



# International Journal of Innovative Research in Science Engineering and Technology (IJIRSET)

*(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)*



**Impact Factor: 8.699**

**Volume 14, Issue 5, May 2025**

# AI Powered Body Mass Index from Facial Images Prediction and Preventive Healthcare

**Manikandan R, Mohammed Asan S, Mohammed Anas A, Vigneshwaran A, A H Jainab Ruxana**

U G student, Department of BME, Dhaanish Ahmed Institute of Technology, Chavadi, Coimbatore, India

Assistant Professor, Department of BME, Dhaanish Ahmed Institute of Technology, Chavadi, Coimbatore, India

**ABSTRACT:** This project introduces a hybrid health monitoring system that integrates deep learning and machine learning for the early detection of health risks. Facial features are processed using a Convolutional Neural Network (CNN) via a laptop webcam to noninvasively estimate Body Mass Index (BMI). At the same time, real-time physiological parameters—heart rate, SpO<sub>2</sub>, and body temperature—are obtained through the MAX30100 sensor. The system combines these visual and physiological parameters, processing them with a K-Nearest Neighbors (KNN) classifier to forecast possible health problems like obesity, hypoxia, hyperthermia, and cardiovascular anomalies. With the integration of CNN-based BMI estimation along with real-time sensor signals, the platform enhances the accuracy of prediction without losing simplicity and transparency. It also offers timely warnings or suggestions for a medical consultation. Low-cost and portable, the system is perfect for remote monitoring and telehealth, enhancing preventive care and lessening healthcare systems' burdens. Scalable by design, the system allows early detection of chronic diseases and maximizes personal health management.

## I. INTRODUCTION

This project presents a novel hybrid health monitoring system with deep learning and machine learning-based early disease diagnosis and preventive medicine. A Convolutional Neural Network (CNN) on a laptop webcam processes facial features to noninvasively estimate Body Mass Index (BMI) in a convenient replacement for conventional measurement techniques. In parallel, real-time physiological parameters—heart rate, SpO<sub>2</sub>, and body temperature—are acquired through the MAX30100 sensor module. Through the combination of visual and physiological information, the system uses a K-Nearest Neighbors (KNN) classifier to forecast health states such as obesity, hypoxia, hyperthermia, and cardiovascular disease. Portable, low-cost, and easy to use, the platform is well-suited for telehealth and remote health monitoring, particularly in resource-limited environments. It prioritizes transparency, data privacy, and modular scalability, enabling future upgrades with new sensors and AI models. This project captures the increasing trend of personalized, preventive healthcare solutions equipping users with real-time actionable health information that enables early intervention.

## II. LITERATURE SURVEY

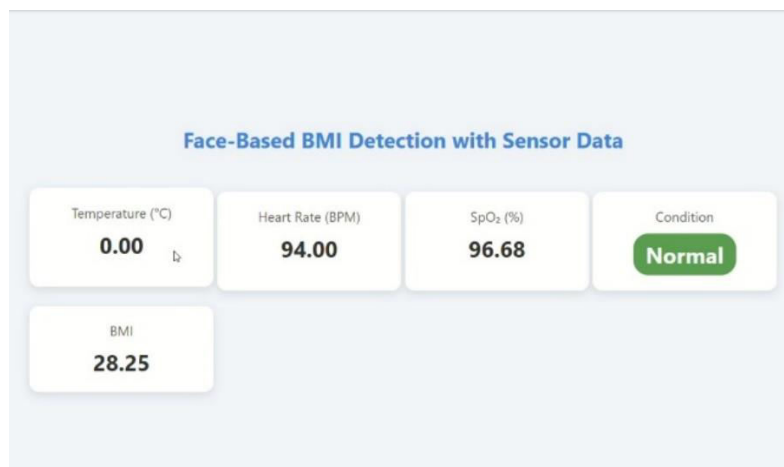
There have been a number of studies that have investigated non-invasive facial analysis-based methods for Body Mass Index (BMI) estimation and obesity prediction. Dr. R. Amutha et al. (2025) have suggested an adaptive BMI estimation method based on facial analysis, giving a tailored approach to health monitoring. Usman Aijaz N. and others (2023) created a machine learning-based model for predicting BMI based on facial images, highlighting the potential of computer vision in health monitoring. Dominika Wilczok (2025) underscored the function of deep learning and generative AI in research on aging and longevity medicine, reinforcing the appropriateness of AI in personalized medicine. Nelida Mirabet-Herranz et al. (2023) presented novel insights into face image-based weight estimation, further corroborating facial analysis as an effective biomarker. Dr. K. Basava Raju and associates (2024) introduced a method of deep learning-based estimation of BMI using facial images for better accuracy and dependability. Also, Bukohwo Michael Esiefarienrhe et al. (2023) introduced software-based estimation and obesity determination from BMI using techniques for facial extraction, highlighting the improvement in AI-assisted healthcare solutions.

### III. METHODOLOGY

The health monitoring system suggested here employs a hybrid approach combining computer vision, sensor data acquisition, and machine learning to ensure precise and real-time health evaluation. The process begins with the capture of a facial image of the user through a laptop webcam, followed by processing using a Convolutional Neural Network (CNN) to estimate Body Mass Index (BMI) based on facial features extracted. At the same time, physiological information such as heart rate, blood oxygen saturation (SpO<sub>2</sub>), and body temperature are recorded in real-time with the MAX30100 and DHT11 sensors connected to a NodeMCU microcontroller. The sensor data is sent to the laptop through serial communication, where it is merged with the calculated BMI to create an extensive health dataset. This combined data is then analyzed through a K-Nearest Neighbors (KNN) machine learning algorithm to categorize the user's health status as normal, obese, hypoxic, or hyperthermic. The final prediction output is presented through a web application interface, giving users real-time feedback and alerts in case any health anomaly is found. This method provides a non-invasive, cost-effective, and efficient solution for individualized health monitoring.

