Likita: A Medical Chatbot To Improve HealthCare Delivery In Africa

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Abstract

Africa is confronted with numerous health challenges and less than 50% of its population, especially those living in urban areas have access to modern health facilities [3]. Maternal and child mortality is very high, and mostly caused by shortage of trained health professionals, high cost of healthcare, and inadequate funding to purchase modern equipment for hospitals, build new hospitals and health centres in rural areas, and recruit enough qualified doctors or specialists.

In this proposal, we explained our research aimed to apply artificial intelligence to improve healthcare delivery in Africa. Specifically, we build an intelligent medical chatbot called Likita that helps in diagnosing common ailments and recommending appropriate treatments, scheduling doctor's appointments, reminding patients on medication, and answering questions on health-related matters.

Author Keywords

Artificial Intelligence; Chatbot; Machine Learning; Natural Language Processing; Health; Africa

ACM Classification Keywords

Computing methodologies~Intelligent agents

Introduction

Africa is the second largest continent in the world by land mass [7]. It is also the second most populous continent in the world, with a population of over 1.2 billion people [12]. However, Africa ranked lowest in terms of healthcare delivery to its citizens, with many African countries (such as Uganda, Togo, Nigeria, South Africa, Liberia, Malawi, Rwanda, Ethiopia, Niger, Cameroon, Zambia, and others) among the bottom 50 in the WHO's ranking of World's Health Systems [9]. In fact, people in sub-saharan Africa have the worst health system in the world, as the region carries 24% of global health issues [5]. This should not be a surprise, as some communicable diseases such as malaria, tuberculosis, and HIV/AIDS, are still prevalent, and some non-communicable diseases (such as cancer, hypertension, diabetes, sleeping sickness, cardiovascular disease, and others) are increasing due to growing middle class population and lifestyle changes [3][6]. Also, maternal and child mortality rate is high compared to other continents [5][11].

Vaccination, drugs, medical advice, and other forms of treatment are ways of preventing or managing these diseases, but lack of easy access to modern health facilities (especially in rural areas) and the cost of obtaining these treatments are some of the factors responsible for the spread and fatality of these diseases [3][6]. Other factors include shortage of qualified or trained doctors and health care professionals since many of them prefer to live and work overseas, especially Europe and North America [3][6]. Insufficient funds [4] to fully equip hospitals and other healthcare centres (such as clinics and primary health centres), as well as to employ trained medical personnel to cater for the entire population [6], is another factor.

In this proposal, we discussed our approach to addressing these challenges and ensure majority of the African population have access to less costly and quality healthcare. Artificial intelligence is at the centre of our research and the end goal is to develop an intelligent chatbot, named Likita, that interact with patients and connect them to qualified medical practitioners where necessary. Likita is also capable of diagnosing common ailments and recommending appropriate treatments, scheduling doctor's appointments, reminding patients on medication, and answering questions on health-related matters.

About Likita

Likita (meaning "Doctor" in one of the African languages) is an intelligent medical chatbot which will bring modern healthcare to Africans living in both rural and urban areas. The chatbot will achieve the following objectives:

1. **Diagnosing some of the common diseases in Africa, such as malaria and tuberculosis**: Likita will ask about symptoms and engage the patients based on questions approved by health professionals to identify the actual ailment probabilistically and the care required. The chatbot determines the severity of the condition and proffer immediate recommendations to stabilize the patient (if critical), while booking an appointment immediately with a specialist. If not critical or severe, Likita will recommend the best treatment or care to apply.

2. **Offering medical advice on health-related issues**: Likita will keep people informed about their medical conditions by providing answers to frequently asked questions. They may ask questions

relating to normal blood pressure, blood sugar levels, diabetes grades and signs, best sleeping positions for babies, and others.

3. **Book appointments with Specialists**: Likita will help people in locating doctors or specialists in their area and booking appointments with them.
4. **Reminders**: Likita will remind patients about their appointments. It will also allow patients to setup reminders for their pills in terms of timing and dosage, so they don't forget when it is time to take the next dose – intelligent reminder.

Likita will also be able to track and monitor patients' improvements or health status, but this feature is reserved for the future.

Likita will be available on popular messaging platforms, such as Facebook Messenger, Skype, and Telegram. Likita can also be downloaded and installed as a mobile app on Android and IOS devices. Likita's availability as a mobile app is highly beneficial since Africa has a very high mobile phone penetration and adoption rate. For instance, 995 million people (more than 81% of African population) currently subscribe to mobile services [2], with the number expected to grow significantly by 2020. Similarly, over 167 million Nigerians [10] (more than 90% of the total population) use mobile phones. Thus, Likita will be accessible and within the reach of most Africans. Those without phones can interact with Likita online via internet-enabled desktop computers or laptops.

Likita's Architecture

As shown in Figure 1, Likita's internal logic or functionality will be based on 3 major pillars in Artificial intelligence – Natural Language Processing [1][8], Knowledge Management [1][8], and Machine Learning.
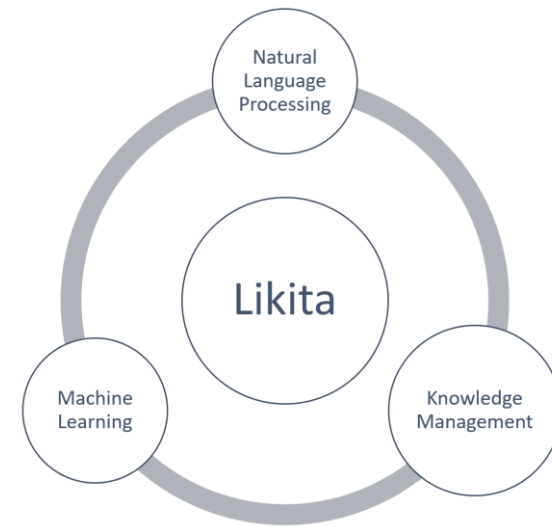

Figure 1: Likita's functionality is based on 3 key structures in Artificial Intelligence

- *Natural Language Processing (NLP)*: This will help Likita understand user's language and determine their intent or what would like to do. Likita will support English at first, but will evolve to support major African languages such as Swahili, Hausa, Zulu, Arabic, and others.
- *Knowledge Management*: Having understood user's intent, Likita will apply knowledge management to determine appropriate response.
- *Machine Learning*: Likita continues to get smarter in answering questions as it receives more data through user/patient interactions.

As Likita evolves, voice to voice conversations with patients will be supported through speech recognition,

and users' attitude or behaviour will be tracked (as they interact with Likita) through sentiment analysis.

Conclusion

Likita will revolutionize healthcare in Africa with respect to diagnosis and treatment of patients. Thus, Likita will help in reducing or eradicating unnecessary doctor's appointments by providing first-hand diagnosis, care, or medical advice which can be sufficient in addressing common health issues. Likita will be a money-saver and ensure majority of Africans have access to quality healthcare irrespective of their location.

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