

Design of Python Based Personal Health Assessment Website

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Abstract—This paper presents a framework capable of accurate analysis of individual's health status, prediction of disease, health advices based on experiences to achieve a healthy life. The proposed framework that would be of great use for any individual is based on machine learning algorithms. Prediction models like SVM, Decision tree are used. Django web framework is used to integrate the algorithms into a user interactive website. React-JS is used to develop the interface of the website.

Keywords—Disease prediction, Real-world dataset, Classification algorithms, Django.

I. INTRODUCTION

Healthcare is one of the biggest industries in the world and it will be having a great impact on the quality of life of people living in the country. It is one of the fastest growing industries in the world. Health care includes all aspects like diagnosis, treatments to diseases, prevention of illness, injuries and other physical or mental impairments to human beings. A health assessment is a plan of care for an individual that identifies the specific needs and how those needs will be addressed by the healthcare system. Health assessment is the evaluation of the health status which in turn keeps check on one's health and thus improves the quality of life. The main goal of AI based health assessing is to analyze, prevent, treat and monitor patient's health outcomes. Algorithms are applied to practices such as diagnosis process, treatment and medication for the illness and so on. These algorithms recognizes patterns in the data gathered from the diagnosis and apply its own logic and comes up with a conclusion which will then be presented to the end user. The distinguishing factor between the orthodox or traditional and the AI based technology is the amount of data it deals with and the output thus provided to the end user after processing enormous amount of data. The precision of the result matters as well. The research studies suggest that AI can do well or more so than human beings in certain healthcare tasks such as diagnosing diseases. It made computers more useful in solving problematic healthcare issues and by using it huge amount of data can be collected, stored and analyzed. This project will explore how artificial intelligence and machine learning can help individual's to achieve a better health.

A. Problem Definition

There is need for personalized health assessment to set health goals, assess individual's progress and to understand their status. To provide information regarding programs

and services to help improve individual's health and well-being. The mission of providing a good healthcare for all ages is not an easy task as there are many obstacles, one of the major obstacle being lack of healthcare workers. The one's who are already present as healthcare professionals are under pressure, doing overtime, reaching their maximum strength and that too in times where entire world is suffering from a pandemic there is need of something else which would support them. This reduces workload and also on patient side who has wait for a nurse or a doctor can save the time. There are other factors like growing population and the percentage of working community also matters. Health cost are also rapidly increasing which cannot be afforded many. So as a possible solution which can reduce the problem to some extent this project is developed. It provides a personalized and interactive website. The website takes in patient's symptoms and health concerns and then as end result guides to correct care based on the diagnosis done by the algorithms running in the background. There are two segments namely physical health assessor and mental health assessor. Both interact with users and take input from the end user which is used to analyze patient's status. The input is fed into the prediction models which will then put out a prediction based on the datasets trained and tested before. There are other features as well which helps user to know about current and essential health related topics. Chatbot is used to interact with user for other things such as feedback or information regarding the site or safety of data etc.

B. Objectives

- 1) The basic objective is to implement each of the functionalities as individual units without any bugs in the units.
- 2) First step is to have effective registration and signup platform for the users.
- 3) First unit to develop is prediction models which requires dataset to be uploaded and then split the dataset into testing and training.
- 4) Prediction models accuracy needs to be compared in order to get a more precise disease detection as this about health.
- 5) Second unit to develop is interface where users can easily interact.
- 6) The website or the interface needs to be user friendly and very simple.
- 7) Third unit is concerned about database. There is a need to store user details and the history. This helps to keep a record and also in future diagnosis.
- 8) Users can use the website to get an idea of their health status and get health related advices.

- 9) All the above discussed units are integrated in a web application and the launched as django application.

C. Scope Of the Project

The scope of this project is the quality of the outputs produced and the algorithms used to produce them. Even though the algorithms used in the project are the latest but it still has its flaws. It would be a real help for the common people. Here the scope of the project is that integration of clinical decision support with computer-based patient records could reduce medical errors, enhance patient safety, decrease unwanted practice variation, and improve patient outcome. This suggestion is promising as data modelling and analysis tools, e.g., data mining, have the capability to generate a knowledge-rich environment which can help to significantly improve the quality of clinical decisions.

The diagnosis part needs to be carried out very precisely and effectively. Moreover clinical decision are mostly based on doctor's intuitions and experiences which will be missing here. Integrating the ML models into web app was complex due to involvement of User Interaction with the output produced was a must. In this particular Project, Django web framework and react framework is used to produce the desired output. The complexity of integration can be reduced in the future. The framework can also be reduced to a mobile app for better accessibility for the User.

