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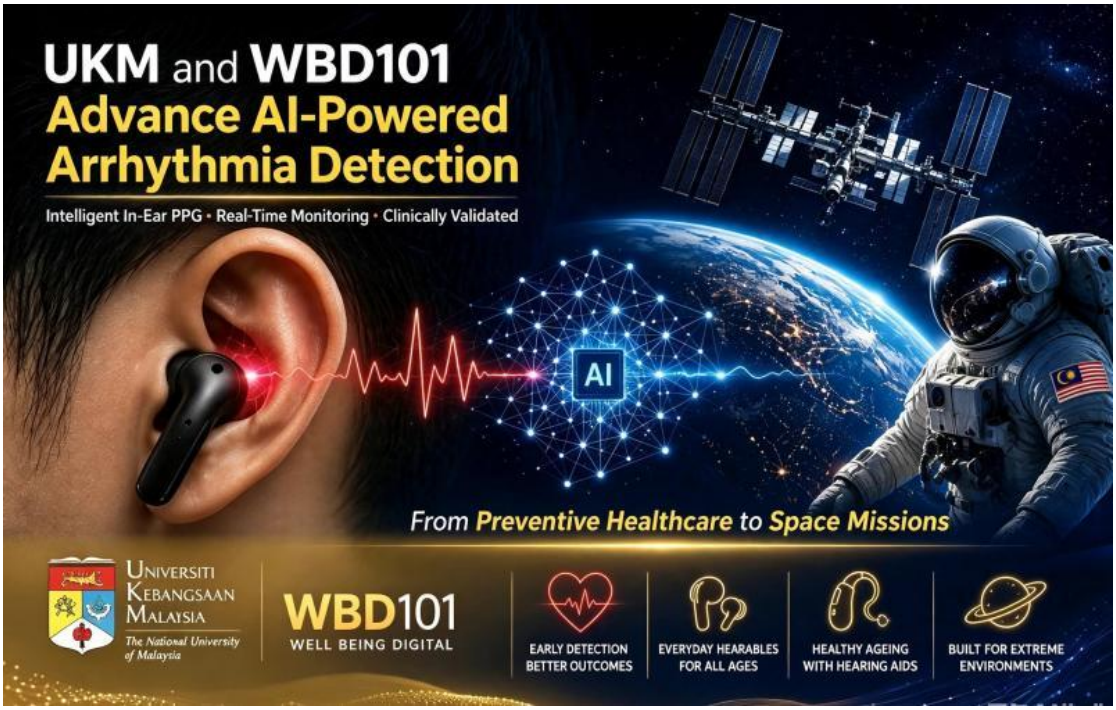
Universiti Kebangsaan Malaysia (UKM) and WBD101 Advance Arrhythmia Detection using only photoplethysmography (PPG) and AI



The UKM-WBD101 collaboration paves the way for more Malaysia innovation in next-generation wearables

UKM and WBD101 develop AI-powered in-ear technology for real-time arrhythmia detection without electrodes

In a multidisciplinary collaboration involving researchers from Universiti Kebangsaan Malaysia (UKM) and Well Being Digital (WBD101) an intelligent in-ear photoplethysmography (PPG) system has been developed to continuously monitor heart rhythms and detect arrhythmias (such as Atrial Fibrillation) in real time, with potential applications ranging from everyday healthcare to future space missions. Cardiac arrhythmia affects millions of people worldwide and can lead to stroke, heart failure, and sudden cardiac

death if left undetected. As wearable devices increasingly evolve from fitness tracking to preventive healthcare, reliable heart rhythm monitoring is becoming more important than ever.
Quality sleep is vital to global health, wit

AI-powered PPG on ear enables arrhythmia detection without conventional ECG electrodes.

The study shows that accurate arrhythmia detection can be achieved using a compact in-ear wearable, reducing reliance on conventional electrode-based monitoring systems. What distinguishes this work from many published studies is the combination of an AI earbuds, advanced artificial intelligence, and validation using real clinical data collected from patients. As arrhythmias such as atrial fibrillation become increasingly common, the widespread use of earbuds and hearing aids creates a unique opportunity to turn everyday in-ear devices into platforms for continuous heart health monitoring.

