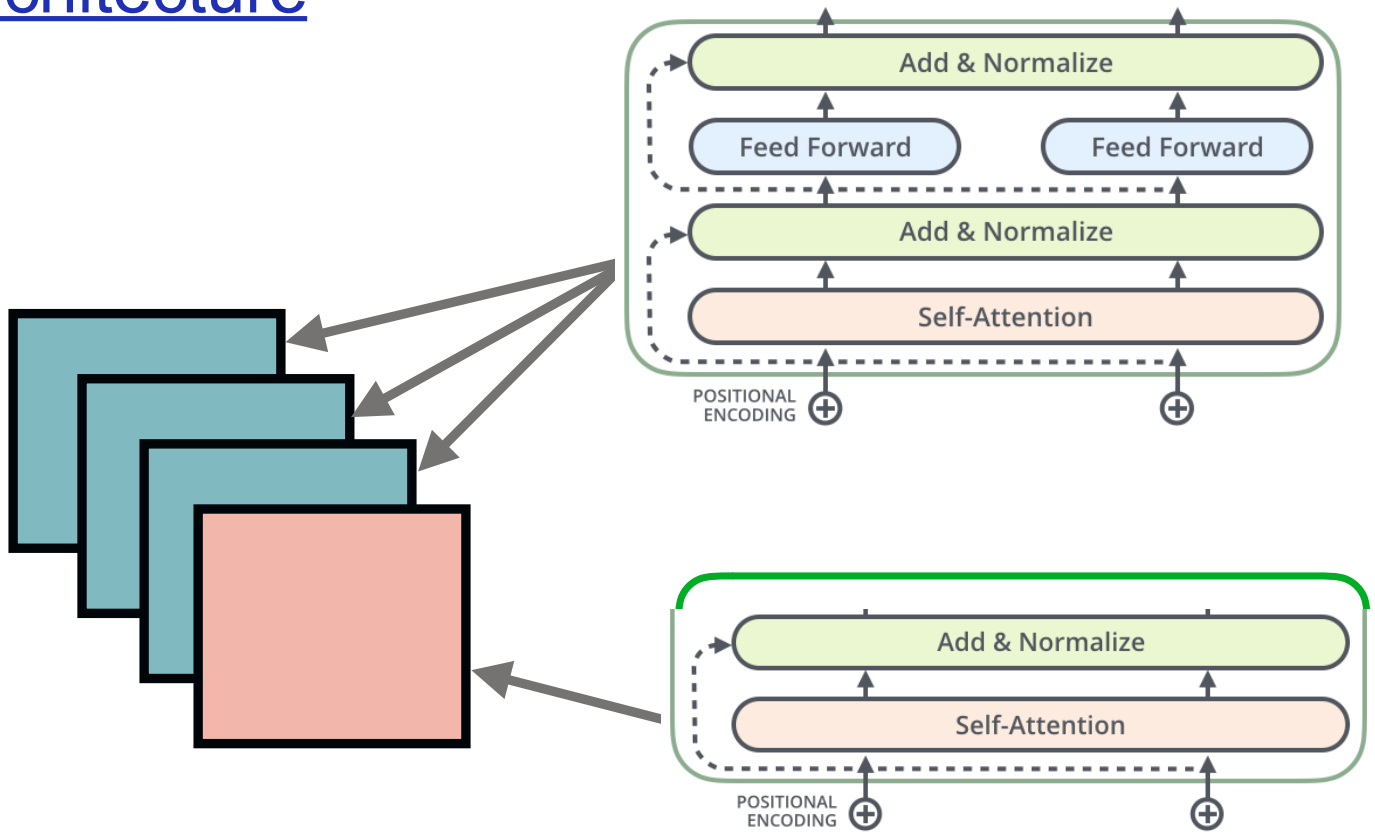
Figure 1: Architecture of Transformer (Image source: Fig 1 & 2 in Vaswani, et al., 2017.)

