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Chronic Disease Prediction after Covid-19 using Machine Learning

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***Abstract*—Chronic Sickness Expectation framework utilizing artificial intelligence(AI) makes precise forecasts about the illness in view of the information/ symptoms that the client goes into the framework. In the event that the patient isn't a lot of serious and the client simply needs to know the kind of sickness, client has had to deal with. A framework offers clients guidance on the most proficient method to keep their wellbeing frameworks with everything looking great and a strategy to distinguish illnesses utilizing this expectation. Today, the wellbeing area assumes a huge part in treating patients' sicknesses, so this framework is likewise useful to the area in illuminating the client and is gainful to the client in the event that the person decides not to visit an emergency clinic or other facility. By entering symptoms and other appropriate data, the client can realize what sickness they are at present encountering, and the area can likewise acquire from this framework by essentially requesting symptoms. This Chronic Sickness Expectation Utilizing AI is totally finished with the assistance of AI and Python Programming language and furthermore utilizing the dataset Persistent Illness Pointers that we will anticipate the infection.**

***Index Terms*— Chronic diseases, Machine learning, Logistic regression, Disease Prediction, Diabetes Prediction and Obesity Prediction.**

I. INTRODUCTION

Computers can be customized to utilize historical information to upgrade performance through AI and machine learning(ML). ML is utilized to make multifaceted models and extract clinical information, acquainting new ideas with specialists and experts. In clinical practice, AI (ML) prescient models can underscore and upgrade rules in the choice of explicit patient treatment choices. These are additionally able to do freely diagnosing different issues as per clinical rules. AI has demonstrated to find success in assisting with navigation and expectation from the massive amount of information created by the medical services area. We improve on AI procedures for exact chronic sickness flare-up expectation. A couple of studies have investigated utilizing ML to

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foresee illness. We recommend a methodology that utilizations AI to identify significant traits utilizing the strategies:

- Random Forest(RF)
- Logistic Regression(LR)
- Decision Trees (DT),
- Naive Bayes (NB)
- K Nearest Neighbor Algorithm (KNN)

The viability of illness forecast is expanding because of these systems. To build the growing experience's exactness, numerous such calculations are utilized. Then, utilizing the datasets within reach, it could be tried. Different feature blends and notable categorization techniques are utilized to present the expectation model. Following the COVID19 wave, individuals are right now struggling with various sicknesses. Thus, it becomes critical to make illness expectations almost immediately. However, for a specialist, making a precise estimate in view of symptoms is excessively difficult. AI is vital in foreseeing the disorder to conquer this issue. Every year, there is critical information expansion in the clinical sciences. The precise examination of clinical information, which has profited from early tolerant consideration, has expanded because of the ascent of information in the clinical and medical services fields. AI uncovers stowed away example data in the tremendous measure of clinical information with the utilization of illness information. While exploring material in libraries and utilizing clever advances to detect patterns, AI is a pivotal step.

While exploring material in libraries and utilizing devices to recognize patterns, AI is a crucial step. We will give the dataset through the model to anticipate the right illness at a beginning phase and the model will actually want to endorse the right drug as per the sickness found to foster reliable expectation models for constant infections utilizing AI procedures. Since constant infections have a sluggish pace of movement, giving ideal finding and effective treatment is basic. Consequently, it is critical to propose a choice model that can help with the conclusion of persistent illnesses and conjecture patient results from now on. In the field of man-made intelligence, there are various techniques to approach doing this, but this concentrate explicitly centers around ML expectation models utilized in the conclusion of Persistent Sicknesses. We will actually want to recognize promising results that work on the nature of patient information and review specific things that are connected with ML calculations in clinical treatment when contrasted with the customary information examination techniques. Our undertaking's significant objective is to deliver programming that will work on medical clinic assignments and supplant the manual expectation framework with a robotized medical services the board framework. Through our undertaking, medical services experts can increment functional proficiency, lower clinical mistakes, and save time. On the off chance that a sickness can be anticipated, early therapy can be proposed to the patients, bringing down the gamble of death and possibly saving their lives. Early location of sicknesses can likewise to some degree limit the expense of clinical consideration.

