Natural Language Processing

Chatbot

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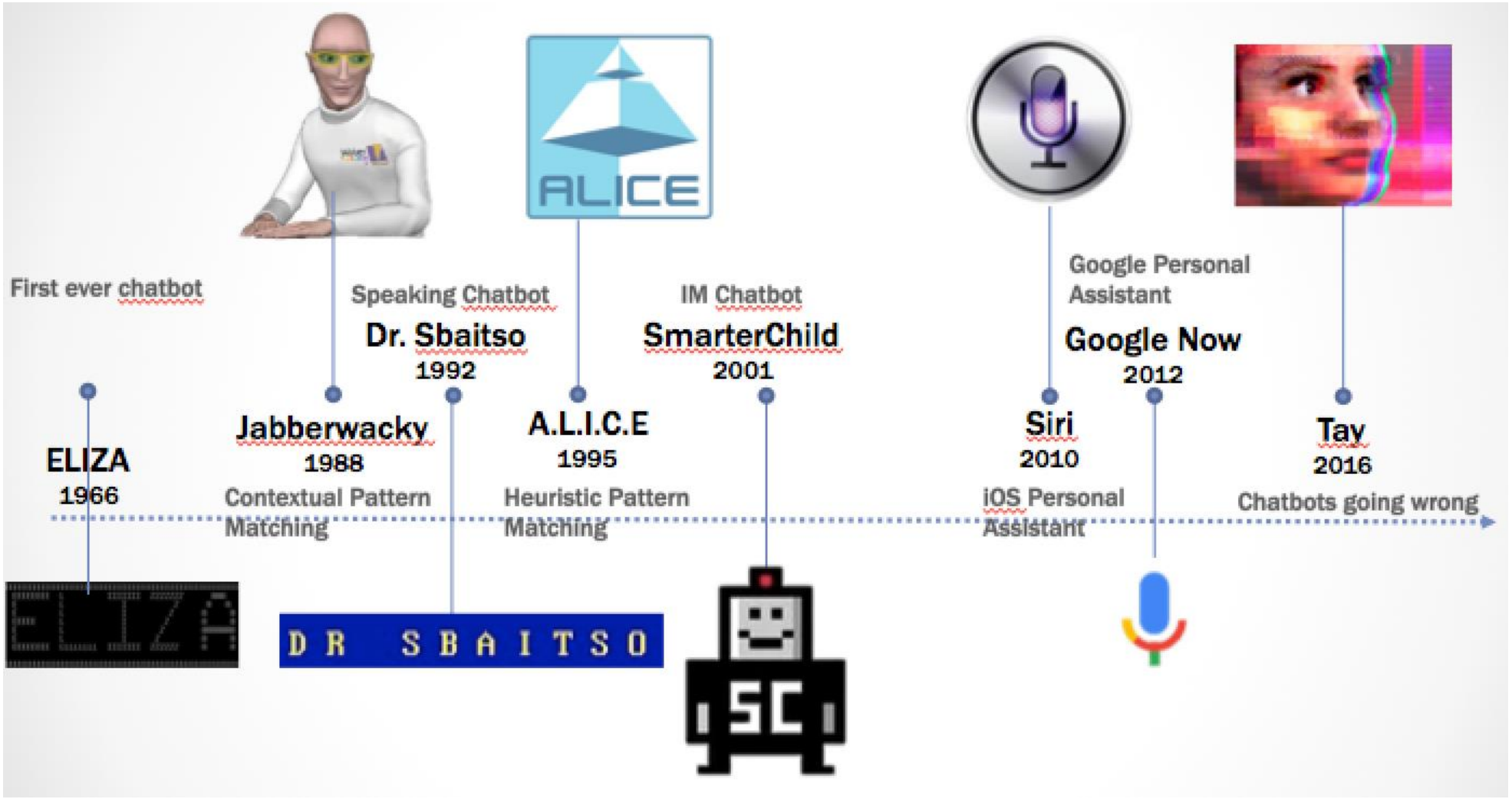
Introduction