The Modified Transformer

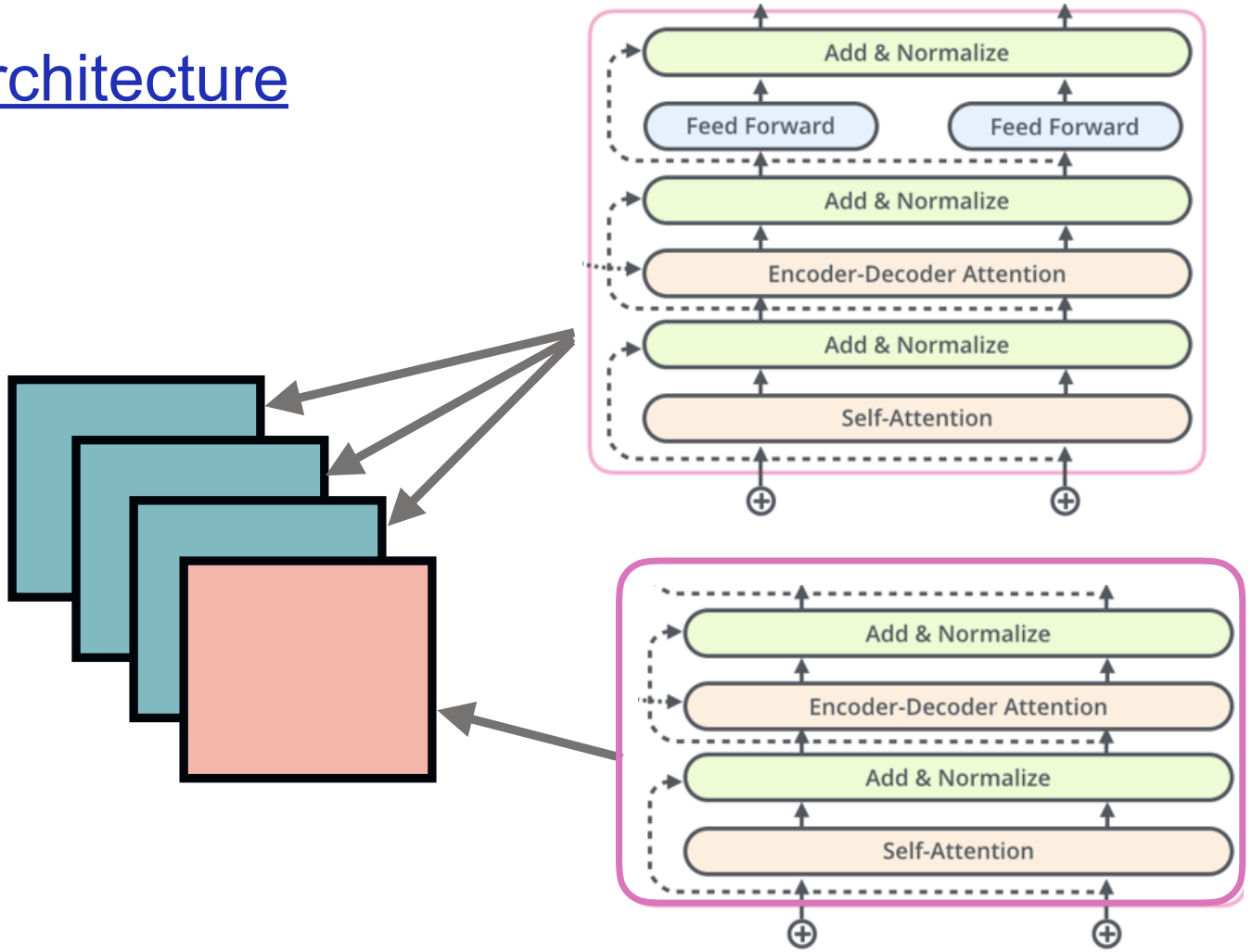
What is the ‘Pizza’ Structure ?