II. Literature Survey

Different techniques for early analysis are utilized in various examinations to study and break down persistent sicknesses. To build the precision of their detection, Patil[1] utilize various information mining procedures, like LR, multi-facet discernment, ANN, choice tables, revolutionary fundamental capabilities, NB, KNN, and successive insignificant enhancement. There is nobody rule for the ideal result in light of the fact that the exactness of these strategies shifts relying upon the sort of dataset utilized. Utilizing a dataset from the UCI computerized vault with 25 credits, 11 of which are numeric, 13 of which are ostensible, and one of which is a class property, Dulhare and Ayesha [2] use the NB classifier with OneR as the characteristic selector to foresee CKD. Through OneR, they had the option to cut how much ascribes by 80% while further developing discovery precision by 12.5%. A bunching method is utilized by Gopika and Vanitha [3] to identify CKD precisely and accelerate determination. They exhibit 87% precision using the fuzzy c-means clustering strategy for a dataset from the UCI machine storehouse utilizing fuzzy means, k-means, and k-medoids approaches. Utilizing a dataset with 2 classes, 400 models, and 24 factors, Charleonnan et al. [4] use DT, LR, support vector machines (SVM), and KNN as classifiers for CKD distinguishing proof. They utilize the UCI AI CKD dataset. The discoveries show that the SVM strategy offers more noteworthy recognition responsiveness and precision.

Ramya and Radha [5] use characterization strategies to concentrate on kidney capability failure. Using RF, radial basic function, and back-propagation neural networks, they arrange cases as per the seriousness of the condition and the different periods of renal sickness. Utilizing a dataset from the territory of Coimbatore for around 1000 patients with 15 factors, they look at different calculations for execution estimates like specificity, kappa, sensitivity, and accuracy, reasoning that the radical basic function is the best classifier with 85.3% location

precision. To approve decision tree and NB, Padmanaban and Parthiban [6] utilized AI methods and a dataset of 600 occurrences. They accomplished 91% discovery exactness through the decision tree and announced 95% responsiveness and 94% explicitness with the decision tree for CKD recognition. Iqbal et al's. [7] investigation of kidney infection ultrasound pictures utilizes surface examination methods to separate among solid and kidney sickness patients. Through MATLAB, they process the root mean square (RMS), homogeneity, normal qualities, and a gray-level correlation matrix(GLCM). These estimations utilize numerical cycles like the Fourier examination. They consider the ultrasound pictures of 32 patients and utilize the RMS and cortical locale upsides of 0.3 and 0.0049, individually, to recognize solid and kidney infection patients. Utilizing a dataset from the UCI AI dataset that contains information on around 400 people, Kayaalp et al.[8] investigation of kidney sickness utilizes hybrid order calculations. They utilize a support vector machine and a K-NN classifier, and they pick the main element in the dataset utilizing the relief and gain proportion approach. They track down that, as far as fmeasure, accuracy, and contrast matrix, the k-NN approach beats different calculations for a subset of highlights.

AdaBoost is utilized by Wibawa et al. [9] for group learning and correlation-based feature selection(CFS), and component choice and helped classifier are utilized to analyze CKD. They utilize NB, KNN and support vector machines to recognize CKD, and they get to the end that AdaBoost and CFS, notwithstanding KNN and NB classifiers, are the most encouraging classifiers for this reason. They accomplish f-measure paces of 0.98, review paces of 0.98, and precision paces of 0.981. Through their classification approach, Wickramasinghe et al. [10] propose different food projects to various patients to manage CKD. Contingent upon the patient's blood potassium level, they prompt an eating routine system. They utilize a multicast brain organization, multiclass choice backwoods, multiclass choice wilderness, and multiclass strategic regression to accomplish 99.17% exactness.

