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Research Article

DocGPT: Impact of ChatGPT-3 on Health Services as a Virtual Doctor

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Abstract

The ChatGPT-3 (Generative Pretrained Transformer 3) is the third iteration of OpenAI's popular language model. It was released in 2020 and is considered one of the most advanced large language models (LLM). It is being trained to retrieve massive amounts of text data from the Internet, making it capable of generating human-like text and performing various Natural Language Processing (NLP) tasks such as text completion, summarization, translation, and more. Whereas ChatGPT-3 is a conversational AI language model based on OpenAI's ChatGPT-3 model and recently released on November 30, 2022. NLT-based ChatGPT-3 has been widely used in various industries, including health and medical sciences. Since the introduction of ChatGPT-3, opinions on the matter have been divided, with some people criticizing it and others welcoming it. In this paper, we explored the potential application of ChatGPT-3 in the health industry. First, we extracted the content provided by the Chatbot about the application of NLP, the potential benefits of health services and types of Internet of Orthopedic Things (IOT). Then is evaluated through a literature review for confirmation of contents. Based on the limited available literature, ChatGPT-3 can become Virtual Doctor (DocGPT).

Keywords: *Natural Language Processing (NLP); Health Sciences; Telemedicine; Virtual Doctor*

Abbreviations

GPT: Generative Pre-trained Transformer; NLP: Natural Language Processing; IoT: Internet of Things; IoOT: Internet of Orthopedic Things; IOT: Internet of Orthopedic Things; USMLE: U.S. Medical Licensing Examination; EHR: Electronic Health Record; LLM: Large Language Model

Introduction

The first and second Generative Pre-trained Transformer (GPT) based on Natural Language Processing (NLP) technology, concerned with the interactions between computers and human language, were introduced in 2018 and 2019. However, the paper related to the current Chatbot, the third GPT (ChatGPT-3), was published in 2020, followed by its release on November 30, 2022, by OpenAI researchers, which is an autoregressive language model that uses deep learning to produce human-like text and speech [1,2]. The NLP is increasingly important in medicine and healthcare, which helps analyze notes and text in electronic health records [3]. Novel technologies are continu-

ally being resisted in the beginning and "Why do people resist new technologies? History might provide the answer". The question was raised and left for history to decide by researchers [4]. Since its trial launch, appraisal, as well as criticism, is there too. Every day, there is a different story:

- Learning Tool or Threat? How a Texas College is Eyeing New AI Program and allowing its bite to avoid as a forbidden fruit [5].
- Was listed as an author on research papers: but many scientists disapproved [6].
- Is Making Universities Rethink Plagiarism [7].
- Has the potential to revolutionize the healthcare industry through natural language processing (NLP) technology by analyzing patient notes, medical journals, research articles, virtual assistants, generating medical reports, documentation and drug discoveries [8].
- Is an excellent tool for bioinformatics (for generating natural language descriptions of genetic data) and biomedical research (for data extraction, literature review, predictive modeling) and mining of biomedical data [9].
- In health care, pharma's latest digital health deal, and long-awaited diabetes tech to get attention, the sensational media stories [10].
- Is expected to disrupt the NHS [11].
- To index clinical research documents and future generation of clinical applications - probably still a few years away from being deployed at the point-of-care - that fully leverage its language-generating capabilities [12].
- And USMLE "Here come the robot doctors" After passing all three parts of the U.S. Medical Licensing Examination by Chatbot, researchers claim that we are moving from "Dr. Google" to "Dr" [13].
- Mental Health and: Mental health experts are concerned that help seekers may be disappointed or misled and even compromise their privacy by confiding in the Chatbot [14].
- And Alzheimer's disease: Researchers claimed that it could identify clues from spontaneous speech that are 80% accurate in predicting the early stages of dementia [15,16].
- And authentic research: The tool can write medical research abstracts that can fool scientists: According to a study, medical researchers could not tell the difference between original research paper abstracts and those fabricated by using [17].
- And absolute virtual physicians (DocGPT) and hospitals: The new concept of Virtual Presentia (VIP) and Virtual Absentia (VIA) Specialist Hospitals leading to Absolute Hospitals was predicted [18]. will likely lay down the foundation of Absolute Virtual Physicians and Hospitals.
- And the Hidden Bias of Language Models, If new AI programs like and LensaAI continue to reflect racist and sexist beliefs, how much can we trust them? [19]. Similarly, critiques found that it needs to tell the truth about itself and have it never been told the truth by its creator, OpenAI? [20].
- Will have huge implications on how researchers work and likely to revolutionize research practices and publishing, bring diversity, accelerate the innovation process, and shorten time-to-publication by helping people to write fluently. Degrading in the quality and transparency of research are potential risks. Researchers think using this technology is inevitable; therefore, banning it will not work [21].

