**Abstract**

Faculty of Engineering Science and Technology

Department of Computer Science and Computational Engineering

UiT The Arctic University of Norway

Improving learning capabilities of chatbots

James Pandey

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This report is a preliminary approach starting with the thesis report on the topic of improving learning capabilities of the chatbot. Here it is to be found the head start and plans and schedule of the thesis work for aforementioned problem description. During the 1st month of the it is to dealing with the background information to be prepared with the thesis topic with preliminary studies. Then in the month of February meeting up with the team and working on with the project to finalize the things to be done and work starting with the 2 part of the project to develop the platform for testing the ability.

Then the focus is transferred to the pre-final stage with working with the thesis report during the month of March and April.

**Introduction**

A chatbot is a computer application or a program which will automate replies or conversation according to assisted intelligence system. It is indeed a virtual assistant or a robot that converse with you in human mannerisms. It has its own set of AI engine mind, that can coincide with the change in scenario then adapt and react to the queries and literally is also able to learn from the same. Now it is getting more personal in nature handling with user identifying and reply according to the particular person it knows. Programs of these types are a simulated version of human which will behave as how a conversation will take place between two person, it is a bound between the action and reaction. An activity from the user is to ask with the chatbot and it should respond according to the desired man-to-man conversation alike how a person would answer if he/she have a response according to the question proposed.

To test the human like nature of the bot, a specific type of test is performed which is called Turing Test [1], it is simply a test to distinguish the ability of intelligent respond of the machine or bot which is identical to human. To further exemplify, let’s say a person ask a question to A and B, the question will be somehow which determines if A or B is human or a bot.

**History overview**

The first chatbot introduced was developed by Prof. Joseph Weizenbaum in 60’s decade named ELIZA[2]. After that its evolving, many companies now are integrating the technologies in their platform to assist user in ideal ways. Social media platform like Facebook have couple of thousands or bots running on their messaging platform and inspiring developer and to build more hype in this trend to provide advanced services to the customer in need.

The present conversational interface is getting more user friendly and intelligent that the community is keen to provide such thing in future that would not demand a user to type or need any screen or mouse like the traditional technologies in existence so far. Integrating voice and video recognition system in such can make a huge impact in the evolvement of the bots and AI to emerge a marvelous achievement in upcoming future inventions.

The conversational approaches are also being so accurate and indistinguishable that you can’t even find out either you are talking to a person or a bot instead, and it is getting more personal day by day like you can feel that it can be your personal assistant like a friend or a relative.

To simulate the conversation, ELIZA[2] uses some sort of pattern matching and substitution methodology. It was based on natural language processing that works by passing words to the system and then matching them with the possible scripted responses. The bases behind this human computer interaction is the phycology of human nature and mostly developed a simulated example of human behavior. Whereas, PARRY[3] triggered output by weights assigned to verbal inputs of attributes and responses it was in existence till early millennium to overcome depression. Dr. Sbaitso, Jobberwacky were another examples of these kind.

And then A.L.I.C.E (Artificial Linguistic Internet Computer Entity)[4] used some heuristics pattern matching module to process the outcomes of the conversations it was developed by Richard Wallace in 1995. Those patterns run over a XML[5] scheme known as AIML (Artificial Intelligence Markup Language) as it was integrated and further developed by Java[6] in 2001 and then it is being used by the developers to work with different programming languages. It is more like chatting with a real person over internet and web platforms.

The more they aged they more get advanced with newer technologies, currently its voiced based virtual assistance with broadening the usage of area. Contributing in the same era it’s with Apple Siri, Google Assistance and Amazon’s Alexa and Microsoft Cortana. They are all intelligent enough to provide and assistance with task such as searching in the web, playing music, controlling home appliances creating daily task reminders, alarms, etc. by just talking with your voice.

But, on the other side of the web there are still a different user based assistance is applicable, to different shops, to different service providers, on their website to assist user with the live chat assistance to different kind of scenario and problems or may be any sort of general inquiries. It is a basic and easy approach for a company to assist it’s customer via its web portal, for example with booking, registration, shopping, purchasing tickets, ordering fast-food or meals or any other type of inquiries, these are general daily activities to handle their clients and has put lot of burden of work under their employee to manage same routine task which could be easily replaceable with virtual assistance.

The focus on this task is the main criteria of this report which is continuingly working simultaneously with the chatbot group for Narvik Municipality to develop a better solution of this version of the bot, to assist in a better way to handle daily queries in the web portal of Narvik Kommune.

**State of Art**

The future is (Artificial Intelligence) AI, soon we are talking with robots and bots all around in any sector for assistance and other daily related works or tasks, such as in school, colleges, banks, stores, shops, hospitals, police station. Human interacts in a way that a person who is seeking a help or assistance is addressed sophisticatedly. And the deal with to do the same thing with virtual assistance and chat bots is far a long way to go on.

These days lots of APIs and chatbot platforms are being lunched and created and they also tend to have more resources and function with as ease, and the revolutionize status of the chatbots are full of excitements.

