



WelBing :WelBing for your Well being

1. INTRODUCTION

Going to the hospital in this pandemic situation is not a good idea, especially for common problems like hand pain or headache. Covid-19 has shed light on the lacking infrastructure in the healthcare sector in India. This made us realize the importance of technology and its need in the healthcare sector. We decided to design an application called Welbing that can identify the disease or the problem so that it can detect it and provide us with the medicine we should take, the correct dosage, and the diet. Our application uses an ML algorithm to know the exact situation of the patient and predict the medicine, dosage, and diet. To know the exact situation of the patient we are using IoT devices such as IoT thermometer, IoT sugar level monitor, IoT bp checker along the BMI of the patient. We used programming languages like Python, Java, Kotlin, and JavaScript, to build our application.

We will consult a doctor to make sure the medicine, dosage, and diet are given correctly.

1.1 Motivation

In the prevailing situation, the health of people must be monitored regularly and also, the required medicines are delivered to people, without overcrowding the hospitals and medical stores, and also avoiding unnecessary travel of people from remote areas which lack medical facilities. Hence this tempted us to create an application that can monitor the health condition of people at home and can diagnose any abnormalities if present and suggest some medicines based on the recommendations of a medical expert.

1.2 Objective

To create a Machine Learning algorithm that can detect abnormalities in our body based on the IoT inputs.

To reduce unnecessary crowd in the hospitals and pharmacies (efficient crowd management) which can avoid recurrences of such pandemic in future.

To provide better health monitoring facilities in remote areas through technology.

To provide convenience to people(especially elderly people) by delivering prescribed medicine to their homes and also by booking/scheduling online appointments with doctor and doctor consultations at your home.

2. Existing Work / Literature Review

Mfine:

Mfine is a Medical application that uses the advantages of the android application to treat the patient effectively.

The similarities between Mfine and Welbing are that both projects are health applications, provide the Book appointment feature, provide Home Treatment option and provide an option for Online consultation. But Welbing differs from Mfine in many ways.

We are using the power of machine learning to predict the medicine and the diet for the patients. We are using the power of the IoT to take input from the patient directly. We are providing the Option to Select the Doctor to book an appointment. Other than this, there are a lot of special features available especially in our app. likely,

- Informing an Emergency *(conditions applied)
- Get Fitness Certificate on the go through online consultation
- Navigating to the nearby pharmacy, medicals
- Maintaining separate records for the family members.

3. Topic of the work

a) System Design / Architecture

IMPLEMENTATION OF ML AND IoT

This application will help the user find their medical analysis based on the IoT inputs and symptoms. We will need to take the inputs and match them with symptoms and threshold limits from a database(verified by the doctor). This verification will be done by ML Data Analysis. We will be using Python Jupyter Software for testing and training the data for the highest accuracy.

Modules and inbuilt features we will use:

- pandas: data structure and data analysis tools.
- NumPy: efficient multi-dimensional matrix analysis.
- Matplotlib : plotting graph.
- seaborn: visualize linear relationship as determined through regression.
- TensorFlow: improve efficiency through ML part.

Dataset: There are many datasets available on google but we are going to collect our own data through Doctor.

<https://docs.google.com/spreadsheets/d/1v7I1uAA6IU4nDnltXOKnHRtfvh7VEa5HBI1p52p4CHg/edit#gid=0>

Dataset collection and Analyses:

