



## THE CAPSULE - AN ARTIFICIAL INTELLIGENCE POWERED CHATBOT IN HUMAN RESOURCES MANAGEMENT SYSTEMS

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**Abstract.** Artificial Intelligence (AI) has an impressively wide range of capabilities, such as making decisions in real-time based on computing technologies and various predefined algorithms. The departments of Human Resources (HR) will also experience the impact of AI. HR professionals understand the importance of powering the human mind and machine learning mixture for a smooth workflow and intuitive work environment. Based on pre-installed algorithms and powerful computational technologies, AI can make decisions in real-time. Through an HR department that incorporates the human dimension and AI, businesses will provide their applicants and workers with an improved experience. Additionally, businesses can better understand their target market and promote result-oriented sales strategies by employing AI technology, which can learn and adapt automatically based on data analysis to provide more refined responses to circumstances. In this study, we focus on the issues such as how AI affects the HR department, the involvement of AI in recruitment and onboarding, employee experience, process improvement, and the automation of administrative tasks. Artificial Intelligence may need a considerable amount of data for proper storage and management to function effectively. Companies would need additional staff to run the sophisticated program and manage it. Using AI software to evaluate the collected data and leave the decision-making to the human workers would be the perfect method for employing AI in HR. Examining the areas where AI may be beneficial before introducing AI within HR operations may increase efficiency and decrease operating costs if the primary purpose is to enhance the overall employee experience. Our study highlights the use of Chatbots and their implemented technologies. Here, the main focus will be on designing and using an Artificial Intelligence-powered Chatbot in HR. Also, we focus on how they can simulate a conversation as a human.

**Keywords:** Artificial intelligence; human resources management; chatbots.

### 1. INTRODUCTION

#### 1.1 Artificial Intelligence

Technology is rising quite quickly in today's world, and we are getting in touch every day with numerous new developments. AI is one of the booming computer science innovations, prepared to create a new revolution by creating intelligent robots. AI is now everywhere around us, and its advance of knowledge is quickly proceeding [21]. It currently deals in several subfields, ranging from general to particular, such as self-driving vehicles, playing chess, proving theorems, playing music, drawing, and other fields. AI is an exciting and universal computer science area that will have a broad scope in the future. AI appeals to make a machine work like a human being. Artificial intelligence consists of two terms, Artificial and Intelligence, where Artificial defines *human-made* and intelligence *thinking ability*. Hence, AI determines an artificial power of thinking. Artificial intelligence occurs when a computer may provide human-based skills, such as understanding, reasoning, and problem-solving. We do not need to pre-program a computer with AI to do any work, even though we can create a machine with programmed algorithms that can work with our intelligence, and that is the awesomeness of AI [1, 2].

In the last few years, a modern approach towards the usage of artificial intelligence is discussed, based on bottom-up techniques by taking the basic building blocks of intelligence and placing them together in specific situations for a definite time with the purpose for those elements to adapt and learn how to handle those situations, which is known as the Situational approach [3]. That is done multiple times, and the results are collected, analyzed, and compared to conclude [4]. They are mainly based on intelligent agents whose behavior is defined correctly in their environment.

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The intelligent behaviour of the agent is achieved due to its interaction with the environment via the connecting of simple process elements that work in parallel (like neurons in the brain). That is the fundamental idea according to which artificial neural networks function. There are different aspects of the behaviour, such as sensing and movement (sensory-motor coordination), recognition of the current situation (classification), decision-making (selection of an appropriate response), and performance (execution of the response). Furthermore, the agents' behaviours can range from fully conscious (cognitive) to the unconscious (reactive), from overt (done openly) to covert (done mysteriously), and from voluntary (the agents act according to their own free will) to involuntary (done without conscious control or done against the will of the agents) [5].

The first fundamental concept of modern artificial intelligence is to consider the way the biological brain works in terms of essential functions, development, and adaptation over time. The second concept is based on relatively simple models of the building blocks of the brain, which are emulated by technological design using electronic circuits or using a computer program designed to simulate the behavior of the building blocks of the brain. These artificial building blocks connect in different ways to act similarly to a brain [6]. Neural networks are the means which are used to simulate the working of a brain. A neural network is a set of interconnected simple process elements, units, or nodes, whose functionality is based on biological neurons [7].

An agent is an object that can perceive its environment through sensors and act on it using effectors. That is more applicable in describing a human or animal; however, it is also helpful in describing the actions of an agent representing a mechanical system or other complex systems, such as a chaotic system, whenever the agent-oriented perspective is used. Therefore, the research of intelligent agents is at the heart of the problem in AI. The initial goal is to build an intelligent supercomputer, but the ultimate goal is to achieve artificial intelligence [8]. The fundamental requirement is to do the right thing; that is, to perform actions where the agent will be most effective. The term *performance measure* determines the agent's success criteria, which is performed objectively. In other words, we, as outside observers, define a standard on what it means to be successful in the environment, and this standard is used to measure the agent's performance. Based on those criteria, we can extract the definition of an intelligent agent. For every possible sequence of perceptions, the ideal agent should take any actions for which it expects to maximize its measure of performance, based on evidence obtained through a sequence of perceptions and any built-in knowledge it possesses. The behaviour of the agent depends solely on the sequence of perceptions up to a certain point.

Artificial intelligence technology aims to create an agent program, which is a function that implements agent mapping from perception to action. The assumption is that the program will run on some computer device which we refer to as architecture. The program is selected so that the architecture accepts and executes it. Intelligent systems decompose into a set of independent semi-autonomous modules, representing separate agents, which are often conceived of as running on individual devices with their processing threads. The architecture can be a simple computer, including hardware for particular purposes such as picture processing hardware or audio input filtering devices. It may include software that allows the isolation between the core computer and program agent to be programmed at a higher level, such as object-oriented programming. In general, the architecture allows the program to access the preceptors from the sensors, run the program, and supply the program's responding actions to the effectors. In the relationship between architecture and the program, the agent can be seen as the architecture plus the program.

