# Analysis of Open-Source Chatbot Frameworks

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## Abstract:

Automation is gaining popularity in present times with use cases varying from navigation on the website, user queries, notification alert etc. It helps the users and developer to focus more on the business logic instead of managing some day-to-day tasks manually. Bots can be leveraged for that particular domain on which automation is required to achieve the desired results. Open-source bots are preferred due to their availability to inspection, continuous improvement and documentation to get started with development. The bots employ machine learning to learn interactively by storing the responses. The conversational bot's support for certain platforms becomes the filter for developers to choose the bot as per the desired platform for deployment. Some of the most popular bots are reviewed and comparative analysis is presented in the paper.

*Keywords* —**Open source, Bot, Rasa, Human Computer Interaction, Natural Language Processing**

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## I.  INTRODUCTION

The Bots are gaining popularity in the IT industry. Tech giants like Microsoft and Amazon have created versatile bots with special features. The bot's application ranges from publishing it on the internet for client assistance to mobile applications like messaging apps to its integration in different software. The bots assist and provide support to navigate, access functionalities and other possible queries/ concerns during application use. Bots are employed by the companies to equip developers with cognitive capabilities. The bots trained using machine learning are fed with high quality conversational data to generate intelligent responses. Intelligent responses and data persistence entitle bots to be used as personal assistants. Certain chatbots employ speech to text conversion for accepting the user speech inputs and return responses. The bot frameworks enable the user to develop customize bots to their own use cases.

According to the requirements and system support, appropriate bot framework is selected.

## II. LITERATURE SURVEY

Since the previous decade, the development of domains like big data, internet of things (IoT), artificial intelligence (AI) and the among others, has led to several improvements. There are several uses for this technology. "Chatterbot" or "Chatbot" is one of these applications. Conversational AIs, or chatbots, imitate human speech while chatting. Combining artificial intelligence with natural language processing, this technology (NLP). Chatbots have contributed to technological development since they replace the need for humans and automate tedious jobs. Chatbots are employed in a variety of industries, including business, healthcare, and education.

We looked at a number of publications for the research and spoke about the many kinds of chatbots, their benefits, and drawbacks. The evaluation said that due of their accuracy and lack

of need on humans, chatbots may be employed everywhere. In order to bring machine learning closer to its original and primary goal of AI, a new area of study and research called "Deep Learning" was established (Artificial intelligence). While DL (Deep Learning) algorithms are set up to gain complexity and abstraction, autonomous learning algorithms have a tendency to remain linear.

In the age of chatbots, they are capable of complicated activities like booking movie tickets and other things in addition to mimicking people. Among other implementations, RASA is an open-source version of the NLU and DIET models. It can engage in conversational flow, interactive learning with reinforcement Neural network, and database and api interactions. This research examines a variety of rasa key properties to see how well it can handle challenging jobs. Implementation specifics are investigated, such as API and database interface.

## III. OPEN SOURCE CHATBOT FRAMEWORKS

### A. BOTKIT

Botkit is the open-source tool to develop chatbots, applications, custom integrations for messaging platforms like Facebook Messenger etc. It has easy kits to start development of the bot. It is part of the Microsoft Bot Framework. Botkit does not include NLP component, user can integrate chosen NLP service with Botkit. It was originally created for Slack, thus it's popular for making Slack bots. The bots built with Botkits are employed for use cases like content sharing bots, productivity bots, gaming bots etc. Large community is present working around Botkit. All of the major NLP engines, including Amazon Lex, IBM Watson Assistant, Wit.ai, and of course Microsoft LUIS, are supported via middleware provided by Botkit. With Botkit, user cannot handle all functions through, unless it is used in conjunction with other Microsoft services. A platform-independent method for creating bots for any communication channel is offered by the Botkit core library. Additionally, individual platform bots can be built using platform specific adaptors. Botkit CMS is free to use.

Machine learning is not involved to make it easy for building chatbots. It integrates with multiple major platforms like Slack, Cisco Webex, Cisco Jabber, MS Teams, Twilio SMS and IPM, Microsoft Bot Framework Google Hangouts Chat. Detailed documentation to get started with development is available on the internet.

### B. RASA

Rasa is open-source tool to build custom conversational AI bot. Rasa stack comprises of two major components: Rasa Core and Rasa NLU Rasa core contributes to the development of intelligent, conversational chatbots, whereas Rasa stack NLU handles natural language understanding.Being a bit difficult to start with, in reality, Rasa Stack is a highly well-liked open-source machine learning framework for building AI chatbots with little to no training data. User can deploy RASA on own system to store components on the personal system. Rasa offers customizability to add the required features and allows numerous environments to development, staging and production. It supports data analytics. Rasa keeps learning with more and more conversations (also referred to as interactive learning). Documentation for Rasa open source, Rasa enterprise and Rasa action server is available on the internet. It is used in chatbots related to fields like business analytics, image search, healthcare etc. It is easy to configure according to the use case defined.

