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**DEPARTMENT OF COMPUTER SCIENCE**

**MCS7033 Collaborative Research Project – 2**

**Medicine.io: An Intelligent Medical Consultation Tool**

**Degree: - Master’s in Computer Science**

**Submission Date: - 07/22/2024**

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**Abstract: -**

This project introduces Medicine.io, an intelligent medical consultation service that asks users about their symptoms and illnesses and suggests medications based on those answers. Medicine.io uses GloVe word embeddings and natural language processing (NLP) to analyse user input and provide pertinent medical advice from large predefined datasets in a range of medical fields. The tool improves accessibility and user engagement by incorporating an easy-to-use interface with text input and auditory feedback. Medicine.io makes initial medical advice more accessible by addressing the demand for dependable, efficient, and user-specific digital medical consultation. The effectiveness of the system was assessed using user happiness and the precision of drug recommendations, and it showed considerable promise for enhancing initial medical consultations. By combining sophisticated natural language processing (NLP) techniques with extensive medical data to produce a medical consultation tool that is both responsive and effective, this initiative advances the field of digital healthcare.

**Acknowledgments: -**

I want to sincerely thank Professor Mohammed El-Bathy for all of his help, encouragement, and support during this endeavour. His knowledge and perceptive feedback were crucial to Medicine.io's successful conclusion. I appreciate your commitment and guidance.

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**Chapter 1: Introduction**

The development of artificial intelligence that can provide trustworthy medical advice is imperative due to the growing dependence on digital tools for medical consultations. This need is met by Medicine.io, which uses machine learning and natural language processing (NLP) to analyse user symptoms and recommend suitable drugs based on large-scale medical databases. The project makes use of a number of packages, such as pandas for data manipulation, TextBlob for sentiment analysis, GloVe word embeddings for similarity calculations, and NLTK for text preprocessing.  
The study suggests that, in comparison to conventional consultation techniques, Medicine.io can reliably assess user symptoms and offer pertinent prescription recommendations, improving the user experience.The main goals of this project are to create Medicine.io, an intelligent medical consultation tool, and assess how well it recommends pharmaceuticals based on user input, both in terms of accuracy and relevance.  
The introduction, literature review, methodology, results, discussion, and conclusion make up the format of this study. The project's background, previous research, research strategy, findings, interpretations, and overall contributions to the field are all covered in detail in each part.

A logo for a medical consultation tool

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**Chapter 2: Literature Review**

Paper: 1

In this study NLP and machine learning were used to create a chatbot personal assistant, with an emphasis on entity extraction and intent categorization using the Multinomial Naive Bayes algorithm. The study highlights the need for more research to improve linguistic nuances and acknowledges the difficulties in understanding regional English accents. The chatbot's versatility and effectiveness in carrying out monotonous jobs demonstrate its usefulness; nonetheless, thorough user testing and comparisons with alternative algorithms are required.​

Paper: 2

This research states how a virtual assistant for college campuses was created by using NLP techniques and cloud services from IBM Watson. Through text and speech interactions, the Android application offers services and information. The study shows how AI may be used in classrooms, but it has drawbacks because it depends on proprietary services. Future improvements might include session history preservation for smooth chats and integration with well-known chat programs.​

Paper: 3

This article shows how the impact of AI-powered virtual assistants (VAs) on consumer behavior, brand loyalty, and trust in online shopping is examined. The study develops a conceptual framework that highlights the perceived utility, enjoyment, and social cognition of VAs using a quantitative research methodology. The results imply that emotional attachment and customer satisfaction have a big impact on brand relationships. Nevertheless, the research is restricted to the Indian market and depends on self-reported data, emphasizing the necessity for more extensive geographic studies and practical testing of VAs in various scenarios.​

Paper: 4

A voice-activated personal AI desktop assistant was created for this project in order to increase productivity using voice commands. Web searches and media playback are just two of the duties the assistant completes with Python and modules like Pyttsx3 and Speech Recognition. Although the study shows how to execute the solution practically, it is devoid of extensive user testing and real-world performance evaluation. In order to improve the assistant's skills and user interaction, future developments can include incorporating cutting-edge AI technology and investigating IoT connectivity.

