Social Media Cloud Contact Center Using Chatbots

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Abstract. The latest technologies advancement in NLP (Natural Language Processing) solution allows developing innovative tools that enrich customer experience with products and services. Contact Center environments gradually adopted real-time analytics solutions, and latest research is focusing on how to integrate social media channels. Based on the work made in SoMeDi and Speech2Processes projects, we propose an innovative chatbot platform that integrates data mining and sentiment analysis technologies. The aim is to offer insight into customer preferences by using DII (Digital Interaction Intelligence) and assist in mitigating several know issues in Contact Center environments.

Keywords: Chatbot · Artificial intelligence · DII · NLP · Machine learning

1 Introduction

The use of AI (Artificial Intelligence) is expected to bring major technological achievements, as computers become more human they will provide a more natural connection between people, linking their online content, and their devices, natural language will become the user interface [1]. Chatbots are created to respond quickly to user questions and obtain valuable information from large amounts of data. Recently, these intelligent personal bots grow towards ubiquity, being embedded in smartphone devices, wearables, and other IoT endpoints.

Our goal is to present an innovative chatbot platform which integrates both DII and Natural Language Processing tools, these DII technologies [2] are thoroughly presented within the SoMeDi [3] project, a research work that focused on the implementation of complex algorithms to crawl the DII data and grasp information about user needs, future trends, product development etc.

We will describe in the next section several intelligent chatbot assistants and the latest technologies used in the development process. In Sect. 3 we present our chatbot platform concept, and how the NLP and DII tools are integrated, while in Sect. 4 we correlate the innovative concepts of the chatbot platform to social media channels within contact centers. In Sect. 5 we draw the conclusions.

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2 Related Work

In this section we present several data mining techniques and AI-powered chatbots, analyzing open source chatbot builder technologies.

2.1 Chatbots and Data Mining Rechniques

The recent research work for implementing better, more efficient solutions in developing data mining applications, revealed several approaches. In [4] the authors present a study for discovering frequent itemsets using HIGEN Miner (History Generalized Pattern), a technique implemented by means of the apriori-based algorithm. Also, in [5] the authors propose a topic augmented neural network to boost message-response matching.

A topic-aware convolutional neural tensor network (TACNTN) is analyzed in [6], where the topic words are obtained from a pre-trained LDA model and their weights are determined by themselves.

Chappie [7], a semi-automatic intelligent chatbot, fulfills the three important criteria of an intelligent chatbot: to understand rather than memorize, handle repetitive queries, and AIML (Artificial Intelligence Mark-up Language) based response mechanism.

Considering the expansion of messaging apps, we also documented several standalone chatbot mobile apps. First launched in 2014, Luka app [8] was thought as a mobile AI-powered social concierge service. Lark [9], a pocket coach and nutritionist, relies on the mobile device built-in sensors to track the users' activities and habits. The user can text or dictate to the chatbot what he ate or drank recently and then receive comprehensive feedback on eating, drinking, exercising, and even sleeping habits.

Penny [10], known as the most polite bank manager ever, is a free personal finance app that offers great insight into your spendings. The app can offer information about past expenses, spendings on food and medicine, income vs spending chart over the last period, by linking to the user bank accounts.

2.2 Open Source Builder Technologies

Open Source Bot Builder SDK [11] allows creating simple and sophisticated dialogues. Cognitive services enable the bot to see, hear, interpret and interact in more humane ways. Microsoft Bot Connector is a communication service that links the Bot with various communication channels such as Skype, SMS, email, and more.

We tested some of these SDK (Software Development Kit) solutions to quickly develop an intelligent application that can perceive human language and respond to user requests. The Azure [11] service accelerates the development of a Bot providing an integrated environment. The process is relatively simple, after creating a user account on Azure platform, the developer selects the programming language (C# or Node.js), and a template to build the Bot. One of the known issues related to human-computer interactions is the ability of the computer to understand what the user wants, this problem can be mitigated by training the chatbot through repetitive tests.

Testing the chatbot and adding intents, entities and utterances, are finalized over the LUIS [12] platform. By using the LUIS web interface supports creating an application

with a set of intentions and entities relevant to a certain application domain. Once the application is implemented, LUIS utilizes active learning to improve. In this learning process, LUIS identifies statements about which it is relatively uncertain and asks the developer to label them according to intentions and entities.

The language is chosen when the application is created and cannot be modified later. After choosing utterances, intents, and entities, the application is tested and trained. Before publishing the chatbot on a channel, it passes through a final test on the Microsoft Azure portal. In the following section, we describe the chatbot platform architecture.

3 Proposed Chatbot Platform Architecture

A lot of the data in social media is text, granting vast possibilities for opinion mining and otherwise detecting trends and developments. Opinion mining involves analyzing people's opinions, sentiments, and attitudes expressed in written language.

So, the implementation of DII tools can advance new solutions, best suited for deployment in marketing strategies or customer care environments. Based on the research work from Somedi project, we plan to integrate:

- Development of a set of advanced mining tools for representing, analyzing and extracting meaningful patterns or topics from social media and digital interaction data;
- Development of a set of improved machine learning algorithms enabling detection, prediction, and support for automatic decision making throughout the processes;
- Improved interactive tools to visualize and manage the data.

