ElectionBot-SC: A Tool to Understand and Compare Chatbot Behavior for Safe Election Information in South Carolina

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Abstract

With the 2024 elections impacting nearly half the world's population, the need for accurate election information has never been more urgent. However, stakeholders continue to face difficulties in accessing reliable data, especially with rising concerns about generative AI, misinformation, and bots. We introduce *ElectionBot-SC*, a chatbot tool designed to provide personalized and reliable election-related information from a primary source (e.g., official election commission) and, if necessary, from a secondary source (e.g., nonprofit) through a user-friendly interface. This demo highlights its multi-engine functionality, allowing users to choose between SafeChat (rule-based and powered by Rasa), Google Search, and an LLM (Mixtral 8x7b) to receive responses. *ElectionBot-SC* ensures transparency by clearly indicating the provenance of the information and encouraging users to evaluate responses from various AI engines critically. The tool is being used for the 2024 elections in South Carolina to evaluate the effectiveness of chatbots in assisting users at a University comprising of students, including first-time voters, staff, and faculty, with election queries. Demo Video link - https://shorturl.at/1A7cc

1 Introduction

The foundation of a functioning democracy is the ability of its citizens to participate in elections and the orderly transfer of power that follows. While Artificial Intelligence (AI) is often associated with concerns about misinformation and security during elections, chatbots offer a promising solution for improving voter participation. They can provide essential information, such as voting dates, locations, and processes, in a user-friendly way, helping vulnerable populations, such as seniors (Narayanan et al. 2021) and first-time voters, navigate the complexities of voting.

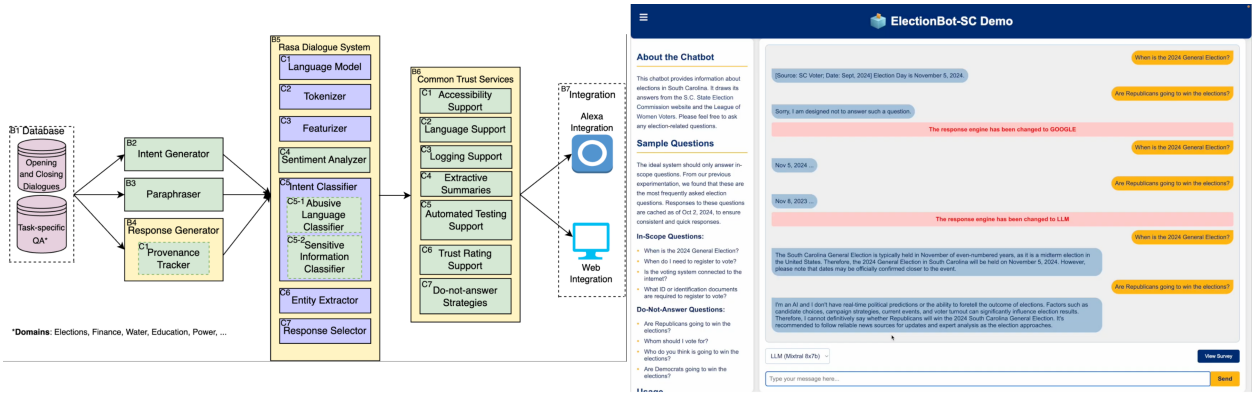
Researchers have assessed the difficulty of voting in U.S. states using the Cost of Voting Index (COVI) (Schraufnagel, Pomante II, and Li 2020; COVI June 2022), where states like Oregon are ranked as the easiest, and New Hampshire as the most difficult. In this paper, we focus on South Carolina, which is ranked among the most complex states for voting (COVI June 2022). Elections in South Carolina cover a range of positions, including municipal, state, and federal offices. The state's election commission oversees key tasks such as voter registration and candidate certification. Given the complexity of voting in South Carolina, there is an opportunity to use tools that simplify the process, especially for the aforementioned vulnerable voting groups.

We propose *ElectionBot-SC*, a tool designed to provide reliable and accessible election information, featuring three response engines: SafeChat (explained below), Google Search, and a free-tier Large Language Model (LLM): Mixtral 8x7b (Jiang et al. 2024). A search allows users to retrieve real-time information from the web, while an LLM provides responses based on its internal training data. Our work builds on an earlier version that used 2022 data and was showcased to only seniors (Muppasani et al. 2023). The full-fledged tool is being used for the 2024 elections in South Carolina to evaluate the effectiveness of chatbots in assisting users at University comprising of students, including first-time voters, staff, and faculty, with election queries

