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RESEARCH STATEMENT:

I'm a recent university graduate with interest in contributing to language understanding tasks with reinforcement learning. Artificial Intelligence has been successful in solving real world problems in natural language processing tasks and knowledge representations. I'm highly motivated in working through the quality of intelligent agents in common-sense learning for sequential decision-making problems in real-world like dialogue understanding.

PREVIOUS EXPERIMENTS IN THE AREA OF CONTROLLED TEXT GENERATION:

I've previously worked on controlled text generation with seq2seq learning architecture which learns via Conditional probability [P(y | x)]. The objectives of the research were to propose suitable metrics upon which the generated text at the decoder output could be observed and evaluated, to present high-level mechanics of control methods in text generation and to analyse the effects of bottleneck vector/context vector in the model. The experiment was conducted on encoder-decoder based learning architecture with homologous GRU layers.

However, variation at the decoder output was analyzed with respect to Weighted Decoding (WD) algorithms including greedy search, beam search and top k-sampling methods. The biggest challenge was to introduce "randomness" to overcome generic and repetitive responses at the decoder output. So, each timestep of the decoder was updated with the probability of each word in vocabulary in proportion to its randomness. A suitable weighted parameter was introduced called SoftMax "temperature" (τ) as a hyperparameter, which could be manually altered by the user. Now, that the SoftMax distribution could be scaled by the parameter (τ) which makes the probability distribution, y-hat ($\hat{y}$) as uniformly distributed labels at each timestep at the decoder output. The size of the weight parameter would be encouraged to generate more generic and specific texts at decoder. Observations were made at the generated texts and corresponding evaluations were reported.

FUTURE RESEARCH DIRECTION– AIM AND OBJECTIVE:

I'd like to address on the question that is currently an on-going problem among the conversational AI in the world.

- How best to improvise intelligent agents for language understanding to communicate in natural language and follow natural language instructions for task completion?

POSSIBILE APPROACHES TO THE PROBLEM:

In future I intent to proceed my research in general direction of solving NLP-Robotics problems by learning to learn agents to communicate in natural language by interacting with dynamic environment, people and language grounding.

Common-sense learning. On a practical note, Humans are closely associated or aligned in making quick decisions in a given situation based on trail-and-error learning or from mistakes learned from history which we call as common-sense knowledge. For example, I'd like to start arguing with a simple game-based knowledge learning wherein it is a general approach to use "torch light" in a dark dungeon or it is a general knowledge to "open" a closed door which allows the agent (player) to learn faster. In factual statement, a set of games that fall within the same gameplay for example, like learning to chop a "carrot", is quite a general way to learn how to chop "jalapenos". But its quite interesting fact that, the above discussed actions are considered as an easy task for a human-player whereas the computer model struggles. My hypothesis is that, I see this as a problem of lack of common-sense which is due to lack of generalization.

Thus, in future I aim to model on a dynamic environment as described above and align it with natural language understanding for task completion.

- As a first step, I intend to work this through building a model for sequential text-based decision-making problem. My overview of the approach is that, a set of training recipes could be considered that would convert a reinforcement learning based model to natural language understanding model simultaneously enabling contextualized language models like GPT, BERT in sequential decision-making problem space.

- As a second step, I plan to evaluate the model on in-domain, out-of-domain dataset for evaluating the common-sense reasoning knowledge and effect of generalization.

- Finally, I'd like to apply the solution to sequential decision-making problems in real-world such as goal-directed dialogue.

On the theoretical side, some of the questions that I wanted to explore are: Goal discovery vs policy discovery? What if a transformer-based language model is employed in embodied language-conditioned task completion systems?

[I'm also interested in working out the problem on different approach through Imitation learning + Self-supervised learning].

REFERENCES:

Sun, Z. L. (March 2020). *Representation Learning for Natural Language.* Beijing: Springer imprint.