Hindawi
Wireless Communications and Mobile Computing
Volume 2022, Article ID 6937128, 9 pages
https://doi.org/10.1155/2022/6937128

Research Article

Explore the Application Effect of Wireless Networks in Smart Clothing Based on Artificial Intelligence Technology

Xiaoyue Cui

College of Art and Design, Zhengzhou University of Light Industry, Zhengzhou, Henan, China

Correspondence should be addressed to Xiaoyue Cui; cuixiaoyue@zzuli.edu.cn

Received 10 January 2022; Revised 8 February 2022; Accepted 11 February 2022; Published 26 May 2022

Academic Editor: Narasimhan Venkateswaran

In the twenty-first century, every individual visualizes enough technological development on both the electrical and electronics sides. At the same time, they were studying artificial intelligence (AI) concepts and trying to implement them in software and hardware parts. Accuracy can be achieved by using sensors, with a combination of software and hardware. Most of the proposed concepts might respond when both clothing technology and AI are attached. While eliminating sensors from the technological concept, there would be a massive change while enhancing essential comfort and transformation. With the help of human commands, the work can be performed accurately as the machines lag in self-thinking ability. In this case, accuracy is one of the most important things to be noted. Having a shared understanding of such concepts as sensor management, cloth adjustment, and design selection will give extra time-saving moments to complete the work. In this research, a digital filter and a QRS (Quick Response System) detection algorithm were implemented to explore smart clothing through wireless networks and AI technologies. The results proved that the proposed algorithm works better than the existing algorithm by providing 2% increased accuracy.

1. Introduction

Intelligent clothing can currently detect and display vital biological signs such as core body temperature, pulse, blood pressure, and respiratory rate in real time [1]. We can carry out our responsibilities of early warning and prevention with the assistance of computer software that can predict future illnesses and symptoms. As a result of their incapacity to provide timely and precise input on their health, neonates and young children would bear the brunt of the detrimental consequences of this situation [2]. When designing intelligent clothing for neonates, accuracy in disease diagnosis and garment comfort are critical considerations. In the real world, the two are frequently at odds with one another. If a high-precision measurement of a physiological signal, such as a body temperature or pulse, is performed close to the skin, it may cause pain and pose a safety hazard [3]. Data and forecasts generated by sensors that do not physically contact the skin can have a significant impact on the quality and reliability of the data and forecasts. This has resulted in an approach to intelligent clothing that is as comfortable as possible, which influences the design process and the accuracy of its forecasts [4]. With significant technology breakthroughs, smart clothing may now be smaller, more energy efficient, more integrated, and more comfortable than ever before. A health database for use in telemedicine and other medical services could be created by combining cloud computing with smart clothing [5]. One of the most eagerly awaited technologies, intelligent clothing, has yet to be introduced to the world. It is becoming more popular in the sports and fashion industries, as well. Individuals would have a difficult time utilizing multiple gadgets or sensors in the previous scenario. An intelligent clothing technology has been introduced to overcome this situation. Multiple sensors can be installed at the entrance of a room, such as a clothing store. These sensors will scan the human posture to gather data on dimensions such as height, width, and weight, among others. This information will be kept in a short-term storage facility. If someone is interested in a specific piece of clothing, an intelligent mirror can be used instead of the trial rooms. This intelligent mirror has the advantage of allowing the wearer to virtually wear the clothing they have selected. The use of AI in smart clothing can save the workers' time. The cloth itself can be made smarter by attaching sensors to it and allowing continuous monitoring of the wearer's health to be performed. To keep tabs on a person's physical movement and health, this concept is primarily used in the sports and healthcare industries. Virtual fitness coaching systems are currently the only use of AI in smart clothing. Many startups, such as Sensoria, offer an AI-based in-app coach to help runners who wear their smart t-shirts get better at their sport by using data generated by the garments as a source for performance analytics. This study is aimed at determining the effect of wireless networks on smart clothing based on artificial intelligence technology. This paper is organized into five sections. Section 1 presents the introduction and motivation of the study, and Section 2 highlights related studies. Section 3 focused on the proposed methodology used for the study. Section 4 presents the results and discussion, and Section 5 discusses the conclusion.

2. Related Work

Smart clothing, on the other hand, is not without its flaws. Traditional clothing is more comfortable to wear than sophisticated clothing [6]. A couple of the disadvantages are washability, the need for regular charging, and the need for internet updates. Since individual variations and artificial interference can affect ECG signal extraction quality, the quality of ECG signal extraction is crucial for health analysis and disease identification [7]. Smart clothes sensors that do not communicate with one another in a smart way can drain a significant amount of power. To detect anomalies in the ECG, we describe a smart clothing platform for ECG collection, analysis, and transmission that can be worn by the wearer [8]. With the use of fabric electrodes that are attached directly to the sensor node, smart clothes may be cleaned and worn with greater comfort [9]. The sensor node, which is connected to a wireless network, monitors cardiovascular health. In addition to the filtering and matching phases, there are two additional phases to the ECG detection technique. At this point, it is easy to eliminate the vast majority of normal ECGs, leaving only the troublesome ones for further investigation and analysis [10]. It was suggested that morphology analysis be performed in order to improve the identification of QRS complexes. The finite state machine can be updated in real time using the RFSM technique [11]. It is possible for power-saving transmission to intelligently decide whether to transmit statistical results or raw data based on HRV analysis. As a result of this innovative technology, it is possible to save a large quantity of energy as well as data. Clothing production lines are spread through the use of a low-cost information gathering system that allows for complete traceability of each item along the supply chain [12]. Experience and intuition are more significant in team leadership than statistics from the garment manufacturing line when it comes to decision-making [13]. When the leader of the management team or other employees is absent, the efficiency and capacity of the manufacturing operation suffer. Data-gathering tools create visual representations of supply chain data based on the data collected. Even the most novice of executives can make use of the data to improve their management skills [14]. Team-based training appears to be effective, according to the findings of the study. The rapid advancements in science and technology have an impact on everyone, including those in the clothing industry. One example of a recent development is the use of nanotechnology in many applications [15]. Nanomaterials offer a variety of unique qualities that make them a significant component of the apparel industry's long-term future. Nanodispersion theory can be applied to the development of wearables that are both safe and intelligent in nature [16].

