Journal of Intelligent & Fuzzy Systems 45 (2023) 4383–4393
DOI:10.3233/JIFS-231899
IOS Press

An application development for smart monitoring of COVID patients using six stage microbiological health systems

Padavala Sai Prasad[a,*], Prabha Shreeraj Nair[b], Anagha Patil[c], Nilesh Madhukar Patil[d], Abhay Chaturvedi[e], Syed Noeman Taqui[f], Hesham S. Almoallim[g], Sulaiman Ali Alharbi[h] and S.S. Raghavan[i]

[a]*Department of Computer Science and Engineering, ST. Martin's Engineering College (Autonomous), Secunderabad, Telangana, India*
[b]*Department of Information Technology, Noida Institute of Engineering and Technology (NIET), Greater Noida, Uttar Pradesh, India*
[c]*Department of Information Technology, Vidyavardhini's College of Engineering and Technology, Vasai, K.T. Marg, Vasai (W), Maharashtra, India*
[d]*Department of Computer Engineering, SVKM's D J Sanghvi College of Engineering, Vile Parle West, Maharashtra, India*
[e]*Department of Electronics & Communication Engineering, GLA University, Mathura, Uttar Pradesh, India*
[f]*Department of VLSI Microelectronics, Saveetha School of Engineering, Saveetha Institute of Medical and Technical Sciences, Chennai, Tamil Nadu, India*
[g]*Department of Oral and Maxillofacial Surgery, College of Dentistry, King Saud University, Riyadh, Saudi Arabia*
[h]*Department of Botany and Microbiology, College of Science, King Saud University, Riyadh, Saudi Arabia*
[i]*Department of Biology, University of Tennessee Health Science center, Memphis, USA*

Abstract. For many, Covid-19 is a short-term, mildly debilitating disease. But some people are still struggling with monthly symptoms with persistent inflammation, chronic pain and shortness of breath. The situation of "long-term cowardice" has become so debilitating that it is now common for some to say that they are tired even if they walk a short distance. So far, the focus has been on saving lives from the plague. But now there are growing concerns about people facing the long-term consequences of the COVID epidemic. The fundamental question, with the uncertainty of whether those with chronic goiter, or all those affected, will fully recover is raised. In this paper a smart monitoring model was proposed to keep monitoring the COVID patient's health conditions. The smart method keep on watching the different changes reflected in the body conditions and ensure the changes in the database. In case any emergency is raised, then these smart monitoring tools inform the information to the doctors. This can very much helpful for the patients to communicate with the doctors.

Keywords: Health care, inflammation, chronic pain, long-term consequences, COVID epidemic

*Corresponding author. Padavala Sai Prasad, Department of Computer Science and Engineering, ST. Martin's Engineering College(Autonomous), Secunderabad, 500100, Telangana, India. E-mail: padavalasaiprasad248@gmail.com.

1. Introduction

The symptoms and impact of COVID-19 vary among individuals, but inflammation is a common feature observed in most cases. Other symptoms include shortness of breath, cough, joint and muscle pain, hearing and vision impairment, headaches, and various organ problems. These symptoms significantly affect the quality of life for individuals. Prolonged recovery time is not solely related to the severity of the infection but can occur even in cases with mild to moderate symptoms. Studies have shown that a significant percentage of patients experience symptoms for an extended period, with inflammation persisting in more than half of the cases. However, most studies have focused on patients requiring hospital treatment, leaving a knowledge gap regarding the long-term consequences for a larger population. The long-term effects of COVID-19 can impact various organs, such as the lungs, immune system, brain, and blood vessels, leading to issues like impaired nutrient absorption, blood disorders, and abnormal coagulation. The number of individuals experiencing chronic symptoms seems to be decreasing over time, but since the virus is relatively new, long-term information is limited. Continuous monitoring of individuals with these symptoms is necessary for an extended period to assess their recovery and potential lifelong problems. Additionally, the risk of recurring symptoms and increased damage in case of future infections raises concerns. The World Health Organization (WHO) has warned that widespread inflammation caused by the virus can result in early-onset heart disease. Extensive research is ongoing to gather evidence and develop effective treatments and vaccines. There are no clinical definitions or list of symptoms that affect all patients. There may be a lot of different experiences between two people with chronic goiter. Nonetheless, inflammation is the most common feature of paralysis. Other symptoms include shortness of breath, intermittent cough, joint pain, muscle aches, hearing loss, vision impairment, headaches, olfactory and heart problems, and heart, lung, kidney, and intestinal problems [1–3]. This will adversely affect the quality of life of the people. Prolonged temple damage does not indicate the time it takes to heal from the intensive care unit [4]. Prolonged and serious health problems can occur even for those with mild to moderate symptoms [5]. The Patients were monitored continuously after being sent home from the hospital. It showed that at least 87 percent of people had at least one symptom for about 2 months and more than half still had inflammation [6–8]. Nevertheless, such studies are conducted only to keep a small number of patients in need of hospital treatment [9]. About half of those surveyed in Dublin were diagnosed with corona virus 10 weeks after exposure. One- third of the victims were unable to return to work. The important thing is that doctors have found that it has nothing to do with the severity of the infection and the inflammation of the body [10].

