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Streamlining the College Experience Through Chatbot Conversations

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Overview

This chatbot aims to streamline all elements of the college experience for prospective and current undergraduate students of U.S. colleges and universities by engaging in meaningful and empathetic dialogue. Navigating college from start to finish while balancing external commitments can induce significant stress in students at all stages in their undergraduate careers. This stress can stem from a variety of factors, such as applying to undergraduate programs, declaring a major, landing an internship, and securing post-graduate plans. While speaking with academic advisors and career counselors is essential, students often neglect to utilize these resources. Thus, interacting with a chatbot would enable users to discuss their decision-making processes regarding academic, social, and professional elements in a more informal manner. Additionally, users can discuss any concerns they may have regarding the college experience, and the chatbot will strive to alleviate such concerns. The novelty of the chatbot stems from its interactive, personable, and informative nature. Specifically, the chatbot does not function primarily as a fact-based recommender system. Rather, it helps users

determine their priorities in a school, internship, or career and brainstorm potential fitting environments, among other pertinent abstract and opinion-based topics. To accomplish these tasks, the chatbot will analyze user preferences, values, talents, and goals and subsequently initiate pertinent discussions.

Introduction & Literature Review

College students have reportedly increased their use of mental health counseling resources in recent years. This increased usage can be attributed to “multicultural and gender issues, career and developmental needs, life transitions, stress, violence, and psychological problems,” among other stressors (Kritzow 2003). While these instances can affect any student at any time, certain instances, such as career planning and life transitions, are more likely to impact certain demographics than others at certain points throughout college. Thus, we intend to segment our audience into three distinct groups: prospective students, first and second years, and third and fourth years.

Prospective students are tasked with the daunting process of deciding what colleges to apply to and subsequently enroll in. Some students have attended school with the same friend group in the same environment for many years and are sometimes not equipped to make an informed decision about their next stage in life. This chatbot will provide a personalized recommendation system that will discuss college as an option, and, if the user is planning to attend college, discuss attributes that may enrich the user’s experience. The conversation will conclude with a small list of schools that satisfies user criteria and preferences as a stepping stone for their college search process.

First year students must often persevere through a range of contradicting emotions, such as fear, sadness, anxiety, and excitement, many of which stem from homesickness, friendsickness, and uncertainty in general. Different demographics of students cope with these feelings differently (Paul and Brier 2010, Leong et al. 1997). This chatbot strives to alleviate any concerns specifically by informing students about what to expect throughout the transition process and talking through their physical and emotional experiences throughout this major change. As Clark (2005) explains in her paper, success as a freshman can be influenced by newfound friendships and positive interactions with professors, academic performance, and relationships outside of college. Thus, the chatbot may initiate conversations around internal

and external relationship development and maintenance, involvement in campus organizations, religious life, academics, dorm life, or other important facets for the student.

As students become more acclimated to their respective colleges, it is crucial for them to partake in valuable academic and professional experiences. Regardless of each student's career trajectory, enriching one's resume is essential. Conversations with third and fourth year students will largely revolve around professionalism pertaining to internships and post-graduate plans.

End Goals

1. **Inform users of valuable academic, social, and professional opportunities:** As previously mentioned, this chatbot does not function primarily as a recommender system. However, the chatbot does seek to make users aware of various opportunities that may satisfy their interests. For example, the chatbot may suggest to a prospective student a potentially fitting institution based on input criteria. The chatbot may also propose to users broader opportunities, such as research assistantships or intramural sports. Nonetheless, the chatbot will offer these suggestions in an interactive and engaging manner.
2. **Boost confidence:** Users who are unsure about pursuing a potential course of study or full-time role, for example, can relay their uneasiness to the chatbot, which will in turn help them logically evaluate their options while forming a personal connection. Because each conversation is customized, users will leave their conversations feeling empowered that they are taking a positive step toward success in their next endeavor.
3. **Guide users through difficult decision-making:** Throughout college, students are faced with difficult decisions. One such decision, particularly pertaining to upperclassmen, is whether to enter the workforce or pursue graduate studies upon graduation. The chatbot will help students evaluate their concerns by taking into account career aspirations and current skills, for example, thus paving the way for more informed decisions.

Scientific Approach

Although our brain is hardwired to understand speech in real time, this process becomes much more complex in computers. Nevertheless, there are numerous methods we can employ to assist the system with eliciting natural, emotion-filled responses based on user input.

Specifically, emora-stdm, a dialogue management framework that makes use of regular expressions and state machines, is used to stimulate a smooth conversation flow. With this framework and some creative coding, we simulate a natural conversation while providing the user with useful feedback.

For the recommendation portion of the bot, we pose a series of questions to users to best inform them about universities that will fit their needs and make seamless transitions so the conversation does not mimic a questionnaire. Through the use of NatexNLU/NLG, packages built into emora_stdm, we are able to create groups of predictable words to look for within the conversation. Overlap between user input and these Natex lists satisfy the transition to the next stage of the conversation. Should the user enter an unrecognizable response, error successors retain the fluidity of the conversation.

