Title : Chatbot – A technological aid to homoeopathy that can improve the homoeopathic prescription.

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ABSTRACT

INTRODUCTION

A "chatbot" is "a computer program or character (as in a game) designed to mimic the actions of a person to converse with human beings" being utilised in various industries, including business, e-commerce, education, entertainment, and health, as well as to mimic human interaction and appease people. In the medical industry, chatbots earlier were primarily used for solving queries related to health; for either finding the correct diagnosis or getting guidance correlating to the treatment. Now, these have transformed to be multilingual, apt for assessing the severity of the illness, recommending a physician, follow-up checks, support with prescriptions and dispensing complete guidance for dietary and lifestyle changes.

CHATBOT IN HEALTHCARE

Numerous chatbots have been designed by various countries, around the globe, during the COVID-19 pandemic, to safeguard their population against coronavirus infections. The foremost benefit of a medical chatbot is that it answers patients' medical difficulties in a chat and delivers a personalized recommendation based on the symptoms.

APPLICATIONS OF AI IN THE HOMOEOPATHIC FIELD

In Homoeopathy, AI has been employed in many ways including fuzzy expert systems and The System for Homeopathic Glaucoma Treatment (SEHO) expert systems (ES) to choose the best approach for treating visual disorders. KENBO, a true ES, records the complete symptoms of the patients and converts them immediately into rubrics from five available repertories. Vithoulkas Expert System, Anne Herscu Module, Paul Ortega Miasmatic Module, and Polarity Analysis are the various modules for case analysis in RADAROpus which also works on the line of AI.

CONCLUSION

The fundamentals, of the patient’s own words and emotions, have the maximum importance. This, if collaborated with technology, can reduce the physician's bias of interpretation to a great extent. Therefore, the need of the hour is to develop such a tool for homoeopathy, which can serve as a chatbot related to a particular repertory, and then, with help of machine learning or AI, can analyse by themselves the various signs and symptoms to be addressed, as described by the patient, and can then define or prescribe a simillimum for the patient or can aid the physician by providing him with a set of few remedies which can, in turn, be the simillimum for the patient.

Keywords: homeopathy, repertory, chatbot, AI

Chatbot – A technological aid to homoeopathy that can improve the homoeopathic prescription.

INTRODUCTION

Computers provide factual details that allure and benefit in many ways. According to Merriam-Webster, a "chatbot" is "a computer program or character (as in a game) designed to mimic the actions of a person to converse with human beings." A chatbot is a program designed to simulate intelligent conversation in a text or speech. These systems can learn on their own and recover their learning using human aid or web resources. It uses Natural Language Processing (NLP) and sentiment analysis to communicate in human language with users or other chatbots via text or voice. The question-and-answer-based protocol is infrequently used in a chatbot for user queries. The "artificial intelligence" (AI) term is applied when a machine imitates "cognitive" functions such as "learning" and "problem-solving" that are associated with human minds. This gives the computer/program the supreme power to emulate the human way of thinking and behaving.

CHATBOT IN HEALTHCARE

Chatbots are primarily text-driven. They possess iconography and comprehensible widgets that simplifies the interaction with a bot simple. Chatbots are being utilised in various industries, including business, e-commerce, education, entertainment, and health, as well as to mimic human interaction and appease people [1]. The current e-healthcare structure entails a complex interaction with humans and machines. An alternative chat interface to act and communicate with patients as if they were humans, should be configured and developed.

Chatbots are classified into two types based on how they respond: non-intelligent and intelligent chatbots. Those that use predefined human-written dialogue flows are non-intelligent whereas intelligent AI chatbots use machine learning or NLP [2]. Rule-based chatbots primarily count on linguistic rules and pattern-matching techniques to determinate learnings and responses and operate algorithms that either are manually created or precedent as decision-makers. The disadvantage of these chatbots is that they are domain dependent. They rely on manually devised rules for respective domains and so are duly rigid. In addition, they are brittle, extremely domain-specific, and difficult to apply to different problems. Chatbots run by AI use machine learning algorithms. They reciprocate based on the data supplied and constantly comprehend and enhance the extant learning models. Before 2010, rule-based chatbots dominated the market which then was replaced by AI-based chatbots as advanced technology started to gain ground. [3,4] In the medical industry, until lately, chatbots were primarily used for queries related to health, where different concerns and circumstances are submitted, for either finding the correct diagnosis or getting guidance correlating to the treatment. Their conditions are predicted based on their clinical symptoms based on matching the symptoms. Now, these

models have transformed and these existing chatbots have evolved to be multilingual, apt for assessing the severity of the illness, recommending a physician, follow-up checks, support with prescriptions and dispensing complete guidance for dietary and lifestyle changes. The algorithm maintains records of previous responses and progressively analyse with more in-depth questions to make an accurate diagnosis. [5–8]