Nevertheless, excessive fatigue is only one symptom of prolonged COVID damage. The pneumonia area is shown in the pneumonia scan image of people with corona virus infection. There is a lot of speculation about this, but no definitive answer. The virus is removed from a large part of the body [11]. But will continue to stick in some small places. If you have diarrhea for long days, the virus will stick in the gut. Some studies suggest that if you can't smell it, it's in the nerves – that's what's causing the problem. The corona virus infects many cells in the body, damaging the immune system and causing damage throughout the body. Some say that if COVID is affected, the immune system will not return to normal and that is what is detrimental to health [12–14].

The infection also affects the way the patient's organs function. This can be seen especially well in the lungs. If there was a scar on it, there were long-term problems even after the SARS or MERS infection [15]. They both belong to the corona virus genus [16]. However, the absorption of nutrients from the patient's diet can also be affected due to COVID Many people with diabetes due to COVID are struggling to control their blood sugar levels [17]. For at least 12 years, SARS has changed the way fats are handled. There are also early signs of changes in the brain structure. But more research is being done on that. COVID-19 damage can also cause blood disorders, including abnormal coagulation. It also affects the blood vessels that carry blood throughout the body. There have been reports of inflammation or coughing after a viral infection. Normally that happens. We have seen that it takes a long time for infections to fully heal [18].

One in ten people with glandular fever will have inflammation on a monthly basis. There is also speculation that if there is an outbreak of the flu – especially after the 1918 outbreak – there may be symptoms similar to Parkinson's [19]. The number of people suffering from chronic goiter seems to be declining day by day. However, since the virus only appeared at the end of 2019, we do not have a long-term infor-

mation package. We are asking that those with this vulnerability be monitored for a few years. There is also some opinion that the number of victims will be very low for more than a year. Although people now seem to be recovering, there are also concerns about whether there will be lifelong problems. Those with chronic inflammatory syndrome are more likely to have that recurrence. The only concern is that if infections occur in the future, more damage may occur [20]. If the long-term COVID is on the same course, expectations are high that there is a chance of a partial recovery. But if it is infected with another corona virus to show symptoms, it may be infected every winter. There is still a chance that more problems will occur in the future. The World Health Organization (WHO) has warned that widespread inflammation caused by the corona virus can lead to heart disease at an early age. It is unknown at this time what he will do after leaving the post. It is unknown at this time what he will do after leaving the post. Researchers are still struggling to gather enough evidence before reaching the final conclusions about the whereabouts of the vaccine. On a trial basis, new corona antiviral drugs are also being tested in the laboratory. But it has not progressed to the point where it can be paid for and tested on humans.

The proposed model aims to provide several benefits in managing the long-term consequences of COVID-19:

1. Early detection and intervention: By continuously monitoring vital signs and symptoms, the smart monitoring system can detect any deterioration in a patient's health at an early stage. This enables prompt intervention and medical assistance, potentially preventing severe complications or hospitalization.
2. Personalized care: The intelligent analytics platform can analyze the data collected from multiple patients and identify trends or patterns specific to different individuals. This allows healthcare professionals to provide personalized care and treatment plans based on each patient's unique needs and response to the virus.
3. Minimized exposure and transmission risk: By reducing the need for frequent physical visits to healthcare facilities, the smart monitoring system minimizes the risk of exposure and transmission of COVID-19. Patients can receive monitoring and medical support from the safety of their homes, reducing the burden on healthcare facilities and resources.
4. Efficient healthcare resource allocation: The remote monitoring system enables healthcare professionals to prioritize their attention and resources based on the severity and urgency of each patient's condition. This ensures that critical cases receive immediate attention while non-emergency cases can be managed remotely.
5. Long-term monitoring and research: The data collected from the smart monitoring system can contribute to long-term research on the effects of COVID-19 and its management. By gathering comprehensive and real-time data, researchers can gain insights into the long-term consequences of the virus, develop effective treatments, and improve future pandemic preparedness.
6. Cost-effectiveness and sustainability: The implementation of the proposed model should consider the cost-effectiveness and sustainability aspects. The long-term benefits and potential cost savings resulting from reduced hospitalizations and efficient resource allocation should be evaluated to justify the investment in the system. Additionally, regular system maintenance, upgrades, and training should be planned to ensure its sustainability over time.
7. Collaboration and interoperability: The proposed model should promote collaboration and interoperability among different healthcare stakeholders, including hospitals, clinics, laboratories, and public health authorities. This collaboration ensures seamless data exchange, coordinated care, and a unified approach in managing COVID-19 cases.
8. Integration with telemedicine and virtual consultations: The proposed model can be integrated with telemedicine platforms, enabling virtual consultations between patients and healthcare professionals. This integration facilitates remote diagnosis, prescription, and medical advice, reducing the need for physical visits to healthcare facilities and minimizing the risk of exposure.