To reduce some of the burden of creating large lists of predicted user inputs via hard coding, we plan to incorporate WordNet, a large lexical database that gives information on words, such as part of speech and synonyms, among other characteristics. By properly leveraging this tool, we can facilitate a greater level of interaction between the user and system. In our case, we use this technique to interpret answers to broader questions. If the user is asked about the type of activity they are most interested in, there are simply too many possibilities to manually create a list that would yield a successful match. Instead, using Macros that utilize Wordnet synsets to identify synonyms for more generalizable input matching in addition to features such as POS tags from the spaCy package, we can search for specific grammatical categories to interpret the response.

Research suggests that ontology-based chatbots are effective at correctly interpreting user input and providing appropriate responses (Vegesna et al. 2018). Thus, we incorporate ontologies to ensure that the system can understand and respond to a breadth of user responses. For example, an ontology containing a list of positive emotions will ensure that the system provides the same response to users who exclaim that they are “fortunate” as it does to

users who exclaim that they are “excited.” Nonetheless, we include sufficient error transitions to account for unrecognizable user responses.

We incorporate dictionaries and frozen sets into ontologies to more effectively manipulate user preferences within the recommender system. Furthermore, this design allows smooth information retrieval into Macros, which we also include to enable the system to utilize user input from previous states as the conversation proceeds. Thus far, the hallmark Macro of this version of the chatbot is the CollegeRecommendationMacro which retrieves previously stored variables and categorizes them into meaningful attributes, such as size, location, and setting. Matched variables will be set to specific characteristics, such as large size, in-state location, and suburban setting. These attributes are paired with the master dataset of colleges and their characteristics. Each attribute corresponds to a set of matching colleges, and the final list of recommended colleges is a result of the intersection of the union of those sets.

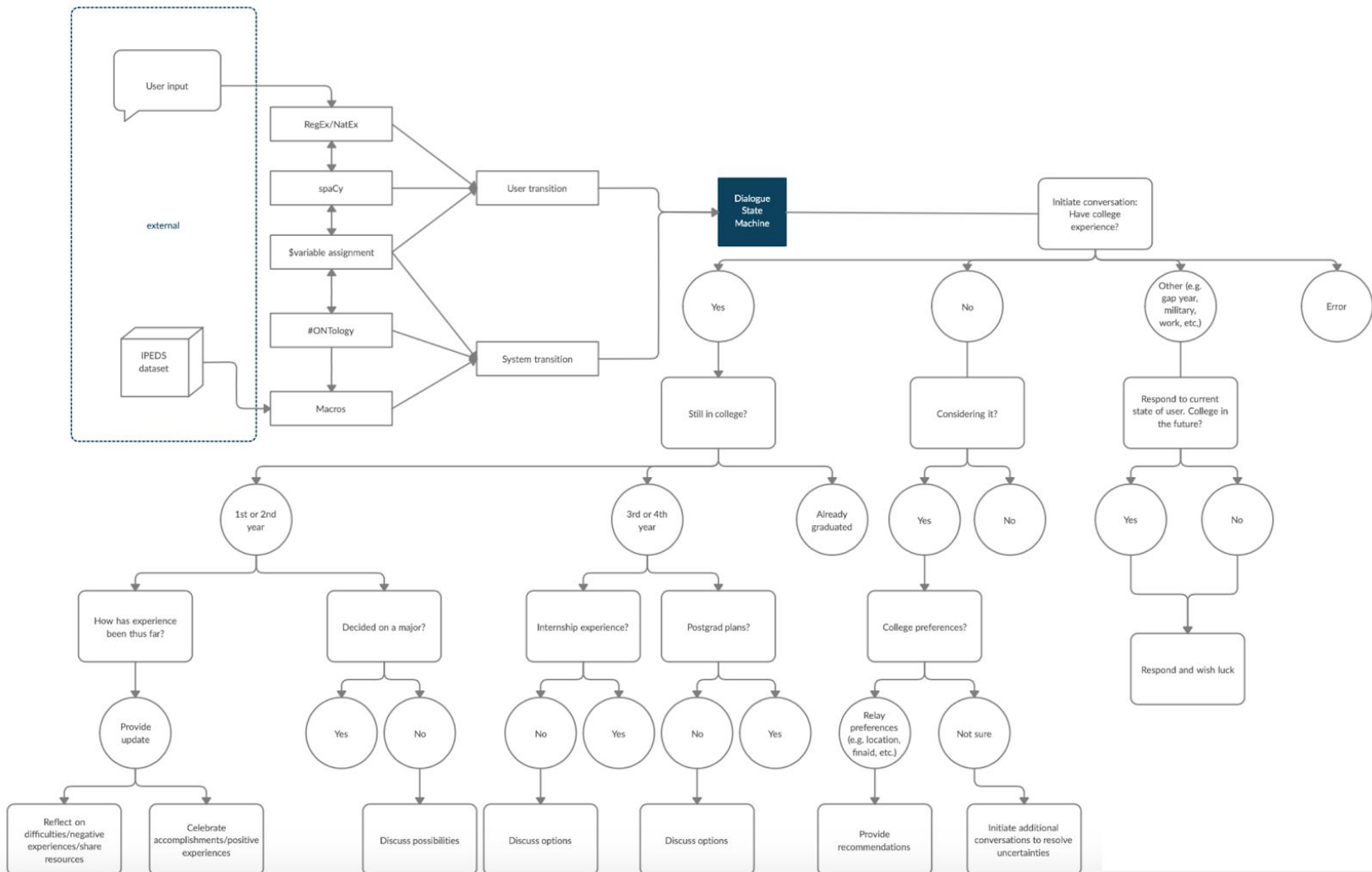
Additional Macros are implemented to control system transitions. For example, the aforementioned emotion ontology is paired with an EmotionMacro, so that the chatbot responds enthusiastically to positive emotions and reassuringly to negative emotions within a single dialogue state system transition. This allows the system to streamline the conversation so that even when the conversation diverges, it will reconvene to the next important question.