Commenting on the technological breakthrough, Wallace Wong, Co-Founder and CTO of WBD101 said: "Obtaining reliable PPG signals from the ear is significantly more challenging than from traditional wearable locations due to limited space, anatomical variations, motion artefacts, and optical interference. Through advanced optical design, signal processing, and AI-driven analytics, we were able to overcome these challenges and achieve clinically meaningful arrhythmia detection in a compact hearable form factor".

Assoc. Prof. Dr. Gan Kok Beng, who led the multidisciplinary UKM research team behind the project https://www.linkedin.com/in/kok-beng-gan-06758331/, said: "This achievement reflects the strength of UKM's collaboration across engineering, medicine, and industry in addressing real-world healthcare challenges. By bringing together experts in biomedical sensing, artificial intelligence, clinical cardiology, and wearable technologies, our team has demonstrated that in-ear PPG can be a viable platform for continuous arrhythmia detection, paving the way for more accessible cardiovascular monitoring solutions for both terrestrial and

future space applications".

"WBD101 is honoured to collaborate with Dr. Gan Kok Beng and the distinguished UKM research team, whose contributions to photoplethysmography (PPG) research span numerous publications and years of innovation" said Kow Ping, Co-Founder of WBD101 https://www.linkedin.com/in/kowping/, "We look forward to bringing the outcomes of this research into future smart earbuds, while extending similar AI-powered arrhythmia monitoring capabilities across a wider range of wearable devices".

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Building on these findings, the researchers will continue advancing AI-enabled wearable health technologies through strong international collaborations between academia, healthcare institutions, and industry partners. From preventive cardiovascular care to future space missions, the work demonstrates how Malaysian research, such as by UKM and supported by global partners such as WBD101, can contribute solutions with worldwide impact.

Original version of Paper in Malay: https://www.ukm.my/jkukm/wp-content/uploads/2026/3805/33.pdf

English version of Paper: Will be available later. Email for details.

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About Well Being Digital (WBD101)
Founded in 2012, WBD101 is a Hong Kong based company whose first patents are dated back to 2008, incubated by the Hong Kong Science and Technology Parks Corporation (HKSTP), it has teams in Hong Kong SAR, Shenzhen China and Singapore to provide very timely support to B2B customers during their product designs, testing and production stages. WBD101 provides Optical Designs (OpticalFusion) and Health-Sensing Algorithm (ActivHearts and Mogo) to earbuds / smartwatches / screenless bands / rings looking to add very accurate vital sensing, it also co-develops Bluetooth SDK with brands to enable optimized Bluetooth IC resources. WBD101's technology has been licensed by several consumer earbud brands and many others in the Fitness/HealthTech/MedTech space.

Over the years, WBD101 won numerous international awards including the Best Wearable Mobile Tech Awards at the Mobile World Congress 2016, Special & Gold Awards at the 43rd Geneva Inventions Conventions, 2016 WITSA Global ICT Award, the inaugural HK City I&T Grand Challenge Innovation Award in 2022 and the 2025 EE Innovation R&D Award (Most Promising Product). Visit https://www.wbd101.net/blog

About Universiti Kebangsaan Malaysia (UKM)
Vision: UKM is committed to be ahead of society and time in leading the development of a learned, dynamic and moral society
Mission: To be the learning centre of choice that promotes the sovereignty of Bahasa Melayu and internationalises knowledge rooted in the national culture
Motto: FAITH KNOWLEDGE DEEDS
Philosophy: UKM affirms the integration of faith in Allah and constructive knowledge; along with the amalgamation of theory and practice as the core fundamentals in the advancement of knowledge, the building of an educated society and the development of the university
Educational Goals: Graduates who Appreciate National Aspiration, who are Competent, Competitive and Innovative
https://www.ukm.my/portal/vision-mission-song-video-mace/