In conclusion, the proposed Smart Six-Stage Microbiological Health System (SSMHS) offers a comprehensive approach to monitor the health conditions of COVID-19 patients and manage the long-term consequences of the disease. By leveraging smart monitoring tools, wearable devices, intelligent analytics, and remote communication, the system

aims to provide timely medical assistance, personalized care, and minimize the risks associated with the ongoing pandemic. Implementing such a system can enhance healthcare outcomes, support research efforts, and ensure the well-being of individuals affected by COVID-19.

2. Literature review

The COVID-19 pandemic has placed significant stress on individuals, leading to increased mortality rates. While vaccines offer hope, their availability to the general population remains uncertain. Due to the lack of monitoring and treatment, many deaths have become unavoidable. Monitoring one's physical condition, especially in the early stages of COVID-19 infection and during self-isolation, is crucial. Patients should regularly measure their heart rate, blood oxygen level, body temperature, and blood pressure. These vital signs provide valuable insights into the body's response to the infection. Interferon beta, plasma therapy, and antiviral drugs are being investigated as potential treatments, but further research is necessary.

Wearing masks, practicing respiratory hygiene, and maintaining good overall health are essential preventive measures. Adequate rest, hydration, and a balanced diet can strengthen the immune system. It is crucial to seek medical advice if symptoms worsen, particularly for breathing difficulties. Home isolation and self-quarantine are recommended to prevent the spread of the virus, but individuals must follow specific guidelines and seek medical assessment when necessary.

The corona virus has caused a great deal of stress to many people. Many are paralyzed at home. Although the corona vaccine is a star of hope, it is not known when it will be available to everyone. Due to the lack of proper monitoring and treatment, a large number of deaths have become inevitable. Let's look at what not only corona patients, but everyone with an early stage of corona infection, and those who come to Corona and are in self-isolation at home need to do to monitor their physical condition [21]. Patients at home should monitor their heart rate, blood oxygen level, body temperature, and blood pressure four times daily. As the immune system becomes more active against the virus, it can help intensify the fight against infection. But when it is high, it can cause major damage to the body and even death [22]. The drug 'Interferon beta' is also being studied in the 'Solidarity' test. It is used in treatments including spinal cord disease. Interferon is a toxin that is a synthesis of chemicals produced in the body during a virus attack. In the blood of those who recover from an infection, there will be cells that fight the virus. The approach is to separate the plasma (the area containing the immune cells) from the blood and inject it into the infected person (plasma therapy). Not only is the need for treatment necessary to save lives, it is also important to rule out the possibility of paralysis taking effect [23]. Once the right treatment is developed, the corona virus can turn into a normal disease. Once the ventilator is needed and the patient stops coming to the hospital, crowding to the intensive care unit will decrease. You do not have to be very strict in controlling people. BPM PR is a measure of how many times the heart beats per minute. You can see the heartbeat on the pulse oximeter. This can be 100 – 160 per minute for children. Boy – Girl may be 60 to 140. Adults should be between 60 and 100 [24].

Oxygen level (SPO2) means serum pressure oxygen. The red blood cells in our blood carry oxygen throughout the body. An oxygen meter can be used to determine the amount of oxygen carried. Generally it should be around 100 for everyone. If it is in the range of 95 to 100 it is normal. 94 Going below that means not getting enough oxygen. If it goes below 90 percent you should seek medical help, which means urgency. Body temperature can be measured with a digital thermometer. You can measure body temperature by placing it in the armpit. Children up to 2 years of age should have a temperature between 94.5 and 99.2 degrees Fahrenheit. Temperatures range from 96.6 – 98 for 3-10 year olds, 95.3 – 98.4 for 11-65 year olds and 96.0 – 97.4 for over 65 year olds. If it is more than that it means fever. Digital devices for diagnosing high blood pressure are currently on the market. Buy them and hold the tube-like strap in your hand and press the button to know the blood pressure. Blood pressure ranges from systolic 80- 120 for children, diastolic 40-80, systolic 90-120 for adolescents, diastolic 50-80, systolic 120 for 19-60, diastolic 80 for under 60, systolic 95 to 145 for diastolic 70 [25].