II. LITERATURE SURVEY

A. Technology

- 1) Machine learning is the branch of artificial intelligence which is based on the idea that systems can learn from the data, find patterns and take decisions without the interference of any human being. It is a way of analysing data that leads to build analytical models. Machine learning algorithms can be categorised into 3 types mainly Supervised, Unsupervised and Reinforced learning.

- Decision Tree: It is a supervised learning algorithm. It uses a tree like graph decision model and its possible consequences. It allows a structured approach to the problem and carried out in a very systematic manner. It predicts the value of target variable by learning simple decision rules implied by previous trained data. There are mainly two types of decision tree types namely categorical variable decision tree and continuous variable decision tree.

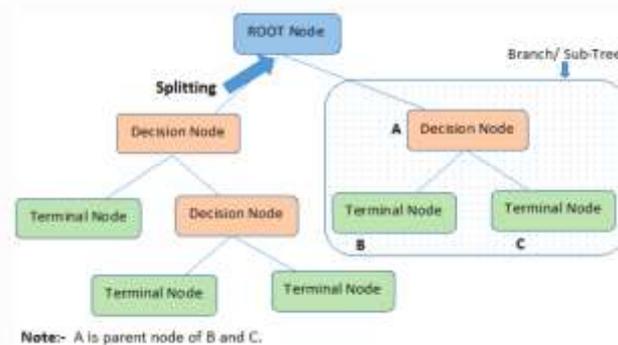


Fig.1 Decision Tree Model

- Naïve Bayes: This algorithm is based on Bayes theorem. It makes an assumption of independence in predictors. It assumes that a particular feature in class is not related to any other existing feature in the class. It is a probabilistic algorithm in machine learning. It works well with Natural Language Processing problems. There are mainly three types in Naïve Bayes and they are Multinomial, Bernoulli and Gaussian. The basic assumption of this algorithm is that each variable is independent and makes an equal contribution to the outcome.

$$P(A|B) = \frac{P(B|A) \cdot P(A)}{P(B)}$$

Labels in the diagram:
 - Top left: Probability of B occurring given evidence A has already occurred (points to P(B|A))
 - Top right: Probability of A occurring (points to P(A))
 - Bottom left: Probability of A occurring given evidence B has already occurred (points to P(A|B))
 - Bottom right: Probability of B occurring (points to P(B))

Fig.2 Naïve Bayes Formula

- 2) React – It is a JavaScript library which can be used to create dynamic and interactive applications for web and smart phones. It's an open source, component oriented front end library. It is responsible for only the application's view layer. React offers an easy way to create dynamic applications because it requires very less coding and provides more functionality. It makes use of virtual DOM which helps to create application quicker and thus improved performance. Components are essential building blocks and a single application can have many components. These components are reusable that is it can be used again elsewhere which reduces time consumption. It has got dedicated tools for debugging thus making the debugging process easy and faster. Some of the features of are JSX(JavaScript Syntax Extension), Virtual DOM, performance, extensions, one way data binding and debugging.



Fig.3 React Features

- 3) Django: Django is a high-level Python web framework for building secure and maintainable websites quickly. Django, which was created by experienced developers, takes care of a lot of the headaches that come with web development, so one can concentrate on writing the app without needing to reinvent the wheel. It's free and open source, with a growing and active community, excellent documentation, and a variety of free and paid-for support options. Django adheres to the "batteries included" principle, which means it comes with practically everything a developer would need "out of the box". Because everything one needs is contained within a single "product," all functions extremely well together, adheres to consistent design principles, and comes with extensive and up-to-date documentation. From content management systems and wikis to social networks and news sites, Django can (and has) been used to create practically any style of website. It can integrate with any client-side framework and serve material in nearly any format (including HTML, RSS feeds, JSON, XML, etc.). Internally, while it provides choices for almost any functionality you might want (e.g. several popular databases, templating engines, etc.), if necessary, it can also be expanded to include other components. Django helps developers avoid many common security mistakes by providing a framework that has been engineered to "do the right things" to protect the website automatically. For example, Django provides a secure way to manage user accounts and passwords, avoiding common mistakes like putting session information in cookies where it is vulnerable or directly storing passwords rather than a password hash. A password hash is a fixed-length value created by sending the password through a cryptographic hash function. Django can check if an entered password is correct by running it through the hash function and comparing the output to the stored hash value. However due to the "one-way" nature of the function, even if a stored hash value is compromised it is hard for an attacker to work out the original password. SQL injection, cross-site scripting, cross-site request forgery, and click jacking are all vulnerabilities that Django protects against by default. Django uses a component-based "shared-nothing" architecture (each part of the architecture is independent of the others, and can hence be replaced or changed if needed). Because the different elements are clearly separated, it can grow to accommodate additional demand by adding hardware at any level: caching servers, database servers, or application servers. Some of the busiest sites have successfully scaled Django to meet their demands. Django programming is written with design principles and patterns in mind, resulting in code that is both manageable and reusable. In particular, it makes use of the Don't Repeat Yourself (DRY) principle so there is no unnecessary duplication, reducing the amount of code. Django also supports the grouping of comparable