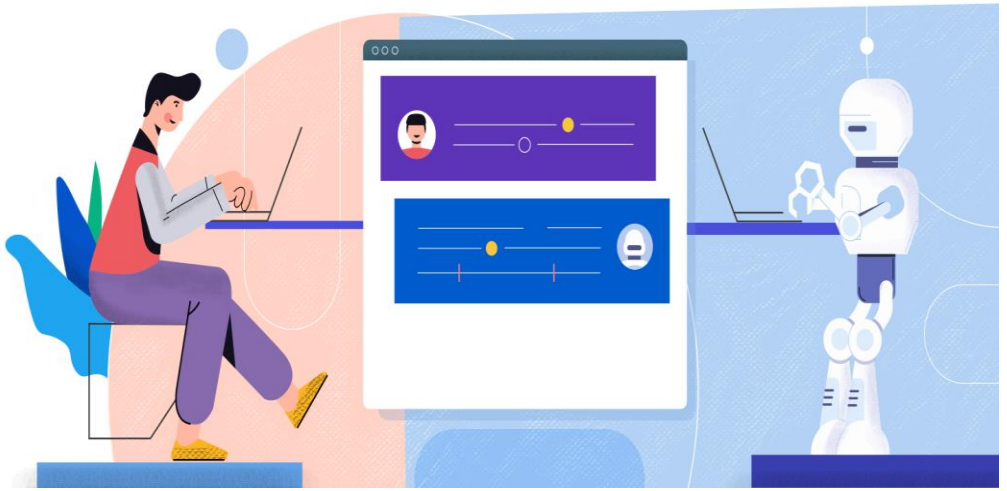
History of the chatbots [1]

[1] The History Of Chatbots – From ELIZA to ALEXA - https://onlim.com/en/the-history-of-chatbots/

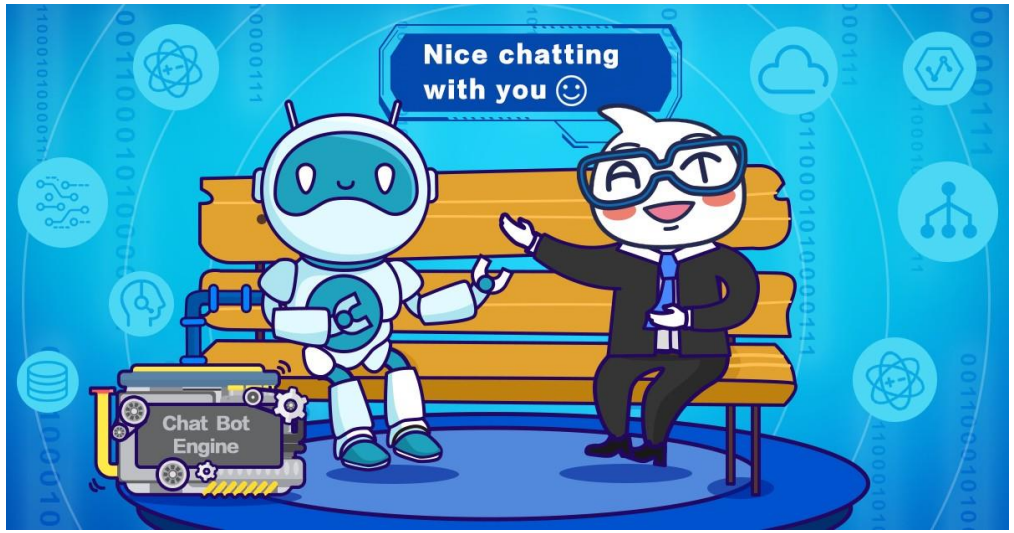
Types of Chatbot

Transactional Chatbot

- Predefined with fixed set of options



Transactional Chatbot [2]



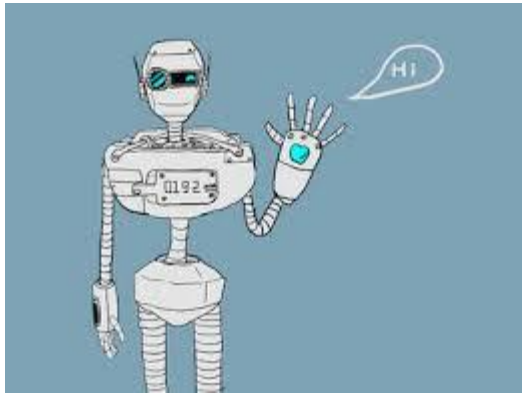
Conversation Chatbot [3]