It has long been a cause of debate over the practicality of chemical components and military gear. A graphene electrical fabric was made by laminating graphene, a lightweight, robust, and scalable material, to form a fabric. Another possibility for the development of intelligent protective gear is to make use of graphene triboelectric nanogenerators, which are now under consideration [16]. A significant sensitivity to clothes has been observed in chemical warfare weapons, which makes them a dangerous weapon to use. As a result of the rapid expansion of digitization, traditional industries such as the garment industry have begun to migrate to digital industries. Customers are anxiously awaiting the introduction of a digital clothing customization platform, despite the fact that user satisfaction is generally low. This is due to a lack of consumer participation as well as poor platform communication on the whole [17]. For personalized clothing modification to be successful, an intelligent interactive platform is required that analyzes the psychological demands of customers before tailoring the sales platform to satisfy those wants. Growing interests necessitate an increase in the need for attire that is truly one-of-a-kind for each individual [18]. As a result of this research, we were able to construct a SOM neural network-based customized clothing suggestion system, which we refer to as an intelligent clothing matching selection system. Customer preferences can be determined by analyzing a combination of subjective and objective data collected from them. With the use of this technology, we are able to provide our clients with relevant clothing suggestions [19]. The potential of wearable computer technology has been demonstrated in recent years, prompting scientists, engineers, and representatives from business and application departments to collaborate in order to bring the technology to market maturity. Despite the fact that wearable computers have laid a solid foundation, the public's expectations for intelligent clothing have yet to be realized [20]. Clothing is a welcome change from staring at a dull electrical gadget. It is customary to dress in attire that is soft, stylish, and comfortable. As a result of this requirement, the computer must be intelligently integrated into the soft, trendy, and comfortable textile. In the presence of such sensors, a textile structural composite may precisely monitor the distribution of physical features within its own framework [21]. Wearable computers can be used for a variety of tasks, from monitoring health to protecting employees from potentially hazardous situations to supporting the physically disabled. Fashion is projected to become more intelligent in the future, but there are a number of concerns that need to be addressed by both the scientific community and those involved in real-world application before it can be considered a fashion trend [22]. Smart clothing has been widely used to safeguard workers in extreme settings as well as to assist those with disabilities in their regular lives and recreational activities, but previous research has revealed that its comfort still needs to be improved. According to the assumption that was made, modern artificial intelligence may be capable of combining signals from noncontact sensors that are positioned in various locations around the environment [23]. For the noncontact sensor to be as pleasant as possible, the accuracy of the sensor has been increased. It was suggested that fashion design and artificial intelligence should be merged into the process, and this was accepted. By using sensors that are close to your skin, you may avoid discomfort while also converting erroneous measurements into accurate ones [24]. This study focused on exploring the application effect of wireless networks in smart clothing based on artificial intelligence technology.

3. Proposed Method

Intelligent clothing, which is one of the most anticipated technologies, is still waiting for its launch in this world. This technology has deeper growth in the sports and fashion technology domains. In the earlier case, multiple gadget utilization or multiple sensor-based device utilization would be highly difficult for individuals. To overcome this scenario, intelligent clothing technology has been introduced. This technology can be implemented in two ways: (1) in a room like a clothing store which can be equipped with multiple sensors at the room entrance. These sensors will perform the scanning process on the human posture to obtain information like height, width, and size. That data will be stored in some temporary storage location. If the person is interested in any clothing item, instead of heading to the trial rooms, an intelligent mirror can be employed. The advantage of this intelligent mirror is that the chosen clothing can be digitized and can be made to be worn by the individual virtually. This saves the time of the people involved in the work; (2) the cloth itself can work smarter by working with the support of sensors attached to the cloth to make continuous monitoring of the person possible to keep track of health. This idea is mainly applied in the sports and healthcare sectors to monitor physical movement and body conditions. These processes are depicted in Figure 1. Designing the smart cloth in either method has to focus on accuracy, which is all about the working of sensors, and comfort, which means that while having the sensors in the cloth, it should not affect the user.

According to the principle of linear theory, a separate prediction mechanism is implemented by defining the human body characteristics. While placing those sensors in the suits, they should be enlarged while wearing the technology suit. From Figure 1, we can see different types of sensors and their usage. Before being placed in the suit, the sensor is checked more than twice, and by fixing the code according to the Celsius rate, it might be working. When the data tagging is over, then as a further move, machine learning concepts can be started through differentiating weak and strong signals. Whatever the things that have been launched in recent days, there will be an average rate of advantages and disadvantages. While the person's mentality changes, the way they think about the product will also change for each person.