disease	dose	patient	time	medication	total medication	avoid
0	0	fever	adult	paracetamol500-1	paracetamol500-1	paracetamol500-3
1	1	fever	child	paracetamol250-1	paracetamol250-1	paracetamol250-3
0	0	headache	adult	paracetamol500-1	paracetamol500-1	paracetamol500-3
1	1	headache	child	paracetamol250-1	paracetamol250-1	paracetamol250-3
0	0	cold	adult	levocetirizine-1, levofloxadamine 120-1	levocetirizine-1, levofloxadamine 120-1	levocetirizine-2, levofloxadamine 120-2
1	1	cold	child	levocetirizine-1, levofloxadamine 120-1	levocetirizine-1, levofloxadamine 120-1	levocetirizine-2, levofloxadamine 120-2
0	0	body pain	adult	acetophenac-100-1, pantoprazol40-1	acetophenac-100-1, pantoprazol40-1	acetophenac-100-2, pantoprazol40-2
1	1	body pain	child	acetophenac-50-1, pantoprazol20-1	acetophenac-50-1, pantoprazol20-1	acetophenac-50-2, pantoprazol20-2
0	0	stomach pain	adult	pantoprazol40-1, Boscopan10-1	pantoprazol40-1, Boscopan10-1	pantoprazol40-2, Boscopan10-2
1	1	stomach pain	child	pantoprazol20-1, Boscopan5-1	pantoprazol20-1, Boscopan5-1	pantoprazol20-2, Boscopan5-2
0	0	nausea	adult	odanestron-1	odanestron-1	odanestron-2
1	1	nausea	child	odanestron-1	odanestron-1	odanestron-2
0	0	dizziness	adult	betahistined-1	betahistined-1	betahistined-2
1	1	dizziness	child	betahistined-1	betahistined-1	betahistined-2
0	0	diarrhea	adult	ora500-1	ora500-1	ora500-2
1	1	diarrhea	child	ora500-1	ora500-1	ora500-2

Accuracy of Data:

```
X = fever[['age', 'temperature']]
y = fever['severity']
```

```
X_train,X_test,y_train,y_test = train_test_split(X,y,random_state = 0)
```

```
from sklearn.neighbors import KNeighborsClassifier
```

```
knn = KNeighborsClassifier(n_neighbors = 15)
```

```
knn.fit(X_train, y_train)
```

```
KNeighborsClassifier(n_neighbors=15)
```

```
knn.score(X_test, y_test)
```

```
0.9761904761904762
```

**Implementation of IoT:
Components required:**



Arduino UNO



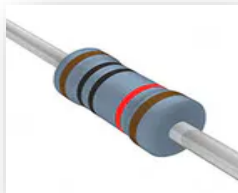
Jump wire (generic)



Pulse Heart Rate Sensor



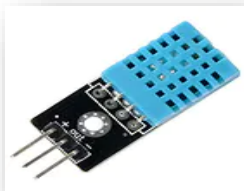
Temperature sensor



Resistor 10 ohm



PULSE OXIMETER AND HEART RATE
SENSOR

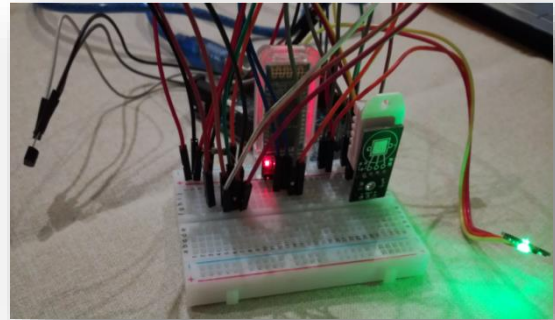
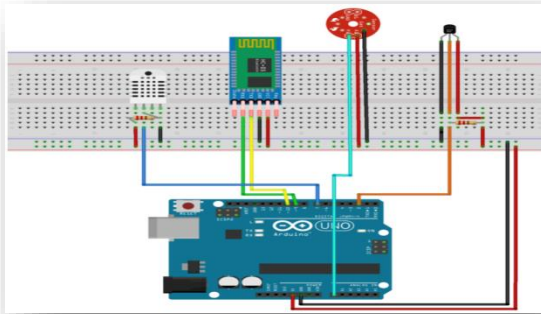