Overall, complex and intelligent behaviour is achieved via interactions of simple entities that represent semi-autonomous agents. Some agents have little or no knowledge of what other agents are doing in such a structure. Agents are relatively independent but still influenced by other agents in terms of achieving goals in the environment. The final result can be achieved by only one agent or a set of agents. Based on the so-called agent's space topology, different agents are defined as collaborative agents, collaborative learning agents, interface agents, intelligent agents, internet agents, reactive agents, and hybrid agents [9]. These agents represent intersections of the sample space topologies of different agents, based on their properties, such as cooperating learning agents and autonomous agents.

An autonomous agent has an understanding and estimation of how its actions could influence its future observations. The last feature listed distinguishes autonomous agents from other software. The assumption is that some generally intelligent systems should be autonomous agents because generating knowledge is the main factor needed. Learning requires senses, often also taking specific actions. An autonomous agent is suitable for learning, incredibly human-like learning. To perform all of this, the agent must have built-in sensors for senses, effectors to act, and primitive

motivators, which motivate its actions. Sensors, effectors, and motivators are primitives that must be built into the agent. There must be the option and possibility for them to develop with time inside of an agent [10].

It is also possible to create an agent system so that all agents inside that system have the same strength and capabilities. On the other hand, some agents can override the decisions of other agents. That is the case in a layered architecture where the higher priority level agents override the agents' actions or decisions with lower priority.

### *1.2 Artificial Intelligence in Human Resource Management*

Nowadays, most professionals recognize now that intelligent technologies are actively transforming workplaces. AI is being used in almost every discipline in our daily life, and hence the human resources management departments are the following targets. A recent study conducted by Oracle indicates that human resources professionals believe that AI offers opportunities for acquiring new skills and gaining more leisure time, helping HR professionals extend their existing positions and be more strategic within their organizations [22]. However, 81% of HR leaders who responded to the survey considered it is challenging to keep up with the rate of technical change at work. Therefore, it is more critical for human resource experts to consider the way AI is reshaping the market.

Artificial Intelligence technology enables computers to learn and make or prescribe decisions from previously collected data. AI can streamline operations and increase the performance of human resource management in a variety of ways [11]. Machines are not intelligent, but they can be fast and accurate by providing them with the appropriate knowledge and technology. Although companies incorporate AI into their human resource systems at different levels, it is apparent that as the technology becomes more broadly adopted, it will have a long-term effect on the field. Therefore, HR professionals should take on technologies and try to adapt them to different roles.

Many companies are now incorporating AI technologies into their recruitment activities. According to Deloitte's 2019 Global Human Capital Trends report, only 6% of respondents believed their company had best-in-class recruiting processes in technology, while 81% felt their organization's processes were standard or below standard [23]. Therefore, companies have many ways to adapt their methods and benefit from cutting-edge technologies. AI will help not just the recruiting company but also the potential candidates during the recruitment process. AI technologies, for example, will streamline application procedures by developing more user-friendly forms that a potential candidate is more likely to complete, thus reducing the number of abandoned applications. While this approach has streamlined the human resources department's position in recruiting, it also provides more straightforward, more accessible, and more substantive processes on the candidate's side, which has been shown to increase the applicant's success rate [12].

Furthermore, AI plays a significant role in nominee rediscovery by assessing the current pool of candidates and recognizing other suitable candidates for new positions in the future. Rather than wasting time and money looking for new hires, HR experts will use this technology to find eligible candidates more efficiently and conveniently than ever before. The onboarding process continues after recruiting managers have determined the right fit for their vacant vacancies. This method would not have to be limited to regular business hours with AI aid, which is a significant change over previous onboarding procedures. Instead, AI technology enables recruits to access human resources assistance anytime and from any place by using chatbots and remote support applications. This transition allows workers to get through the onboarding process at their speed and eliminates logistical pressure, and, in most cases, results in quicker integration [1].

HR experts may use artificial intelligence to increase organizational mobility and job satisfaction and improve the recruitment process. Human resources teams can now more reliably gauge workforce retention and work satisfaction than ever before due to customized communication surveys and employee recognition programs. That is extremely helpful given the importance of understanding workers' overall needs. On the other hand, there are many primary operational advantages of providing this knowledge as well. According to a recent study, some AI software may analyze critical metrics of employee performance to determine those who should be promoted, thus driving internal mobility. That has the potential to dramatically lower talent recruiting costs while still increasing employee retention rates. This technology, however, is not limited to finding prospects for internal promotion. It can also determine who a team is most likely to leave. Having this information as quickly as possible helps HR experts deploy retention measures until it is too late and will help minimize employee turnover strategically. [12]

Incorporating AI into different human resource systems is a primary advantage compared to other fields and industries. By automating low-value, conveniently repeatable routine activities, HR practitioners gain more time to devote to corporate strategic planning. As a result, the HR department is willing to become a proactive business partner within their organizations. Innovative technology can simplify procedures such as profit administration, pre-screening applicants, interview preparation, and more. Each of these activities is critical to an organization's ultimate performance; carrying out the tasks involved in those procedures takes time. The burden of these responsibilities often ensures that HR practitioners have less time to devote to supporting their workers in more impactful ways. Using AI tools to simplify administrative activities can help alleviate this burden. According to an Eightfold report, HR staff who has used AI software handled administrative activities 19% more efficiently than departments who did not use such technology [24]. HR experts will dedicate more resources to strategic planning at the corporate level than the time saved [1].

While it is evident that AI will positively impact human resource management in the years ahead, HR experts should also be mindful of the potential challenges. One of the apparent challenges revolves around making AI easier and better to use. The most common deterrent to using AI at work is apprehension about security and privacy. Furthermore, according to the previously mentioned research conducted by Oracle, 31% of the respondents would instead communicate with a person in the workplace rather than a computer. HR experts must be prepared to resolve these issues by keeping familiar with trends and technologies as they grow and improve [12].

## 2. RESEARCH METHODOLOGY

### 2.1 Objectives and hypotheses

This study aims to create a project regarding an AI interviewer. Besides, we aim to create a Demo version of the system with basic decision-making skills and analysing opportunities. In that Demo version, we will create a Chatbot that talks with the end-user using natural language to simulate human interaction. It should contact the user, recognize the input from the user, and connect the user needs to the proper contexts, meaning that the *bot* is trained to answer the user using a Machine Learning (ML) approach. A so-called dictionary is created with different intents, such as the *tags*, *patterns*, *responses*, and *context* explained in the following.

