Supplemental research summary statement

I find it useful to write a brief research summary statement to provide additional context and details on some of mentioned projects undertaken, and to provide points of clarification on the corresponding additional documents I may have submitted during application.

1. Deep semantic role labeling with auxiliary tasks, evaluating the utility of linguistic features

In view of the history of NLP research, the scope of this project was to set up a framework to effectively evaluate the utility of linguistic features in DL based transformer models for SRL. In the context of this set-up, we formulated the auxiliary task based on syntactic considerations and evaluated consequences on fine-tuning. As a clarification, mentioned BIO tags are for syntactic phrases. Additionally, syntactic structure is explicitly modeled in the auxiliary task over modeling for directed distances. A prior work on semantic parsing is submitted for publication review.

For future purposes, I have studied/applied in-context learning in modern LLMs, understand the utilities/limitations of auto-regressive LLMs. Current LLMs consist of baseline pre-training with masked language modeling. Then, instruction tuning is used to align the output of an LLM with user preferences. In an RL setting, a reward model could trained be via ranking different LLM outputs for a given input based on different inference techniques. Then, based on the reward model, the LLM could be tuned with PPO. Other approaches for instruction tuning with contrastive learning exist. I current understand issues of hallucinations, knoweledge staleness, grounding in LLM paradigms, understand curent methods in RAG, semantic search, have thoughts on the future of LLMs.

2. Entity linking across databases and knowledge graphs

My given task here was, for a certain problem description, elaborate how different modeling approaches can be utilized to solve the problem, expand on a solution formulation for an approach. In the context of this given task, I had submitted a write-up whose scope was solution ideation. Further, in terms of implementation, based on data centered considerations, I decided to go with another approach which best suited the problem.

I understand that the goal of academia is the communication of useful knowledge, and the goal of industry is the creation of useful deliverables. I found it useful to attempt to develop/document approaches for an abstract formulation of the problem. I then focused on data driven, pragmatic considerations for an engineering formulation of the problem. In order to create useful knowledge, empiricism and delivery is of value, I refined approaches to go ahead with for pragmatic utility.

3. Augmented dirichlet prior networks

I had explored frameworks for uncertainty estimation and out-of-distribution detection, finding dirichlet prior networks of utility. I understand that redesigning classifier nets as dirichlet prior nets is not straightforward, I had reviewed the details and problems regarding that. I had seen literature which attempted to do the same, they had provided arguments and displayed empirical results. That work was on arxiv. I talked to my Professor for that class in detail, regarding their work, and whether or not I should attempt to proceed along those lines, and caveats regarding the same. Regarding the workflow, I was in communication with the Professor.

I found utility in the potential of being able to enhance classifier nets to provide out-of-distribution detection and uncertainty estimation functionalities, attempted to structure problem forumulations along those lines. As we attempted to replicate the displayed literature results, we were not able to replicate the same numbers. Given what we were able to replicate based on their methods, we were able to improve upon the same. We developed other formulations for dirichlet prior networks and feature learning.

4. Conclusion

The write ups discussed above can be found on the following link. Apart from the details mentioned above, I am happy to provide revised versions of these write ups, implementation reports, updates or any other clarifications as desirable. Other relevant work includes industrial projects in image tagging, experiments in sequential variational autoencoders, a finished and ready draft in heuristics and feature engineering for semantic role labeling, ongoing industrial projects in learning management systems, ongoing research projects in knowledge agnostic language modeling, sentence representations in view of entity sense configurations. I happy to provide as many details as feasible.

Given the time and constraints, I have worked on getting the projects going and bringing them to a logical point for further pursuit by others interested. I have learned valuable lessons from my academic and professional experiences, and there is a lot more I would like to do. I look forward to a new phase in my life, joining a PhD program in Fall 24.