Potential references:

**Abdul-Kader, S. A., and Woods, J. 2015. “Survey on Chatbot Design Techniques in Speech Conversation Systems,” IJACSA) International Journal of Advanced Computer Science and Applications, (6:7)**

-The Natural Language ToolKit (NLTK) is a set of modules, tutorials and exercises which are open source and cover Natural Language Processing symbolically and statistically. NLTK is used to split words in a string of text and separate the text into parts of speech by tagging word labels according to their positions and functions in the sentence. The resulting tagged words are then processed to extract the meaning and produce a response as speech or action as required.

-The Chatbot is a computer programme that mimics intelligent conversation. The input to this programme is natural language text, and the application should give an answer that is the best intelligent response to the input sentence.

-Writing a perfect Chatbot is very difficult because it needs a very large database and must give reasonable answers to all interactions

-Designing a Chatbot software package requires the identification of the constituent parts. A Chatbot can be divided into three parts: Responder, Classifier and Graphmaster (as shown in Figure. 1) [11], which are described as follows:

1) Responder: it is the part that plays the interfacing role between the bot’s main routines and the user. The tasks of the responder are: transferring the data from the user to the Classifier and controlling the input and output.

2) Classifier: it is the part between the Responder and the Graphmaster. This layer’s functions are: filtering and normalising the input, segmenting the input entered by the user into logical components, transferring the normalised sentence into the Graphmaster, processing the output from the Graphmaster, and handling the instructions of the database syntax (e.g. AIML).

3) Graphmaster: is the part for pattern matching that does the following tasks: organising the brain’s contents, storage and holding the pattern matching algorithms.

-SQL A Relational Data Base (RDB) is one of the techniques recently used to build Chatbot knowledge bases. The technique has been used to build a database for a Chatbot, i.e. to enable the Chatbot to remember previous conversations and to make the conversation more continuous and meaningful.

**Petter Bae Brandtzaeg(&) and Asbjørn Følstad “Why People Use Chatbots”**

**-** There is a growing interest in chatbots, which are machine agents serving as natural language user interfaces for data and service providers. However, no studies have empirically investigated people’s motivations for using chatbots.

**-** an online questionnaire asked chatbot users (N = 146, aged 16–55 years) from the US to report their reasons for using chatbots. The study identifies key motivational factors driving chatbot use. The most frequently reported motivational factor is “productivity”;

**A Chatbot for Psychiatric Counseling in Mental Healthcare Service Based on Emotional Dialogue Analysis and Sentence Generation -** [**Kyo-Joong Oh**](https://ieeexplore.ieee.org/author/38064975000)

**;**[**Dongkun Lee**](https://ieeexplore.ieee.org/author/37086141818)**;**[**Byungsoo Ko**](https://ieeexplore.ieee.org/author/37086090190)**;**[**Ho-Jin Choi**](https://ieeexplore.ieee.org/author/37277426500)

**-** we adapt various natural language processing (NLP) methods to analyze consult contents

- the service respond appropriately according to user's new inputs using natural language generation (NLG) methods

- At other times, the service suggest useful information to promote mental health, and recommend items for feeling bet-ter. At this time, the conversational service consider clinical psychological and ethical aspects.

**A Tool of Conversation: Chatbot M. Dahiya 2017**

- Chatbot recognize the user input as well as by using pattern matching, access information to provide a predefined acknowledgment.

- A chatbot is one of the simple ways to transport data from a computer without having to think for proper keywords to look up in a search or browse several web pages to collect information; users can easily type their query in natural language and retrieve information.

**CHATBOT IN PYTHON Akshay Kumar1, Pankaj Kumar Meena2, Debiprasanna Panda3, Ms. Sangeetha4 2019**

- Chatbots are programs that work on Artificial Intelligence (AI) & Machine Learning Platform.

- A chatbot is merely a computer program that fundamentally simulates human conversations

- functions through AI and machine learning has an artificial neural network inspired by the neural nodes of the human brain

- According to research, nowadays chatbots are used to solve a number of business tasks across many industries like E-Commerce, Insurance, Banking, Healthcare, Finance, Legal, Telecom, Logistics, Retail, Auto, Leisure, Travel, Sports, Entertainment, Media and many others.