Still the chatbots are in very early age of the developments and much more new conversational trend can be implemented based on integrating and emerging new platforms and technologies. There are fewer things to consider first to get in through the chatbot development project.

1. Concept

It is the main starting idea so that to be clear with why it is being developed, the motivation ideas plays a significant role here. What the chat bot should do? Or for whom it’s going to be used, it could be in this present case working with the Municipality that it is designed for the Municipality of Narvik’s clients to fulfil their inquiries and issues they come front seeking assistance with. And it of course helps to keep away the burden from the general tasks from the employee and that would definitely lead to productivity letting the employees to focus on other mandatory special tasks.

1. Medium of Interaction

The medium of interaction is via web portals interface, which will handle the live chat application UI, is being developed by the students of bachelor in IT, in UiT Narvik. The UI is based on Java and AIML technology to monitor and respond the queries from the web live chat interface. It is a chat application that writes back the queries sent by clients.

1. Conversational UX

The chatbot is capable enough to take all the queries form the users and should be able to respond in a way that resembles if it is a human assistance. Using AI to reply, learn and predict answers and also give trending recommendations, and keywords being used frequently.

There are already various of technologies existing with the chatbot projects, some of these are listed below from Chatbots journal,

* + - 1. Bot Platform
      2. IBM Watso
      3. Microsoft Bot Framework uses LUIS
      4. Wit.ai
      5. Api.ai
      6. Semantic Machines
      7. Digital Genius
      8. Chatfuel
      9. Pypestream
      10. Pandorabots
      11. Agentbots
      12. Chatscripts

**Newer startups**

Twyla

Msg.ai

Rasa NLU

Reply.ai

Many Chat

KITT.AI

It’s Alive

The learning capability of the bot is can be improved in several ways, just like a human learning process what a child learns from parents, elders, or teachers it is the same with chatbots. They will tell exactly the same thing they know, they don’t have human cognitive concise to deal with the problems and respond them in a proper way, they respond what they learned. If they are incorrect in any way they should be corrected. Here comes the part to improve the learning capability of the chatbot. If a chatbot doesnot know what to answer then it means the conversation must be transferred to the human agent. But after that the conversation is recorded and analyzed by the chatbot to learn from it. This is how we do it.

So far, the uniqueness in this chatbot is it to recommend clients with significant trending and much used keywords news, happenings around. And it will not just return text replies, it will provide appropriate link or suggestion to the users transcribing texts from the website news feed, events.

**Process of learning**

Learning mechanisms could be of various type,

1. Supervised or controlled learning

• Training data includes both the input and the  desired results.

• For some examples the correct results (targets) are known and are given in input to the model during  the learning process.

• The construction of a proper training, validation and  test set is crucial.

• These methods are usually fast and accurate.

• Have to be able to generalize: give the correct results when new data are given in input without  knowing a priori the target, Neural Networks, Multi-Layer perceptron, Decision Trees can be used.

1. Non-supervised Learning

• The model is not provided with the correct results

during the training.

• Can be used to cluster the input data in classes on the basis of their statistical properties only.

• Cluster significance and labeling.

• The labeling can be carried out even if the labels are only available for a small number of objects representative of the desired classes.

• Cleanup data, sampling, noise reduction, handle missing data, normalization, feature extraction, Kmeans and Self Organizing Maps could be used.

**Propose of the solution**

Problem area here is to provide virtual assistance to the seeker via chatbot responses, which includes following tasks.

Narrow down in 1st phase with FAQ, Frequently asked questions.

First things to consider with this is to narrow down frequently asked questions to provide assistance, analysis of the keywords and linguistics questions and give response with appropriate answers.

Learning phase, In 2nd phase if a question which could not be found in any responses criteria then a reciprocated question to elaborate the question is asked to the user, or something like guessing keywords to learn from the users question creating ontologies of known and learned keywords. In more advance cases the conversation is forwarded to the live agents to deal with and the bot will be in learning mode to learn from the conversation.

(Target) Advance phase, in 3rd phase it will be able to provide the logical answers of the question various type of question after learning enough for what is needed during testing phases of the 1 and 2.

**Key Benefits to Narvik Municipality**

Lessening or eliminating the unnecessary human interaction to be handled by chatbots

The chatbot will assist to the user in an appropriate way that no human interaction is needed unless required then this can be overlapped by human agent.

**Future Enhancement Ideas**

I through recommendation system will be purposed that will identify user preferences and activities and purpose a recommendation relevant to it, also it will be multilingual with ability to respond in English and as well as Norwegian.

In addition to this a text to speech and image recognition or video analysis module could be used to identify the emotions and the weights of voice to distinguish between different ages or gender or people and adapt responses according to it.

**Reference**

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      2. <https://chatbotsjournal.com/25-chatbot-platforms-a-comparative-table-aeefc932eaff>
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**Appendix A**

Chatbot Journal Comparison Chart

Sample questions and data