

Module 3: Portfolio Milestone

Brady Chin

Colorado State University Global

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Dr. Dong Nguyen

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Portfolio Milestone

The purpose for this project is to develop an adaptive chatbot that effectively works in uncertain environments by adapting its responses in real time with reference to conversation context and user input. Using adaptive control principles, the chatbot will handle ambiguity, maintain context, and provide context-related, context-specific responses. Pre-trained models like GPT-2/3 will be used to deploy the system with conversational data fine-tuned and uncertainty management mechanisms added on top to enhance user interaction and real-time adaptability.

Goals

The goals of this chatbot project are to create a system that can adapt to the evolution of the conversation, still cope with uncertainty in the user inputs, and hold context throughout the conversation. The chatbot will be designed to adapt responses from ambiguous or unclear questions from users, by either asking for clarification, offering multiple potential answers, or providing a fallback answer. The chatbot will also maintain context of the conversation in order to respond sensibly as the conversation goes on. Finally, the chatbot is meant to create a seamless and natural experience and to navigate both expected and unexpected conversations.

Tools, Libraries, Models

The chatbot's development will make use of several libraries and tools. Python will be the primary programming language, libraries such as Hugging Face Transformers to leverage pre-trained models such as GPT-2/3, and PyTorch/TensorFlow for the fine-tuning, minimizing potential confusion and performance problems of learning with technique optimizations. In terms of integrating existing pretrained datasets, provide structure from Hugging Face or datasets like Persona-Chat, or Cornell Movie-D dialogs will be selected to train the model for the conversational goals. Finally, we might potentially include scikit-learn to allow for uncertainty based classification, to enable the chatbot to successfully interact with user prompts.

Adaptive Control

This chatbot initiative will apply adaptive control strategies to help manage uncertainty and modify the behavior of the system in-the-moment. The chatbot will utilize a feedback model to respond to ambiguous or unclear user responses. For example, in the case that the chatbot has uncertainty about the prompt, it may ask a clarification request or generate a list of possible responses that the chatbot could either ask or select to respond to uncertainty based on past interactions. The system will also maintain the tracking of the context of the conversation, and if the conversation changes course unexpectedly the chatbot will adjust the conversation accordingly. This adaptive control will allow the chatbot to learn constantly and to adjust to conversations and allow for a more natural user experience.

Plan

The development plan for the chatbot starts by collecting and preprocessing data from a conversational data set. Next, a pre-trained model, such as GPT-2/3 will be fine-tuned for the purpose of generating human-like responses. A context tracker will be included that will track conversation history and a question classifier will be used to detect uncertainty in user input. The chatbot will modify its response by either seeking clarification, offering alternatives, or using fallback replies. We will iteratively evaluate the performance of the chatbot based on how well the chatbot adapts to ambiguous inputs, adjusts to shifts in the conversation, and remains coherent, and will make adjustments as necessary based on identified weaknesses.

Conclusion

This project will yield a chatbot that leverages adaptive control to respond intelligently to uncertainty and evolving speech. The system will exhibit the capability for AI to manage unpredictable input from the human user along a conversation while still maintaining coherence and interest as it tracks context and utilizes dynamic response methods based on tuned models in language processing.