Research suggests that Named Entity Recognition (NER) can facilitate high quality and precise system recognition and recall without compromising efficiency (Jilek 2018). Thus, we aim to implement NER tagging from the spaCy package to capture information in direct response to a question for playback to the user. Finally, as previously mentioned, most of our design is rooted in hard coding expected inputs. For instance, we have hard-coded several responses to users who may not have had college experience at all in addition to directing the conversation to a subtopic of financial options for prospective students who indicate an interest in such. Incorporation of natural, humanistic expressions in speech such as “yeah” and “so” enhance the user experience to create more personal, empathetic, and human-like interactions. Periodic references to a user’s answers and opinion-based suggestions attempt to make the user feel heard and their emotions validated.

As previously touched upon, to more effectively advise students about specific universities that match their preferred characteristics, we make use of public datasets that give valuable information, such as location, population size, and reputation. By distilling through the list of

colleges we can more successfully recommend a university tailored to the individuals' needs. The initial dataset used was the "Integrated Postsecondary Education Data System" by the National Center for Education Statistics. This dataset offered crucial information, defining some of the more concrete attributes about the university but lacked important features (e.g. tuition). Thus we joined the aforementioned dataset with another dataset entitled "University Rankings 2017" (Sidberry and Greenleigh, 2016), which provides text snippets from U.S. News that describes some of the more subjective attributes of the university.

System Architecture



Below is a sample conversation with a first year college student that the chatbot is expected to achieve:

System: Hi, how are you? I am a recent college graduate and miss school very much. Have you been to college?

User: Yes, I'm currently a freshman.

System: Freshman year is an exciting time, although it is also a period of growth and challenges. How has your experience been so far?

User: Honestly, I am not very happy. I miss my family and high school friends.

System: I'm sorry to hear. Have you gotten involved in campus life? Joining student organizations is a great way to make friends.

User: Not really.

System: Well, I'm sure your school has a lot of options. What do you like to do for fun?

User: I love to paint.

System: It's great that you like art! Have you looked into any art organizations? My school had a lot of art clubs.

User: No.

System: The university website would be a great first place to look for art opportunities on campus. College is also a great time to try something new. How are your classes going?

User: Pretty well. I have good grades so far.

System: That's very impressive. Many people have a hard time academically transitioning to college. I wish you luck in the rest of the semester.

User: Thank you, I appreciate the well wishes!

Novelty & Impact

This chatbot strives to assist users at all stages of their undergraduate careers. This chatbot can also inform parents, guidance counselors, teachers, and mentors about opportunities for their students. Perhaps the strongest novelty of this bot is its ability to provide meaningful insight about a wide range of educational content in a conversational manner. This bot is not intended to function as an efficient search engine. Rather, it is designed to provide users with a customized and personalized system that will help them reason through their options or emotions at whatever stage they are in. Although the chatbot does offer advice or suggestions especially in the college recommendation segment, the bot will more so facilitate conversation topics that ultimately empower users to shape their experiences and futures.

This bot will influence conversational AI with its novel methodology and specialized content. Current chatbots are largely information-based, which, although useful in time-constraining circumstances, are emotionally disconnected from users. The chatbot infuses personal preferences in its responses to avoid the robotic tone that many bots on the market currently elicit. Most importantly, the bot seeks to positively impact the lives of current and prospective college students. The bot's resourcefulness, usefulness, and understanding maximize user engagement. Success may be quantified via high retention rates. For example, the bot would be considered a success if a user who chatted with the bot as a prospective student returned as a first year student.

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