Materials and Methods

OpenAI provided ChatGPT-3 was used throughout the paper to generate content about its application in the provision of health services in general, followed by types of Internet of Orthopedic Things (IOT) by hitting ten times its icon "regenerate response" for more information. Later summaries of all types of IOT were extracted and counter-confirmed by a literature review with relevant citations.

Material collected through ChatGPT-3 remained un-cited in the paper to avoid confusion and repetition, but other scientific literature retrieved was cited appropriately.

is a specific implementation of NLP and is a pre-trained language model developed by OpenAI., NLP is a broad field of study in AI, while is a specific tool developed for NLP tasks such as conversational AI. Therefore, if the literature review confirms the application of NLP, then indirectly, has similar potential., ChatGPT-3 is the branch of NLP and has similar potential but is faster when it comes to human-like text.

The following three questions with an additional three sub-question we asked to ChatGPT-3 and duplication was removed:

1. What are the applications of natural language processing (NLP)?
2. What will be the impact on health services?

   We asked additional questions about it too.

   - Where was cited as a co-author?
   - Where was cited in scientific journals?
   - Can we use ChatGPT as a reference in the scientific journal?
3. What is the internet of orthopedic things (IOT) and its classification?

Results and Discussion

What are the applications of natural language processing (NLP)?

Natural language processing (NLP) has several applications in the healthcare industry. Some notable uses of NLP in healthcare include the data processed, compiled and confirmed with scientific literature and refereed with citations:

1. **Clinical document analysis:** NLP extracts relevant information from unstructured clinical documents such as patient medical records, doctor notes, and discharge summaries [22].
2. **Sentiment analysis:** NLP is used to determine the emotional tone of patient feedback, helping healthcare providers understand how patients feel about their care [23].
3. **Diagnosis assistance:** NLP can help doctors to diagnose illnesses by analyzing large amounts of data, including symptoms, medical history, and lab results [24].
4. **Medication management and prescription extraction from clinical notes:** NLP can ensure healthcare providers that patients receive the correct medication at the right time by analyzing electronic prescriptions and medical records [25].
5. **Clinical trial recruitment:** NLP can help in patient-matching patients for appropriate clinical trials by analyzing their medical records and history [26].
6. **Public health surveillance:** NLP can monitor and analyze extensive data to detect and respond to outbreaks of infectious diseases [27].
7. **Medical coding and billing:** NLP can be used to automate the process of assigning codes to diagnoses and procedures for insurance reimbursement [28].
8. **Drug and treatment recommendations:** NLP can analyze patient data and medical literature to provide personalized drug and treatment recommendations for healthcare providers. Only those healthcare providers who will be resistant and refuse to work with AI lose their jobs over time. AI systems will not replace human clinicians but will augment their efforts to care for patients. AI can perform healthcare tasks as well or sometimes better than humans [29].

9. **Clinical decision support and virtual assistants:** NLP algorithms can analyze patient data to provide medical professionals with real-time, evidence-based recommendations for diagnosis and treatment. The NLP-based clinical decision support (CDS) system was satisfactory in post-colonoscopy patient follow-up and scheduling [30].

The use of NLE for various clinical applications is for COVID-19 question-answering systems, electronic health records (EHRs), mental health, understanding of health behaviors, surveillance, and outbreak prediction systems, fighting misinformation, knowledge transfer, and other clinical applications. NLP assists medical professionals in enhancing the precision and effectiveness of patient care, clinical research data, and medical diagnosis and treatments [31].

What will be the impact of ChatGPT and health services?

Here is a summary of the OpenAI chatbot response: As a language model, can be used in a variety of ways to enhance the provision of healthcare services, such as triage, clinical features, and appointment scheduling, medical coding and documentation, drug discovery, medical research, and medical education, while also increasing efficiency, lowering costs, and improving patient satisfaction [32].