A wise and functional methodology for the programmed recognizable proof of Diabetes Mellitus utilizing Neural Network was proposed [11] by Sonu Kumari and Archana Singh. The Yue Chang et al. study [12] utilized ANNs to move toward the objective of diagnosing and showed the need of preprocessing and supplanting missing values in the dataset viable. Better exactness was acquired with less time spent preparing the set thanks to the Changed training set. Sajida [13] utilized the CPCSSN dataset and three AI strategies to foresee the diabetes sickness(DS) in beginning phases to shield individuals from an early demise. In this review, Packing, Adaboost, and DT (J48) were utilized to anticipate diabetes. The researcher analyzed the aftereffects of those techniques and reached the resolution that the Adaboost strategy in Weka information mining devices was more effective and precise than different techniques. NB, RBF Organization, and J48 datamining strategies were used by Sadri et al. [14] to analyze type II diabetes. They utilized WEKA. At long last, they found NB, which outflanked different calculations as far as exactness rate (76.96%). As per Prema N S et al. [15], diabetes is anticipated involving group casting a voting classifiers for the Pima Indian diabetes dataset. When contrasted with other characterization calculations, the 10-overlay cross approval technique, what divides information into 30% preparation and 70% testing, yields the most noteworthy exactness of 80% and 81% for the dataset. This exploration concentrates by J. Pradeep Kandhasamy and S. Balamurali [16] assesses the adequacy of calculations that are utilized to anticipate diabetes utilizing information mining draws near. To arrange patients with diabetes mellitus, essayists have likewise utilized the J48 decision Tree, KNN, RF, and support vector machines classifiers. Eight key ascribes were utilized by creators to look at four expectation models for diabetes mellitus in two separate contexts.One is before the dataset has been pre-handled. As per the investigations, the choice tree J48 classifier is more exact than the other three classifiers, with a precision pace of 73.82%. When contrasted with before examinations, the pre-handled dataset created more exact outcomes. KNN (k=1) and RF perform far superior than the other three classifiers in this present circumstance and deal 100 percent precision. This exhibits that our dataset will create good outcomes for our concern once the uproarious information has been eliminated.

J. Steffi et al. [17] gave an illustration of how information mining order calculations like NB, LR, C5.0, SVM, and ANN are utilized to show actual forecast of diabetes mellitus. They likewise directed a relative investigation of these calculations utilizing their particular Measurement Measures, like Exactness, Accuracy, Responsiveness, Explicitness, and F1 Score. In view of their exactness measurements, the C5.0 and LR are similarly great as a result of the examination exertion. Rahul and Minyechil Alehegn [18] researched various information mining philosophies and their applications. Different clinical informational collections have been exposed to the utilization of AI calculations. The exactness of a solitary calculation was lower than that of a troupe. DT offered great exactness in many examinations.

Weka and Java are the apparatuses utilized in this study's hybrid framework to estimate diabetes dataset. In Jayalakshmi, T. furthermore, Santhakumaran's[19] review, different supervised classifier AI calculations were

applied to a training set that was made by eliminating features with next to zero significance to foreseeing diabetes. Just the attributes hat were positioned higher, were given more noteworthy weight, and were bound to foresee the beginning of diabetes were thought about when this was finished utilizing the chi-squared test. It was seen that the NN technique created the most elevated precise outcomes on this preparing set. The three types of diabetes and their causes are examined by Sajida Perveen et al. in their review from [20]. Furthermore, it utilizes the forecast and grouping technique. This gives the sickness forecast a more serious level of exactness. Sadri Sa'di et al.'s[21] investigation of various information mining calculation techniques used to estimate the advancement of diabetes. In this review, one of the most involved calculations for sickness expectation is Classification and NB. In this review, K. R. Pradeep and N. C. Naveen [22] looked at and assessed the precision of different AI calculations. As per this review, there are contrasts in the strategy's exactness when pre-handling. This shows that the exhibition and exactness of sickness expectation are both influenced by the pre-handling of the informational index. Yunsheng Melody et al. [23] portray and make sense of numerous classification calculations utilizing different attributes, including age, skin thickness, insulin, pulse, glucose, and different estimations. The researchers involved a small example of information in their review to foresee diabetes. Five distinct techniques, including GMM, ANN, SVM, EM, and LR, were utilized in this exploration. The specialists get to the last end that ANN (Artificial Neural Network) gave high precision to diabetes expectation. In their examination, Monika and Pooja Sharma[24] directed factual examination on the clinical estimation list information of patients with and without diabetes. Based on the gave clinical information, they have additionally utilized supporting calculations to give an exceptional grouping of diabetes model.

To conjecture diabetes, Jaffar Abbas et.al.[25] clinical bioinformatics investigation has been finished. The WEKA program was utilized as a mining device to distinguish diabetes. The UCI vault was utilized to acquire the Pima Indian diabetes information base, which was then utilized for investigation. To foster a strong model that predicts and identifies the diabetes condition, the dataset was inspected and examined. To increment exactness, this study utilizes bootstrapping resampling. Then, NB, DT, and KNN are applied, and their presentation is thought about. In his review, Minyechil Alehegn [26] utilized DISKR (lessen the size of the preparation set for KNN) to eliminate exceptions/OOBs (out of bag) from the troupe approach of machine learning. Additionally, the storage space was kept to a minimum in this examination. Accordingly, subsequent to taking out variables or cases that have minimal bearing on the exploration, the space intricacy is diminished and more viable. Information digging Approach was applied for diabetes sickness expectation and therapy by V. Kumar and L. Velide [27]. They utilized NB, JRip, J48 (4.5), DT, and NN techniques. They carried out utilizing the WEKA device. They accomplished a J48 calculation precision rating of 68.5%.