The following will discuss the software and platforms used for the Demo creation in more detail. In the process of hiring employees, Artificial Intelligence is implemented with several hypotheses, as follows:

1. AI should only be used for automated tasks.
2. AI should be responsible for the entire procedure of hiring new employees, even the final decision-making.
3. Empathy and emotional bias should not play a role in the employee recruitment process.
4. "The Capsule" as an AI interview system is applicable right away.
5. In the future, AI will play an essential role.

### 2.2 Artificial Intelligence Bots

AI bots represent self-learning bots that are developed using natural language processing and machine learning. The process of developing and training AI bots takes much time and much data. On the other hand, AI bots will save a significant amount of time and resources in the long term. AI bots' ability to self-learn saves resources because, unlike rule-based bots, they do not need to be revised regularly. AI bots can be designed to understand various languages and overcome the problems of personalized communication. AI bots can learn to read customer's emotions using deep learning. These bots can communicate with customers depending on their mood. AI bots can help deliver customized customer support and increase customer loyalty by constantly learning. Since AI bots can manage customer requests from start to finish without requiring human intervention, they can provide round-the-clock customer service.

AI can make bots intelligent, but it cannot teach them to understand the meaning of human experiences. Human behaviour is primarily context-driven. Humans, for example, may alter their speech style depending on the situation. They use more straightforward vocabulary and shortened sentences when dealing with young children. Furthermore, when human employees deal with customers, they adopt a more formal tone. Since bots cannot comprehend human context, they interact in the same manner with everyone, regardless of the factors present. The potential of AI bots to

self-learn can seem beneficial to organizations, but it may also be problematic at times. AI-driven bots cannot make correct decisions, and as a result, they can learn what they are not meant to do. The development of AI-driven chatbots started a long period ago.

### 2.3 Chatbots

Nowadays, chatbots are used almost everywhere [21]. There are multiple definitions of a Chatbot. Chatbots are present for a long time; however, they have only recently gained attention from consumers and organizations. The shift in understanding for chatbots and conversational interfaces was primarily driven by advancements in artificial intelligence, machine learning, and the growing prevalence of messaging applications. Chatbots are being found in a variety of businesses and for a variety of purposes. If we focus on the history of chatbot development, the conclusion can be made that it all started with the Turing test and development of the first chatbot known as Eliza until today, where we have intelligent bots in our pockets. A timetable for the development of chatbots can be introduced by focusing on some time stamps that played an important role. The main emphasis points of Chatbot developments are summarized in Ref. [13]. Chatbots are mainly used nowadays for two main reasons: personal usage, and the second one is the usage of chatbots to improve an organization's business usage.

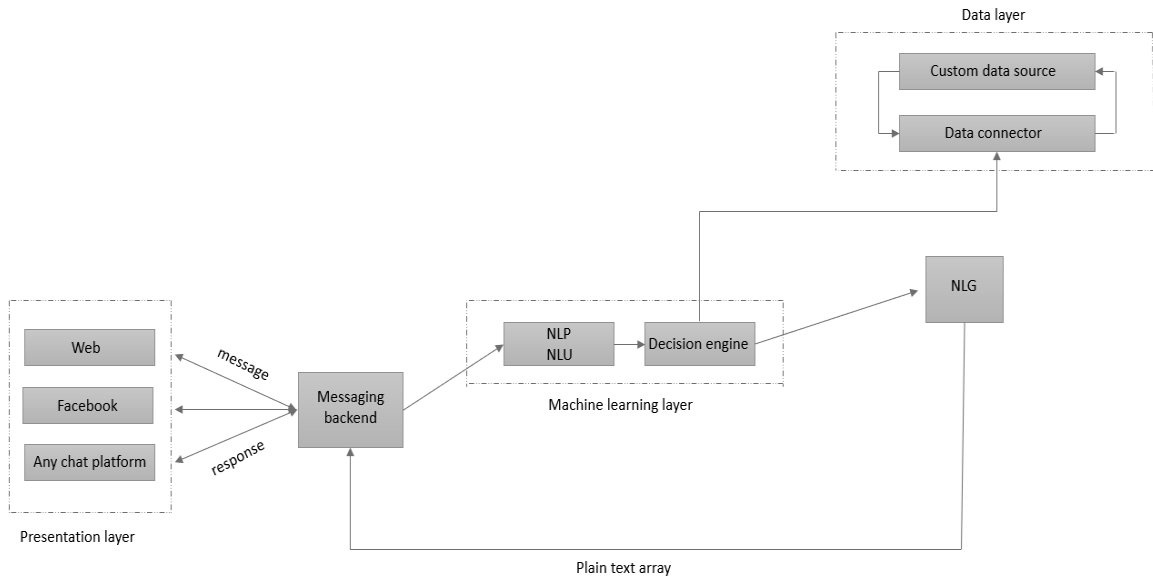
Particular prerequisites of chatbots need to be satisfied, such as NLP – natural language processing, NLU – natural language understanding, NLG – natural language generation. Additionally, two important things to consider, which are not an integral part of the chatbot design, are application programming interfaces (APIs) and the user experience (UX).

There are different ways provides to classify Chatbots [13]. The classification is usually done based on a particular problem. Two initial starting points are mainly used: problems trying to be solved and functionalities trying to be incorporated. According to these two starting points, several Chatbot groups can be identified, as described in [13].

The heart of Chatbot development is its architecture. The design involved in developing a Chatbot varies significantly depending on its usability and business operations background. The necessary design is determined by the kind of domain the Chatbot would have. Two basic models on which all the chatbots can be traced include the *generic-based model* and *retrieval-based model*. With the generic-based model within it, traces of AI can be identified. There is a training model within this concept, and the generic-based model is contextually based. It is a type of model where machine learning is used to generate responses. Information/response is generated after understanding and analysing the input from the user. The retrieval-based model is characterized by specific predefined rules based on which the response is generated. The process goes as follows: the user sends a message, from which the context of the message is processed, the context is checked based on the predefined rules, according to which there exist predefined responses, if the context is valid, a response is sent back. One example of the usage of this model can be seen in situations when the user has to press a specific key to continue. This model does not require any usage of AI or machine learning. The developer predefines the rules and responses.