When questioned about its function as a co-author, non-self, and self-citation in scientific literature, it provided the following information.

- **Where was cited as a co-author?** The reply was that had not been cited as a co-author in any published research or articles as it is a machine-learning model and not a human researcher. Similarly, in reply to another question? Stokel-Walker (2023) claimed that is listed as an author on research papers: but many scientists disapprove [6]. Both findings are contradictory to each other.
- **Where is cited in scientific journals?** "I am sorry and I could not find any scientific journal which cited ChatGPT. Please provide more information about the context in which you are looking for this citation". However, this is not a fact. Recently Biswas (2023) claimed in a paper titled "and the future of medical writing" that this is a powerful tool that could assist human writers in some tasks [33].
- **Can we use ChatGPT as a reference in the scientific journal?** Yes, it is possible to use it as a reference in a scientific journal if it is relevant to the research conducted and the journal's guidelines permit using online sources as references. It is always essential to give references for any content, including the date and version of the model used and the source of the data used to train it. Additionally, it is important to note any limitations of the model. Similarly, refused to generate fake citations or abstracts [34]. The New York City public school decided to ban their students from accessing the for generating text in school networks due to the safety and accuracy of the content [35].

Virtual health assistants: Virtual health assistants may assist patients with appointment scheduling, respond to medical inquiries, and give information about health issues which can manage by using to improve the flow of information between patients and healthcare professionals. The virtual medical expert system is an expert system that uses natural language processing. It functions more swiftly than traditional telemedicine systems and achieves an accuracy of 85.5%, claim researchers [36]. Virtual assistants also allow patients to communicate with them in natural language about their symptoms. The assistant can then use machine learning to suggest the following steps: seeing a doctor or going to the emergency room. Artificial intelligence can provide patients with triage and diagnostic information with a level of clinical accuracy and safety comparable to that of human doctors, according to a comparison of artificial intelligence and human doctors for diagnosis and triage [37].

Medical diagnosis: By providing details about symptoms, potential causes, and available treatments, can help clinicians diagnose patients. During the Covid-19 pandemic, when massive volumes of text-based data were created from various sources, including hospitals, medical literature, and social media, the area of natural language processing (NLP) had immense promise [38].

Medical research and multiple languages translation: May be used to evaluate vast amounts of medical literature and data to find trends and produce discoveries, including translating scientific knowledge into various languages during pandemics. To create real-time evidence-based question-and-answer systems that automatically translate the most recent scientific knowledge to many languages and communicate the findings globally, NLP may be applied to the scientific literature, multiplying during the epidemic [31] and other language models have the potential to improve care's effectiveness and efficiency while also cutting costs. It is crucial to remember that this technology is still in progress, and further study is necessary to comprehend its possible effects fully.

Medical education: Can create interactive educational materials for medical students and professionals. A review article on natural language processing in medical education identified 30 articles indexed by PubMed relating to medical education, and 14 were explicitly related to medical education in emergency medicine [39].

Electronic health record (HER) data: The development of NLP techniques to convert clinical text into structured clinical data can direct therapeutic decisions to postpone or prevent illness through the full potential benefits of EHR data [40]. Large amounts of free-text data can be collected, processed, and organized more effectively by NLP than by humans. Analysis of operation and radiological reports, automated reporting of EHR data, and patient reviews of doctors and practices have all been used in orthopedics [41].

Improving communication between patients and medical professionals: Can assist doctors in better understanding a patient's past and present problems as well as in educating and instructing patients in a manner that is easy to understand. ChatGPT in health services should be done with caution as it may raise ethical and privacy issues. could dramatically increase the effectiveness and quality of healthcare services by automating repetitive tasks and providing patients and healthcare professionals with more precise and personalized information. There is a significant chance that other influential language models will impact health care. It is essential to remember that GPT-based models have recently begun to influence Health Services and that further study and development are required to realize these potential advantages fully. This article aims to illustrate the value of deep learning and natural language processing in electronic health records. The doctor can make swift judgments in an emergency based on the EHR. In addition, it can help make clinical forecasts, recognize disease sooner, predict the need for subsequent checkups, and, if necessary, make predictions about impending hospitalization [42].