Niyati Gupta [28] gives an exhaustive examination of the information mining methods right now being used for diabetes expectation. Moreover, it gives data about Type1, Type 2, and Type 3 diabetes. With the guide of information mining methods, for example, the KNN Calculation, Bayesian Classifier, Credulous Bayesian Classifier, and Bayesian Organization, the objective of diabetes is to expect the infection. Also, the effects of diabetes on patients are talked about in this work. The proposed strategy by N.Deepika et al.[29] endeavors to give a compelling crossover order system for expecting and following the Diabetes condition. The essential objective of this exploration is to find and make models that will really help clinical experts, so empowering people to carry on with longer lives in our planet.

As indicated by before review, AI might assist with ordering information into unmistakable classes and conveys vital experiences into the information. The outcomes show that when include determination strategies are joined with AI methods, precise characterization results can be acquired. This review utilizes a bunch of the most widely recognized AI methods alongside include choice procedures to order solid and kidney sickness patients while keeping up with the benefits of characterization results for AI strategies.

III. System Design

The proposed architecture's system flow is depicted in Fig. 1. The first level of the system flow is for input data with symptoms. The second level involves data processing and trained disease prediction models. The third level includes disease prognosis and medication advice before returning to the main dashboard display.

A. Architectural Design

The suggested architecture's architectural design is seen in Fig. 2. Using a username and password, the patient or user will log onto the dashboard. After the user or patient enters their medical information. This medical data is gathered and analysed using ML models. The disease prediction will be finished once the data has been processed. If a patient has a chronic illness, medication will be advised.

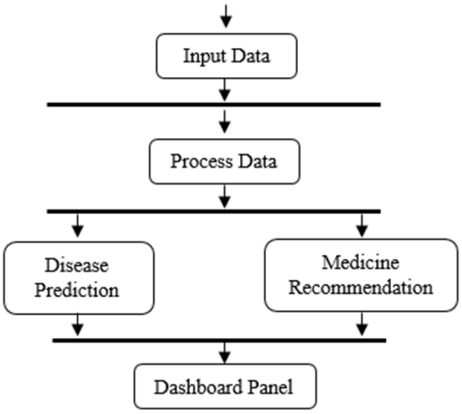

Figure 1: System flow

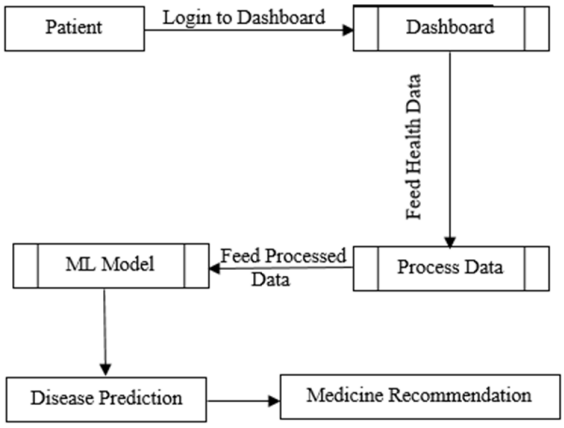

Figure 2: Architectural Diagram

B. Sequence Diagram

In a sequence diagram, connections between objects are displayed in the sequential request in which they happen. Sequence diagram graphs show the moves made by the parts of a framework in sequential request. User must first sign up with a username and password. After registering, the user can log in immediately using their username and password. The customer is then given the option to select an ailment for detection, such as diabetes and obesity. If a patient has a persistent illness, medication will be given after entering their medical information.