Chatbots help to assess the health condition by simply documenting the indications or testing of an ECG. It allows the user to extrapolate the question. They can even test the solution provided with the prescribed uses and therapeutic composition. It helps them to decide on measures for appropriate care with the analysis from artificial intelligence. An idea was proposed where the AI could predict diseases based on the symptoms and provide the index of available treatments. Periodically, if a person's body is analyzed, it is possible to anticipate any potential threat even before they initiate any damage to the body. [9]

The chatbot device performs simple diagnoses on diabetic patients and acts as a virtual diabetes doctor. The chatbot uses the parameter called Vpath to recall the prior dialogue that corresponds with the whole discussion for diagnoses as a virtual diabetes doctor. [10]

This chatbot aims to make a conversation between humans and machines. Here the system stores the knowledge database to identify the sentence and make a decision to answer the question. The input sentence will get the similarity score of input sentences using bigram. The chatbot knowledge is stored in Relational Database Management System. [11]

The foremost benefit of a medical chatbot is that it answers patients' medical difficulties in a chat and delivers a personalized recommendation based on the symptoms. The Chatbot is devised to convey medication as an age-dependent pharmaceutical dosage for the patient. A dedicated device to answer all medication queries is designed. Effective Illness Diagnosis Based on Symptoms is simple to operate for a safer presence established on feedback and learning [2].

Numerous chatbots have been designed by various countries, around the globe, during the COVID-19 pandemic, to safeguard their population against coronavirus infections. These addressed various issues like complaints and symptom analysis, some spread the word for prevention, and a few like the WHO nCOV-19 Launched Bot updated the daily cases for fresh new cases, recovered cases and those also who succumbed to death. In India, the Aarogya Setu application was designed to boost awareness of nCOV-19 with the help of a chatbot [12]

APPLICATIONS OF AI IN THE HOMOEOPATHIC FIELD

In Homoeopathy, AI has been employed in many ways including fuzzy expert systems and The System for Homeopathic Glaucoma Treatment (SEHO) expert systems (ES) to choose the best approach for treating a visual disorder. [13] ES provides information about potentially less effective medications and the patient's symptoms that an individual physician would treat. The prototype system has usable Braille adaptions for the utilization of ES by blind people. [14]

Homoeopathic ES was designed using neural network-based technology and concept theory which could also diagnose a patient based on their guiding symptoms. It could determine the homoeopathic medication for patients with allergic illnesses and syndromes. [15,16]

KENBO, a true ES, records the complete symptoms of the patients and converts them immediately into rubrics from five available repertories. [17] It determines the dominant symptom of the case and accordingly proposes the reportorial approach. It determines from one among Kent's approach, Boeninghausen's-Boger's approach, and Regional approach. Then the simillimum for the case is proposed established on the results of repertorization, the dominance of miasm, the constitution of the individual and the affinity of the potential drug. Along with the simillimum, its corresponding potency and repetition are also suggested. The ES also involves in the decision for the second prescription according to Kent's 12 Observations and Hering's Law of Cure.

With polarity analysis, advanced development in Boenninghausen's concept of contraindications was verified and introduced. This delivers a more accurate possibility of simillimum by the process of repertorisation. Coupled with various checklists and questionnaires, there was an increase in simillimum by 22% in acute diseases and 16% in chronic diseases. An average improvement rate of 9% was observed in chronic disease. [18]

A modern epidemiological tool for defining the keynote symptoms of medicine is the Likelihood ratio (LR) which calculates the prior and posterior probability of the effectivity of medicine in presence of a certain symptom. LR and statistical probabilities may not eliminate but can still minimize bias and may validate rubrics and medicines in any particular repertory.

