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RESEARCH BULLETIN

AI–VR Powered EchoPulse by IIT (ISM) Dhanbad's Prof. A. C. S. Rao Redefines Cardiac Diagnostics with Faster, Transparent and Immersive Heart Analysis

In a major breakthrough for healthcare technology, Prof. A. C. S. Rao of the Department of Computer Science and Engineering of IIT (ISM) Dhanbad has developed "EchoPulse," an advanced system combining Artificial Intelligence (AI) and Virtual Reality (VR) to transform the way heart diseases are diagnosed. The innovation enables automated and accurate analysis of heart function, reducing dependence on time-consuming manual processes and large labelled datasets.

EchoPulse works by studying heart scan data and identifying patterns on its own, helping doctors assess heart performance quickly and reliably. What makes it unique is its use of Virtual Reality, which allows doctors and researchers to visualise heart activity in an interactive 3D environment. This not only improves understanding but also makes the system's predictions more transparent and easier to trust, addressing a common limitation in AI-based diagnostics.

Explaining the approach, Prof. Rao notes that "by leveraging advanced self-supervised learning techniques, the system analyzes cardiac volume time series directly from echocardiographic data, autonomously identifying meaningful physiological patterns without the need for exhaustive prior labeling." He further highlights that the system integrates explainable AI with immersive visualisation, enabling clinicians to clearly understand how conclusions are derived.

The system can estimate key clinical parameters such as how efficiently the heart pumps blood, offering valuable support in early detection and treatment planning. By simplifying complex medical data into clear insights, EchoPulse has the potential to make advanced diagnostics more accessible, especially in resource-constrained settings.

Supported by a research grant of around ₹47 lakh from the Anusandhan National Research Foundation (ANRF), the project highlights its strong national relevance and impact.

Prof. Rao brings extensive experience in machine learning, bioinformatics, soft computing and data-driven systems. His research spans areas like disease prediction, medical imaging and intelligent analytics, with numerous publications in reputed international journals. An alumnus of IIT (ISM) Dhanbad, he has also served at institutions such as NIT Warangal and GITAM University.

EchoPulse represents a significant step towards next-generation healthcare, where technology enables faster, clearer and more reliable diagnosis, ultimately improving patient care and clinical decision-making.

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