DHT11 Temperature And Humidity Sensor
Module



HC-05 Bluetooth Module

Wiring of Arduino and breadboard and SCHEMATICS Sketch for the wiring

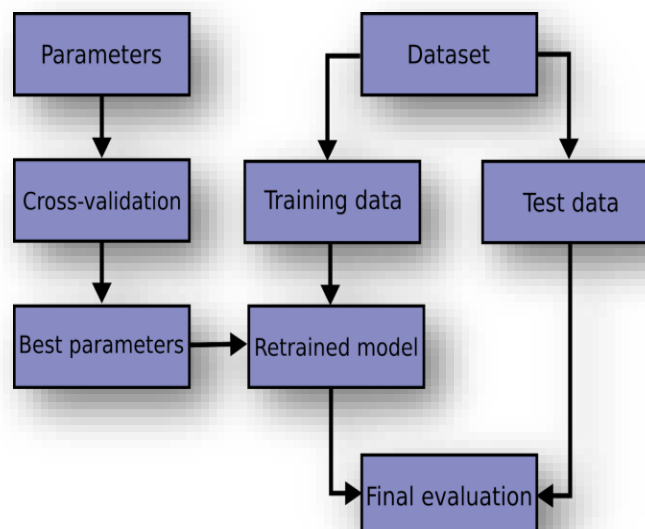


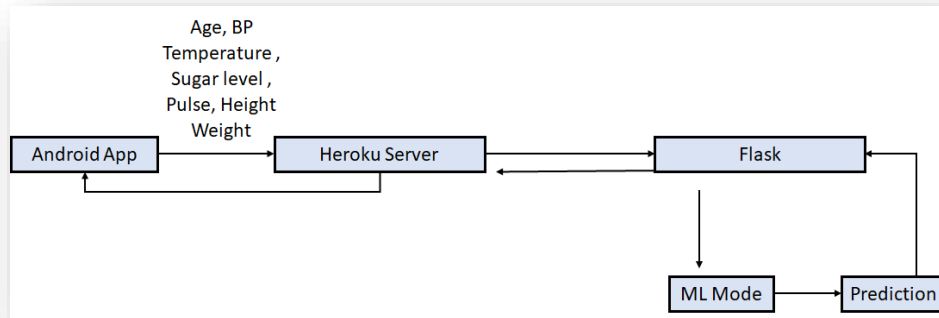
Implementation and Working of ML :

The machine learning algorithm which we have used for training our dataset is the k- nearest neighbors algorithm [K-NN algorithm] K-NN is a non-parametric algorithm, which means it does not make any assumptions on underlying data. This algorithm assumes the similarity between the new case/data and available cases and puts the new case into the category that is most similar to the available categories. Though this algorithm can be used for both Regression as well as for Classification. But mostly, it is used for Classification problems. Our dataset belongs to the classification category where we have to identify or classify whether the disease is severe or not based on temperature inputs, whether the pulse is good or below average according to the age, check if the sugar level is low or not, etc. and this where the K-NN algorithm fits in. There are more reasons why we used this algorithm such as:

- It is simple to implement.
- It is robust to the noisy training data.
- It can be more effective if the training data is large.