The virus spreads through the airways, i.e. through small droplets that are expelled when someone sneezes or coughs. These drops can spread to surfaces such as a person's hand or door, i.e. anywhere people touch. From there, the tiny droplets that carry the virus can be transferred to your mouth and lungs. Wearing masks not only protects you from others, but also prevents you from spreading the disease to others if you have it. Moreover, there is a greater

need for individuals, such as health workers [26]. So, if you suspect you have a respiratory illness, wear a mask. Otherwise do not. The germ can protect us from ovulation and prevent it from spreading to others. In traditional medicine the risk is not going to come. But there is no problem as long as the above mentioned safety practices are not abandoned believing that the traditional medicine will remain a shield. As well as fruits, vegetables etc. increase our immune system. Let the sun shine on the body in true times. Drink plenty of water. Do not achieve anxiety. Depression can lower your immune system. Naturally your body will not be able to face the germs [27, 28].

3. Proposed model

The proposed six stage microbiological health system (SSMHS) that fully ensures the detection of COVID-19 virus infected persons without contact, with 100% non-infectious cleanliness within the healthcare system and minimal physical contact while providing health care services. Because the symptoms of COVID-19 are similar to the symptoms of many common illnesses (such as the flu and flu), you may be suffering from a disease other than corona. If you think you are sick, the first thing to do is 'self-isolation', that is, staying at home or somewhere without going out. Thus, it does not spread to others. This is something that must be strictly adhered to and there should be no direct or indirect physical contact between you and your caregivers. It is best to follow respiratory hygiene, such as on your elbow or on a cloth / sheet that you can safely dispose of. Not only do you wash your hands often, but you also tell those around you to do the same. Also, get good rest, eat plenty of fluids, and eat fruits to boost your immune system. If you have difficulty breathing, call the contact number for advice. Generally speaking, do not go directly to the doctor unless instructed. Because, if you were really sick, you would be hurting everyone along the way. If you have a cough and / or runny nose, wear a face mask to prevent infection. Otherwise, the mask is of no use.

In this way, it ensures the highest possible protection against COVID-19 infection for all of its patients, health care visitors and paramedics.

Stage 1:

This means that security personnel are deployed at the entrance of the hospital to detect potential individuals with the virus.

Stage 2:

The health care workers wear smart infrared AI helmets to check and know the body temperature of those who come to the hospital from a distance.

Stage 3:

At the health care system operating in the health care area, hospital staff using thermal infrared guns checks the visitors' body temperature and confirm that their hands have been sanitized and that they are wearing N95 helmets.

Stage 4:

Includes smart thermal surveillance cameras. Constantly monitors and monitors everyone on the hospital premises 24 hours a day.

Stage 5:

Available to patients and visitors using state-of-the-art COVID-19 test equipment that tests COVID-19 using three different, advanced technologies: RT-PCR, TRUENAT, and CB NAAT.

Stage 6:

24x7 robots that are constantly on the move are installed. These robots will ensure that frequently touched wall, floor and surfaces of devices are cleaned frequently with sanitizer fluid at all times.

It recommends "three things" to save energy:

- Plan and act so that you do not have to work too hard. Make sure you have plenty of rest.
- Plan for daily chores. Divide work that is more tiring with other times of the day.
- Prioritize – Think about what needs to be done and what can be postponed

Isolation (quarantine) is recommended at home because most of the Govit-19 patients are asymptomatic. Some people make that decision on their own and isolate themselves at home. It sometimes ends in danger. Go to the nearest Triage Centers to find out if the corona is positive. Depending on the severity of the COVID infection, medical teams at these centers will provide guidance. The medical team will also clarify who should be isolated from home and who should be admitted to hospitals. It is unfortunate that the existence of something called triage centers is only widely known to people during the second wave of corona intensity.

There are two types of 'isolations':-

Step 1 Isolation:

In one, you will be housed in rooms arranged by the government, thus drastically reducing your contact with others who are not infected. If you come to India from a country where the disease is highly prevalent, you will be isolated in this manner.

Step 2 Isolation:

If you suspect that you have been in contact with someone with an illness, you will be subjected to 'self isolation'. This means you will not have to stay at home or anywhere else. If you stay here, you can stay where you think others will not spread.

'Isolation' ensures that your physical contact with others is minimized. The 'isolation' period usually lasts two weeks. At the end of two weeks, if the health officials / doctors who check your health confirm that you are not infected, then 'isolation' is not necessary. There is no need to be afraid of isolation. At most, it will be slightly different from our daily habits. But a well-designed 'isolated' place will ensure that you are in touch with family and friends and in touch with people from the outside world. This will ensure that you are provided with nutritious food and other amenities. Thus there will be no problem in the facilities suitable for you to stay.

Depending on whether the impact of the disease is diminishing or not, the rules regarding isolation will continue to be evaluated. The government is likely to have more stringent rules to determine who should be isolated and who is not. It depends on the corona distribution.