To conclude the architecture of chatbots, there is a model defined from which all chatbots can be developed. This model is known as the basic block diagram for any type of Chatbot, as shown in Figure . A message/input from the user is sent from the presentation layer. The presentation layer represents the host platform of the Chatbot. After the message is extracted, it reaches the machine learning layer. Inertly the natural language processing and understanding perform. After that, a decision engine is triggered. The decision engine is mainly a part of the Chatbot based on the retrieval-based model, meaning that the next step is determined according to some predefined rules. If we have a retrieval model, then the message is sent to the data layer is where the response context is decided and sent to the natural language generation for competition. In the generative generative-based model, the data layer is not triggered. The response is created following AI and machine learning, and it is sent to the natural language. Natural language generation converts the response in a form understandable to the user and sends it to the presentation layer.

The responses can be generated in various ways, known as the response generation mechanism of chatbots. This mechanism centers around two essential parts: pattern-based heuristics and intent classification using machine language.



**Figure 1.** Basic Block Diagram Model

#### 2.4 Dialogflow

The Dialogflow console is used to develop, construct, manage, finalize, and test agents. [14] Dialogflow represents a human-computer interface technology focused on Google developers' natural language. This Google-powered platform allows developers to build text-oriented conversation interfaces in various languages to respond to consumer concerns. Dialogflow is using machine learning as its foundation. Dialogflow agents represent virtual agents that conduct discussions with end-users. They are modules for understanding natural language coming used for recognition of human language complexities. Dialogflow converts text or audio extracted from the interaction with end-users into structured data, which is the format understandable by the platform. A Dialogflow agent is like a call center agent for a human being. They both need to be trained in handling the planned chat situations, and there is no need for that training to be too explicit in the preparation. Agents are often used as high-level configuration and data containers. Agents in Dialogflow can be created from scratch by the developer, but the platform exists predefined agents. These are known as prebuilt agents. Prebuilt agents are a group of agents for general use by Dialogflow. Today, the limitations with the usage of prebuilt agents are that they are only available for the US region, and they are only provided in a few languages. Prebuilt agents are not created; they are imported to the platform from the database provided by it.

Intents are the crucial piece in creating intelligent chatbots. For every keyword/phrase/text being forwarded to the chatbots, something known as that conversation intends. An intent categorizes an end user's intention for one conversation turn. For each agent, developers define multiple intents. Different combinations of intents are used to handle entire conversations. Intents include four essential components, such as training phase, actions, parameters, and responses.

The training phase includes example phrases regarding what the input can be from the end-user. If the end-users input matches or is similar to these phrases, the intent of this phrase matches the input, and a specific action will be triggered. Not every possibility of the input phrases needs to be defined because the Dialogflow platform provides built-in machine learning that can match phrases that resemble one another and correctly recognize the context. For each intent, actions can be defined. These actions are triggered when intent matching occurs. The process of intent matching also includes exactions of specific values from the user input. These values are known as parameters. Each parameter has a type, known as entity type, that dictates how the data is extracted. Parameters are data that have a

logical background and are used to define precise responses. Responses are given as text, speech, or visual graphics. Responses are the answer generated by the platform and send back to the end-user. Responses are used to answer some questions the -user has, as the end-user for additional information or simply ending the conversation.

Entities dictate exactly how data from an end-user expression is extracted. There exist two types of entities, namely predefined and custom. Here, predefined is an entity created by the system, and the developer defines custom.

Context represents the current state of a user's request that allows the chatbots to transfer information between intents. It is used to create a logical whole from multiple intents. Events are used to trigger specific intents. Usually, intents are triggered by the user input, but intents are also triggered from the backend with events. There are two types of events: platform-dependent events and custom events.

Chatbots can be created using all the parts mentioned above, but at that point, the chatbots are still not functional. A crucial process is the training to make it functional and ready to be launched. Nowadays, AI and machine learning are involved in the chatbots' architecture, making the training process more general and simplified. The training at this point of the technology development stage should be just done in a broad way to define context, but the chatbots define all the specifics by finding patterns and analyzing the context. The training process is initiated by defining the chatbots' specific use case. The use case represents the specific problem the AI-enabled Chatbot needs to be able to solve. If the AI Chatbot cannot understand what the end-user wants, a frustrating user interface will be created. Very particular intents need to be created that serve a given objective to prevent this and understand how to teach a Chatbot. The usefulness of the AI Chatbot relies explicitly on the use of actual language in the sample expressions. The usage of several different terms to evoke each of the intents during the creation and testing of the Chatbot is essential. Many iterations are required to ensure all of this. Continuous updating and defining new keywords to invoke intents is crucial to ensure an overall usage rate of the bot. The whole training process must not be conducted only by the developers, but a wide variety of testers is beneficial.

### **3. RESULTS AND ANALYSIS**

#### *3.1 Data collection methods*

Two methods are discussed to collect data. In the first method, the data were collected using the quantitative method through the Google forms platform. This type of data collection was used to quantify attributes, attitudes, and several defined variables with a motive to back or oppose a specific hypothesis of a specific phenomenon. Later on, computational, statistical, and mathematical tools derive results from the collected quantitative data. The second method used is the face-to-face interview method based on a predefined structured questionnaire. The questions for each questionnaire are prepared and defined in this study, as described in Refs. [12, 15].

Google form method was selected to collect data from a variety of people. This method was used to compile all the standard survey fields (text, dropdown, scales, and multiple-choice questions). The Google form used for our specific case was constructed from 19 questions (both regarding respondent information and topic-related questions) and one field where the respondents can express their personal opinions or comments.

The interview regarding our research was conducted with a director working in an IT company in Vienna, Austria, who has already applied some form of artificial intelligence in their structure, and they also plan to extend it. The interview was constructed of eleven questions. The questions are based on his subjective opinion regarding the usage of AI in the hiring process, the implementation of AI in the HR department in the specific case of that company, and their opinion regarding further usage of AI in the HR department as well as the implementation of AI in general.