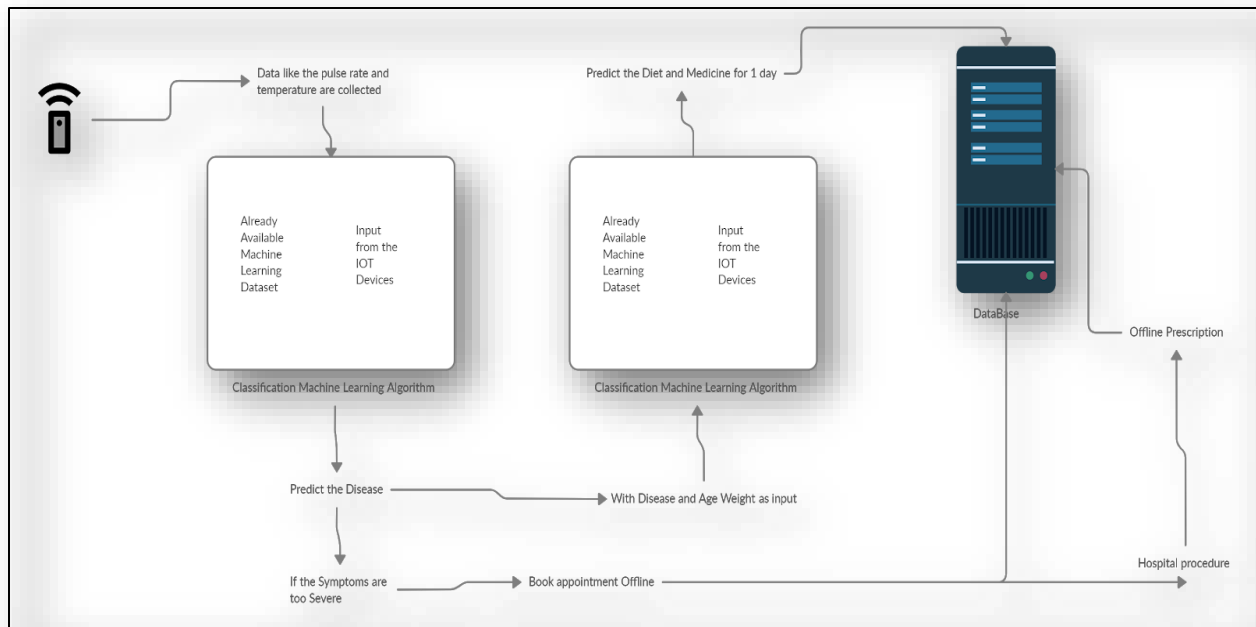
FLOWCHART





WORKING OF ML

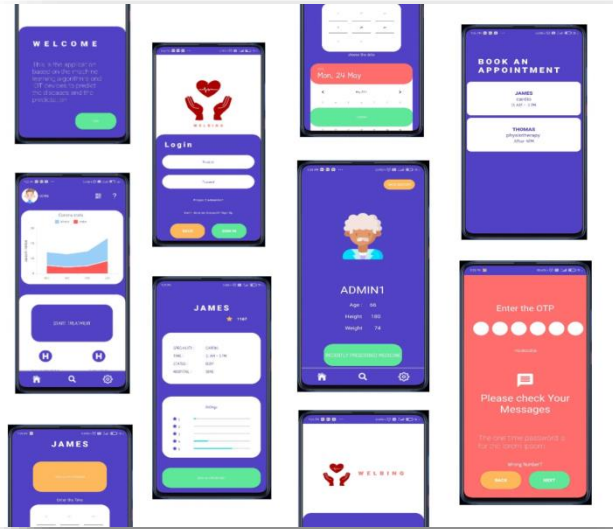
In our android app, we have allowed the user to give inputs such as age, BP, temperature, sugar level, pulse, height, and weight. The data entered by the user goes to the Heroku server. Through that, it goes to the flask framework. Here the ML algorithm is applied. This algorithm makes the prediction and then returns it to the flask framework. From there, it returns to the Heroku server and from there to the android application, where the user can see the result for the input data.



WORKING OF IOT AND ML

UI IMPLEMENTATION :

The UI and UX play an important part in the success of any application. The better the experience is the more comfortable it is for the user to use the application. With user-friendly UI, users feel more connected and comfortable. With keeping this idea in mind, we have invested ourselves in UI and UX design. We have to use Adobe Xd for UI implementation.



<https://drive.google.com/file/d/1tyUsnKVpPy7b0HmW88dYAXNCUHdmLfbC/view?resourcekey>

Implementation of Security:

Here we have the AES Encryption technique. AES encryption, or advanced encryption standard, is a type of cipher that protects the transfer of data online. Currently, AES is one of the best encryption protocols available, as it flawlessly combines speed and security. Also, It is found at least six times faster than triple DES.