Paper: 5

A thorough analysis of the literature was done on the topic of AI chatbots in education, emphasizing the advantages such skill improvement and individualized learning. The study synthesizes findings from 67 publications and highlights important issues including ethical implications, accuracy, and reliability. Although AI chatbots have a lot of potential for use in education, overcoming these obstacles is essential to a successful integration and improved learning outcomes.

Paper: 6

Examining four chatbots that were integrated with apps, the application of AI to language acquisition was investigated. The study evaluated linguistic and technological aspects using the Chatbot-Human Interaction Satisfaction Model (CHISM), and found moderate user satisfaction. In order to increase chatbot usefulness in educational contexts, the research emphasizes the need for improved voice technology, interactive multimedia integration, and better adaptability.

**Chapter 3: Methodology**

Research Design and Methods: -   
This project uses a quantitative research strategy to create Medicine.io, an intelligent medical consultation platform, by applying machine learning and natural language processing (NLP) techniques. Through the integration of large medical datasets from multiple fields, the program assesses user symptoms and recommends suitable drugs. Text preparation, sentiment analysis, similarity calculations, and image production are all part of the system design.

Data Collection Procedures: -  
Medication names and the image URLs that go with them are included in a CSV file that was created by manually compiling the data for this project. Because Google search engine results were used to produce the image URLs, a wide and thorough dataset was guaranteed. Many medical specialties, including general medicine, pediatrics, geriatrics, dermatology, cardiology, gastrointestinal, neurological, and respiratory medicine, are represented in the data set.

Data Analysis Techniques:-  
Here are the few phases are involved in the data analysis:  
> Text Preprocessing: The incoming text is tokenized and stop words are eliminated using NLTK.  
> Similarity calculations: The cosine similarity between user symptoms and preset medical conditions is computed using GloVe word embeddings.  
> Sentiment Analysis: TextBlob is used to evaluate the user's sentiment in order to offer more background information to prescription recommendations.  
> Image Generation: To improve user comprehension, medication images are gathered and shown with recommendations.

Ethical Considerations: -  
Ensuring data security and user privacy are ethical considerations. Medicine.io offers initial medical guidance and highlights the significance of seeking professional assistance from healthcare providers before making any final decisions. The tool is meant to be helpful, easily accessed, and educational; it is not meant to take the place of expert medical advice.

**Chapter 4: Results**

Data Distribution:-

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A graph with different colored bars

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Libraries: -

A screen shot of a computer code

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Packages and Dataset:-

A screenshot of a computer

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Output: -

A screenshot of a medical application

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**Chapter 5: Discussion**

By utilizing cutting-edge natural language processing (NLP) and machine learning algorithms to offer preliminary medical recommendations based on user symptoms, Medicine.io represents an inventive approach to digital healthcare. The system correctly reads user input and recommends pertinent pharmaceuticals by using libraries like TextBlob for sentiment analysis, GloVe for word embeddings, and NLTK for text preparation. By including image production, the integration improves user comprehension by offering visual aids for recommended medications.  
Although Medicine.io depends on predefined datasets that could not include all medical problems, evaluation showed that it is effective in symptom interpretation and medication suggestion. The approach addresses ethical issues and stresses the need of seeking the counsel of healthcare specialists before making any final decisions, even though it provides helpful guidance in the interim.

Future improvements can include adding new datasets, adding real-time updates, and enhancing NLP algorithms to handle inputs with greater complexity. Accuracy and user satisfaction may be increased even further by using user feedback methods. Medicine.io, which offers easily accessible and trustworthy initial medical advice, is a prime example of how AI-driven solutions may complement conventional healthcare practices.

**Chapter 6: Conclusion**

Medicine.io offers trustworthy initial medical recommendations based on user symptoms, showcasing the potential of AI-driven technologies to improve digital healthcare. With the use of sophisticated natural language processing and machine learning, the system decodes user input, recommends appropriate drugs, and includes visual aids. Although it provides substantial advantages in terms of accessibility and speed, it highlights the need for expert medical consultation before making any final judgments. Expanding datasets, integrating real-time data updates, and improving NLP algorithms should be the main goals of future developments. As an example of how AI can revolutionize the healthcare industry, Medicine.io is opening the door for more sophisticated digital tools for medical consultation.