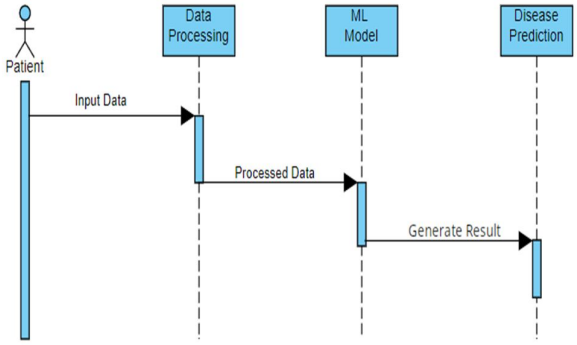

Figure 3: Sequence diagram

IV. Results and Discussions

A. Patient Registration page

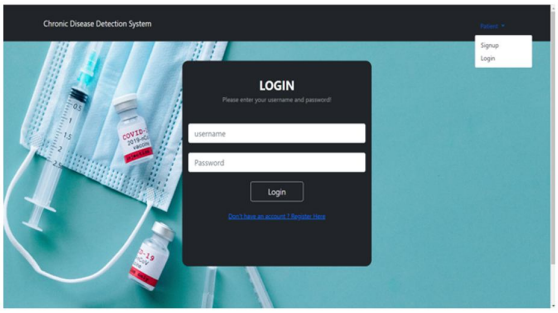

Figure 4: Patient Registration page

There is a page where patients can register. The patient can enter their login and password on this registration page, and they must also confirm their password. There are guidelines to follow while inputting a password. The guidelines are as follows: There must be a minimum of 8 characters, at least one of which must be an upper case [A-Z] alphabet, at least one number or digit between [0-9], and at least one letter from [_ or @ or $]. If a specific requirement is not met, an invalid password error will appear. In order to comply with password regulations, the patient must re-enter their password. Following registration, patients can login immediately using their name and password without having to do so again. He can then forecast the illness.

B. Home Page

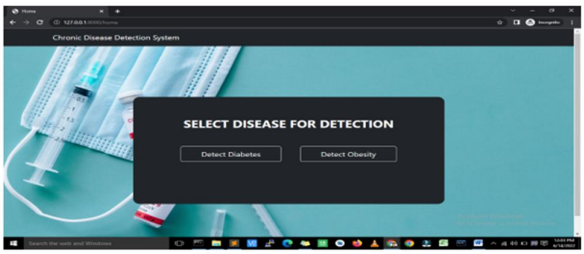

Figure 5: Home Page

Patients choose which infections to test for in light of their symptoms. Various sorts of diabetes have different basic causes. Notwithstanding, diabetes can result in an excess of sugar in your blood no matter what the sort you have. Serious medical problems could come about because of having an excess of sugar in your blood. Furthermore, with regards to corpulence, a convoluted sickness creates when an individual weigh more than is smart for their level. Dietary patterns, actual work levels, and rest plans are only a couple of the numerous factors that could prompt unnecessary weight gain. The patient can pick the infirmity to be identified in view of the side effects he is encountering.

C. Diabetes Prediction Page

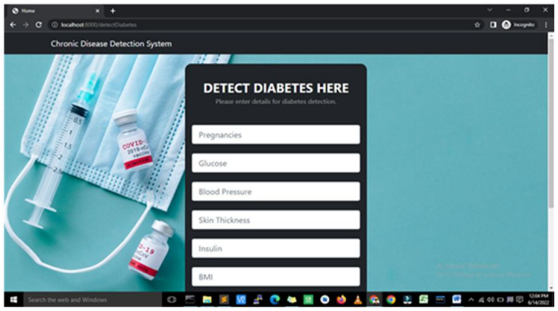

Figure 6: Diabetes Prediction Page

Utilizing the elements, we provide for our AI model and the notable Pima Indians Diabetes Information base, we will actually want to anticipate in the event that the patient has diabetes or not. The dataset contains 768 records of different more established female patients with diabetes and healthy. Eight distinct elements make up the dataset age, body mass index, blood pressure, number of pregnancies, insulin, and diabetes pedigree function.