Conversational Chatbot

- Designed to respond to the conversation in a natural human like manner

[2] Image source: https://www.ometrics.com/blog/what-is-a-chatbot/
[3] Image source: https://alibabatech.medium.com/better-e-commerce-customer-service-from-alime-to-you-656e34934f66

Dataset Description



Dialog chatbot[5]

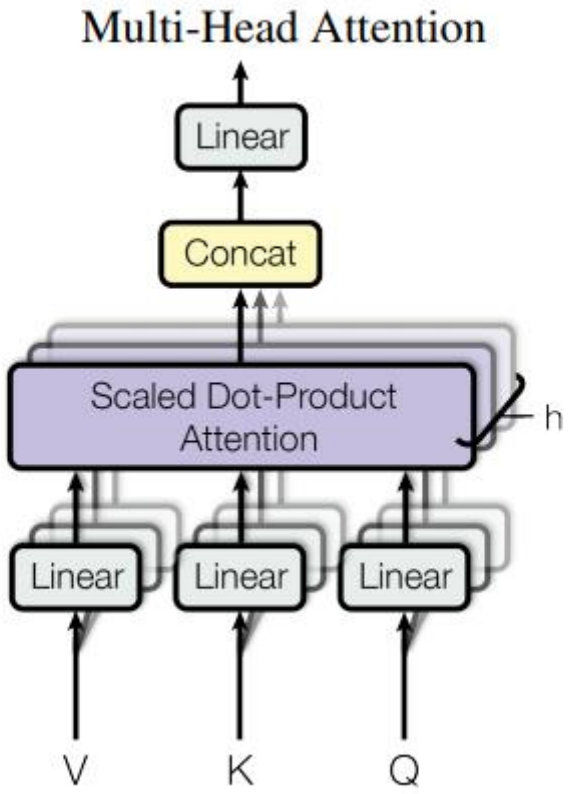
Data set used Cornell_Movie-Dialogs_Corpus [4]

- movie_lines.txt
  - contains actual text of each utterance
  - contains fields like lineID, characterID, movieID, charactername and text

- movie_conversations.txt
  - structures of the conversations
  - Contains fields like characterIDs of the first and second character who are involved in the conversation
  - movieID of the movie conversation and the list of utterances

[4] C. Danescu-Niculescu-Mizil and L. Lee. Chameleons in imagined conversations: A new approach to under-standing coordination of linguistic style in dialogs InProceedings of the Workshop on Cognitive Modelingand Computational Linguistics, ACL 2011, 2011 - https://www.cs.cornell.edu/~cristian/Cornell_Movie-Dialogs_Corpus.html
[5] Image source: https://pytorch.org/tutorials/beginner/chatbot_tutorial.html