#### *3.2 Data analysis*

We divided data into two groups, namely the Google form data and Interview data. The analysis was performed using the Google forms spreadsheet and data analysis tools. After that, several smaller tools were used to organize the data and draw conclusions from it. After analysing the questions and the answers, the decision has been made to create four subgroups that contain data that is linked and creates a logical whole. The results are shown in Table 7.

Our data confirm that the used sample has a wide variety, which is concluded by analysing the basic information retrieved from the 210 respondents. From Table 7, 4/5 of the total number of respondents are no older than 30. Thus, this shows us that AI, with AI being a reasonably new concept and technology, awakes the interest of reasonably young members of society. That is also confirmed by the fact that 50% of the respondents are students. The sample can be seen as representative because the respondents are spread worldwide, with 50% being from Europe and others being spread in Australia, North America, and Asia. Another indicator of the data's representativeness is that people with different levels of education accomplished, ranging from upper secondary education until doctor degree.

**Table 7.** Respondent Information of Group 1.

Number of respondents	210	
Age	16-30	81%
	30-40	14.3%
	40+	4.8%
Gender	Male	76.2%
	Female	23.8%
Occupation	Student	50%
	Other	50%
Continent	Australia	5.3%
	North America	19.4%
	Europe	52%
	Asia	23.3%
Level of education	Bachelor degree	61.9%
	Upper secondary education	9.5%
	Master degree	23.8%
	Doctor degree	4.8%

The second group of questions focuses on assessing and measuring the readiness of companies and people to organize and attend job interviews conducted by AI, respectively, as shown in **Table 8**. The results indicate that most respondents have had experiences attending a job interview before. The experience they all had is, conducting job interviews in conditions where human interaction was present. That is reflected in their answer, in which stats show that 90% of the respondents prefer human interaction over AI interaction during an interview. That should be taken with a dose of caution because the AI interaction is discussed just from a theoretical point.

Moreover, also subjective comprehension about AI that the respondents have must be taken into account. An indication that we should answer a dose of precaution is also the answer received from the next question, asking if the respondents think they would be comfortable attending an AI job interview. A drastic percentage drop can be seen, with only 38% of respondents stating that they would not be comfortable in such a scenario. However, the assumption that the awareness regarding AI is still not satisfactory can be made because 34% of the participants



remained neutral regarding this topic. On the contrary, assessing the opinion of AI conducted job interviews from a purely technical point of view, more than half of the respondents agree that AI would make the whole process faster and more efficient. However, they limit themselves firmly because they only perform the "dirty" work from the technical perspective.

**Table 8.** Preparedness to Conduct AI Interview of Group 2.

<b>Attended job interview?</b>	Yes	90.5%
	No	9.5%
Human interaction or AI during the interview?	Human interaction	90.5%
	AI interaction	9.5%
Would you be comfortable going to a job interview conducted by AI?	Yes	28.6%
	No	38.1%
Do you think AI conducted job interviews more effectively/less time-consuming?	Yes	52.4%
	No	47.6%

Now, let us assume that we are forced to take an AI-conducted job interview. The point here is to make the respondent enter the mindset that they have to take such an interview, and now we want to extract some information from them regarding their opinion and expectation before the interview. **Table 9** presents the results of this assessment. Our data indicate two points to be emphasized. As mentioned, the core of the interview should be influenced by the human factor. The respondents still prefer and demand human interaction during the core process of the interview, but putting the "humanity" aside, they all agree that AI can optimize the whole process of the interview regarding things like analyzing data, scheduling, and similar things. That also confirms that 91% of the respondents think that the final decision should depend on humans.

**Table 9.** AI opinion Assessment of Group 3.

<b>Does AI increase your chance of getting the job?</b>	Yes	4.8%
	No	71.4%
Do AI interviewers reduce subjectivity?	Yes	61.9%
	No	38.1%
Are you comfortable with the scenario in which AI just accesses your CV and evaluates just your experience?	Yes	52.4%
	No	47.6%
Do you think AI should be used only to narrow down possible candidates but that humans should have the final decision?	Help with decision	90.5%
	Make final decision	9.5%
Would you feel comfortable with AI finding and analyzing all data that can be found online?	Yes	52.4%
	No	47.6%

While constructing this questionnaire, expectations were that respondents will not be "friendly" towards the idea of the whole process being automated and that AI should be implemented and applied. Thus, an additional section has been created that deals with and tries to understand the reasoning. The main things that tried to be understood are why there is a general opinion that empathy plays such a crucial role. The results are summarized in **Table 10**. From

Table 4, the respondents just confirmed the predictions, with 81% of them stating that human empathy plays an important role, 52% of respondents think that they would be negatively affected by the fact that the AI conducted interview is not natural and artificial. There is also an exciting conclusion gotten here. People generally tend to regard human interaction kind of in only a positive light, especially when comparing humans and machines. They tend to disregard the fact that people are emotionally driven contrary to machines, and there are millions of different personalities, then people tend to act unpredictably. Also, subjectivity plays a huge role as well as discrimination on various grounds.

**Table 10.** Emotional Intelligence of Respondents of Group 4.

<b>Should Human empathy influence the final decision?</b>	Yes	81%
	No	19%
AI interviewers being not natural and simulated is affecting you during a job interview?	Yes	52.4%
	No	19%
Do personality traits have high importance during a job interview?	Strongly agree	57.1%
	Agree	33.3%
	Neutral	4.8%
	Disagree	4.8%
	Strongly disagree	0%
If you find yourself in an uncomfortable situation during the interview and cannot present yourself in the best light during a specific situation, do you think the human ability to understand and show empathy is a crucial advantage over AI?	Yes	90.5%
	No	9.5%

The final thing regarding this group of questions to be pointed out is the question that tries to understand the influence of personality traits on making decisions. The respondents were asked to choose one of the options on the 5-point Likert scale, ranging from strongly agree up to disagree strongly. The results are summarized in **Table 11**. Our results indicate that most respondents agree that personality traits have high importance during a job interview. Sometimes, they can even overshadow the actual technical qualifications a candidate should possess.