D. Obesity Prediction Page

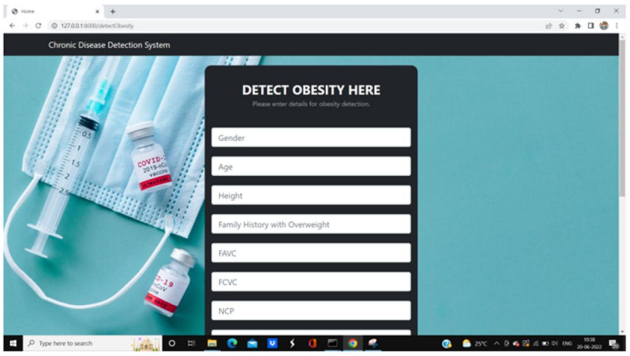

Figure 7: Detect Obesity

Data on the pervasiveness of weight among people with a scope of dietary inclinations and states of being, matured 14 to 61. A web-based study was utilized to assemble information, and anonymous individuals answered each inquiry. After the information was handled, 17 attributes and 2111 records were acquired. The accompanying attributes are connected to dietary patterns: Frequency of high-calorie food consumption (FAVC), Frequency of vegetable consumption (FCVC), Number of main meals (NCP), Frequency of food consumption between meals (CAEC), Frequency of water consumption per day (CH20), and Frequency of alcohol consumption (CALC). Calorie consumption monitoring (SCC), physical activity frequency (FAF), time utilizing technological devices (TUE), and transportation used (MTRANS) are attributes associated with state of being. Different factors acquired were gender, age, level, and weight. The information can be investigated utilizing arrangement, forecast, division, and affiliation calculations since it incorporates ceaseless and mathematical information.

E. Predicted Diabetes Disease Output Page

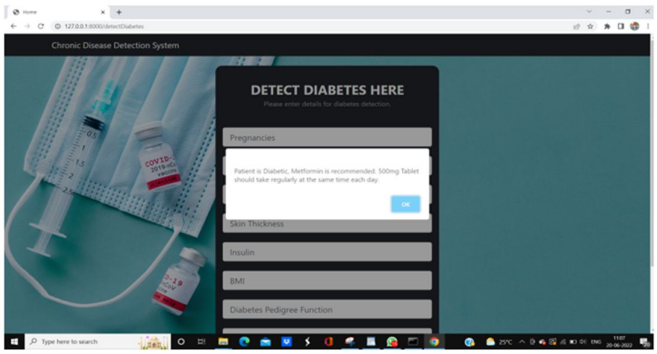

Figure 8: Diabetes Output page

The framework assesses the client's symptoms as information and produces an infection expectation that incorporates the probability that the condition will happen. We conjecture sicknesses like diabetes utilizing LR, RF, and DT. Various models, systems, and calculations are utilized to estimate and break down each ongoing illness. The proposed framework likewise incorporates a suggestion plan to recommend the kind of drugs to be taken relying upon the patient's ongoing symptoms, considering the proper safety measures to be executed.

F. Predicted Obesity Disease Output page

The framework assesses the client's symptoms as information and produces an infection expectation that incorporates the probability that the condition will happen. We figure problems like obesity using LR, RF, and

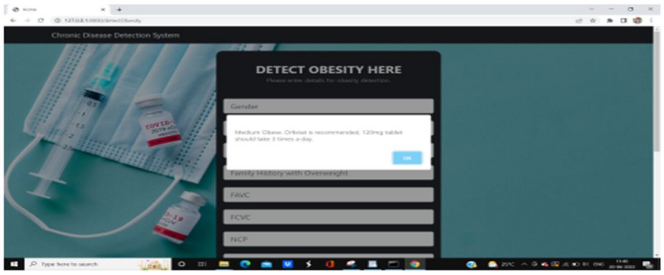

Figure 9: Obesity Output page

DT. Various models, methodologies, and calculations are utilized to gauge and dissect each constant infection. The recommended framework is likewise equipped with an idea plan to propose the sort of drugs ought to be taken in view of the patient's ongoing side effects, considering the going to of the proper measures.
In the final chapter, we wrapped up our effort to predict chronic diseases and discussed potential future improvements.

V. Conclusion

The article Chronic Illness expectation utilizing AI is exceptionally useful in everybody's everyday life, except it is especially huge for the medical care industry since they are the ones who consistently utilize these frameworks to predict the sicknesses of the patients in view of their overall data and the symptoms they have encountered. These days, the health sector area assumes a huge part in treating patients' sicknesses, so this framework is likewise useful for the area to illuminate the client and is valuable to the client if the person decides not to visit an emergency clinic or other center. By entering the symptoms and other appropriate data, the client can realize what infection they are encountering, and the area can likewise acquire from this framework by basically asking the client. The occupation of the specialists can be diminished and they will actually want to precisely gauge the patient's affliction assuming that the wellbeing area embraces this thought. The objective of the Persistent Sickness Expectation is to offer figures for various normal diseases that, whenever left untreated or some of the time even dismissed, can become deadly and create critical issues for both the patient and their friends and family. For better chronic illness expectation, future examination ought to inspect a few directed and solo AI strategies with extra performance markers.