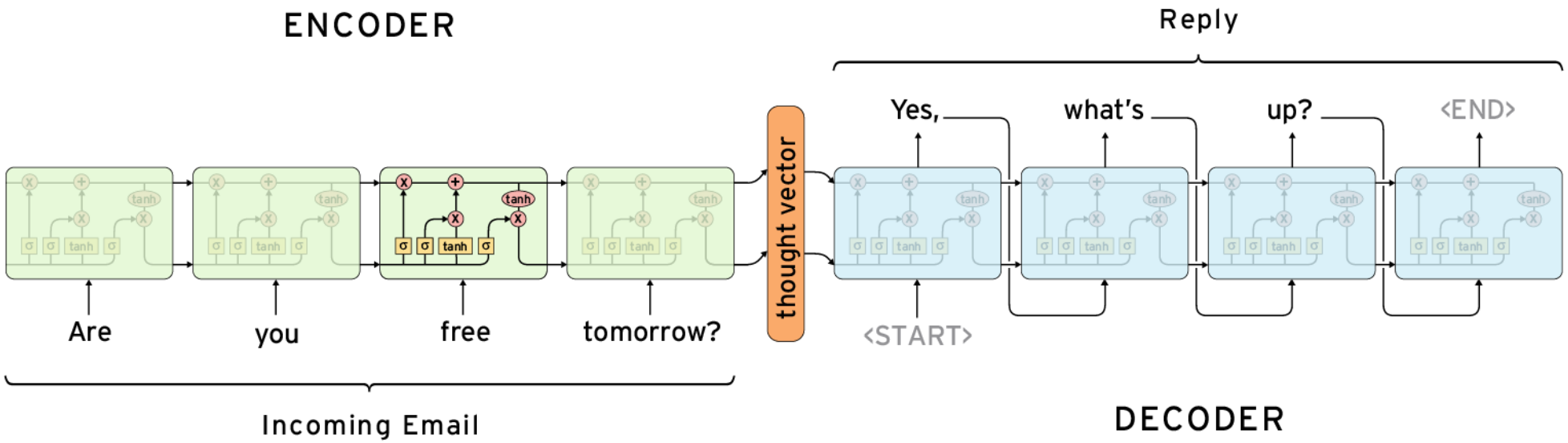
Multi-Head Attention



Multi-Head Attention[6]

[6] Image source: https://www.tensorflow.org/text/tutorials/transformer#create_the_transformer