AES is a symmetric type of encryption, as it uses the same key to both encrypt and decrypts data. It also uses the SPN (substitution permutation network) algorithm, applying multiple rounds to encrypt data. There are three lengths of AES encryption keys which are 128, 192, 256 bits. Each key length has a different number of possible key combinations.

It comprises a series of linked operations, some of which involve replacing inputs with specific outputs (substitutions) and others involve shuffling bits around (permutations).

We have used this encryption technique for our application because

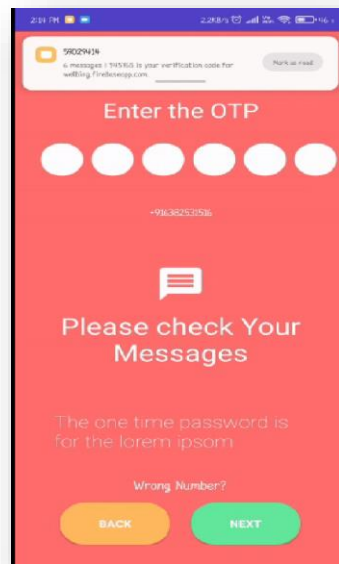
- It is used as a replacement for DES(Data encryption standard) as it is much faster and better than DES.
- It is flexible and has an implementation for software and hardware.
- It provides high security and can prevent many attacks.
- It doesn't have any copyright so it can be easily used globally.
- It provides high security to the users.
- It provides one of the best open source solutions for encryption.
- It is a very robust algorithm.

Also, we have used two-factor authentication for our application. This is a double layer of security, which creates a pathway that requires validation of credentials (username/email and password) followed by creation and validation of the One Time Password (OTP). This adds a layer of security. The two main methods for delivery of the OTP are SMS-based and application-based. For our application, we have used SMS Based.

Here, the OTP is generated on the server side and delivered to the authenticator via text message. after regular authentication is successful. This is quite straightforward. It is the standard procedure

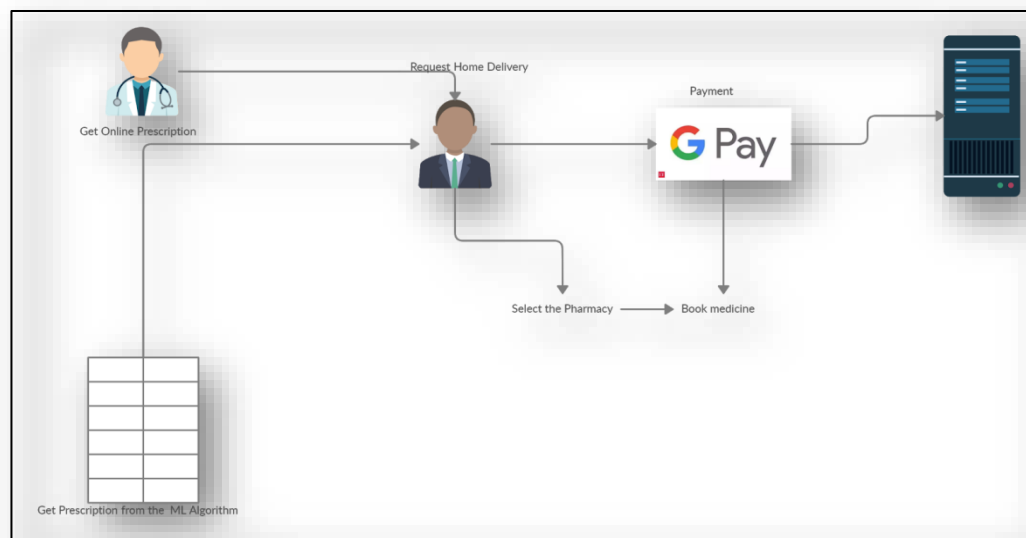
for delivering the OTP via a text message. The OTP is a numeric code that is randomly and uniquely generated during each authentication event.

