CMSC 491/691:
Interactive Fiction and
Text Generation
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Die Roll Action Generating Operational Network (DRAGON)

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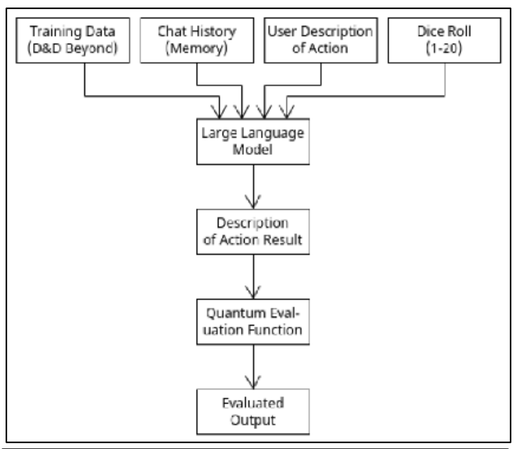
DRAGON generates action effect descriptions in response to player input. Model output is evaluated using a quantum cost function.

INTRO

- DRAGON is a large language model that generates action result descriptions given an action description and a die roll

METHODS

1. Selected a LLAMA-2 model fine-tuned on D&D text data
2. Prompted the model with an action description and a die result
3. Evaluated the model output using the following metrics:
   1. BLEU = $BP \times \exp(\sum_{n=1}^{N} \omega_n \log p_n)$
   2. ROGUE = $\sum_{n=1}^{N} r_n$
   3. λambeq score (see right)



DRAGON Model Diagram

Trial	BLEU	ROUGE	LAMBEQ
#1Target (success) Hypothesis(success)	0.937	1.0	**0.986**
#2 Target (success) Hypothesis(failure)	0.875	0.830	**0.913**
#3 Target (failure) Hypothesis(success)	0.453	0.224	**0.201**

Score results during inference.

RESULTS

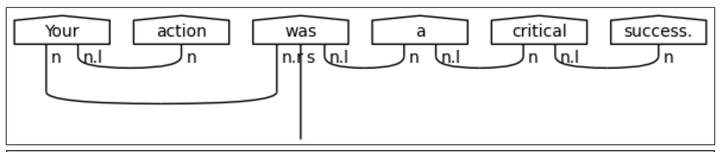
- DRAGON successfully generates actions descriptions in response to the player prompts
- It does not always return a description of the success of the action
- The λambeq similarity score is a working but overoptimistic evaluation metric

DISCUSSION

We developed a dynamic generating game framework that incorporates quantum computing for inference optimization. Using the λambeq toolkit, we implemented cost control mechanisms based on quantum-native constructs. Experimental results demonstrate that our proposed framework achieves near-optimal performance acceleration compared to commonly used classical methods.

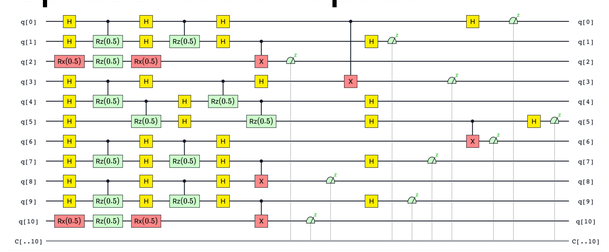
ΛAMBEQ SCORE

- λambeq is a python package for quantum natural language processing
- We use λambeq to encode a natural language circuit into a DisCoCat representation



DisCoCat String Diagram Example

- We then use λambeq to generate a quantum program from the DisCoCat diagram
- The quantum program encodes the sentence in a latent representation space



Circuit Representation of Above DisCoCat Diagram

- We encode the model output and an expected output into a representation space and compute the distance between the two points in the space
- This successfully creates an evaluation metric; however, it tends to give much greater scores then BLEU and ROGUE in most cases

https://github.com/joshl1-umbc/cmsc691_term_project