References

[1] Patil PM, “Review on Prediction of Chronic Disease using Data Mining Techniques”, International Journal of Computer Science and Mobile Computing, Vol.5, No.5, (2016), pp.135-141.
[2] Dulhare UN & Ayesha M, “Extraction of action rules for chronic disease using Naïve bayes classifier”, IEEE International Conference on Computational Intelligence and Computing Research (ICCIC), (2016), pp.1-5.
[3] Gopika M, “Machine learning Approach of Chronic Disease Prediction using Clustering Technique”, International Journal of Innovative Research in Science, Engineering and Technology, Vol.6, No.7, (2017), pp.14488 14496.
[4] Charleonnan A, Fufaung T, Niyomwong T, Chokchueypattanakit W, Suwannawach S & Ninchawee N, “Predictive analytics for chronic disease using machine learning techniques”, IEEE International Conference on Management and Innovation Technology (MITicon), (2016), pp.MIT-80.
[5] Ramya S & Radha N, “Diagnosis of chronic disease using machine learning algorithms”, International Journal of Innovative Research in Computer and Communication Engineering, Vol.4, No.1, (2016), pp.812-820.
[6] Padmanaban KA & Parthiban G, “Applying Machine Learning Techniques for Predicting the Risk of Chronic Disease”, Indian Journal of Science and Technology, Vol.9, No.29, (2016), pp.1-5
[7] Iqbal F, Pallewatte AS & Wansapura JP, “Texture analysis of ultrasound images of chronic disease. IEEE Seventeenth International Conference on Advances in ICT for Emerging Regions (ICTer), (2017), pp.1-5.
[8] Kayaalp F, Basarslan MS & Polat K, “A hybrid classification example in describing chronic disease”, IEEE Electric Electronics, Computer Science, Biomedical Engineerings' Meeting (EBBT), (2018), pp.1-4.
[9] Wibawa MS, Maysanjaya IMD & Putra IMAW, “Boosted classifier and features selection for enhancing chronic disease diagnose”, IEEE 5th International Conference on Cyber and IT Service Management (CITSM), (2017), pp.1-6.
[10] Wickramasinghe MPNM, Perera DM & Kahandawaarachchi KADCP, “Dietary prediction for patients with Chronic Kidney by considering blood potassium level using machine learning algorithms”, IEEE Conference on Life Sciences (LSC), (2017), pp.300-303.