The implementation of artificial intelligence makes the prediction process simpler. While analyzing such data from its default historical path, some faster data analysis methods are necessary. With the user's instruction, the system will be working and sending its output. If the user makes any mistake, the system will repeat the same. However, data collection is an important process in data analysis. Every single piece of data that should be stored in the system fails to navigate the data from its database, resulting in error formation. Figure 2 represents a form that gives the actual process of how the data is stored and accessed by the system. Finally, the models are used to display them on the screen once the finalization is over.

In most smart clothing, temperature microsensors along with various other sensors are utilized. In this research, sensor data is considered to be available earlier and focused on the data transfer through wireless sensor networks.

3.1. Proposed Work. The smart clothing framework comprises of (a) smart clothes of fabric working electrode to gather signals, (b) a sensors incorporating a signal conditioning circuit but also microprocessor device that can transform vital signs to better quality data, (c) an android device having to act as an entry point server to demonstrate analysis results, and also (d) a health cloud platform which can transfer private data to a health center for health discussion. Fabric sensors and an IoT device are also the main components of smart clothing. The smart clothes are washable which have the same material characteristics as regular clothing.

Because the signals are also too weak among the distorted, a 100-gain amplifier is needed to amplify the difference signal but also constrain some in signal. A E_s frequency digital filter QRS detection (0.6 Hz to 280 Hz) is being used to reduce noise outside of the signal band.

$$\text{Frequency} = \sum_{i=0}^{j} E_i - E_j, \tag{1}$$

$$\mathrm{E_s} = \sum_{i=0}^{j} \sqrt{E_i E_j}. \tag{2}$$

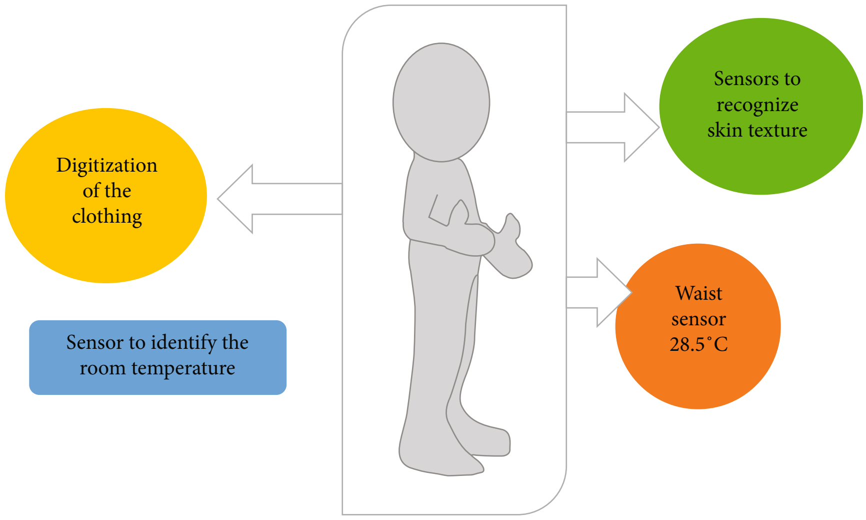

Figure 1: Sensor combination by linear model.

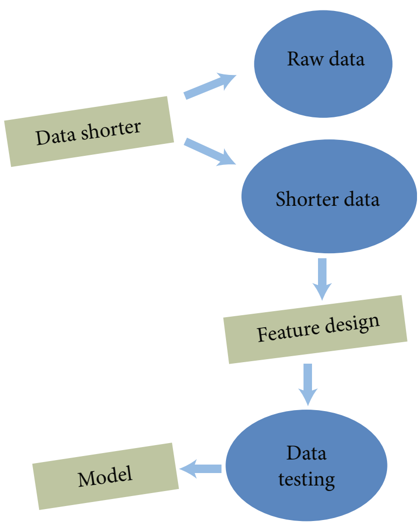

Figure 2: Artificial intelligence in intelligent clothing.

Table 1: QRS morphology with wireless network signals parameters.

Indicator	Formula	Minimum	Maximum
QRS complex. Width	X_s − X_Q	42 m	170 ms
QRS complex. Height	Y_R − Y_s	0.04 mV	1.5 mV
Q wave horizontal	Y_Q − Y_S	0	1.5 mV
RR wave interval	R_i − R_i − 1	250 ms	1400 ms

Equations (1) and (2) show the mechanism to calculate the frequency response E_{s-s_0} for the correlating circuit. E_i and E_j are the maximum (250 Hz) and minimum (0.6) cutoff frequencies, respectively. $R.\Delta_{s_0}$ is a quality factor that characterizes the bandwidth of a resonator in relation to E_s. The $n^{-}(s)$ represents the narrower bandwidth value but it is a clear peak, whereas the higher value is given as k^2. To improve the Pc ingredient in Equation (3), secondary amplitude (75.3gain) is used, and a high pass digital filter (60 Hz and 70 Hz) is required for the (Equation (4)) negation of a Dc source.

$$n^{-}(s) = \frac{1}{2\pi r^2 \tau} R.\Delta_{s_0} \left[\frac{1}{|E_{s-s_0}|} + \left| \frac{1}{k^2 E_{s-s_0}} \right| \right] - \frac{1}{n} \ln \frac{1}{2nk} \left(\hat{s}.\left(k^2 E_{s-s_0}\right) + \left|k^2 E_{s-s_0}\right| \right), \tag{3}$$