Those without corona serious injuries are in hospitals and those with severe corneas are at home. Many people have the understanding that it is enough to be isolated from home alone. It is not possible to predict exactly when the current corona symptoms will suddenly intensify. In the midst of such confusion it is necessary to be clear about what kind of medical help should be taken by those with COVID positive. Many people who panic when it comes to corona positive isolate themselves at home without any medical advice. They also take self-medication that they are familiar with. This is completely wrong.

- Antiviral drugs – These are capable of attacking the corona virus directly in the body.
- Immunosuppressant's – When the immune system is actively working, it causes great harm to the body.
- Immunosuppressant taken from the plasma (Plasma) of the blood of people recovering from Govit-19 infection or made in laboratories can infect the corona virus.

Most people have mild symptoms such as the flu. Most often, these include high fever, dry cough and fatigue. In some cases, there may be body aches, shortness of breath, muscle and joint pain, sore throat, headache, runny nose and occasional diarrhea. The disease affects older people more than younger people. 0 to 9 year olds are much less affected. The disease can severely affect people who already have certain diseases, such as diabetes, heart disease, lung disease, or low immunity. The disease is often spread by droplets that are released when an infected person coughs or sneezes. These droplets will last on the spilled area and then you can touch your mouth or face after touching these areas. It then enters your body, especially reaching your lungs.

4. Results and discussion

The proposed six stage microbiological health system (SSMHS) was compared with the existing multi-branch deep learning network (MBDLN), practical model and application for COVID-19 detection (PMACD), Efficient deep neural networks (EDNN) and End-to-end convolution neural network (ECNN).

4.1. Sore throat monitoring

Sore throat is one of the main symptoms of COVID type. It can cause sore throat and irritation. The first person to detect the COVID variant is said to have had this symptom. Table 1 shows the Comparison of Sore Throat Monitoring.

4.2. Headache monitoring

Headache is a condition that can occur for many reasons, but as far as the COVID variant is concerned, scientists have insisted that it should be included in the official symptom list. Headache is a common disease that causes inflammation in the body after infection and shown in Table 2.

4.3. Nasal congestion monitoring

Since most omega-3 symptoms are associated with colds or flu, it is suspected to be Covit-19A or the

Table 1
Comparison of sore throat monitoring

No. of samples	MBDLN	PMACD	EDNN	ECNN	SSMHS
1000	44.36	52.29	44.52	45.07	94.14
2000	44.47	52.27	44.69	45.34	94.64
3000	44.49	51.39	43.96	45.04	94.52
4000	41.39	48.56	40.62	41.53	91.29
5000	40.19	47.24	39.89	40.21	90.91
6000	39.58	46.41	39.00	39.67	90.34
7000	39.17	46.01	38.92	39.37	90.64

Table 2
Comparison of headache monitoring

No. of samples	MBDLN	PMACD	EDNN	ECNN	SSMHS
1000	42.98	52.76	42.17	41.88	85.30
2000	41.35	51.02	40.59	40.46	84.01
3000	40.87	48.68	38.39	39.20	83.00
4000	39.58	47.87	36.76	37.21	82.11
5000	37.47	45.58	35.62	34.74	81.74
6000	35.98	43.65	33.42	33.30	80.10
7000	34.17	41.92	32.27	31.58	79.73

common cold. Nasal congestion is a symptom associated with the corona virus. Runny nose has become a very common symptom in Govit-19 patients and shown in Table 3.

4.4. Fever monitoring

Influenza in general is a natural reaction of our body against infection. Our immune system tries to identify germs that enter our body from the outside and destroy them. This process raises the body temperature. This is what is clinically called fever.

As the body temperature rises it becomes harder for germs to enter the body from the outside and multiply in the body. In short, the flu is the body's immune system's fight against germs that enter from the outside. The same thing happens with the COVID 19 infection.

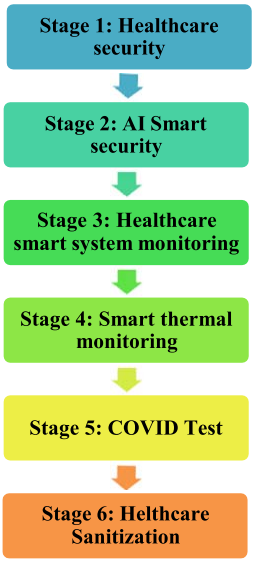

Fig. 1. Proposed SSMHS – Stages.

4.5. Mild symptoms monitoring

Many have minimal symptoms when compared to children who have been exposed to corona infection. Often accompanied by congestion, cough low-grade fever and chills with fatigue. Like the flu, hydration is encouraged by consuming adequate fluids.

There is no separate treatment for other symptoms such as loss of taste and smell. But usually gets better over time. Anti-body therapy can be given to children 12 years of age and older who are at high risk for complications despite mild symptoms. Children at high risk Children with asthma or other lung diseases, neurological conditions such as Down syndrome and cerebral palsy, and children at risk for any disease that affects the immune system should be careful.