- AIML and LSA are used for creating chatbots. Artificial Intelligence Markup Language (AIML) and Latent Semantic Analysis (LSA) are used for developing chatbots, which are used to define general pattern-based queries

- Extensible Markup Language (XML) is the base for the derivation of Artificial Intelligence Markup Language (AIML). It has a class of data object called an AIML object that describes the behavior of computer programs. It consists of units or tag called topics and categories. There each category consists of a pattern that contains input and template which contain the answer of chatbot based on queries.

- AIML represents the knowledge put into Chatbots and is based on the software technology developed for A.L.I.C.E

- The pattern tag identifies the input from the user and the task of template tag is to respond to the specific user input, these are the most frequent tags and the bases to design AIML Chatbots with an intelligent response to natural language speech conversations

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[**https://studio.carnegiemuseums.org/literature-review-chatbots-conversational-experiences-566de218f92a**](https://studio.carnegiemuseums.org/literature-review-chatbots-conversational-experiences-566de218f92a)

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[**https://www.frontiersin.org/articles/10.3389/fpsyg.2017.00796/full**](https://www.frontiersin.org/articles/10.3389/fpsyg.2017.00796/full)- mental health

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<https://www.codementor.io/@garethdwyer/building-a-telegram-bot-using-python-part-1-goi5fncay> - building chatbot python telegram

<https://www.cambridge.org/core/services/aop-cambridge-core/content/view/0ACB73CB66134BFCA8C1D55D20BE6392/S1351324916000243a.pdf/return_of_the_chatbots.pdf>

- Return of chatbots 2016

- Whether you call these things digital assistants, conversational interfaces or just chatbots, the basic concept is the same: achieve some result by conversing with a machine in a dialogic fashion, using natural language.

- Big Four: Apple’s Siri, Microsoft’s Cortana, Amazon’s Alexa and Google’s new Assistant – voice assistants plus many many more text based assistants

- Many see this technology as heralding a revolution in how we interact with devices

- interaction with technology using either natural language text or speech is becoming increasingly feasible, and potentially very significant.

<http://tmaa.com/specializeddigitalassistantsandbots.html> - generate global revenues of $7.9 billion in 2016, rising to $623 billion by 2020.

<http://www.pandorabots/> - world’s leading chatbot platform, claims 225 thousand developers, 285 thousand chatbots created, and over three billion interactions. N

<http://www.wsj.com/articles/facebook-hopes-chatbots-can-solve-app-overload-1460930220> - Mark Zuckerberg proclaimed that chatbots were the solution to the problem of app overload

<https://www.forbes.com/sites/kathleenchaykowski/2016/07/01/more-than-11000-bots-are-now-on-facebook-messenger/#191762494fd7>

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<http://www.scielo.org.mx/scielo.php?script=sci_arttext&pid=S1405-55462015000400625>

* Alice bot pattern matching

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V. Mateljan, D. Čišić and D. Ogrizović, "Cloud Database-as-a-Service (DaaS) - ROI," The 33rd International Convention MIPRO, Opatija, 2010, pp. 1185-1188.  
URL: <http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=5533641&isnumber=5533310>

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<https://www.reddit.com/r/MachineLearning/comments/3ukvc6/datasets_of_one_to_one_conversations/> - conversational dataset

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* Understanding User Interactions with a Chatbot: A Self-determination Theory Approach

<http://blogs.evergreen.edu/cpat/files/2013/05/Computer-Power-and-Human-Reason.pdf>

interesting read on why you should never make a mental health chatbot

<https://arxiv.org/pdf/1908.08835.pdf> - deep learning based chatbot models –

**recurrent encoder-decoder =** end-to-end trainable neural networks

This architecture was adapted from the neural machine translation domain

* seq2seq
* RNN
* Deep seq2seq

<https://www.youtube.com/watch?v=SJDEOWLHYVo> - end to end systems are what we should be striving for – train single dataset

* Need RNN recurrent neural net, feed back into input while training it

<https://blog.aimultiple.com/chatbot-analytics/> - useful resource for limitations/testing/frameworks etc

<https://arxiv.org/pdf/1809.02839.pdf> - training data DNN

<https://www.quora.com/What-are-chatbots>

* a stateful chatbot is able to review past interactions and frame new responses in context.
* stateless chatbot approaches each conversation as if it was interacting with a new user. In contrast,