<https://drive.google.com/file/d/1DvDxSYLdXgwcZ01yG2SQnAI3gVwFG8tv/view?resourcekey>



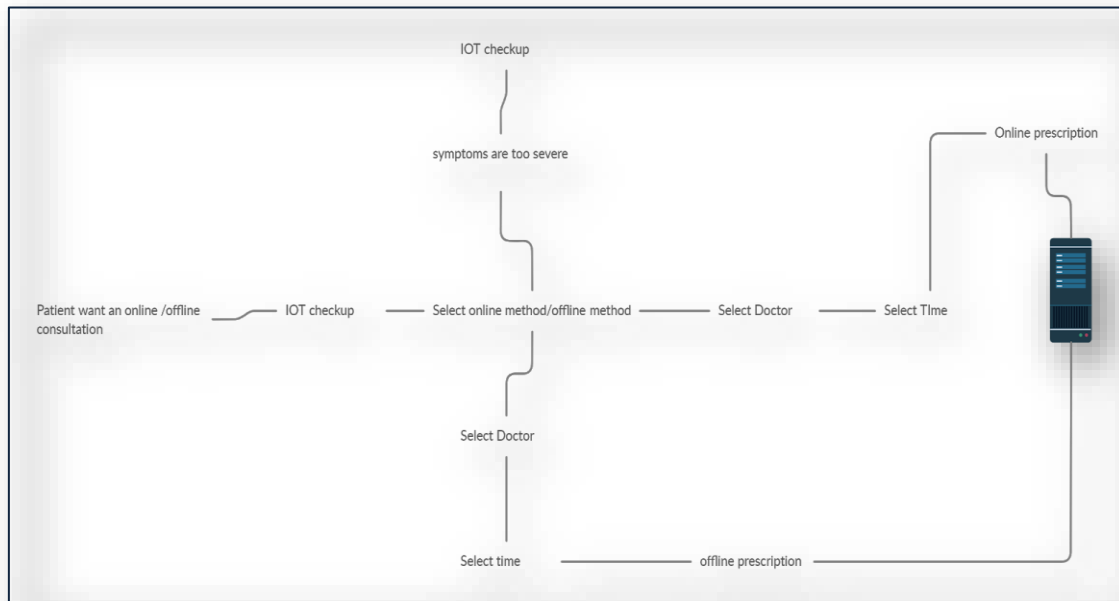
b) Working Principle :

As it is a Medical Help Application, we included the feature of shopping medicine from this app. The prescription will be sent to the pharmacy selected in the nearby area, the order will be processed and the bill will be shown to the user. This will even have the option as per user preference whether to pick up the medicine on their own or get it delivered. This will ensure that social distancing and overcrowding are avoided. People will have one thing to worry about during their illness.



MEDICO

IMPLEMENTATION OF APPOINTMENT



As the health analysis will be over and the final Health Card Report will be produced, based on the severity of the patient appointment with the doctor will be suggested. Then the patient can choose the doctor and book an appointment with them either in Online or Offline mode. The doctors related to the specific issue will be listed which will ease the need to search for the doctor. This will not only benefit the remote user but also the in-city users as it will also allow visit appointments. Here The ML will search the registered doctor dataset and provide the best choice of doctors.

c) Results and Discussion :

We have collected data to create our own dataset with the help and approval of the Medical Professionals have successfully created an android app that successfully prescribes medicines and diets based on the data trained using ML and IoT inputs.

<https://drive.google.com/file/d/1N-hoZX5ZTrGYejL5ngVnmrFCikT5lstr/view?resourcekey>