functionality into reusable "applications" and, at a deeper level, into modules (following the Model View Controller (MVC) design). Django is written in Python, a programming language that runs on a variety of platforms. That means that you are not tied to any particular server platform, and can run your applications on many flavours of Linux, Windows, and Mac OS X. Furthermore, Django is well-supported by many web hosting providers, who often provide specific infrastructure and documentation for hosting Django sites.

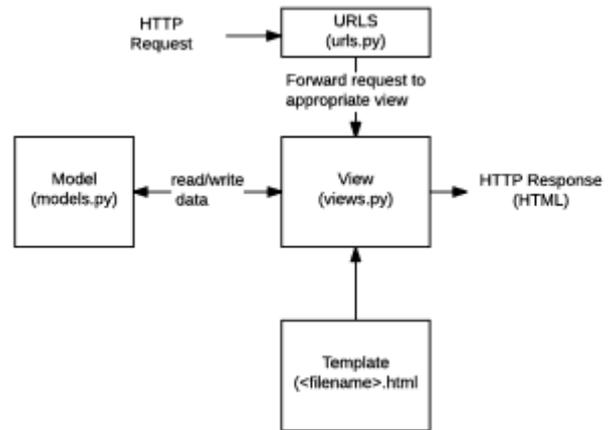


Fig.4 Django App Framework

B. Existing System

BUOY HEALTH

Buoy Health is a symptom and cure checker powered by artificial intelligence that employs algorithms to identify and treat sickness. A chatbot listens to a patient's symptoms and health concerns before directing them to the appropriate treatment based on the chatbot's diagnosis.

Harvard Medical School is just one of the many hospitals and healthcare providers that uses Buoy's AI to help diagnose and treat patients more quickly.

QVENTUS

Qventus is an artificial intelligence (AI)-based software platform that handles problems, such as those in emergency rooms and patient safety. The company's automated software prioritises patient illness or injury, records hospital wait times, and even plots the quickest ambulance routes.

BABYLON HEALTH

Babylon employs artificial intelligence to provide tailored and interactive healthcare, as well as face-to-face visits with doctors at any time. The company's AI-powered chatbot speeds up the examination of a patient's symptoms and then suggests a virtual check-in or a face-to-face appointment with a health expert.

These existing systems does not provide a separate segments for physical and mental illness. They require additional informations while assessing.

C. Methodology to be followed

To finish this project and make a working model that showcases our idea within the given deadline, we have decided to follow various Software development and Software Testing principles and methodologies:

- 1) Planning: The purpose of the first phase is to find out the scope of the problem and determine solutions. Resources, costs, time, benefits and other items are

generally considered here. In our project we have decided to follow a divide and conquer approach to finish certain tasks, with each of us having various skill sets, we were able to almost perfectly give roles that we are most proficient at, and this planning has helped us to minimize time, and maximize utilization of resources.

- 2) Research Paper Analysis and Requirements: In this phase we have gone through research papers put out by other people, related to healthcare and AI based healthcare systems, expanding our horizon on these topics, and checking the feasibility as well as limitations of our project.
- 3) Software Engineering Methodologies: There are various SWE methodologies, and we had to pick the one that works the best for the development of our project.