**Table 11.** Emotional Intelligence of Respondents Filtered.

Do personality traits have high importance during a job interview?	Strongly agree	57.1 %		Agree	90.4 %
	Agree	33.3 %			
	Neutral	4.8 %			
	Disagree	4.8 %			
	Strongly disagree	0 %			Disagree

The analysis regarding the interview has shown a higher degree of readiness to implement and adapt the usage of AI in the HR department and even generally in companies for other purposes. Some points of emphasis required to be accentuated are:

- AI will remove mental drudgery. It can do work that a human cannot. Worth developing.
- Automation does not just understand the replacement of human labour with machine labour. It can be understood as a broad application matter, reaches into different spheres. Advantages of automated tasks include increasing efficiency, productivity, decreasing time consumption, and allowing resources to be directed elsewhere. Thus, it enables companies to remain small and agile. The disadvantages mainly include the doubts of what automation means and brings to businesses, workers, and consumers.
- What exactly does it mean is a company ready to implement AI? Regardless of the company size or industry in which it operates, adding automation into a business environment can cause significant shifts in the way an organization conducts itself.
- In modern IT companies, such as the one interviewed works in, AI is primarily implemented in cognitive engagement. Mainly through the usage of chatbots, intelligent agents, and machine learning.
- One interesting thing, coming from an insider in the world of technology, was that even though the usage of AI in the HR department can be time-saving and efficient in the initial stages of recruitment, the final decision should eventually depend on the human factor.
- AI's potential seems limitless; however, could the automation of the entire job recruitment process be done? Also, AI empathy is not sufficient for human empathy. Keeping in mind that people seeking a job can be in an emotionally vulnerable position, in such situations seeking a job can be in an emotionally vulnerable position. There is no reality where machines are effective at respecting and expressing empathy for job candidates.
- The usage of AI in the future will be inevitable. However, humans will play a significant role in the future of AI.
- AI hiring should be transparent and open to challenge. Complex algorithms used in AI can make the selection decision challenging to justify because it makes it almost impossible to understand how the conclusions are made. Therefore, if the selection decision cannot be easily explained, AI could be quickly challenged from a legal perspective.

The general conclusion that can be crystallized from both of these methods is that AI and automation within the HR department should be only used as a helping tool in the initial phases of the recruitment process, in stages such as candidate screening or interview scheduling; however, the final decision should be made by a human.

#### 4. CHATBOT – APPOINTMENT SCHEDULER

A simple chatbot is created in this study that demonstrated how chatbots could be implemented within HR. The chatbots purpose will be to schedule appointments for the organization where the chatbot is used, with possible job applicants. The chatbot functionality logic will accept contact from the end-user, provide the end-user with basic information about the organization (if asked), perform a simple dialogue interaction with the end-user to extract necessary data, and schedule the appointment. Before the appointment scheduling, the time slot availability of the time and date provided by the end-user is checked and compared with the data available in the organization's calendar. If the timeslot is free, the appointment is set. If the timeslot is taken, the end-user is informed and can schedule the appointment for another time. The Chatbot architecture includes the text messenger platform, Dialogflow platform (Chatbot engine), and Backend applications (frequently asked questions about the company database and third party application of Google calendar).

The Chatbot will be a general one, and the different processes will be handled via the intents. The primary intent is the appointment scheduler. Initially, the training phrases are created; they help give the agent guidelines on his problem, which he needs to be managing.

In Figure, the phrases highlighted in yellow are recognized by the system as entities. The entities automatically recognized by the platform are known as system entities. Besides system entities, the developer also has the freedom to define his entities, which can be associated with any given phrase/keyword. In a training phase where all the possible input phrases are listed, responses to those inputs also exist.

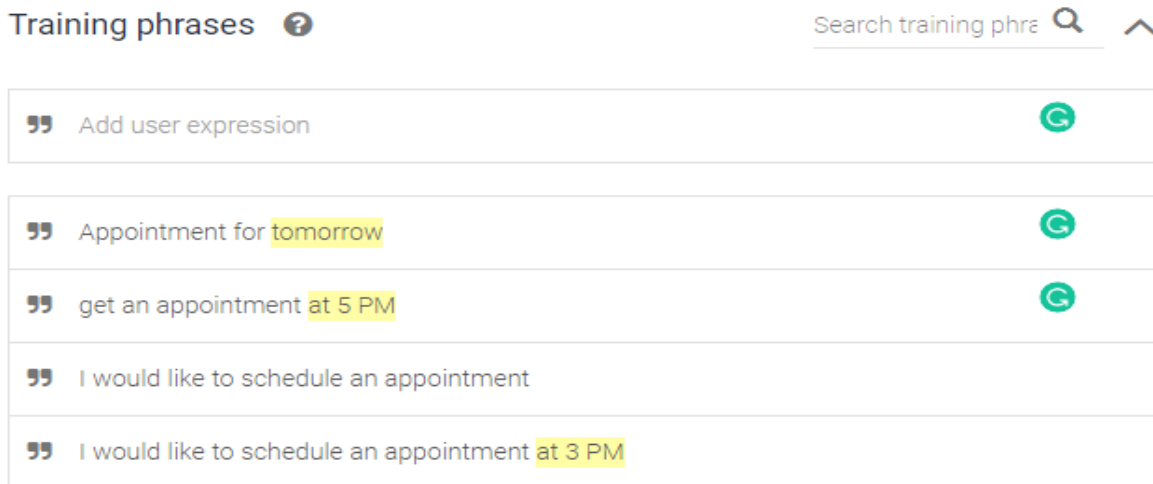


Figure 2. Agent Training

The developer defines responses, and they can be in many forms. For this specific situation, the following response, as shown in Figure , is listed.

