Research on Precision Health Care through AI Sensing

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Abstract

Due to Taiwan's aging population, many patients have chronic diseases. Last year, the number of people seeking medical treatment for chronic diseases reached 12.86 million. On average, one in every two citizens suffers from chronic diseases. The rate of chronic comorbidities is relatively high, with more than 7 million people suffering from two or more chronic diseases. As the saying goes, prevention is better than treatment. Prevention is the so-called health care. Accurate health care must be achieved through long-term, extensive data analysis of three parameters: daily exercise, diet, and body fat, to find the best health care model. This study uses the linear regression method as the basis for machine learning, and the machine learning modeling method is built into the front-end sensing unit (with edge computing). Dynamic demolding and comparison results are transmitted through the Internet of Things and APP technology to personal mobile phones, allowing users to know their best healthcare mode, simplifying tedious procedures, and achieving precise healthcare goals.

Research Methods

This article applies the home AI precision health care platform to improve the condition of patients with hypertension, allowing patients to slowly return to normal and continue to maintain health, as shown in Figure (1), which integrates a self-made physiological data sensing and wireless transmission unit, home-type The wireless charging unit, big data collection unit, extensive data analysis unit, and Machine Learning modeling unit, etc., the entire platform architecture operation process is for patients with hypertension to carry blood oxygen detection bracelets, wirelessly charge and transmit data to The extensive data collection unit then conducts data analysis (multi-parameter cor-relation analysis) through the big data analysis unit, and finally performs Machine Learning modeling. The modeling method uses linear regression analysis to find specific personal ways to improve the condition of hypertension. Equation (exclusive mode) guides patients to adjust their diet and exercise according to the instructions and observe whether the relationship between body fat and high blood pressure is developing positively (high blood pressure improvement direction).

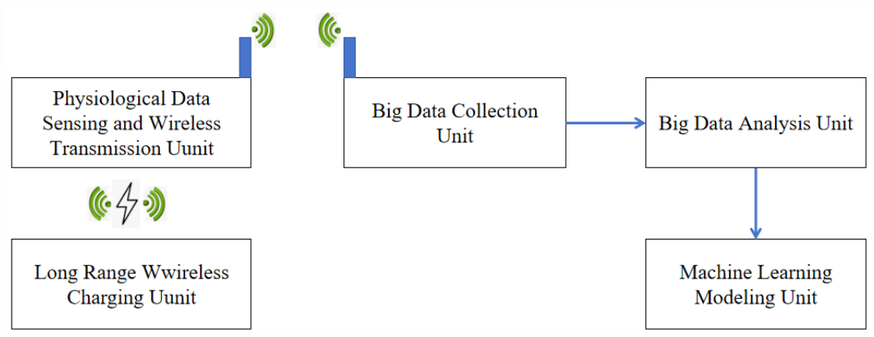
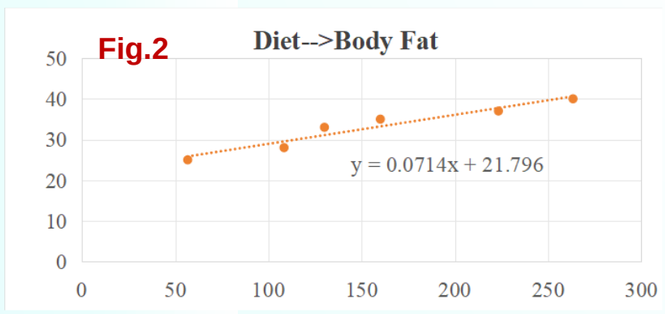
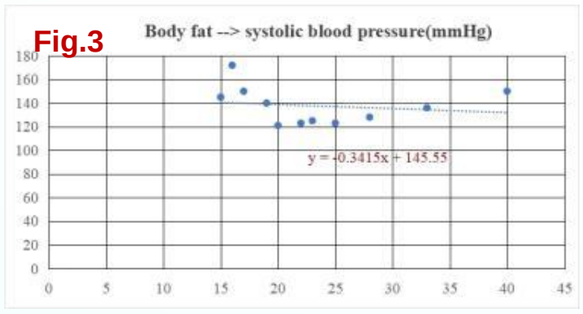


Fig. 1 Home AI Precision Health Care Platform Architecture

Results and Discussion





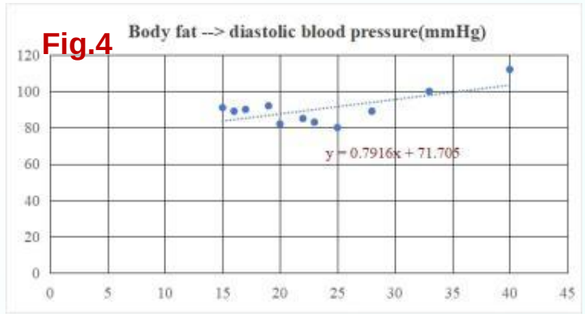


Fig. 2 Linear correlation plot of diet versus body fat
Fig. 3 Body fat versus diastolic blood pressure
Fig. 4 Body fat versus systolic blood pressure

$$f(y1)=0.00714*f(Fint)+12.336 \quad (1)$$
$$f(z1\_1)=0.7916*f(y1)+71.705 \quad (2)$$
$$f(z1\_2)=-0.3415*f(y1)+145.55 \quad (3)$$
$$f(z1)=f(z1\_1)+f(z1\_2) \quad (4)$$

Conclusions

Through simulation examples, this article learned that there is a direct relationship between diet and body fat and an indirect relationship with blood pressure. We can obtain the defensive equation that diet directly corresponds to blood pressure through body fat through the relationship between these two la-yers. As shown in formula (5), the research procedures and steps of the hypertension defense equation model are shown in Figure (7). This hypertension defense system can include four steps. The third step will carry out the dynamic de-molding ratio of the hypertension condition. Yes, the mold release comparison equation is shown in Formula 6. If mold release is detected in step 4, an exclusive real-time SMS notification will be sent to the experimental subject to achieve the purpose of immediate hypertension prevention.

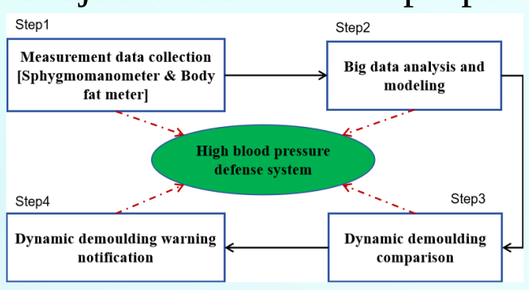


Fig. 5 Health equation modeling research diagram

$$f(z)=f(z1\_1)+f(z1\_2)=(a1*f(y1)+b1)+(a2*f(y1)+b2) \quad (5)$$
$$\text{Demoulding}: |\text{Predicted-Actual}| > \text{RMSE} \quad (6)$$
Remark：Root Mean Squared Error (RMSE)