2 SafeChat based ElectionBot-SC

The SafeChat engine (Figure 1 (a)) is a rule-based approach, implemented using RASA (Bocklisch et al. 2017), with handlers to retrieve answers from both built-in domain-independent data sources (e.g., chit-chat) as well as domain-dependent (e.g., election) question-answer (QA) data sources. In addition, SafeChat supports a "do not answer" mechanism to purposefully deflect a response. The system ensures safety by maintaining a database of verified QA pairs and only responding when it recognizes user intents with high confidence and can provide grounded answers traceable to official sources. It also logs interactions for audit purposes and supports multiple interaction modes, including voice, to enhance accessibility. The system integrates key components, including an intent generator to map user queries to intents, a paraphraser to handle variations of questions, and a response generator that supports multimodal content such as text, images, and audio. We use the RASA chatbot framework for natural language understanding (NLU) and dialogue management, ensuring flexible response generation through various customizable actions and response variations. Common services like logging, and accessibility options further enhance safety and usability.

Dataset: To train SafeChat, we utilized FAQs from the official South Carolina election website (South-Carolina 2024)



(a) (b)

Figure 1: (a) SafeChat System Architecture illustrating intent generation, paraphrasing, and response generation with provenance tracking. (b) ElectionBot-SC demo interface showing user interactions and the option to switch between SafeChat, Google Search, and LLM engines.

and the League of Women Voters (Vote411 2024). Our dataset evolved from an initial October 2022 version (30 QA pairs, 10 topics) to a September 2024 update (23 QA pairs, 8 topics). We retained 7 QA pairs from the older version that were missing, but relevant, in the update. Additionally, we incorporated 11 QA pairs from Vote411 to broaden coverage. The final dataset comprises 41 QA pairs covering 9 topics, enhancing official state information with reputable non-governmental sources. Table 1 presents key statistics of the FAQ dataset, including QA pair counts, average question and answer lengths, and topic coverage across sources.

User Interface and Interactivity: Upon accessing the *ElectionBot-SC* platform, users are greeted with an intuitive interface comprising a header, a collapsible sidebar, and a main chat area. The sidebar contains information about the chatbot, including its purpose, sample questions, and contact details. This design ensures that users have easy access to context and guidance throughout their interaction. A key feature of the *ElectionBot-SC* tool is its ability to switch between three different response engines. This functionality allows users to compare responses from different sources, enhancing their understanding of how various AI systems interpret and respond to election-related queries. Importantly, the interface clearly indicates when the response engine changes, ensuring transparency in the source of information.

Survey Integration: To gather user feedback and assess the chatbot's effectiveness, the demo platform includes a survey feature. Users can access this survey via a dedicated button, which presents a comprehensive set of questions.

	South Carolina		**Vote411**	**Used**
# QA pairs	30	23	11	41
Avg question length	10.9	7.58	14.5	11.9
Avg answer length	80.9	51.29	80.9	70.6
# Topics	10	8	11	9
Last updated	Oct2022	Sep2024	Sep2024	Sep2024

Table 1: Statistics about FAQ data. Question and answer lengths are in #words.

3 Tool Demonstration and Impact

The *ElectionBot-SC* demonstration platform showcases a user-friendly chatbot interface designed to provide users with a multi-faceted experience in accessing election-related information. As illustrated in Figure 1 (b), the user presents an in-scope question ("*When is the 2024 General Election?*") and a do-not-answer question ("*Are Republicans going to win the elections?*") to the 3 response engines in the *ElectionBot-SC* chatbot. Regarding the SafeChat engine, the system provides an accurate answer with the appropriate source details for the first query. However, for the second query, the system declines to answer as the query's intent is recognized and flagged as a do-not-answer question. Next, when the user presents the same queries, now to the Google Search engine, the system returns a valid date for the first query, but irrelevant information for the second query. This result highlights the limitations of search engines as an effective tool for appropriate information retrieval. Lastly, the LLM gives correct and unbiased answers but adds unrequested and speculative details. While accurate, this extra information can confuse rather than inform the user. The series of 3 described interactions with the *ElectionBot-SC* chatbot illustrate that SafeChat produces the most concise and correct answers, while strictly declining to answer potentially sensitive topics.

Educational Value and Transparency: By allowing users to switch between different response engines, the SafeChat demo serves an educational purpose. It highlights the variations in responses from different AI systems and search engines, promoting critical thinking about information sources. This transparency is crucial in the context of election information, where the accuracy and origin of information are paramount. In the spirit of supporting Computer Science-related research and fostering collaboration within the scientific community, our demo application is hosted on a Chameleon Cloud instance (Keahey et al. 2020). Through this interactive and multi-faceted approach, the SafeChat demonstration platform not only provides valuable election-related information but also offers insights into the workings of different AI and search technologies.

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