### IV. EXPERIMENTAL RESULT

The BMI estimation and health prediction system combines facial analysis via CNNs and physiological signal data using machine learning to deliver a robust, effective predictive platform for personal health monitoring. The integration of MAX30100 ensures that vital signs such as heart rate, SpO<sub>2</sub> levels, and temperature are seamlessly captured and analyzed alongside facial-based BMI estimations. The use of KNN for health condition prediction provides a simple yet effective technique to draw complex correlations between health parameters and potential risks.



### V. CONCLUSION

In summary, the project is successful in bringing together cutting-edge deep learning and machine learning approaches to offer a successful, non-invasive health monitoring system. With the combination of facial analysis for BMI estimation and real-time biometric information from sensors such as the MAX30100 and DHT11, the system provides a holistic health profile without physical measurements. The application of the KNN classification model helps in precise prediction and classification of the likely health conditions, which makes it possible to have an early warning of risks like obesity, hypoxia, and cardiovascular diseases. Additionally, the real-time monitoring and cloud-based visualisation make it possible to have hassle-free access and alertness, thus making the system very suitable for remote health monitoring and telemedicine. This approach not only enhances personal well-being, but also contributes to proactive health-care management, providing considerable potential both in personal health monitoring and scalable health-care applications.



## REFERENCES

- 1) Yubo Zhang, Wei Li, "2021 IEEE Globecom Workshops (GC Wkshps)," 2021, DOI: 10.1109/GCWkshps52748.2021.9682060.
- 2) Jiten Sidhpura, Rudresh Veerkhare, Parshwa Shah, Surekha Dholay, "2022 International Conference on Innovative Trends in Information Technology (ICITIIT)," 2022, DOI: 10.1109/ICITIIT54346.2022.9744191.
- 3) Chih-Hua Tai, Daw-Tung Lin, "2015 16th IEEE International Conference on Mobile Data Management," 2015, DOI: 10.1109/MDM.2015.40.
- 4) Joshua C. Gonzales, Joshua Ron G. Garcia, Jocelyn F. Villaverde, "2022 6th International Conference on Communication and Information Systems (ICCIS)," 2022, DOI: 10.1109/ICCIS56375.2022.9998152.
- 5) B.Srinivasa Rao, Y.Ashok Kumar, V.Vinay Sai, G. Srinu, "2024 International Conference on Emerging Systems and Intelligent Computing (ESIC)," 2024, DOI: 10.1109/ESIC60604.2024.10481611.
- 6) D. Nikhil Reddy, B. Mahadev, K.V. Achyuth, Sharmila Nageswaran, "2018 International Conference on Communication and Signal Processing (ICCSP)," 2018, DOI: 10.1109/ICCSP.2018.8524208.
- 7) Nabatchian, E. Abdel-Raheem, M. Ahmadi, "2008 Congress on Image and Signal Processing," 2008, DOI: 10.1109/CISP.2008.479.
- 8) Sai Santhosh Pentakota, A Lakshmi Priya, Sheri Saket Reddy, J Umarani, "2024 IEEE International Conference on Computer Vision and Machine Intelligence (CVMI)," 2024, DOI: 10.1109/CVMI61877.2024.10782389.
- 9) Ashwani Kumar, Kondam Deeksha, G. Sai Pooja, T. Tarun Reddy, Tera Akhil Reddy, "2022 5th International Conference on Multimedia, Signal Processing and Communication Technologies (IMPACT)," 2022, DOI: 10.1109/IMPACT55510.2022.10029205.
- 10) Hera Siddiqui, Ajita Rattani, Karl Ricanek, Twyla Hill, "2022 IEEE/CVF Conference on Computer Vision and Pattern Recognition Workshops (CVPRW)," 2022, DOI: 10.1109/CVPRW56347.2022.00330.
- 11) Quoc-Trung Pham, Anh-Tuan Luu, Thanh-Hai Tran, "2021 International Conference on Advanced Technologies for Communications (ATC)," 2021, DOI: 10.1109/ATC52653.2021.9598340.
- 12) Ankur Haritosh, Ayush Gupta, Ekam Singh Chahal, Ashwin Misra, Satish Chandra, "2019 Twelfth International Conference on Contemporary Computing (IC3)," 2019, DOI: 10.1109/IC3.2019.8844872.
- 13) Chong Yen Fook, Lim Chee Chin, Vikneswaran Vijejan, Lim Whey Teen, Hasimah Ali, Aimi Salihah Abdul Nasir, "2020 IEEE-EMBS Conference on Biomedical Engineering and Sciences (IECBES)," 2021, DOI: 10.1109/IECBES48179.2021.9398733.



INTERNATIONAL  
STANDARD  
SERIAL  
NUMBER  
INDIA



# INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

 9940 572 462  6381 907 438  [ijirset@gmail.com](mailto:ijirset@gmail.com)



[www.ijirset.com](http://www.ijirset.com)

Scan to save the contact details