It is crucial to remember that while GPT-based models can help with some activities, they should not be used to recommend or diagnose a patient's condition or receive medical treatment because they need more expertise and judgment. and similar language paradigms could profoundly impact the sector of health services. They can help with patient education, treatment planning, and medical diagnostics. They can also be used to create patient-specific health information and increase the effectiveness and accuracy of electronic health records. Additionally, they can be applied to enhance the functionality of clinical decision support systems and aid in creating novel pharmaceuticals and medical equipment. The use of NLP in healthcare should be done with care, as it is necessary to ensure the information's accuracy, privacy, and security.

What is the internet of orthopedic things (IOT) and its classification?

The internet of orthopedic things (IoOT) is a rapidly growing field that revolutionizes how orthopedic care is delivered. Interestingly, differentiated the internet of things (IoT) and internet of orthopedics things (IoOT) by using different abbreviations, which are not available in available scientific literature. Therefore, we preferred IoT for the Internet of Things and IOT for the internet of orthopedic things with a difference of small and capital "O." in our paper. With the help of IoT technology, orthopedic devices can share data with healthcare providers and patients in real-time. This allows for more accurate and timely diagnosis, treatment, and monitoring of orthopedic conditions. Overall, the advancements in IOT are helping to improve the quality of orthopedic care, making it more personalized, efficient, and effective. As technology continues to evolve, we can expect to see even more innovative solutions for orthopedic patients in the future.

Internet of orthopedic things (IOT) refers to the use of connected devices and technology in orthopedics. Some examples of IOT devices include:

- **Wearable sensors:** Orthopedic surgeons are paying more attention to sensors that record movement, posture, and activity levels. The pen and paper of the upcoming wave of data gathering are sensors. These sensors gather wide-ranging information to promote the acceptance and relevance of digital health. The following digital revolution, the internet of things, will indeed impact orthopedics and medicine. The internet of things (IoT) is increasingly employed to offer remote health monitoring and emergency notification systems [43].
- **Smart prosthetics**: These are being used as artificial limbs which use sensors and connected technology to provide improved functionality and control for users. A skin-inspired tactile sensor for intelligent prosthetics based on giant magneto-impedance (GMI) material embedded with an air gap was designed [44].
- **Remote monitoring systems**: Devices that allow medical professionals to monitor patients remotely, such as monitoring the healing process after orthopedic surgery. Virtual reality-based orthopedic telerehabilitation shows promising results at Rutgers [8].
- **Surgical robots:** These are robots that can be controlled by surgeons remotely to perform procedures with greater precision and accuracy. Seven companies are transforming orthopedics with robot-assisted surgery [45]. Orthopedic robots: Orthopedic bone drilling robot (ODRO), orthopedic teleconsultation robots (OTOROB) have been designed to facilitate surgeons [46-48].
- **Smart implants**: Medical devices that are implanted into the body and connected to the Internet to provide real-time data on the patient's condition. Smart implants in orthopedic surgery, improving patient outcomes [49]. Recent advances in wireless sensors and medical telemetry are promising new and hitherto unexplored opportunities in orthopedic implants. This implies miniature unobtrusive sensors that are implanted along with the orthopedic device and used to wirelessly communicate information to exterior monitoring/control equipment [50]. One of the most significant advancements in IOT is the development of smart orthopedic devices. These devices are equipped with sensors, processors, and communication capabilities, allowing them to collect and transmit data on a patient's condition, movement, and activity. For example, intelligent knee braces can monitor knee joint movement and send data to a healthcare provider, who can then adjust the brace's settings to provide the best possible support and rehabilitation. A smart knee implant captures vital information to help physicians understand how patients are healing and what kind of progress they are making. Persona IQ is the first and currently only smart implant available on the market [51].
- **Smart casts:** These are casts that are equipped with sensors that can track the patient's progress and provide real-time feedback for physical therapy. Haleem., *et al*. (2020) mentioned different major applications of IOT in orthopedics, i.e. information on the fractured bone and deformations, health monitoring and report generation, improved communication, secure digital storage of patient data, tracking orthopedics devices, check and control of all parameters, and knee replacement [52]. ActiveArmor created a 3D-printed cast or orthotic support device for injuries and pain that meets the demands of the medical community. This was the first water-safe, custom-fit, designed, fabricated orthosis available in the US Market [53]. A rapid and patient-specific intelligent designing technique and 3D-printed orthopedic cast were developed, which is wear-friendly, requires less expertise required to design and faster in preparation [54].
- **3D printing technology:** For customizing orthopedic implants and devices is getting popularity too. Orthopaedics was among the first medical fields to use 3D printing online. Orthopedic surgeons use it in their clinical practice for patient-specific orthopedic applications [55]. Another advancement in IOT is the use of 3D printing technology to create customized orthopedic devices. With this technology, physicians can create devices that are tailored to a patient's specific needs. This can lead to better outcomes and faster recovery times for patients.
- **Personalized care:** IOT is also helping to improve the management of chronic orthopedic conditions. For example, patients with osteoarthritis can use smart devices to monitor their condition and receive personalized treatment plans. This can help to reduce