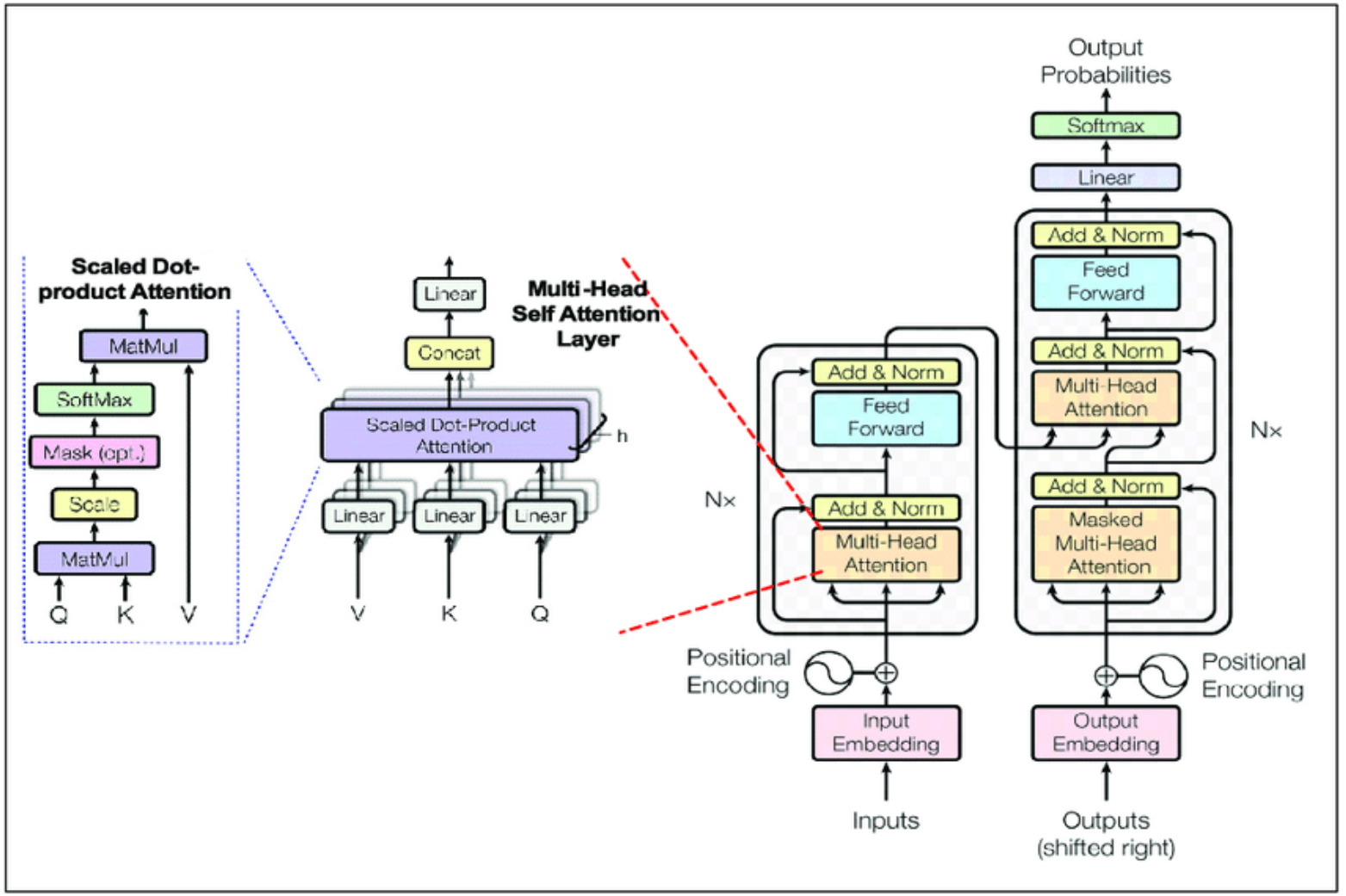
Encoder Decoder model



Encoder Decoder model [7]

[7] Image source: http://www.wildml.com/2016/04/deep-learning-for-chatbots-part-1-introduction/

Transformers



Transformer Model Architecture [8]

[8] Image source: https://www.researchgate.net/figure/Transformer-Model-Architecture-Transformer-Architecture-26-is-parallelized-for-seq2seq_fig2_342045332

Evaluation Criteria

- Avoiding Repetition: We will check whether the generated response is not repetitive
- Making Sense: Whether the generated response is grammatically correct, not a gibberish response
- Relevance: Whether the generated output response is relevant to the context

Results and Evaluation

Input 1:	Where have you been?
Output 1:	where do you think i ve been ? i took the baby for a stroll in the park .
Input 2:	I counted on you to help my cause. You and that thug are obviously failing, Aren't we ever going on our date?
Output 2:	yeah . what do you think ?
Input 3:	Have you seen Joey and Kincaid! God, i can't find them.
Output 3:	i m sure they re around .

Bot generated response	Repetition*	Making sense*	Relevance*
Output 1	4	5	4
Output 2	4	5	4
Output 3	4	3	3

* Rating on a scale of 1 to 5,
0 = repeated response/ gibberish response/ not relavant response to context
5 = no repetition/ grammatically correct response/ relevant to the context

Results and Evaluation

Input 4:	Two units in four days. How many spares do we have ?
Output 4:	two more .
Input 5:	Is that women a complete fruit-loop or is it just me?
Output 5:	it s just you .
Input 6:	What is your name?
Output 6:	my righteous name is big black

Bot generated response	Repetition*	Making sense*	Relevance*
Output 4	5	5	5
Output 5	3	3	4
Output 6	3	4	3

* Rating on a scale of 1 to 5,
0 = repeated response/ gibberish response/ not relavant response to context
5 = no repetition/ grammatically correct response/ relevant to the context

Results and Evaluation

Input 7:	he was this ancient guy i read about who was like, killed his kids 'cause they didn't want to run the kingdom the way he thought they should
Output 7:	they were little one
Input 8:	How you holding up, Wade?
Output 8:	i m fine, fine
Input 9:	Your majesty is there a balled in Figaro?
Output 9:	yes , in the third act.

Bot generated response	Repetition*	Making sense*	Relevance*
Output 7	4	4	4
Output 8	4	5	4
Output 9	5	5	5

* Rating on a scale of 1 to 5,
0 = repeated response/ gibberish response/ not relavant response to context
5 = no repetition/ grammatically correct response/ relevant to the context

Manual elevation done using : https://forms.gle/XiootsRfQqai1FKu8

Key Takeaways

- Tuning the hyperparameters for better results
- Proper text processing will reduce the training time
- Evaluation of the conversational chatbot should be done based on the purpose of the tasks that are assigned or the functionalities it must adhere to fulfil
- Transformer is the neural network mechanism which depend on the self attention mechanism
- Positional encoding will give the relative position information of the words with respect to the sentence for the transformer

References

- Attention is all you need: Discovering the Transformer paper - Detailed implementation of a Transformer model in Tensorflow - https://towardsdatascience.com/attention-is-all-you-need-discovering-the-transformer-paper-73e5ff5e0634
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