<https://towardsdatascience.com/recreating-myself-from-whatsapp-chats-6dadfaff0d2b>

* whatsapp chats dataset

<https://towardsdatascience.com/e2e-the-every-purpose-ml-method-5d4f20dafee4>

end to end neural networks

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gogle meena bot – end to end neural network - Underneath Meena is the Transform Seq2seq foundation

<https://arxiv.org/pdf/2001.09977.pdf>

* human like open domain chatbot
* open domain v closed domain = engage in any convo (open), respond to keywords/intents (closed)
* examples of open domain bots – cleverbot/mitsuku
* supervised/unsupervised learning

<https://medium.com/@BhashkarKunal/conversational-ai-chatbot-using-deep-learning-how-bi-directional-lstm-machine-reading-38dc5cf5a5a3>

* deep learning based AI conversational bot

<https://github.com/PolyAI-LDN/conversational-datasets> - qa dataset amazon

When using these datasets in your work, please cite our paper, [A Repository of Conversational Datasets](https://arxiv.org/abs/1904.06472):

@inproceedings{Henderson2019,

author = {Matthew Henderson and Pawe{\l} Budzianowski and I{\~{n}}igo Casanueva and Sam Coope and Daniela Gerz and Girish Kumar and Nikola Mrk{\v{s}}i\'c and Georgios Spithourakis and Pei-Hao Su and Ivan Vulic and Tsung-Hsien Wen},

title = {A Repository of Conversational Datasets},

year = {2019},

month = {jul},

note = {Data available at github.com/PolyAI-LDN/conversational-datasets},

url = {https://arxiv.org/abs/1904.06472},

booktitle = {Proceedings of the Workshop on {NLP} for Conversational {AI}},

}

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* end to end model

<https://arxiv.org/pdf/1409.0473.pdf>

* nmt

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<https://www.aclweb.org/anthology/P17-2079.pdf> - A Sequence to Sequence and Rerank based Chatbot Engine

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* 10 min intro to seq2seq

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* TF sentiment analysis text classification
* Ready to use datasets – used movie corpus

<https://www.aclweb.org/anthology/N19-4011.pdf>

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* Recent advancements in NLP

<https://blog.aimultiple.com/chatbot-analytics/>

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<https://blog.aimultiple.com/chatbot/>

* What is a chatbot

<https://blog.aimultiple.com/chatbot-testing-frameworks/>

* Chatbot testing frameworks

<https://blog.aimultiple.com/chatbot-fail/>

* Chatbot failures

<https://medium.com/huggingface/how-to-build-a-state-of-the-art-conversational-ai-with-transfer-learning-2d818ac26313>

<https://github.com/huggingface/transfer-learning-conv-ai/blob/master/convai_evaluation.py>

* Creating state of the art AI conversational bot
* Few lines of persona
* Dialog history
* Utterances
* Generates reply
* **Transfer Learning**

start by pretraining a language model on a very large corpus of text to be able to generate long stretches of contiguous coherent text,

fine-tune this language model to adapt it to our end-task: dialog.

It’s a rather large dataset of dialog (10k dialogs) which was created by crowdsourcing *personality sentences* and asking paired crowd workers to *chit-chat* while playing the part of a given character (an example is given on the left figure).

The two most common decoders for language generation used to be **greedy-**decoding and **beam-search**.

**Greedy-decoding***-* each time step, we select the most likely next token according to the model until we reach end-of-sequence tokens. – risk= *highly probable* token may be hiding after a *low-probability* token and be missed.

***Beam-search***try to mitigate this issue by maintaining a beam of several possible sequences that we construct word-by-word. At the end of the process, we select the best sentence among the beams. Over the last few years, beam-search has been the *standard decoding algorithm* for almost all language generation tasks including dialog

several developments happened in 2018/early-2019. First, there was growing evidence that beam-search was strongly *sensitive to the length* of the outputs and best results could be obtained when the output length was *predicted* before decoding

greedy/beam-search decoding was replaced by ***sampling***from the next token distribution at each time step. These papers used a variant of sampling called ***top-k sampling***in which the decoder *sample only from the top-k most-probable tokens* (k is a hyper-parameter).

*beam-search* and *greedy decoding* fail to reproduce some distributional aspects of human texts as it has also been noted in the context of dialog systems:

<https://jalammar.github.io/illustrated-transformer/> - transformer model