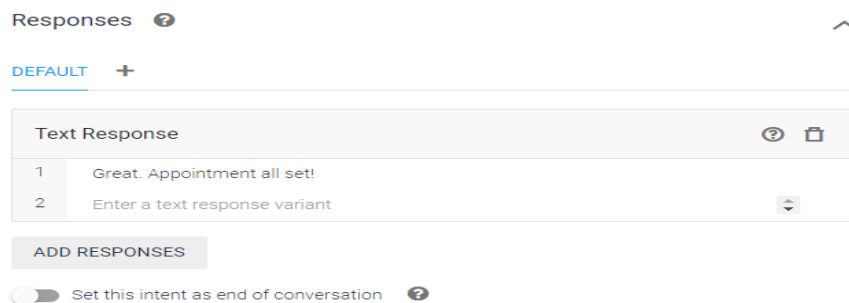


Figure 3. Agent Training

The exciting thing about using the Dialogflow platform in creating chatbots is that AI and machine learning are within it. That means that after a sufficient amount of training data, the chatbot will develop its knowledge base and recognize situations correctly and map them to the correct intents in situations where the input is not covered in the training phase. The machine learning model behind the scenes extracts the critical information and identifies what the intent is trying to say. Within the response section, the defined and detected entities can be used. They are defined in a general way using the \$ sign followed by the entity's general name. The problem with this kind of response implementation is that the platform gets into a loophole and cannot generate a proper response when the user input does not contain any keywords defined as entities. A way to fix this situation is to make the entities required, meaning that the user is obligated to provide data identified as entities. The platform is intelligent, and if the user initially does not provide such data, the chatbot will bring the conversation back at the beginning and require the user the needed data. For this purpose, the platform can ask in a general way, which sounds robotic and unnatural, or the developer can define prompts. These are shown in Figure .

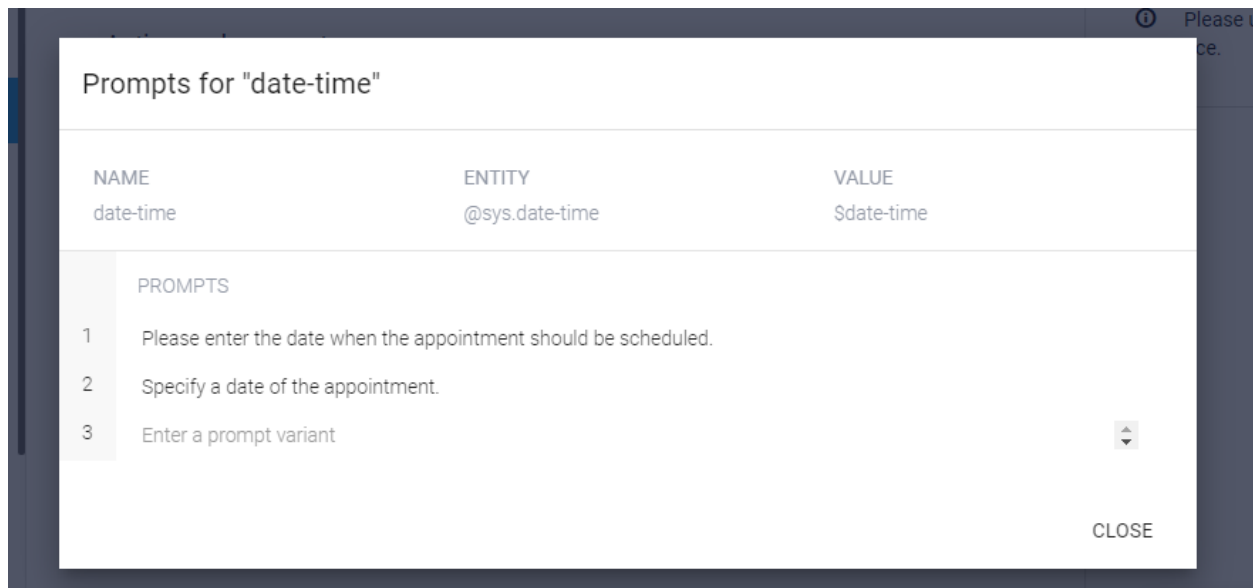


Figure 4. Requiring Entities

For the situation where the user does not respond expectedly, matching with the current context or the general purpose of the chatbot, the Dialogflow platform has a predefined fallback intent. The fallback intent has a default response that helps to return the conversation in the expected format.

A simple schedule appointment bot is created, but how useful is it just existing within the Dialogflow platform? The answer surprisingly is "not at all". For this reason, Dialogflow enables the developer to integrate the bots created on it with all the big and known platforms, might they be websites, social media, or messenger applications. The chatbot is designed on one platform, but it can be deployed on multiple ones. Mostly the chatbots are integrated with messaging applications. Initially, a representation of how to include a chatbot on some personal websites will be shown. Code one shown below is provided by the Dialogflow platform, which can be integrated into the website's source code.

```
<iframe
  allow="microphone;"
  width="350"
  height="430"
  src="https://console.dialogflow.com/api-
  client/demo/embedded/78b9b64e-2f83-4367-98cb-3f83f9940aa9"
>
</iframe>
```

Code one.

The newest version of Dialogflow introduced a new feature known as Knowledge Connector. It enables the chatbot to answer queries based on predetermined sources of knowledge such as websites, FAQs, or knowledge-based articles. The Knowledge Connector is still seen as a beta feature. Thus it needs to be additionally enabled in order to be used and implemented. Inside it, the first thing to do is to create a knowledge base. The benefit of using this feature is to avoid using a significant number of intents and instead replace the ones centered around basic info. The previously created scheduled appointment chatbot needs to check the calendar and schedule the meetings following it. The connection is established via the usage of fulfillments. Fulfillment is a piece of code that connects the Dialogflow agent/chatbot to the backend applications. Fulfillments provide two options, webhooks (for linking servers) and the inline editor, provided by Google, in where there is an option to code the connection between a backend application and the agent directly. (My custom-created code given). There exists the Google calendar API to integrate the calendar into the application.

In the Google cloud platform, the calendar API needs to be enabled to initialize the process. Then at the same platform, a new service is created, under credential, that has the role of a Dialogflow editor. From that service, a JSON key is extracted. The key holds all the necessary linkage information required. On the website [calendar.google.com](https://calendar.google.com), a new calendar is created, and it is linked with the chatbot by using the data provided by the JSON file. The calendar is edited to be set to the correct location and time zone.

