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PhD APPLICATION: University of Birmingham, Supervision: Dr. Mohan Sridharan

RESEARCH STATEMENT:

I'm a recent university graduate with an interest in contributing to deep understanding of conversational dialogue generation in natural language processing. Machine learning has successfully solved real world problems in natural language processing and dialogue generation. I'm always fascinated towards solving problems in real-world with cutting-edge technologies. I'm always passionate about mathematics and very much interested in solving problems on continuous optimization, vector calculus and probability distribution.

EXPERIMENTS IN THE AREA OF CONTROLLED TEXT GENERATION:

I've previously worked on controlled text generation with seq2seq learning architecture under CPSC672. The objective of the research was to propose suitable metrics upon which the generated text at the decoder output could be observed and evaluated. I succeeded in presenting low-level to high level platforms such as diversity, coherence and engagingness of the target texts upon which the generated text was observed. The experiment was conducted on encoder-decoder based learning architecture with homologous GRU units.

However, variation at the decoder output was "controlled" with respect to Weighted Decoding (WD) algorithms including greedy search, beam search and top k-sampling methods. The biggest challenge was to introduce "randomness" at the generation to overcome generic and repetitive responses at the decoder output. So, we proposed adjustment of probability in P (target | source, z) at each timestep of the SoftMax distribution at the decoder which was controlled by introducing SoftMax "temperature" (τ) as a hyperparameter. 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. Observations were made at the generated texts and corresponding evaluations were reported.

FUTURE RESEARCH DIRECTION:

I'd like to address on the question that is currently an on-going problem among the Robot-Language understand world.

- How best to enable robot agents to understand and learn natural language interactively and cumulatively with minimum human feedback?

In future I intend to collaborate natural language processing with Robotics to solve grounded language perception and action in robot agents through human-robot dialog with reinforcement learning taxonomy. I also aim to evaluate the agent on a virtual robotic environment like Amazon's mechanical Turk and would make plans to transfer learned agents to physical robotic system to test, analyze and demonstrate the behaviour of the system in real-world.

POSSIBILE APPROACHES TO THE PROBLEM:

From previous researches in the field of language understanding for robot-agents the exploration delay and reward functions has been an **"obstacle"** in learning.

1. Learning semantic parser from conversational agents could be used for better semantic understanding of tasks and mapping of tasks with goals in the new environment. Active learning algorithm could be used to query or loop around to better learn the task in the new environment.
2. Inverse reinforcement learning method-based language-conditioned reward function vs language conditioned policy.
3. Cognitive science, Neuroscience and language learning approach. Neuroscience and natural language could be studied in context of how the learning methods (like actor-critic method for example) of the brain is used to reinforce parameters for better language learning tasks in RL.