[11] S. Kumari and A. Singh, "A data mining approach for the diagnosis of diabetes mellitus," 2013 7th International Conference on Intelligent Systems and Control (ISCO), Coimbatore, India, 2013, pp. 373-375, doi: 10.1109/ISCO.2013.6481182.
[12] Yue Chang, Xudong Chen, "Estimation of Chronic Illness Severity Based on Machine Learning Methods", Wireless Communications and Mobile Computing, vol. 2021, Article ID 1999284, 13 pages, 2021. https://doi.org/10.1155/2021/1999284
[13] Sajida, Perveen., Muhammad, Shahbaz., Aziz, Guergachi., Karim, Keshavjee. (2016). Performance Analysis of Data Mining Classification Techniques to Predict Diabetes. Procedia Computer Science, 82:115-121. doi: 10.1016/J.PROCS.2016.04.016
[14] Sadri Sa'di, Amanj Maleki, Ramin Hashemi, Zahra Panbechi and KamalChalabi, " Comparison of Data Mining Algorithms on the Diagnosis of Type-II Diabetes", International Journal on Computational Science & Applications (IJCSA) Vol.5, No.5,October 2015 DOI:10.5121/ijcsa.2015.5501
[15] Prema N S, Varshith V, Yogeswar J, "Prediction of Diabetes using Ensemble Techniques", International Journal of Recent Technology and Engineering (IJRTE), ISSN: 2277-3878, Volume-7, Issue-6S4, April 2019
[16] J. Pradeep Kandhasamy, S. Balamurali,"Performance Analysis of Classifier Models to Predict Diabetes Mellitus", Procedia Computer Science, Volume 47, 2015, Pages 45-51, ISSN 1877-0509, https://doi.org/10.1016/j.procs.2015.03.182.
[17] J. Steffi, Dr.R.Balasubramanian and Mr.K.Aravind Kumar,"Predicting Diabetes Mellitus using Data Mining Techniques, Comparative analysis of Data Mining Classification Algorithms", International Journal of Engineering Development and Research, IJEDR 2018, Volume 6, Issue 2, ISSN: 2321-9939, Page No. 460-467.
[18] Minyechil Alehegn, Rahul Raghvendra Joshi,"Type II Diabetes Prediction Using Combo of SVM". International Journal of Engineering and Advanced Technology (IJEAT), ISSN: 2249 – 8958, Volume-8 Issue-6, August 2019, Page No.712-715.
[19] Jayalakshmi, T. and Santhakumaran, A. (2010) A Novel Classification Method for Diagnosis of Diabetes Mellitus Using Artificial Neural Networks. International Conference on IEEE Data Storage and Data Engineering (DSDE), 9-10 February 2010, 159-163.https://doi.org/10.1109/dsde.2010.58
[20] Sajida Perveen, Muhammad Shahbaz, Aziz Guergachi, Karim Keshavjee,"Performance Analysis of Data Mining Classification Techniques to Predict Diabetes", Procedia Computer Science, Volume 82, 2016, Pages 115-121, ISSN 1877-0509, https://doi.org/10.1016/j.procs.2016.04.016.
(https://www.sciencedirect.com/science/article/pii/S1877050916300308).
[21] Sadri Sa'di, Amanj Maleki1, Ramin Hashemi, Zahra Panbechi and Kamal Chalabi, "Comparison Of Data Mining Algorithms in the diagnosis of Type II Diabetes",International Journal on Computational Science & Applications (IJCSA) Vol.5, No.5,October 2015, Page No. 1-12, DOI:10.5121/ijcsa.2015.5501
[22] K. R. Pradeep and N. C. Naveen, "Predictive analysis of diabetes using J48 algorithm of classification techniques," 2016 2nd International Conference on Contemporary Computing and Informatics (IC3I), Greater Noida, India, 2016, pp. 347-352, doi: 10.1109/IC3I.2016.7917987.
[23] Yunsheng Song, Jiye Liang, Jing Lu, Xingwang Zhao,"An efficient instance selection algorithm for k nearest neighbor regression", Neurocomputing, Volume 251, 2017, Pages 26-34, ISSN 0925-2312,
https://doi.org/10.1016/j.neucom.2017.04.018.
[24] Monika and Pooja Sharma,"Survey on Prediction and Analysis of Diabetic Data using Machine Learning Techniques", International Journal of Computer Sciences and Engineering, Vol.6, Issue 6, June 2018 E-ISSN: 2347-2693, Page No. 1032-1038.
[25] Jaffar Abbas, M. Aqeel, J. Abbas, B. Shaher, Jaffar A. , J. Sundas, W. Zhang,"The moderating role of social support for marital adjustment, depression, anxiety, and stress: Evidence from Pakistani working and nonworking women", Journal of Affective Disorders,Volume 244,2019,Pages 231-238,ISSN 0165-0327,https://doi.org/10.1016/j.jad.2018.07.071.
[26] Minyechil Alehegn and Rahul Joshi,"Analysis and prediction of diabetes diseases using machine learning algorithm: Ensemble approach", International Research Journal of Engineering and Technology (IRJET),e-ISSN: 2395-0056, p-ISSN: 2395-0072, Volume: 04 Issue: 10, Oct -2017, Page No. 426- 436
[27] VelidePhani Kumar and Lakshmi Velide,"A Data Mining approach for Prediction and Treatment of Diabetes Disease, The International Journal of Science Inventions Today (IJSIT), Volume 3, Issue 1, January-February 2014, Page No. 73-79
[28] Niyati Gupta, A. Rawal, and V. Narasimhan.2013, "Accuracy, Sensitivity and Specificity Measurement of Various Classification Techniques on Healthcare Data", IOSR Journal of Computer Engineering, vol. 11, no. 5, pp. 70-73 .
[29] N.Deepika, Dr.S.Poonkuzhali.2018, "Design of Hybrid Classifier for Prediction of Diabetes through Feature Relevance Analysis", International Journal of Innovative Science, Engineering & Technology, Vol. 2 Issue 10.