- Waterfall: The waterfall model is a linear project management strategy in which stakeholders and customer requirements are gathered at the start of the project, and a sequential project plan is then built to fit those requirements.
- Agile: The Agile methodology was developed as a response to increasing problems/issues with Waterfall and other highly structured, inflexible methodologies. This approach is designed to accommodate change and the need to produce software faster.
- Feature - driven development: An Agile methodology for developing software, Feature-Driven Development (FDD) is customer-centric, iterative, and incremental with the goal of delivering tangible software results often and efficiently. FDD in Agile encourages status reporting at all levels, which helps to track progress and results.
- Scrum: Another way to implement the agile approach, Scrum borrows from Agile's foundational beliefs and philosophy that teams and developers should collaborate heavily and daily. With Scrum, software is developed using an iterative approach in which the team is front and center—experienced and disciplined workers on smaller teams might find the most success with this method, as it requires self- development. As with most Agile approaches, XP allows for frequent releases in short development sprints that encourage change when needed.
- Lean: Lean is both a workflow technique and a mentality, taking manufacturing concepts and practises and applying them to a wide range of sectors, including software development. While Agile is an important and incredible methodology for the practical application of development best practices, it does not contain instructions for implementing these principles across the organisation or outside of development work.

- 4) Software testing methodologies: The many techniques or procedures used to test a program to verify it behaves and appears as intended are referred to as software testing methodology. This includes everything from

front-end to back-end testing, as well as unit and system testing.

- 5) Data Collection: Data collection is the process of gathering and calculating information on varying interest, in a very established and systematic fashion that enables one to answer stated research questions, test hypotheses, and evaluating the outcomes.

III. REQUIREMENT ANALYSIS

A. Functional Requirements

In software engineering, a functional requirement defines a function of a software system or its component. A function is described as a set of inputs, the behaviour, and outputs. Calculations, technical details, data manipulation and processing, and other precise functionality that describes what a system is expected to achieve are examples of functional requirements. Behavioural requirements describing all the cases where the system uses the functional requirements are captured in use cases.

Here, the system has to perform the following tasks:

- User Friendly Framework that doesn't require Perquisite Knowledge.
- Produce accurate and quality forecast of sales
- To Produce User interactive output for sales data visualization
- To produce quality product association rules so, that retailer can make effective decisions.
- To integrate models into a single web app using Django.

B. Non-Functional Requirements

In systems engineering and requirements engineering, a non-functional requirement is a requirement that specifies criteria that can be used to judge the operation of a system, rather than specific behaviours. This should be contrasted with functional requirements that define specific behaviour or functions. The plan for implementing functional requirements is described in the system design.

1) Accessibility: The degree to which a product, equipment, service, or location is accessible to as many individuals as possible is referred to as accessibility.

2) Maintainability: Maintainability is the ease with which a software product can be adjusted in order to improve it. In other ways to:

- Correct defects
- Meet new requirements

By simply adding the required files to an existing project, new functionalities can be added to the project based on user requirements. Because the programming is so basic, it's much easier to detect and fix bugs, as well as make changes to the project.

3) Scalability: System is able of handling increased total throughput under an increased load when resources (usually hardware) are included, the system is able to handle greater total throughput under higher demand. In scenarios with low bandwidth and a large number of users, the system can function normally.

4) Portability: Portability is one of the key features of high-level programming. When migrating software from one environment to another, portability is the concept of being able to reuse existing code rather than writing new code. A project

can be performed under different operating environments if it meets its minimum specifications. In this situation, just system files and dependent assemblies would need to be configured.

C. Hardware and Software Requirements

1) Hardware Requirements:

- Processor: Processor above 2 GHz
- RAM: 8 GB
- Hard Disk: 128 GB
- GPU: Nvidia GTX 1050 Ti or above

2) Software Requirements:

- Operating system: Windows 10
- Front End: HTML, CSS, JavaScript
- IDE: Visual Studio Code, Jupyter Notebook
- Server: Django

