ABSTRACT

This research aims to address prodigality of device specification on computer devices. The idea of customer-centric nature has been more for company profits rather than meeting end user specifications. Ecommerce exhibits alluring devices to clients who end up purchasing devices that do not match their needs. Institutions also spend money for resources that are not relevant. Most users are concerned about devices meeting their needs without understanding their complex functionality. Online stores create platforms such as chat rooms where a client can inquire on products. However, this knowledge base is biased as it informs of company- centric products. In most cases online agents present an alluring device to the client who then purchases the device that does not meet their specifications. As a result, end users (both individuals and institutions) spend money on unnecessary resources. A hyper-personalization model is the proposed solution for this challenge. This is about giving priority to the end user rather than the product itself. Hyper personalization is a way of communicating and targeting individual customers with tailor-made specifications. Hyper-personalization utilises user profile data, artificial intelligence and advanced algorithms from different sources like social media to expertly tailor marketing content, products or service offerings that suit end users. An end user will have the opportunity to specify the functions they need from a computer device as the application gives optimum recommendations without prejudice of products from ecommerce world.

## Designing a Hyper-Personalization Chatbot for Device Specifications

**Objectives and Scope: (First model for laptops only)**

The goal is to develop a chatbot that provides personalized device specifications based on user preferences and historical data. The scope includes determining which devices, such as smartphones and laptops, the chatbot will cover, as well as the specific features it will consider, including processor type, RAM, and screen size.

**Data Collection:**

User data will be collected to understand preferences, previous interactions, and purchase history. Additionally, a comprehensive dataset of device specifications will be compiled from manufacturers, retailers, and tech review websites. Historical chat logs will also be collected to analyse common user queries and interaction patterns.

**Data Pre-processing:**

The next steps involve cleaning the data to remove irrelevant information, standardize device specification formats, and clean chat logs. This includes normalizing text data by converting it to lowercase, removing special characters, and correcting misspellings. Additionally, tokenization will be applied to split the text data into tokens (words or sub words) for easier processing. Stop words, which are common words that do not contribute significantly to the meaning, will also be removed.

**User Profiling:**

The process includes segmenting users based on demographic information, preferences, and behaviour patterns. Feature extraction will be conducted to identify key aspects such as frequently searched specifications, preferred brands, and budget ranges.

**NLP Model Development:**

Intent recognition will involve training models to identify user intents, such as requesting recommendations, comparisons, or specific device information. This will be achieved using algorithms like Support Vector Machines (SVM), Random Forest, or deep learning models such as Convolutional Neural Networks (CNNs) and Long Short-Term Memory networks (LSTMs).

Entity recognition will focus on training models to identify entities like device names, specifications, and brands, employing techniques like Conditional Random Fields (CRF), SpaCy, or BERT-based models.

For context understanding, models will be implemented to maintain context across multiple turns in a conversation, using transformer-based models like GPT or BERT

**Personalized Recommendation Engine:**

The chatbot will utilize collaborative filtering to recommend devices based on similar user preferences. Additionally, content-based filtering will be employed to suggest devices based on the user's past interactions and specified preferences. A hybrid approach, combining both collaborative and content-based filtering, will be implemented to enhance the accuracy and relevance of the recommendations.

**Chatbot Framework Integration:**

The project will involve selecting a chatbot framework, such as Rasa or Microsoft Bot Framework, which supports Natural Language Processing (NLP) integration. A dialogue management system will be developed to handle user interactions and maintain conversational context. Additionally, response generation models will be implemented to provide natural and informative replies to user queries.

**Training and Fine-Tuning:**

The process will include splitting the data into training, validation, and testing sets. Models will be trained using the training set and validated with the validation set. Hyperparameter tuning will be performed to optimize model performance. Additionally, transfer learning will be applied by fine-tuning pre-trained models, such as BERT or GPT, to better suit the specific domain of device specifications.

**Testing and Evaluation:**

Functional testing will be conducted to ensure the chatbot handles various user queries effectively and maintains context accurately. Performance metrics will be evaluated using measures such as accuracy, precision, recall, F1-score, and user satisfaction. Additionally, A/B testing will be implemented to compare different versions of the chatbot and determine the best-performing one.

**Deployment and Monitoring:**

The deployment phase will involve launching the chatbot on relevant platforms, such as websites or mobile apps. Continuous monitoring will be essential to track the chatbot’s performance and user interactions, identifying areas for improvement. A feedback loop will be established to collect user feedback and periodically retrain the models to enhance the chatbot's effectiveness and accuracy.

**Privacy and Security:**

Ensuring compliance with data privacy regulations, such as GDPR and Data Protection Act (2019), will be crucial to protect user data. Additionally, security measures will be implemented to safeguard the chatbot and user data from potential threats.

**Documentation and Reporting**

Detailed documentation of the methodology, data, models, and system architecture will be maintained. Findings and performance metrics will be presented through reports and dashboards to support continuous improvement. This methodology aims to create a hyper-personalized chatbot that effectively delivers device specifications tailored to individual user preferences and needs.