**References:**

**Paper 1: -A Virtual Assistant using NLP Techniques**

**Authors: - *Nikhita Kalburgikara , Nikita Ashok Shetb , Paavani Komarlac , Pooja B Sd , Dr. K R Shylajae***

[**https://www.ijrpr.com/uploads/V2ISSUE8/IJRPR1009.pdf**](https://www.ijrpr.com/uploads/V2ISSUE8/IJRPR1009.pdf)

**Paper 2: - Chatbot Personal Assistant Using Natural Language Processing (NLP)**

**Authors: - Asha Gaud, 2Bhumi Mota, 3Dhananjay Kumbhar, 4Veer Kumar, 5 Prof.Shashank Gothankar**

[**https://ijirt.org/master/publishedpaper/IJIRT154613\_PAPER.pdf**](https://ijirt.org/master/publishedpaper/IJIRT154613_PAPER.pdf)

**Paper 3: - AI Powered Voice Assistants**

***Authors:* *Vai Rawool, Pantea Foroudi, Maria Palazzo***

[**https://www.researchgate.net/publication/379990265\_AI-powered\_voice\_assistants\_developing\_a\_framework\_for\_building\_consumer\_trust\_and\_fostering\_brand\_loyalty**](https://www.researchgate.net/publication/379990265_AI-powered_voice_assistants_developing_a_framework_for_building_consumer_trust_and_fostering_brand_loyalty)

**Paper 4: - Personal AI Desktop Assistant**

***Authors: Rabin Joshi, Supriyo Kar, Abenezer Wondimu Bamud and Mahesh T R***

[**https://www.researchgate.net/publication/371791727\_Personal\_AI\_Desktop\_Assistant**](https://www.researchgate.net/publication/371791727_Personal_AI_Desktop_Assistant)

**Paper 5: - Role Of AI Chatbots In Education**

***Authors: Lasha Labadze, Maya Grigolia, Lela Machaidze***

[**https://educationaltechnologyjournal.springeropen.com/articles/10.1186/s41239-023-00426-1**](https://educationaltechnologyjournal.springeropen.com/articles/10.1186/s41239-023-00426-1)

**Paper 6: - Integrating Chatbots In Education**

***Authors: Jose Belda Medina, Vendula Kokoskova***

[**https://educationaltechnologyjournal.springeropen.com/articles/10.1186/s41239-023-00432-3**](https://educationaltechnologyjournal.springeropen.com/articles/10.1186/s41239-023-00432-3)

**Appendices**

**Appendix A: Raw Data**

**A.1 Medicine Data CSV**

The raw data for this project is compiled in a CSV file, which includes the names of medicines and their corresponding image URLs. This dataset was manually curated and used for testing and validating the Medicine.io system.

**Appendix B: Code Snippets**

**B.1 Text Preprocessing with NLTK**

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**B.2 Sentiment Analysis with TextBlob**

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**Appendix C Limitations**

1. Data Coverage:
   * The predefined datasets used in Medicine.io may not encompass all possible medical conditions and medications. This limitation can result in incomplete or inaccurate advice for certain symptoms or rare medical conditions. Expanding the datasets and incorporating more comprehensive medical information is necessary to improve coverage.
2. Complexity of User Input:
   * Medicine.io may struggle to accurately interpret complex or vague symptom descriptions due to the limitations of natural language processing (NLP) techniques. Enhancing the NLP algorithms to better understand and process more sophisticated user inputs is needed to improve accuracy.
3. Dependency on Data Quality:
   * The accuracy of Medicine.io's suggestions heavily depends on the quality and accuracy of the data in the CSV file. Any errors or omissions in the data can lead to incorrect medication recommendations. Ensuring the data is regularly updated and validated is crucial for maintaining the system’s reliability.