Encoder Architecture

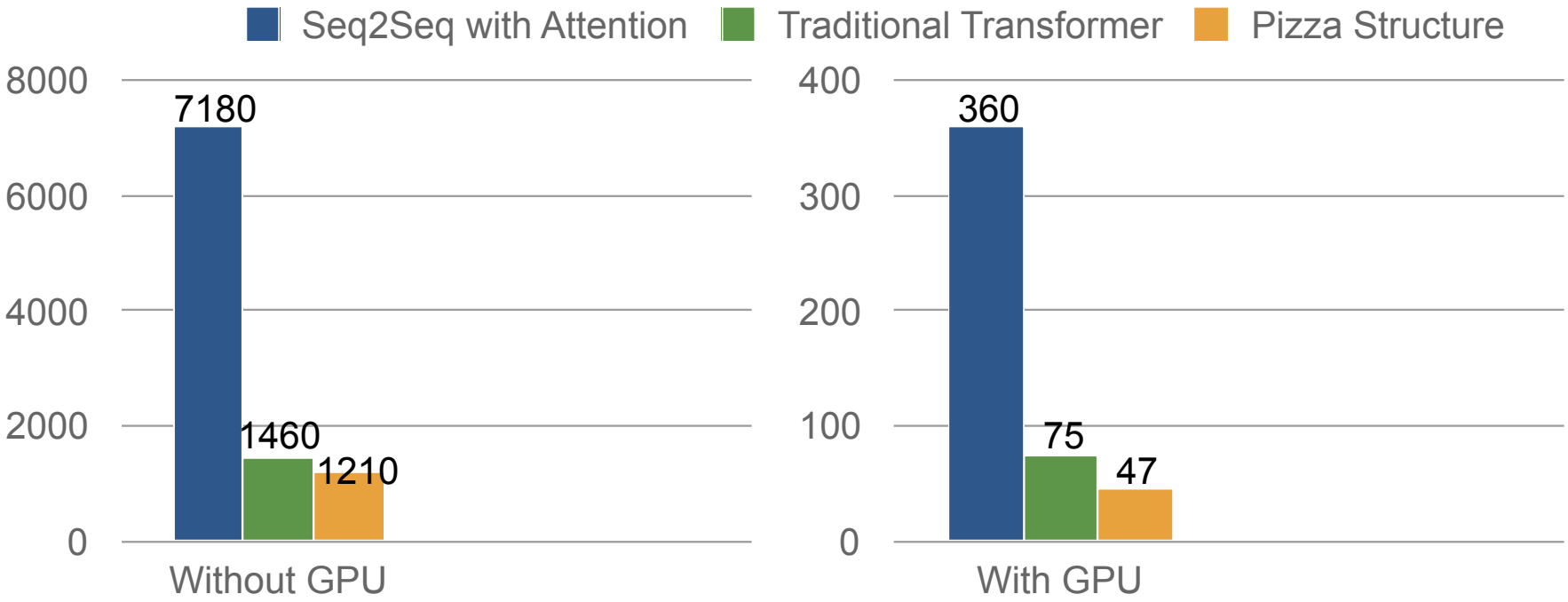


Decoder Architecture



Advantages:

- The topping layer has 3 times less parameters than the traditional stack layers.
- The training time reduces significantly.



Results :

Original Text	Seq2Seq with Attention	Transformer	Pizza Transformer
have you killed tybalt ?	hast thou slain tybalt ?	hast thou slain tybalt ?	hast thou slain tybalt ?
i will hit you !	i will , beat thee !	i will strike thee !	i will strike thee !
What is wrong with you ?	what is amiss you ?	what is your passion ?	what is thy wrong with thee ?
what fight was here ?	what fray was here ?	what fray was here ?	what fray was here ?
what do you want ?	what would you ?	what would you ?	what s your will ?
i ll bite you by the ear for that joke .	i will tell thee by the joyful office for that jest .	i ll bite you by the ear of that jest .	i ll bite thee for that kind of jest .
BLEU Score:	**0.497**	**0.508**	**0.517**

Conclusion:

- How attention plays a major role.
- Style Transfer and Translation tasks performs better using only Self Attention.
- Transformers make the task more parallelizable .
- Introduction to the Pizza structure.
- Advantages over traditional transformer:
    1. Less parameters
    2. Faster training speed
    3. Better accuracy

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Thank You !