4.6. Severe symptoms monitoring

Unfortunately some teenagers experience more symptoms. These are common. Conditions such as mood swings or confusion, difficulty breathing, persistent chest pain, severe vomiting, decreased urination, chest pain, blue lips, and severe vomiting may

Table 3
Comparison of nasal congestion monitoring

No. of samples	MBDLN	PMACD	EDNN	ECNN	SSMHS
1000	52.87	48.66	42.01	40.87	87.30
2000	51.38	46.69	39.59	38.67	85.31
3000	50.58	45.56	39.18	37.87	84.11
4000	48.25	44.35	37.58	37.20	83.63
5000	47.24	43.98	35.26	35.77	82.20
6000	46.60	42.45	34.01	34.68	81.04
7000	45.94	41.95	31.28	34.20	80.27

Table 4
Comparison of fever monitoring

No. of samples	MBDLN	PMACD	EDNN	ECNN	SSMHS
1000	44.36	52.29	44.52	45.07	94.14
2000	44.47	52.27	44.69	45.34	94.64
3000	44.49	51.39	43.96	45.04	94.52
4000	41.39	48.56	40.62	41.53	91.29
5000	40.19	47.24	39.89	40.21	90.91
6000	39.58	46.41	39.00	39.67	90.34
7000	39.17	46.01	38.92	39.37	90.64

Table 5
Comparison of mild symptoms monitoring

No. of samples	MBDLN	PMACD	EDNN	ECNN	SSMHS
1000	38.27	42.05	44.16	41.93	79.38
2000	36.98	41.30	39.54	38.53	79.28
3000	37.23	41.33	39.54	38.89	79.21
4000	37.36	42.15	40.01	40.08	79.17
5000	37.28	42.24	40.21	39.95	79.13
6000	37.29	42.37	40.47	39.93	79.10
7000	37.64	42.79	41.10	40.36	79.08

Table 6
Comparison of severe symptoms monitoring

No. of samples	MBDLN	PMACD	EDNN	ECNN	SSMHS
1000	37.41	40.99	40.83	38.61	79.39
2000	36.91	40.99	39.74	38.35	79.28
3000	36.16	40.16	38.60	37.78	79.22
4000	36.16	40.89	38.96	38.92	79.17
5000	37.21	42.00	40.49	39.94	79.13
6000	37.49	42.40	41.13	40.18	79.10
7000	36.77	41.83	40.55	39.53	79.08

Table 7
Comparison of vaccination monitoring

No. of samples	MBDLN	PMACD	EDNN	ECNN	SSMHS
1000	45.70	32.46	65.34	37.45	79.39
2000	47.36	38.32	58.50	43.63	79.28
3000	47.81	37.18	57.21	45.12	79.22
4000	43.12	38.32	55.07	48.36	79.17
5000	42.73	39.20	56.64	47.64	79.13
6000	42.89	40.40	58.26	47.51	79.10
7000	43.63	42.05	60.06	48.78	79.08

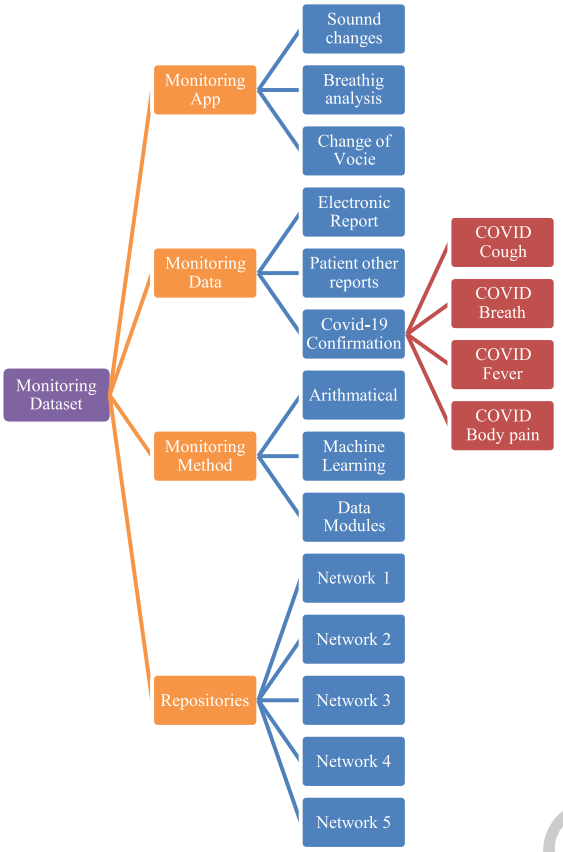

Fig. 2. COVID 19 smart monitoring.

occur. This suggests an urgent need for medical treatment.

4.7. Vaccination monitoring

The corona vaccine is recommended for adolescents. It is imperative that everyone be vaccinated at regular intervals without neglect. Although faced with infection after corona vaccination they are not pushed to the acute treatment stage. There is also reason to say that the booster dose is currently given after two installments of vaccination.