the progression of the disease and improve the patient's quality of life. A narrative report on managing osteoarthritis pain with smart technology identifies and describes the current literature focused on smart technology for pain management in individuals with OA [56].

- **Electronic health records and other digital tools:** For managing patient information and treatment plans are on the rise. Internet of Things (IoT) enabled healthcare helps to take the challenges of the COVID-19 pandemic. IoT's sensor-based technology provides an excellent capability to reduce the risk of surgery during complicated cases and is helpful for the COVID-19 type pandemic. Medical students can now be better trained for disease detection and well-guided for the future course of action [57].
- **Clinical decision support systems:** These include systems that use IoT data to provide clinical decision support to healthcare professionals, such as identifying patients at risk of complications, providing real-time monitoring of patients, and identifying patients who may require additional care. IBSC (Intelligence-based spine care) model is dreamed of being highly impactful in the world of spine care by reducing morbidity and financial burden on our healthcare systems [58]. The IoT is the next digital wave that will undoubtedly affect medicine and orthopedics. Internet of things (loT) devices are now being used for remote health monitoring and emergency notification. This article reviews current and future concepts in digital health that will impact trauma care [43].
- **Devices for augmented and virtual reality for orthopedic rehabilitation:** These technologies allow for remote rehabilitation and physical therapy sessions, allowing patients to follow their exercise plan at home or any other place. Smart devices are used in physical therapy to track progress, provide feedback and guidance, and monitor the healing process. Virtual reality, augmented reality, gamification, and telerehabilitation: Psychological impact on orthopedic patients' rehabilitation provided an excellent outcome during COVID-19. Remote virtual technologies allow the delivery of high-quality care at reduced costs. This is a necessity, given the growing demand for orthopedic rehabilitation and the increasing costs related to it. Future studies need to develop specific and objective methods to evaluate the clinical quality of new technologies and definitively demonstrate the advantages of VR, AR, gamification, and telerehabilitation compared to face-to-face orthopedic rehabilitation [59].
- **Smart surgical instruments:** Can provide real-time feedback during procedures and improve the precision of surgeries. The "Smart" surgical drill provides intelligence and safety for surgery. Today's methodology is to slow down the drill to avoid thermal injury to the bones and soft tissues [60].
- **Medical equipment and diagnostic devices:** This includes devices such as X-ray machines, MRI machines, and other diagnostic equipment that can be connected to the internet to share data with healthcare professionals. Not only the X-rays and MRI machines but a novel application of wireless smart glasses to visualize intraoperative imaging for orthopedic surgeons have been developed [61]. Wireless tags provide details of orthopedic implants [62]. Smart bone drilling machine has been designed by other researchers, too [63].

Conclusion

Will not only change the health industry in terms of clinical diagnosis, biomedical research, bioinformatics, data mining, digital health records, physician notes extraction, and other multiple tasks but has the potential to assist humans at home as an absolute virtual physician (DocGPT) including getting "some-help" in an emergency when no immediate help is available. We should not be reluctant to use technology, but cautious alarm should be there every time the mind of treating physicians, nurses, allied health workers and researchers for patient safety with a manifesto "First, Do Not".

Conflict of Interest

The authors declare that they have no conflicts of financial interest or competing interests regarding the publication of this manuscript. No funding was involved in the preparation of this paper. OpenAI ChatGPT-3 was used to generate content and countercheck with literature.

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