Whenever there is an interaction between the user and the chatbot, the Dialogflow agent handles the entire conversation between the user and the chatbot. Whenever the conversation happens, Dialogflow first assesses the user's intent. If it is "schedule an appointment", it will link it to the correct intent. After the linkage creates, back at the Dialogflow platform, the fulfillment code is adapted. Once it comes over, all the data in the form of capturing essential information, such as date, time, type of appointment, is passed to Dialogflow in the form of HTTP request and response. The information passes on specific intents where the developer has previously enabled the fulfillment for that specific intent. Based on every conversation, turn the program analysis to code two shown below.

```
Exports.dialogflowFirebaseFulfillment = functions.https.onRequest((request, response)
=> {
  const agent = new WebhookClient({ request, response });
  console.log("Parameters", agent.parameters);
  const appointment_type = agent.parameters.AppointmentType;
```

Code two.

Here, the request has all the parameters required as part of the query. Next, an agent is created, which contains parameters. Within these parameters are the critical data is stored. Additionally, a function (in this case, `makeAppointment`) is created to handle the whole process. This function is passing the information, formatting dates, capturing the data and the time as information extracted from the conversation, and appending it together. The function is shown below on code three.

```
function makeAppointment(agent) {  
    // Calculate appointment start and end datetimes (end = 1h from start)  
    const dateTimeStart = new Date(new Date.parse(agent.parameters.date.split('T')[1].  
    split('-')[0]));  
    console.log("expexted String", agent.parameters.date.split('T')[0]  
    + 'T'+agent.arameters.  
    time.split('T')[1].split('-')[0] + timeZoneOffset);  
    const dateTimeEnd = new Date(new Date(dateTimeStart).setHours(dateTimeStart.  
    getHours( ) + 1));  
    const appointmentTimeString = dateTimeStart.toLocaleString('en-US',  
    { month: 'long', day: 'numeric', timeZone: timeZone }  
}
```

Code three.

In the last part, the checking of the availability of the date and time is performed. Based on this, a response is generated, whether positive (create appointment) or negative (selected date or time not available), as inside code four.

```
console.log("dateTimeStart", dateTimeStart);  
console.log("dateTimeEnd", dateTimeEnd);  
console.log("appointmentTimeString", appointmentTimeString);  
return createCalendarEvent(dateTimeStart, dateTimeEnd, appointment_type).then(( ) =>{  
    agent.add("Ok, let me see if we can fit you in. ${appointmentTimeString} is fine!.");  
}).catch(( ) => {  
    Agent.add("I'm sorry, there are no slots availibale for ${appointmentTimeString}.");  
});
```

Code four.

If the process can be performed, an intent map is triggered. Code five presents the mapping. Within it, the intent is handled, and the appointment inside the calendar is triggered.

```
let intentMap = new Map( );
intentMap.set('schedule appointment',
makeAppointment);
agent.handleRequest(intentMap);
```

Code five.

## 5. DISCUSSION

According to [16], human thought, and hence its understanding, is not established using the algorithms but instead using a trial-and-error basis within some inspiration. That is a different process, and most likely not sharable, that a machine (such as a robot) would employ; for instance, the Turing machines for solving a problem would ignore the human understanding and apply an algorithm indefinitely until hopefully a solution. In contrast, trial-and-error reasoning is based on prior experience, and it is seen as the basis of mathematical achievements. As stated in [16], perhaps it is possible to create a human-like brain within the robotic computer, and then robotic computer brains behave like a human brain when trained based on the initial information to gain some experiences.

The way the brain generates consciousness is still a mystery [17]. Based on the scientific view, consciousness emerges from complex computation among simple neurons that receive synaptic input signals and integrate them to a threshold for bit-like firing. Furthermore, as a network of  $10^{11}$  neurons computing by bit-like firing and variable strength chemical synapses. The brain is the standard model for computer simulations in artificial intelligence.

The brain can account for non-consciousness cognitive functions from the computer viewpoint, including our mental processing and controlled behavior. The complex problem is how cognitive processes are accompanied or driven by phenomenal conscious experience and subjective feelings.

Other issues also suggest that the brain-as-computer perspective may not be completely accurate, and hence other approaches are required. For instance, the conventional brain-as-computer perspective fails to account for the complex problem. Differences between consciousness and non-consciousness processes cannot address non-computable thought and understanding [18, 19]. The causal efficacy of consciousness and any impression of free will cannot be addressed because measurable brain activity corresponding to a stimulus often occurs after responding to that stimulus. The brain-as-computer view depicts consciousness as an epiphenomenal illusion [20].

## 6. CONCLUSIONS

This study designed a Chatbot for use in the HR department called "The Capsule". Our study set up a general hypothesis on whether we should use AI in the HR department. Our investigation indicated that AI should only be used for automated tasks. The implementation of AI in such cases has been proven more than beneficial because it brings a higher level of optimization, increases efficiency, and, most importantly, saves time. Also, our study indicates that AI should be responsible for the entire procedure of hiring new employees, even the final decision making. The hiring process of new people should be a versatile process, including many factors, mainly considering the candidates' technical competence and personality traits.

Furthermore, empathy and emotional bias should not play a role in the employee recruitment process. With AI, we automatically exclude any chance of bias being present, which favors the use of AI, that being "emotionless" actually helps, but the vast withdrawal is that empathy lacks.

Moreover, AI will play an essential role in the future. We might even argue that AI will change the world more than anything in the history of humanity. Even today, AI is slowly integrated into most of the spheres of everyday life.

Finally, we conclude that AI should be implemented in the process of hiring employees. Efficiency, optimization, effectiveness, time consumption, all of this can be improved and almost brought to an optimal level. However, the final decision regarding actually hiring people should still be in our hands.



The scope of future implementations is vast in this section of the information technology industry. AI-driven chatbots will undoubtedly play an essential role inside the HR department in analyzing, locating, and hiring new staff. The plan of ours is to try and, with the right resources, financial and technological, actually bring the Capsule idea from theoretical into practical.

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### Software

The chatbot software is in the following repository link: <https://github.com/damirrahmani/appointmentSchedulerBot>.

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