(d) Individual Contribution by members

<u>Members</u>	<u>Responsibilities</u>
Karthikeyan P	<ul style="list-style-type: none">● IoT circuit design● Developing Machine learning model● Making the application secure using encryption● UI/UX design of the application
Sakthi Vignesh	<ul style="list-style-type: none">● Developing Machine learning model● Making the application secure using encryption● UI/UX design of the application
Tanya Gupta	<ul style="list-style-type: none">● Developing Machine learning model● Making the application security using encryption● UI/UX design of the application
Kabiya Kumari	<ul style="list-style-type: none">● IoT circuit design● Developing Machine learning model● UI/UX design of the application
Kavya Singh	<ul style="list-style-type: none">● IoT circuit design● Developing Machine learning model● UI/UX design of the application
Muskan Agarwal	<ul style="list-style-type: none">● IoT circuit design● Developing Machine learning model● UI/UX design of the application
Muskan Sharma	<ul style="list-style-type: none">● IoT circuit design● Developing Machine learning model● UI/UX design of the application
Adhwaith Raghavan	<ul style="list-style-type: none">● IoT circuit design● Developing Machine learning model● UI/UX design of the application
Aruthra C	<ul style="list-style-type: none">● Collection of dataset● Consultation with doctors● Contacting and consulting pharmaceuticals

4. CONCLUSION

Health factors of humans if neglected will result in serious issues and can even cause danger to their life. Automating the continuous monitoring of health parameters through IoT and Machine learning techniques can be the solution to these issues. This is the very reason we decided to work on this project. By implementing ML and IoT we were successfully able to create a mobile application called WelBing for medical purposes with the correct carry out of the data set (1 lakh data set) collected by our members. Our project resulted in providing medical services like booking doctor's appointments, access to medical history, medicine availability, effective crowd management, and maintenance of patient records, hustle-free appointments, easy access to medicine and pharmacy.

https://drive.google.com/file/d/1D3BM_Er4-DWawAlXq7Wwre0CySOxdcQw/view?resourcekey



5. Reference:

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- <https://www.scribd.com/document/411426730/Old-Age-People-Health-Monitoring-System-using-IoT-and-ML>
- <https://protonmail.com/blog/what-is-end-to-end-encryption/>
- <https://patents.google.com/patent/US20010052071A1/en>
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- [A Survey of Machine and Deep Learning Methods for Internet of Things \(IoT\) Security Mohammed Ali Al-Garadi, Amr Mohamed, AbdullaAl-Ali, Xiaojiang Du, Mohsen Guizani](#)
- [File Encryption, Decryption Using AES Algorithm in Android Phone Suchita Tayde*, Asst.Prof. Seema Siledar](#)

- [Application of k-Nearest Neighbour Classification in Medical Data Mining Hassan Shee Khamis, Kipruto W. Cheruiyot, Stephen Kimani](#)
- [IoT-based telemedicine for disease prevention and health promotion: State-of-the-Art](#)
- [MACHINE LEARNING BASED DISEASE PREDICTION WEBSITE USING SYMPTOMS OF A PATIENT](#)
- [A new One-time Password Method](#)
- [Securing SMS Based One Time Password Technique from Man in the Middle Attack](#)
- [Design of a time and location based One-Time Password authentication scheme](#)
- [Two Factor Authentication Using Smartphone Generated One Time Password](#)
- [SMS-Based One-Time Passwords: Attacks and Defense](#)
- [Ak-Nearest Neighbor Based Algorithm for Multi-label Classification](#)
- [Survey of Machine Learning Algorithms for Disease Diagnostic](#)
- [Doctor Consultation through Mobile Applications in India: An Overview, Challenges and the Way Forward](#)
- [The Internet of Things for Health Care: A Comprehensive Survey](#)
- [Internet of Things \(IoT\): A Vision, Architectural Elements, and Future Directions](#)
- [A health monitoring system for vital signs using IoT](#)
- [IOT Based Remote Patient Health Monitoring System](#)
- [A Survey on IoT Security: Application Areas, Security Threats, and Solution Architecture](#)
- [Smart Doctors Appointment and Prescription System](#)
- [978-1-5090-5421-3/16/\\$31.00 ©2016 IEEE A Smartphone based Application to Improve the Health Care System of Bangladesh](#)
- [PatDoc App \(Patient –Doctor Application\)](#)
- [Research on mobile intelligent medical information system based on the Internet of things technology](#)