Where a current polarization with the moment R at an arbitrary location r0 inside the sphere for a circular uniform transmission line with radius but also reflectivity 3. Assume there is a point E_s with a radius denoted by n/s. When point P is inside the sphere, $E_i - E_j$, the battery-powered possibility on point can also be determined as

$$P = \frac{n}{s} + \sum_{i=0}^{j=1} E_i - E_j. \tag{4}$$

The high pass digital filter rejects signals at 60 and 70 hertz, and the capacitance is 0.1 E. Equation (4) assists in the selection of a suitable resistor (R) and capacitance (C). C is 0.1 $R.\hat{s}$, and $R \sin \theta$ notch is 70 Hz. The resistor has a resistance of about 27.7 k. At 10000 Hz, the digital filtered signals are collected and fed into the microcontroller. The following Equation (5) represents this process.

$$n(\alpha\hat{s}) = \frac{4}{4\pi r^2 \alpha^2} R.\hat{s} = \frac{4}{4\pi r^2 \alpha^2} R \sin \theta. \tag{5}$$

Even though $n(\alpha\hat{s})$ sensors are only connected to the surface of the internal organs in actual signal measurements, the area of the conducting sphere is taken into account. The mentioned equation to determine the voltage differential on point P can be seen as the signals on the surface, for any point α^2 on the sphere surface, that is, $E_i - E_j(n)$ determine

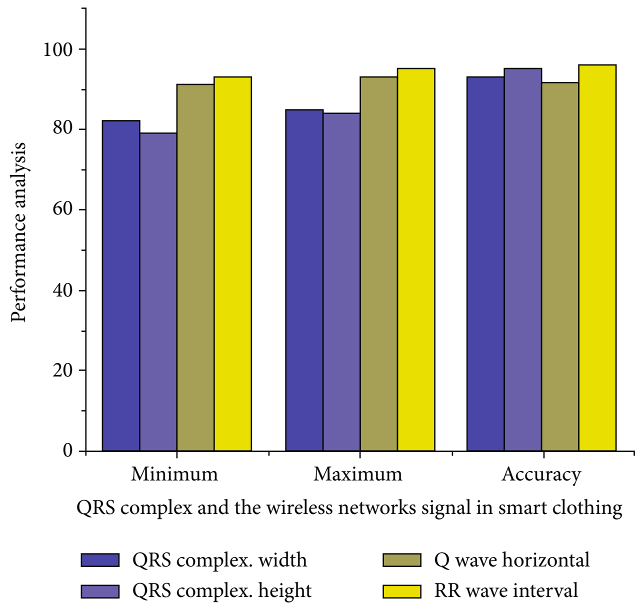

FIGURE 3: Relationship between the QRS complex and the wireless network signal in smart clothing.

TABLE 2: Wireless network signal package smart clothing format.

Parameter	X	Y	Z
P1	$0 < X < 3$	$2 < Y < 10$	$5 < Z < 65535$
P2	$3 < X < 65535$	$11 < Y < 65535$	$Z = 2$
P3	$3 < X < 65535$	$11 < Y < 65535$	$0 < Z < 3$
P4	$4 < X < 65535$	*	$0 < Z < 2$
P5	$X = 7$	*	*
P6	$10 < X < 65535$	$7 < Y < 65535$	*
P7	*	$9 < Y < 27$	$0 < Z < 2$

Smart cloth P1 to P7 represents P1: Under Armour; P2: Levi's; P3: Tommy Hilfiger; P4: Samsung; P5: Ralph Lauren; P6: Sensora; P7: Loomia.

the

$$k(\alpha\hat{s}) = \frac{1}{2}\sum\left\|E_i - E_j(P) - \frac{4}{4\pi r^2\alpha^2}R\sin\theta\right\|^2. \quad (6)$$

The sensor node's microcontroller is primarily in charge of analyzing data but also controlling the WSN with AI module to transmit its results to the perfect introduction server. Because once point $\hat{s}$ is within the physical realm, $E_i - E_j$, the rechargeable possibility on point x is specified as follows:

$$k(\alpha\hat{s}) = \frac{1}{2}\sum_{i=1}^{x}\frac{1}{n}\ln\frac{1}{2nk}\left(\hat{s}.\left(k^2E_{s-s_0}\right)+\sum\left|k^2E_{s-s_0}\right|\right). \quad (7)$$

The $E_{i,j}^{(\Delta)}$ convolution process refers to the process of performing a template operation onto an ε image that used a

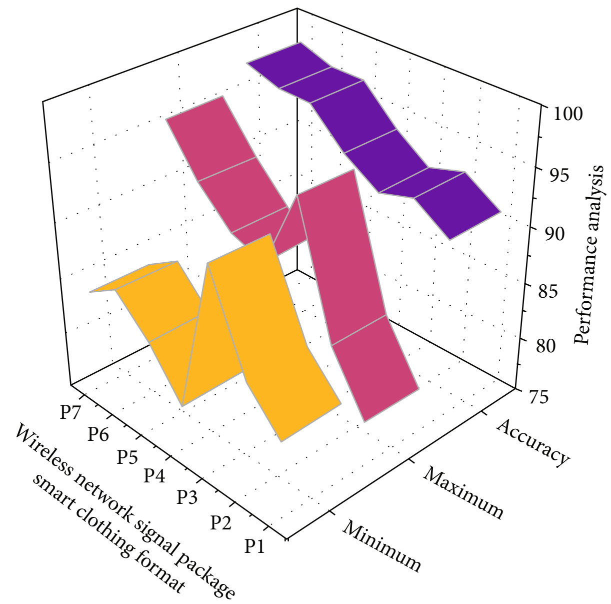

FIGURE 4: Performance analysis for wireless network signal package smart clothing format.