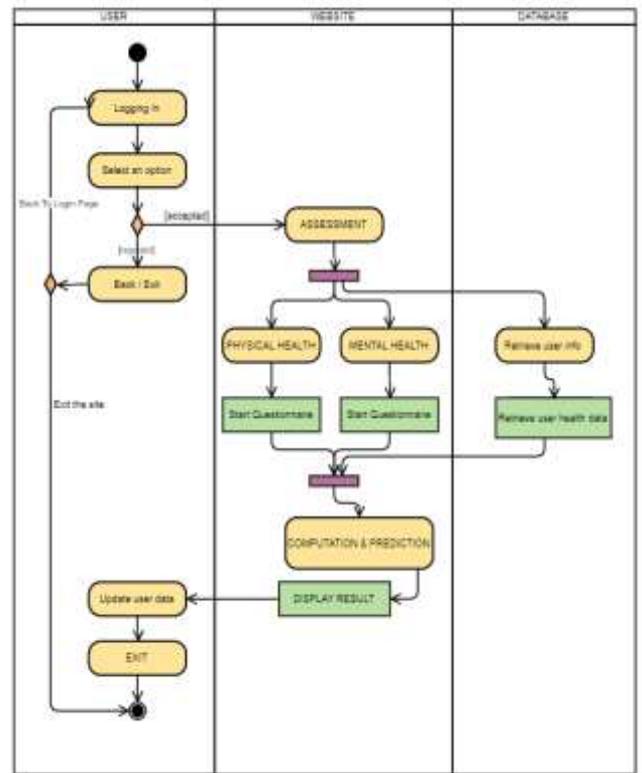


Fig.7 State Diagram

IV. DESIGN

A. Design diagrams

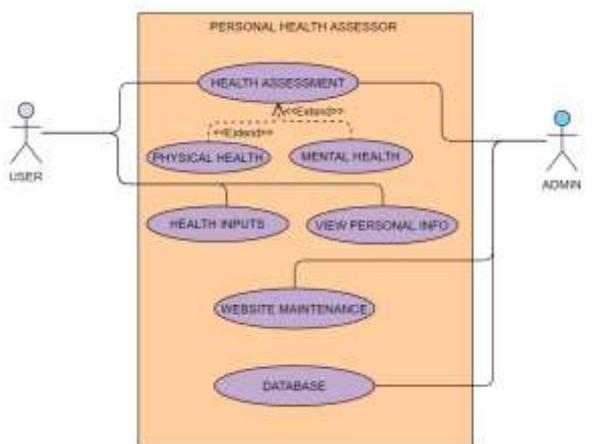


Fig.6 Use Case Diagram

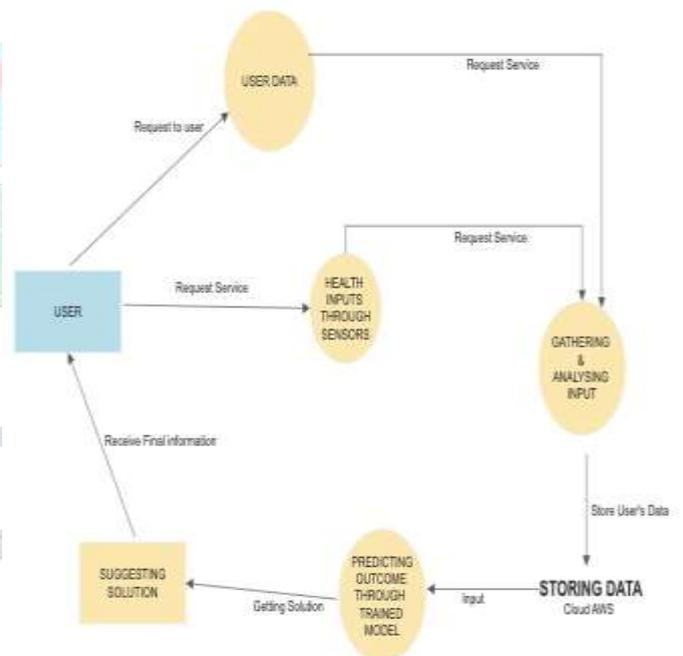


Fig.9 DFD Level 1

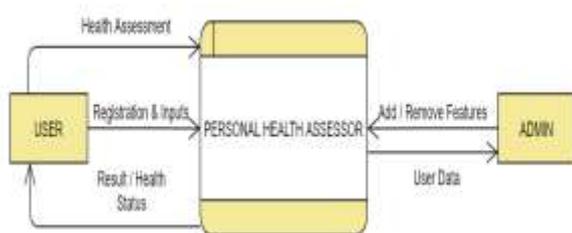


Fig.8 DFD Level 0

IV. CONCLUSION

The project aims to meet the need for a personalized health assessment to set health goals. It tries to assess individual's progress and to understand their status. And to provide information regarding programs and services to help improve individual's health and well-being. The motivation of using AI in healthcare, presented the various healthcare data that AI has analysed and surveyed the major disease types that AI has been deployed. Despite the fact that AI technologies are garnering a lot of attention in medical research, real-world implementation

is still a challenge. Also once an AI system gets deployed after initial training with historical data, continuation of the data supply becomes a crucial issue for further development and improvement of the system. The current healthcare environment does not offer any incentives for system data sharing.

In the future, this project can be further improved by utilizing much bigger dataset than the one being utilized currently. This would aid in increasing the accuracy of our prediction models. Furthermore, other models of Machine learning could also be studied to check for the accuracy rate resulted by them.

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