The severity of the vaccine is up to six months. It then provides more protection when the booster is put back on while the malignancy subsides. People should be vigilant and come forward to get vaccinated as doctors and health workers provide full treatment.

5. Conclusion

In case of corona virus infection, most people are treated at home with mild exposure by taking paracetamol medication and fruit juices. But when some people need intensive care in a hospital, they may need the help of an artificial respirator, such as a ventilator. Although some people strongly believe that there is not enough trace of how traditional medicine can help with this viral infection. Some fragmentary incidents are presented as evidence for this. Health is the combination of mind and medicine, so sometimes we call the placebo effect (comfort medicine) effect that can help heal the hopeful peace of mind even if it does not heal under the influence of drugs. The proposed six stage microbiological health system (SSMHS) was compared with the existing multi-branch deep learning network (MBDLN), practical model and application for COVID-19 detection (PMACD), Efficient deep neural networks (EDNN) and End-to-end convolution neural network (ECNN). However social distance activities (such as giving at least one meter interval to each other) such as respiratory hygiene (sneezing and sneezing only with mouth and nose closed) and hand washing can be of great strength.

Declaration

Ethics approval and consent to participate

No participation of humans takes place in this implementation process.

Human and animal rights

No violation of Human and Animal Rights is involved.

Funding

No funding is involved in this work.

Data availability statement

Data sharing not applicable to this article as no datasets were generated or analyzed during the current study.

Conflict of interest

Conflict of interest is not applicable in this work.

Authorship contributions

There is no authorship contribution.

Acknowledgments

This project was supported by Researchers Supporting Project number (RSP2023R283), King Saud University, Riyadh, Saudi Arabia.

References

[1] A. Fakhry, X. Jiang, J. Xiao, G. Chaudhari, A. Han and A. Khanzada, Virufy: a multi-branch deep learning network for automated detection of COVID-19. (2021) *arXiv preprint arXiv:2103.01806*.

[2] M. Loey and S. Mirjalili, COVID-19 cough sound symptoms classification from scalogram image representation using deep learning models, *Computers in Biology and Medicine* **139** (2021), 105020.

[3] C. Chakraborty and A.N. Abougreen, Intelligent internet of things and advanced machine learning techniques for covid-19, *EAI Endorsed Transactions on Pervasive Health and Technology* **7**(26) (2021), e1.

[4] M. Kavitha, T. Jayasankar, P.M. Venkatesh, G. Mani, C. Bharatiraja and B. Twala, Covid-19 disease diagnosis using smart deep learning techniques, *Journal of Applied Science and Engineering* **24**(3) (2021), 271–277.

[5] A. Ponomarchuk, I. Burenko, E. Malkin, I. Nazarov, V. Kokh, M. Avetisian and L. Zhukov, Project Achoo: a practical model and application for COVID-19 detection from recordings of breath, voice, and cough, *IEEE Journal of Selected Topics in Signal Processing* (2022).

[6] V. Madaan, A. Roy, C. Gupta, P. Agrawal, A. Sharma, C. Bologa and R. Prodan, XCOVNet: chest X-ray image classification for COVID-19 early detection using convolutional neural networks, *New Generation Computing* **39**(3) (2021), 583–597.

[7] T. Alafif, A.M. Tehame, S. Bajaba, A. Barnawi and S. Zia, Machine and deep learning towards COVID-19 diagnosis and treatment: survey, challenges, and future directions, *International Journal of Environmental Research and Public Health* **18**(3) (2021), 1117.

[8] A. Akman, H. Coppock, A. Gaskell, P. Tzirakis, L. Jones and B.W. Schuller, Evaluating the covid-19 identification resnet (cider) on the interspeech covid-19 from audio challenges. (2021). *arXiv preprint arXiv:2107.14549*.

[9] S. Ouladi, M.J. Ebadi, A.A. Safaei, M.Y. Bajuri and A. Ahmadian, Efficient deep neural networks for classification of COVID-19 based on CT images: Virtualization via software defined radio, *Computer Communications* **176** (2021), 234–248.

[10] H. Coppock, A. Gaskell, P. Tzirakis, A. Baird, L. Jones and B. Schuller, End- to-end convolutional neural network enables COVID-19 detection from breath and cough audio: a pilot study, *BMJ Innovations* **7**(2) (2021).

[11] A. Fathan, J. Alam and W.H. Kang, An Ensemble Approach for the Diagnosis of COVID-19 from Speech and Cough Sounds. In *International Conference on Speech and Computer* (2021) (pp. 190–201). Springer, Cham.

[12] S.K. Ghosh and A. Ghosh, ENResNet: A novel residual neural network for chest X-ray enhancement based COVID-19 detection, *Biomedical Signal Processing and Control* **72** (2022), 103286.