template to determine the

$$E_{i,j}^{(\Delta)} = \sum E_{i,j}^{(\Delta)} - \sum\left|k^2E_{s-s_0}\right| + \varepsilon\frac{1}{2nk}k^2E_{s-s_0}. \quad (8)$$

Each i, j template can be a digital filter or a convolution kernel model; the template where $\Delta$is all the parameter is shown as

$$E_{i,j}^{(\Delta)} = \sum E_{i,j}^{(\Delta)} - R.\Delta_{s_0}\left[\frac{1}{\left|E_{s-s_0}\right|} + \left|\frac{1}{k^2E_{s-s_0}}\right|\right]. \quad (9)$$

The results produce a $R.\Delta_{s_0}[1/(|E_{s-s_0}|) + |1/(k^2E_{s-s_0})|]$ random survey smart cloths transmission map. The contribution of AI with wireless networks through wearable computing frequency level within the preceding process of consolidation has become the outcome of a set of experiments in the following convolution process following

$$k(\alpha\hat{s}) * E_{i,j}^{(\Delta)} = \sum_{i=0}^{j}\sum_{j=o}^{i}k(i,j)\int(E+i, R+j) + E_{i,j}^{(\Delta)} - R. \quad (10)$$

The outcomes yield a random sample smart cloths signal map. The contribution of the AI with wireless networks in smart clothing frequency level with in preceding combination process has become the output of a series of experiments in the subsequent convolution process. The $1 + e^{-n'}$ Sigmoid functions, activation functions, and rectified linear function are examples of commonly used standard functions

Table 3: Performance result analysis for the wireless network in signal in smart clothing frequency (low and high).

Parameter	SDNN	LF	HF
P1 –P7	0.12-0.16	0.04–0.15	0.15–0.4
Minimum	0.06 -0.11	0.02-0.13	0.12-0.04
Maximum	0.17-0.11	0.11-0.02	0.11-0.03
Average (%)	93	96	98

that are represented as the following equations:

$$\int (k(\alpha\widehat{s})) = \sum \frac{1}{1+e^{-n'}} + \frac{1}{2\pi r^2 \tau} R.\Delta_{s_0}\left[\frac{1}{\left|E_{s-s_0}\right|} + \left|\frac{1}{k^2 E_{s-s_0}}\right|\right], \tag{11}$$

where

$$\int \left(E_{i,j}^{(\Delta)}\right) = \sum \frac{E^n - E^{-n}}{E^n + E^{-n'}} - \frac{1}{n} \ln \frac{1}{2nk}\left(\widehat{s}.\left(k^2 E_{s-s_0}\right) + \left|k^2 E_{s-s_0}\right|\right). \tag{12}$$

Then,

$$\int \left(k(\alpha\widehat{s}) * E_{i,j}^{(\Delta)}\right) = \max_{n\longrightarrow 1}\left(E_{s-s_0}, n\right) + k(i,j) \int (E+i, R+j). \tag{13}$$

The $E^n - E^{-n}$ represents the smart cloth network that will normalize the frequency level of selected features. Because once the features are extracted it prevents the Equation (14) specifying the $\max_{n\longrightarrow 1}(E_{s-s_0}, n)$ variation among neighboring frequency and it is similar to the stream of functionality and prevents from becoming huge variation and is represented as the standardized Equation (15).

$$E_{n,k}^i = \sum \frac{s_{n,k}^i}{\left(h + \alpha \sum_{j=\max_{i\longrightarrow 1}(0,i-k/2)}^{\min_{i\longrightarrow 1}(k-1,i+k/2)} \left(s_{n,k}^j\right)^2\right)^{\beta'}} - R.\Delta_{s_0}\left[\frac{1}{\left|E_{s-s_0}\right|} + \left|\frac{1}{k^2 E_{s-s_0}}\right|\right], \tag{14}$$

$$R_n^i = s\left(k_n^i\right) = s\left(\sum_{i=1}^{\Delta_{n-1}}\left(R_n^{i(\Delta)} E_{n-1}^{(\Delta)} + s\right)\right) - \frac{1}{n} \ln \frac{1}{2nk}\left(\widehat{s}.\left(k^2 E_{s-s_0}\right)\right). \tag{15}$$

This algorithm produces $R_n^{i(\Delta)} E_{n-1}^{(\Delta)}$ its same set of smart clothing frequency visualizations as the initial WSN with AI techniques; however, $(s_{n,k}^j)^2$ the size of every feature chart is lowered. The neurotransmitter efficiency (Equation (16)) is as follows.

$$E_{n,k}^i = \int \left(k(\alpha\widehat{s}) low\left(E_{i,j}^{(\Delta)}\right) + \min_{n\longrightarrow 1}\left(E_{s-s_0}, n\right) + k(i,j)\right). \tag{16}$$

