

Wearable Photoplethysmography: Current Status and Future Challenges

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Introduction: Photoplethysmography is an optical sensing technology which is widely used in wearables such as smartwatches. The photoplethysmogram signal is primarily influenced by heart rate and rhythm, but also by a wide range of physiological factors including blood pressure, respiration, and the autonomic nervous system. Consequently, much research focuses on developing wearable photoplethysmography technology for health and fitness applications, including arrhythmia, blood pressure, and sleep monitoring. This talk will outline key research directions to realise the full potential of wearable photoplethysmography.



Wearable photoplethysmography device.

The 2023 Wearable Photoplethysmography

Roadmap: A team of 51 researchers recently wrote ‘The 2023 Wearable Photoplethysmography Roadmap’. This article details 24 topics for future research within the areas of: sensor design, signal processing, applications, and research directions. Key themes emerge throughout the Roadmap, providing insights into the status of wearable photoplethysmography and future challenges for research. These are now summarised.

Status of Wearable Photoplethysmography: The functionality of wearable photoplethysmography devices is expanding, with the ability to measure further physiological parameters. The accuracy of these parameters is being optimised through innovative approaches to sensor design and signal processing. The expanding functionality is enabling new applications in both health and fitness. A key step in the use of devices for these applications is to gain the trust of device users, clinicians, and policy makers.

Future Challenges: Challenges to realising the full potential of wearable photoplethysmography include: identifying and handling low quality signals; making photoplethysmography datasets and code openly available; designing device validation processes; identifying and mitigating against sources of inaccuracy; ensuring equity of access to devices; and establishing best practices for acquiring photoplethysmography measurements.

Conclusion: Wearable photoplethysmography has potential to be used in a wide range of health and fitness applications. ‘The 2023 Wearable Photoplethysmography Roadmap’ presents directions for future research to maximise its benefit.