When an analysis of 2039 prescriptions was done for thermal relations with 4715 for desires/aversions for specific food items it was observed that a single patient might have a desire/aversion for multiple food items. But on the contrary, a comparison with Kent's repertory revealed discrepancies. This has led to initiatives for refining and standardizing the homoeopathic literature. A new task for modifying Kent's and Boenninghausen's repertories has begun by introducing LR and polarity analysis. [19–21]

RADAROPUS, the most extensively used Knowledge-Based Expert System in the field of homoeopathy, is focused on the simillimum selection and includes four-way deduction approaches for rating homoeopathic medications. It encompasses multiple features like different rubric-analysis methods, quick reference remedy keynote, a database option for a personal materia medica collection, and the ability to extract information about a drug. This KBES is rapid and flexible. [22,23] The recent introduction of Encyclopaedia Homeopathica (EN), delivers comprehensive literature of varied sources of books and materia medica along with a "help" section for quick and assisted information. Vithoulkas Expert System, Family Finder, Anne Herscu Module, Paul Ortega Miasmatic Module, Polarity Analysis Energetic Remedy Picture are the various modules for case analysis is another unique feature of RADAROpus which also works on the line of AI. [24]

The simillimum via repertorization always is based on the choice of rubrics selected in any particular case. The rubrics contain expressions which can be regarded as fuzzy, such as ‘never’, ‘sometimes’, ‘always’, etc., causing difficulty in dealing with traditional computational approaches. There is a necessity for a decision tree system for selecting the simillimum in Homoeopathy aided with the application of a Fuzzy Expert System. Fuzzy set theory in expert systems is an intriguing route to handle the illustration of inaccurate medical entities. It downsizes the sensitivity of the system to the mistakes that a homoeopath makes and increases the security of the system. With the emphasis laid on the terms and expressions of the patient in Homoeopathy making it very sensitive, a fuzzy expert system for the proper selection of remedy is proposed. [25,26]

A homoeopathic medical diagnosis system using multi-agent system (MAS) technology has been suggested wherein the patient's symptoms are monitored and analysed to determine the disease and then create a fitting prescription for each patient. [27]

Using the concept of an internal "engine" that can access the cases, their repertorization, and the prescribed medications an ongoing dynamic materia medica and a dynamic repertory that can be constantly built and shaped from the wealth of clinical information that is readily available online is proposed which can enhance the success of simillimum prescription and cure/relief rates. [28]

CONCLUSION

The work done herewith in the field of chatbots in the healthcare sector does certainly pave a way for its application in the field of alternative medicine of Homoeopathy. There has been numerous research indicative of the change and upliftment of the homoeopathic repertory while working hand in hand with AI and technology. Despite all this the main core of homoeopathy lies in its patients. The basic fundamentals, of the patient’s own words and emotions, have the maximum importance. This, if collaborated with technology, can reduce the physician's bias of interpretation to a great extent. The right interpretation of the word, feelings and emotions is a must and that can be best explained by the one suffering. Therefore, the need of the hour is to develop such a tool for homoeopathy, which can serve as a chatbot related to a particular repertory, and then, with help of machine learning or AI, can analyse by themselves the various signs and symptoms to be addressed, as described by the patient, and can then define or prescribe a simillimum for the patient or can aid the physician by providing him with a set of few remedies which can, in turn, be the simillimum for the patient.

REFERENCES

1. Adamopoulou E, Moussiades L. Chatbots: History, technology, and applications. *Mach Learn with Appl*. 2020;2:100006. doi:10.1016/j.mlwa.2020.100006

2. Bulla C, Parushetti C, Teli A, Aski S, Koppad S. A Review of AI Based Medical Assistant Chatbot. *HBRP Publ*. 2020;3(2):1-14. doi:10.5281/ZENODO.3902215

3. Caldarini G, Jaf S, McGarry K. A Literature Survey of Recent Advances in Chatbots. *Inf*. 2022;13(1):41. doi:10.3390/info13010041

4. Maroengsit W, Piyakulpinyo T, Phonyiam K, Pongnumkul S, Chaovalit P, Theeramunkong T. A survey on evaluation methods for chatbots. In: *ACM International Conference Proceeding Series*. Vol Part F1483. Association for Computing Machinery; 2019:111-119. doi:10.1145/3323771.3323824

5. Rarhi K, Bhattacharya A, Mishra A, Mandal K. Automated Medical Chatbot. *SSRN Electron J*. Published online July 20, 2018. doi:10.2139/ssrn.3090881

6. Dharwadkar R, Deshpande NA. A Medical ChatBot. *Int J Comput Trends Technol*. 2018;60(1):41-45. doi:10.14445/22312803/ijctt-v60p106

7. Habib FA, Shakil GS, Iqbal SSM, Sajid STA. Self-Diagnosis Medical Chatbot Using Artificial Intelligence. In: *Journal of Web Development and Web Designing*. Vol 3. ; 2021:587-593. doi:10.1007/978-981-15-6707-0_57