To normalize the value of $k(i,j)$ of the extracted smart clothing frequency, we must accomplish the network again and find the accurate linearity of $E_{i,j}^{(\Delta)}$ using WSN with AI techniques operation. The normalization $\min_{s\longrightarrow 1}$ and $\max_{s\longrightarrow 1}$ function is used to perform normalization in a specific area. As a result, we still must describe a parameter that specifies the dimensions of the normalized area, and the function of normalized Equation (17) is given as

$$\int \left(k(\alpha\widehat{s}) * E_{i,j}^{(\Delta)}\right) = \sum \frac{k(\alpha\widehat{s}) * E_{i,j}^{(\Delta)}}{1 + n/E^2 \sum_{k'=\max_{k\longrightarrow 1}(0,k-[E/2]),}^{\min_{k\longrightarrow 1}(k,n-[E/2]+E)} \sum_{s=\max_{s\longrightarrow 1}(0,R-[R/2]),}^{\min_{s\longrightarrow 1}(k,R-[R/2]+R)} \left(E_{\int k(\alpha\widehat{s}) * E_{i,j}^{(\Delta)}}^{k'R'}\right)^{\beta'}}, \tag{17}$$

The use of artificial intelligence simplifies the prediction process. Some fast information analysis methods are required when analyzing that kind of data from its norm historical path. The system will work and send its output based on the user's instructions. If the consumer makes an error, the scheme will repeat it. Even so, data collection seems to be a critical step in data analysis. Every set of information that really should be created and stored fails to traverse the data from the database, resulting in the formation of errors. These results depicts the actual process by which the system stores and accesses data are processed. Finally, once the finalization is complete, the models are being used to showcase them on the screen.

4. Experimental Results and Discussion

Quick Response System (QRS) morphology with wireless network signal parameters is represented in Table 1. Indicators utilized in the data collection with the support of wireless sensor networks are QRS complex for width and height, Q wave horizontal, and RR wave interval.

For each of these indicators, the equation for evaluating the indicators and the minimum and maximum accepted values are defined. In this table, R_i is the real-time R peak position, and R_{i-1} is the previous real-time R peak position which is considered in the parametric representation.

In Figure 3, the role or relationship between the QRS complexity and wireless network signal is represented. It gives a graphical representation of the metrics such as maximum, minimum, and accuracy, which is the identification of the user's width and height to select the correct fitting of the clothes that meet their needs. The analysis was performed for the minimum, maximum, and average range of signal strength.

For any given cloth, it has specific parametric representations depending on the gender, age, and cost of the product. In Table 2, three wireless network signal ranges (X, Y, and Z) are considered for data transfer from a specific sensor that provides a specific parametric value. The "$*$" notation in the table signifies that the specific parameter cannot obtain any information from that range sensor. P1-P7 also divides the signals into normal and

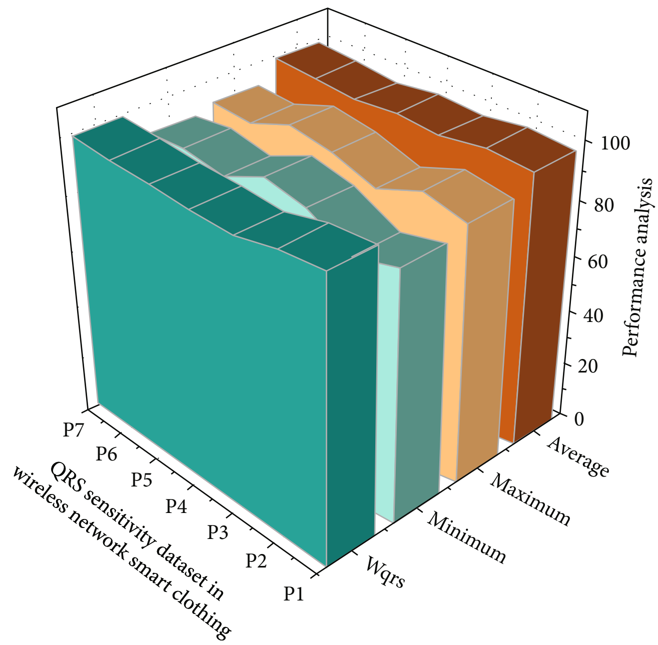

Figure 5: Performance analysis for QRS sensitivity dataset minimum and maximum average in wireless network smart clothing.

Table 4: The test result for QRS sensitivity dataset in wireless network smart clothing.

Smart clothing number	Test result for QRS sensitivity			
	Wqrs (%)	Minimum (%)	Maximum (%)	Average (%)
16256	100	89	92	98
16272	99	85	95	99
16273	95	93	89	97
16420	96	96	94	98
16483	97	89	97	96
16539	98	92	91	98
16773	99	90	92	99

abnormal parameters based on the attribute value range. The graphical representation of this table is represented in Figure 4. Multiple sensors somewhere at the room entrance can be installed in a room such as a clothing store. These sensors will scan the human posture to gain information such as height, width, and size. That information will be saved in a temporary storage location. Instead of going to a trial rooms, a smart mirror could be used if its researcher is interested in just about any clothing item. The benefit of such an intelligent mirror would be that the chosen clothing could be digitized and virtually worn by the individual.

As a result in Figure 4, intelligent clothing is designed to be as comfortable that also influences the creative process and also the accuracy of its forecasts. Smart clothing may be smaller, more highly saving, more integrated, and much more comfortable than before thanks to significant technological advances. Combining cloud computing and smart clothing could result in the creation of a health database used in telemedicine as well as other medical services. Smart clothing, on either hand, has some flaws. Traditional clothing is much more light and comfortable than elegant clothing. Wash ability, a need for frequent charging, and a need for web updates are just a few of the drawbacks.