[13] A. Imran, I. Posokhova, H.N. Qureshi, U. Masood, M.S. Riaz, K. Ali and M. Nabeel, AI4COVID-19: AI enabled preliminary diagnosis for COVID-19 from cough samples via an app, *Informatics in Medicine Unlocked* **20** (2020), 100378.

[14] S.S. Stevens, J. Volkmann and E.B. Newman, The mel scale equates the magnitude of perceived differences in pitch at different frequencies, *Journal of the Acoustical Society of America* **8**(3) (1937), 185–190.

[15] B.W. Schuller, D.M. Schuller, K. Qian, J. Liu, H. Zheng and X. Li, COVID-19 and Computer Audition: An Overview on What Speech & SoundAnalysis Could Contribute in the SARS-CoV-2 Corona Crisis, *Frontiers in Digital Health* **3** (2021), 14.

[16] Y. Wang, M. Hu, Q. Li, X.P. Zhang, G. Zhai and N. Yao, Abnormal respiratory patterns classifier may contribute to large-scale screening of people infected with COVID-19 in an accurate and unobtrusive manner. (2020). *arXiv preprint arXiv:2002.05534*.

[17] N. Sharma, P. Krishnan, R. Kumar, S. Ramoji, S.R. Chetupalli, P.K. Ghosh and S. Ganapathy, Coswara–a database of breathing, cough, and voice sounds for COVID-19 diagnosis. (2020). *arXiv preprint arXiv:2005.10548*.

[18] F. Al Hossain, A.A. Lover, G.A. Corey, N.G. Reich and T. Rahman, FluSense: a contactless syndromic surveillance platform for influenza-like illness in hospital waiting areas, *Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies* **4**(1) (2020), 1–28.

[19] S. Yadav, M. Keerthana, D. Gope and P.K. Ghosh, Analysis of acoustic features for speech sound based classification of asthmatic and healthy subjects. In *ICASSP 2020–2020 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)* (2020) (pp. 6789–6793). IEEE.

[20] R.M. Simply, E. Dafna and Y. Zigel, Obstructive sleep apnea (OSA) classification using analysis of breathing sounds during speech. In *2018 26th European Signal Processing Conference (EUSIPCO)* (2018) (pp. 1132–1136). IEEE.

[21] M. Ramkumar, N. Basker, D. Pradeep, R. Prajapati, N. Yuvaraj, R. Arshath Raja and A. Alene, Healthcare Biclustering-Based Prediction on Gene Expression Dataset, *BioMed Research International*, 2022.

[22] S. Hannah, A.J. Deepa, V.S. Chooralil, S. BrillySangeetha, N. Yuvaraj, R. Arshath Raja and A. Alene, Blockchain-Based Deep Learning to Process IoT Data Acquisition in Cognitive Data, *BioMed Research International*, 2022.

[23] J. Mohana, B. Yakkala, S. Vimalnath, P.M. Benson Mansingh, K. Srihari and V.P. Sundramurthy, Application of Internet of Things on the Healthcare Field Using Convolutional Neural Network Processing. *Journal of Healthcare Engineering*, 2022.

[24] N. Arivazhagan, K. Somasundaram, D. Vijendra Babu, M. Gomathy Nayagam, R.M. Bommi, G.B. Mohammad

and V. Prabhu Sundramurthy, Cloud-Internet of Health Things (IOHT) Task Scheduling Using Hybrid Moth Flame Optimization with Deep Neural Network Algorithm for E Healthcare Systems, *Scientific Programming*, 2022.

[25] N. Yuvaraj, K. Srihari, S. Chandragandhi, R.A. Raja, G. Dhiman and A. Kaur, Analysis of protein-ligand interactions of SARS-Cov-2 against selective drug using deep neural networks, *Big Data Mining and Analytics* **4**(2) (2021), 76–83.

[26] S. Kannan, N. Yuvaraj, B.A. Idrees, P. Arulprakash, V. Ranganathan, E. Udayakumar and P. Dhinakar, Analysis of convolutional recurrent neural network classifier for COVID-19 symptoms over computerised tomography images, *International Journal of Computer Applications in Technology* **66**(3–4) (2021), 427–432.

[27] V. Maheshwari, M.R. Mahmood, S. Sravanthi, N. Arivazhagan, A. ParimalaGandhi, K. Srihari and V.P. Sundramurthy, Nanotechnology-Based Sensitive Biosensors for COVID-19 Prediction Using Fuzzy Logic Control, *Journal of Nanomaterials*, 2021.

[28] R.D. Aruna, S.D. Surendran, N.D. Yuvaraj and B. Debtera, An Enhancement on Convolutional Artificial Intelligent Based Diagnosis for Skin Disease Using Nanotechnology Sensors, *Computational Intelligence and Neuroscience*, 2022.