8. Luz MT, De Camargo KRJ. A Comparative Study of Medical Rationalities. *Curare J Ethnomedicine*. 1997;12:1-22. Accessed December 4, 2022. www.irjet.net

9. Madhu D, Jain CJN, Sebastain E, Shaji S, Ajayakumar A. A novel approach for medical assistance using trained chatbot. In: *Proceedings of the International Conference on Inventive Communication and Computational Technologies, ICICCT 2017*. Institute of Electrical and Electronics Engineers Inc.; 2017:243-246. doi:10.1109/ICICCT.2017.7975195

10. Lokman A, Zain J. Designing a Chatbot for diabetic patients. In: *International Conference on Software Engineering & Computer Systems (ICSECS'09)*. ; 2019:19-21.

11. Setiaji B, Wibowo FW. Chatbot Using a Knowledge in Database: Human-to-Machine Conversation Modeling. In: *Proceedings - International Conference on Intelligent Systems, Modelling and Simulation, ISMS*. ; 2016:72-77. doi:10.1109/ISMS.2016.53

12. Battineni G, Chintalapudi N, Amenta F. AI Chatbot Design during an Epidemic Like the Novel Coronavirus. *Healthc (Basel, Switzerland)*. 2020;8(2). doi:10.3390/HEALTHCARE8020154

13. Parajiya T, Farkunde T, Popat MK, Professor A. A Survey on Applications of AI in Homeopathy. *Int J Adv Res Sci Commun Technol (IJARSCT*. 2022;2(3). doi:10.48175/568

14. Alonso-Amo F, Grmez A, Lopez Gomez G, Montes C. 0957-4174(94)E0001-B An Expert System for Homeopathic Glaucoma Treatment (SEHO). *Expert Syst Appl*. 1995;8(1):89-99.

15. Sarker G, Nasipuri M, Basu DK. A New Expert System on Homoeopathy using Concept Theory based Rule Induction. *http://dx.doi.org/101080/02564602199611416570*. 2015;13(1):17-20. doi:10.1080/02564602.1996.11416570

16. Yessin S V., Pet'ko AP. Neural Net-Based Homeopathic Treatment Selection Method in Fevers with Drug Allergies. *Homœopathic Links*. 2006;19(02):90-91. doi:10.1055/S-2006-923822

17. Xavier Cabre-Playa. Kenbo. Hpathy. Published February 16, 2006. Accessed December 7, 2022. https://hpathy.com/software/kenbo-reviewed-by-xavier-cabreplaya/

18. Frei H. Polarity analysis, a new approach to increase the precision of homeopathic prescriptions. *Homeopathy*. 2009;98(1):49-55. doi:10.1016/J.HOMP.2008.10.002

19. Rutten ALB, Stolper CF, Lugten RFG, Barthels RWJM. Statistical analysis of six repertory rubrics after prospective assessment applying Bayes' theorem. *Homeopathy*. 2009;98(1):26-34. doi:10.1016/J.HOMP.2008.11.012

20. Rutten ALB, Frei H. Opposite repertory-rubrics in Bayesian perspective. *Homeopathy*. 2010;99(2):113-118. doi:10.1016/J.HOMP.2010.02.002

21. Kharal A. Homeopathic drug selection using Intuitionistic fuzzy sets. *Homeopathy*. 2009;98(1):35-39. doi:10.1016/J.HOMP.2008.10.003

22. Homeopathy Software Online | Homeopathic Repertory | RadarOpus. Accessed December 12, 2022. https://www.radaropus.com/

23. Fichefet J. Computer-aided homœopathy. *Br Homeopath J*. 1991;80(1):34-38. doi:10.1016/S0007-0785(05)80421-1

24. Flowers B, Luis DL. RADAROPUS-FULL LIBRARY-ENGLISH Repertories.

25. Shiry Ghidary S. Remedy Selection based on Artificial Intelligent Methods. *Int J Comput Appl*. 2011;19(9):975-8887.

26. Pawar AR, Kini SN. Artificial Intelligence For Homeopathic Remedy Selection.

27. Chakraborty S, Gupta S. A novel Multi Agent System based Homeopathic Medical Diagnosis System. *CALCON*. Published online 2014:1-4.

https://www.academia.edu/11488573/A_novel_Multi_Agent_System_based_Homeopathic_Medical_Diagnosis_System

28. A call for a new concept of homeopathic software – Dynamic homeopathic software. - תגורי יוסי. Accessed December 7, 2022. https://ytagori.com/blog/dynamic-repertory/