Table 3 gives the performance result analysis of network signaling in the smart clothing technology. The frequency or signal strength of the sensors is critical for performing smart clothing analysis. There is a minimum and maximum frequency requirement to make the sensors function properly in acquiring data about the user's physic. This will aid in displaying the appropriate cloth to the user. In this table, SDNN (standard deviation of all normal RR intervals), LF (low frequency, 0.04–0.15 Hz), and HF (high frequency, 0.15–0.4 Hz) are considered for analysis.

Figure 5 depicts the performance of the QRS sensitivity on smart clothing technology with the help of intelligent wireless networking concepts. The numerical representation of the figure is given in Table 4. Smart clothing number is a clothing serial number. The person is assumed to have a variety of clothes irrespective of gender and age. The Wqrs is used to abbreviate the QRS morphology analysis algorithm, which is given in the table. It can also be said that Wqrs provides the accuracy of the sensitivity analysis and for most clothing it has attained greater than 95% accuracy. Also, minimum, maximum, and average result analysis were performed for the QRS sensitivity, and in most cases, the proposed algorithm gave better results.

Table 5 gives the numerical representation of the forthcoming Figure 6.

The diagram in Figure 6 gives the performance analysis of the proposed digital filter and QRS detection algorithm with the existing morphology analysis. From the

Table 5: Comparison result analysis for existing method.

Algorithm	Low frequency (%)	High frequency (%)	Accuracy (%)
Digital filter and QRS detection algorithm	84	95	99
Existing method: morphology analysis method	89	96	97

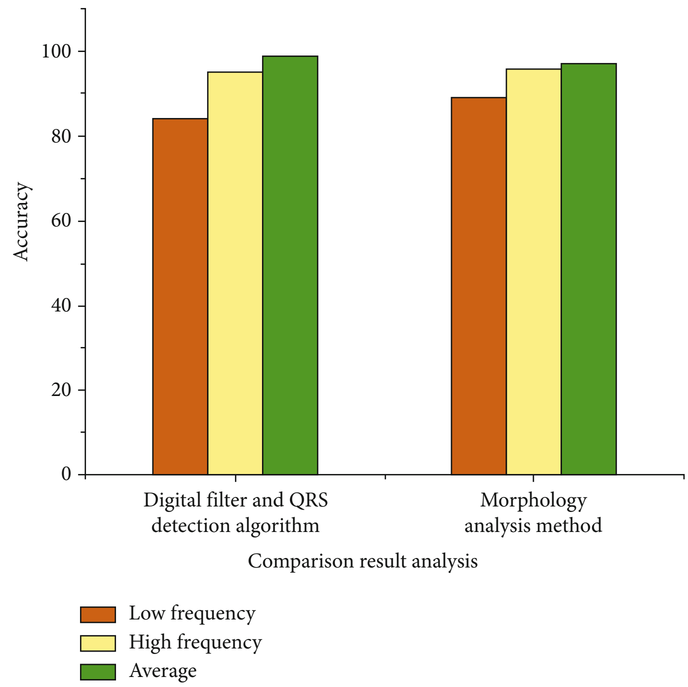

Figure 6: Comparison result analysis for the existing method.

results, it can be observed that the proposed model provides improved results of 99% accuracy, which is a 2% increase over the existing method. However, the proposed algorithm shows less performance in low and high frequency recognition.

5. Conclusions

Intelligent clothing has become a trend in the modern world. Many people prefer to get clothes through this approach. This study focused on evaluating the application effect of wireless networks in smart clothing based on artificial intelligence technology. The vast majority of the ideas put forth could work if they were integrated with both clothing technology and artificial intelligence. There would be a massive shift in technology while enhancing essential comfort and transformation if sensors were removed from the concept. The work can be done accurately with the help of human commands, as the machines lack the ability to think for themselves. When it comes to this particular situation, accuracy is critical. Time-saving opportunities can be gained if the team understands concepts like sensor management, clothing adjustment, and design selection. Digital filters and QRS (Quick Response System) algorithms were used in this study to investigate smart clothing via wireless networks and AI technologies. The study results proved that the algorithm has provided 99% accuracy and works better than the existing method. For future research, it is highly recommended to analyze the behavior of people buying smart clothes using artificial intelligence.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The author declares that there are no conflicts of interest.

Acknowledgments

The author acknowledges the support from the Key R&D and Promotion Project of Henan Province (Science and Technology) in 2022: "Research on Intelligent Wearable of Chinese Medicine Physiotherapy empowering periarthritis of shoulder" (Project No. 222102220040).

References

[1] J. Vestin, A. Kassler, S. Laki, and G. Pongracz, "Toward in-network event detection and filtering for publish/subscribe communication using programmable data planes," *IEEE*

Transactions on Network and Service Management, vol. 18, no. 1, pp. 415–428, 2021.

[2] Z. Guan, Y. Xu, H. Jiang, and G. Jiang, "International competitiveness of Chinese textile and clothing industry – a diamond model approach," *Journal of Chinese Economic and Foreign Trade Studies*, vol. 12, no. 1, pp. 2–19, 2019.

[3] X. Guan, X. Guo, L. Zhang, H. Zhao, and S. Xie, "Research on the development direction of marketing models of foreign trade enterprises in the new era," *E3S Web of Conferences*, vol. 251, article 01016, 2021.