### C. PANDORABOTS

Based on the open-source programming language Artificial Intelligence Markup Language, Pandorabots is a platform for chatbots.Using AIML, all the intelligence of the bot is built up as Pandorabots does not include ML tools commonly supported by other bots like Amazon Lex sample utterance training or Azure Cognitive Services by Microsoft. The framework's integrated hosting and natural language processing (NLP) engine may be realistically integrated with any application— including software for vending machines—using the Pandorabots API. Pandorabots is used in ecommerce for services and selling products (e.g

integrating Pandorabots with Facebook Messenger and allowing to purchase directly through the Messenger application). The Pandorabots code is open to the developer, giving the flexibility of development, configuration and integration. Scripting in AIML is incredibly flexible, and the development community is passionate about it.According to Pandorabots website, the response time for Pandorabots hosted bots is around 0.3 seconds, even for bots that have ~3 lakhs defined intents. Pandorabots predefined content libraries enables user to not write all the input/output pairs. Thus, the libraries provide a shortcut to accelerate development. Pandorabots API enables integration of framework's NLP engine and hosting platform into an application. The command line can be leveraged using Pandorabots CLI to communicate with the API. Pandorabots can offer consulting services. The documentation is available for deployment of the bot on different messaging platforms. Several SDKs allow accessing the Pandorabots API: Go, Node.js, Python, Ruby, PHP etc. Machine Learning is not included in Pandorabots. Bot would not respond to any query other than rules (input/outputs scripts) programmed in the bot. This kind of bots are rigid in nature.

### D. BOTTENDER

Bottender is used to build UI for conversations. User can design actions for events and state during usage and responses are produced accordingly (declarative approach). Users can make applications on desired channel (supported by Bottender) can be created using Bottender on supported channels. The number of configurations required for setting up the Bottender is less and it has been optimized for real world use cases. In the APIs, conversations are defined using functional (building functions for different inputs) and declarative approach; user defines the routes and the side effects with function actions. The supported channels are Messenger, WhatsApp, LINE, Slack, Telegram and Viber. Multiple chat channels are supported in the very early stage to meet enterprise project needs. This consists of setting up the channels, enabling them

and developing cross platform bot actions. Languages are typescript and JavaScript.

### E. OPEN DIALOG

Open Dialog is open-source conversational application which helps teams to create conversational applications. Conversational applications are made using Methods, tooling, integration, API endpoints, support for popular conversation interfaces like Facebook, and support for integration with NLU systems such as LUIS, Spacy and Lex. Conversation Designer is the Open Dialog's central functionality. Users don't need to write codes for the design and development of complex conversation patterns resulting is faster speed of execution. The Builder converts user's conversation design into Conversation Description Language. Based on the specification, engine handles the management of conversation and facilitates interactions with other systems (NLUs and external APIs). Flexible design for integration is offered with multiple input interpreters for user input, interleaving of conversations with the actions and quality context management for the semantics.

TABLE I
COMPARISON OF FRAMEWORKS

| Bot Name | Programming Languages | License | Channels | Clients/Fields |
|---|---|---|---|---|
| BOTKIT | JavaScript | MIT License | Slack, Cisco Webex, Cisco Jabber, MS Teams, Twilio SMS and IPM, Microsoft Bot Framework Google Hangouts Chat | Employed for use cases like content sharing bots, productivity bots, gaming bots etc |
| RASA NLU | HTTP API, Python | Is an open-source tool | Viber, Slack, Facebook Messenger, Twilio, Telegram | Insurance Banking Health Telecoms Travel |
| OPEN DIALOG | Laravel framework written in PHP , | Open source - Apache 2.0 | works with any server meeting PHP | Cyber helpline bots, Medicine store bots, College |

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|---|---|---|---|
| | frontend using VueJS | license | version requirements (e.g Nginx, Apache) | university bots etc. |
| **BOTTE NDER** | Typescript, JavaScript | MIT License | Messenger, WhatsApp, LINE, Slack, Telegram and Viber | Use cases like Todo bots |
| **PANDO RABOT S** | SDKs: Go, Node.js, Python, Ruby, PHP | AIaaS offers a free, ten-day Developer Plan trial.<br><br>https://developer.pandorabots.com/#plans | The web, games, social networks, linked gadgets, and messaging and native apps all have chatbots that were created and maintained by Pandorabot. | Common use cases include advertising, virtual assistance, e-learning, entertainment and education. Use the platform for teaching and research. |

## IV.    RESULTS & ANALYSIS

It is impractical to examine all of the chatbot development frameworks and platforms in one research due to their extensive intricacies. The most well-known open source chatbot development frameworks and several subjects that are closely linked to chatbot development were considered for comparison in this thesis. The objective was to contrast these frameworks and suggest which would be an appropriate chatbot development option. To analyze these frameworks regarding those relevant concerns, similar case study chatbots were developed using each framework while taking into account the documentation of each framework. According to the findings, the RASA framework would be better suited than others for chatbot creation

## V. CONCLUSION

There are various other open-source chatbot frameworks available. Each frameworks have its merits and demerits. The choice of bot depends on the particular use-case scenario and feasibility. The documentation for open-source frameworks is available from there official documents as well as from open forums. With the advent of technology advancement, the evolution in frameworks is also expected rapidly.

## ACKNOWLEDGMENT

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