Also, we aim to integrate enhanced natural language processing (NLP) tools from Speech2Process [13] project, and domain knowledge that changes according to the content of the dialog between the chatbot and the customer.

We propose a conceptual model (Fig. 1) of an Intelligent Chatbot Framework that supports the generation of intelligent assistant chatbot. The Platform will support the realisation of the following main functions of the chatbot: (i) sensing (ASR - Automatic Speech Recognition), (ii) thinking, that is Understanding Spoken Language (SLU) and deciding the next move of the system, (iii) acting, that is, on the one part synthesizing the specifying questions and the messages to the client, on the other part executing the wanted service.

The main components of the Platform are the following: (i) the engines, which implement the functions of the chatbot, (ii) design methodology for the technological components, based on ML (Machine Learning) technologies for UX design solutions, and, (iii) a tool-kit which supports the design and development process.

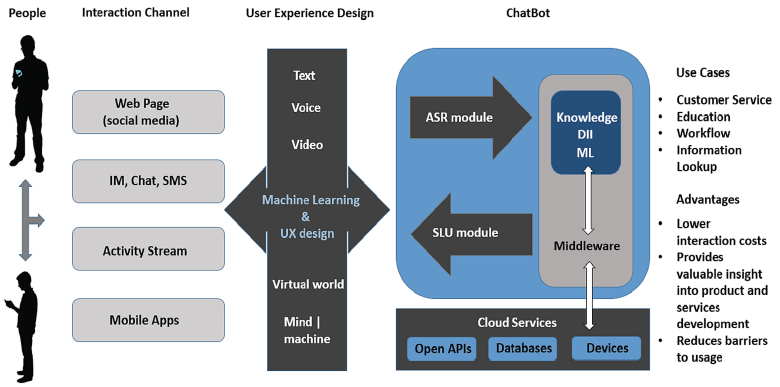

Fig. 1. ChatBot platform architecture

4 Social Media and Contact Centers

Social media is an important source of DID (Digital Interaction Data). Social media channels continuously evolve and change the way people communicate with each other and also how they interact with companies [14]. Aral et al. [15] claim that social media is "fundamentally changing the way we communicate, collaborate, consume, and create". This context is caused by the technological concept of Web 2.0, that presumes the creation and exchange of user-generated content [16]. Social media has already proved as an important marketing tool [17], and several Marketing trends rise towards structured social data (by implementing the following data mining technologies: sentiment analysis, trend analysis, pattern recognition, tagging/annotation, and toping modeling) used to improve ad targeting, based on the customers' profiles, brand mentions, topics, etc.

Also, the future of customer services lies too in social media. According to a Gartner report [18], by 2017, 50% of consumer product investments will be redirected to customer experience innovations. Gartner already stated that failure to respond via social channels can lead to a 15% increase in the churn rate for existing customers.

Regarding the industry needs, we documented several papers, and reports as in [18] and observed the financial resources to be allocated in the immediate future for this field of research. According to [19], social marketing budget will double in the next five years.

Nowadays, it is a known reality that many companies made social media channels a touch point for customer service. Contact centers are the first line of interaction with customers, and one of the urgent needs viewed from the experts' point of view is to enhance one of the key performance metrics in the contact center, First-Contact Resolution (FCR) and cover all contacts, regardless of channel. According to [20], changing the business processes within a Contact Center should start by mitigating the FCR rate (1).

$$(\text{Total Incidents Resolved} - \text{Total Incidents Reopened})/(\text{Total Incidents Opened}) = \text{FCR } \% \quad (1)$$

Integrating DII technologies will allow the analysis of repeating contacts across all the interaction channels, analysis of customer profiles for more-predictive contact patterns, and after reviewing these contact patterns and analyzing customer profiles, inefficient or ineffective processes will be revealed.

We can resemble these processes in the diagram presented in Fig. 2 with scrapping social media by using data mining and process the data with opinion mining tools, in order to reveal the hidden value from DII.

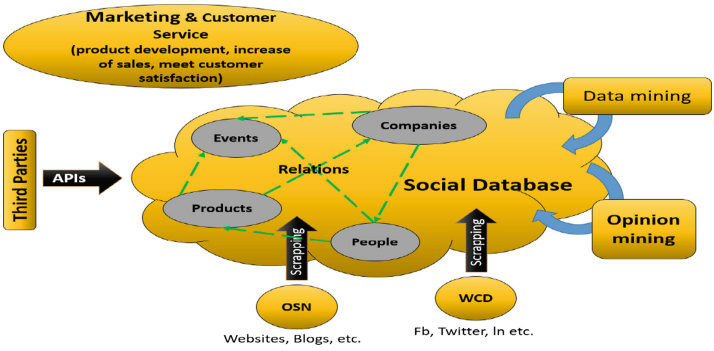

Fig. 2. Data mining and Opinion mining applied to social media platforms

5 Conclusions

The role of chatbots is to enable human machine interaction using natural language. We presented how chatbots are meeting customers expectations in social media cloud contact centers. Chatbots create a direct and close line between business and users, regardless of the service provided, offering 24/7 instant services and assistance, being always helpers and listeners. As future work we will develop a chatbot with medical knowledge for patient recovery after mobility health issues.

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