[4] C. Gu, R. Zhou, L. Hu, and G. Gao, "A method of garment factory workers' performance monitoring using control chart based on RFID system," *The International Journal of AdvancedManufacturing Technology*, vol. 107, no. 3-4, pp. 1049–1059, 2020.

[5] X. Tang, "Research on smart logistics model based on Internet of Things technology," *IEEE Access*, vol. 8, pp. 151150–151159, 2020.

[6] O. Ayadi, N. Cheikhrouhou, and F. Masmoudi, "A decision support system assessing the trust level in supply chains based on information sharing dimensions," *Computers & Industrial Engineering*, vol. 66, no. 2, pp. 242–257, 2013.

[7] Y. Xin, D. Zhang, and G. Qiu, "Application of nanomaterials in safety intelligent clothing design," *Integrated Ferroelectrics*, vol. 216, no. 1, pp. 262–275, 2021.

[8] Y. Jin, D. Ka, S. Jang et al., "Fabrication of graphene based durable intelligent personal protective clothing for conventional and non-conventional chemical threats," *Nanomaterials*, vol. 11, no. 4, p. 940, 2021.

[9] Y. Wang and Z. Liu, "Personalized custom clothing for intelli gent interaction design," in *Emerging Trends in Intelligent and Interactive Systems and Applications: Proceedings of the 5th International Conference on Intelligent, Interactive Systems and Applications (IISA2020)*, pp. 698–709, Shanghai, China, 2021.

[10] H. Liu and H. Ma, "Design of intelligent clothing selection system based on neural network," in *2019 IEEE 3rd Information Technology, Networking, Electronic and Automation Control Conference (ITNEC)*, pp. 1789–1792, Chengdu, China, 2019.

[11] X. Guo, Z. Chen, X. Hu, and X. Li, "Multi-source localization using time of arrival self-clustering method in wireless sensor networks," *IEEE Access*, vol. 7, pp. 82110–82121, 2019.

[12] Z. Xiao, W. Li, Y. Wu et al., "Preliminary study on regional technology architecture and planning of ubiquitous power internet of things part one overall architecture," *Procedia Computer Science*, vol. 175, pp. 752–757, 2020.

[13] W. Hamdy, N. Mostafa, and H. Layaway, "An intelligent warehouse management system using the internet of things," *International Journal of Engineering & Technology Sciences*, vol. 32, no. 1, pp. 59–65, 2020.

[14] N. Liu, J. S. Pan, J. Wang, and T. T. Nguyen, "An adaptation multi-group quasi-affine transformation evolutionary algorithm for global optimization and its application in node localization in wireless sensor networks," *Sensors*, vol. 19, no. 19, 2019.

[15] K. Hwang, M. Chen, H. Gharavi, and V. C. Leung, "Artificial intelligence for cognitive wireless communications," *IEEE Wireless Communications*, vol. 26, no. 3, pp. 10-11, 2019.

[16] S.-K. Noh, "Classification of clothing using googlenet deep learning and IoT based on artificial intelligence," *Korean Institute of Smart Media*, vol. 9, no. 3, pp. 41–45, 2020.

[17] K. Gai, K. Xu, Z. Lu, M. Qiu, and L. Zhu, "Fusion of cognitive wireless networks and edge computing," *IEEE Wireless Communications*, vol. 26, no. 3, pp. 69–75, 2019.

[18] S. K. Mohanty and S. K. Udgata, "SATPAS: SINR-based adaptive transmission power assignment with scheduling in wireless sensor network," *Engineering Applications of Artificial Intelligence*, vol. 103, no. 11, article 104313, 2021.

[19] A. Zappone, M. di Renzo, M. Debbah, T. T. Lam, and X. Qian, "Model-aided wireless artificial intelligence: embedding Expert Knowledge in deep neural networks for wireless system optimization," *IEEE Vehicular Technology Magazine*, vol. 14, no. 3, pp. 60–69, 2019.

[20] Y. Dai, D. Xu, S. Maharjan, G. Qiao, and Y. Zhang, "Artificial intelligence empowered edge computing and caching for internet of vehicles," *IEEE Wireless Communications*, vol. 26, no. 3, pp. 12–18, 2019.

[21] M. E. Morocho-Cayamcela, H. Lee, and W. Lim, "Machine learning for 5G/B5G mobile and wireless communications: potential, limitations, and future directions," *IEEE Access*, vol. 7, no. 99, pp. 137184–137206, 2019.

[22] L. Caviglione, M. Gaggero, J. F. Lalande, W. Mazurczyk, and M. Urbański, "Seeing the unseen: revealing mobile malware hidden communications via energy consumption and artificial intelligence," *IEEE Transactions on Information Forensics and Security*, vol. 11, no. 4, pp. 799–810, 2016.

[23] I. Chih-Lin, Q. Sun, Z. Liu, S. Zhang, and S. Han, "The big-data-driven intelligent wireless network: architecture, use cases, solutions, and future trends," *IEEE Vehicular Technology Magazine*, vol. 12, no. 4, pp. 20–29, 2017.

[24] P. Pace, G. Fortino, Y. Zhang, and A. Liotta, "Intelligence at the edge of complex networks: the case of cognitive transmission power control," *IEEE Wireless Communications*, vol. 26, no. 3, pp. 97–103, 2019.