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interfacing.[77] These systems are biocompatible and energy efficient but are far from maturity.[78] The lack of standardized architectures, synchronization issues, and high latency in molecular propagation make them suitable only for niche applications at present.[79] The overarching limitation remains the absence of a unified protocol stack or interoperability model that bridges nanoscale networks with conventional ICT layers. Without this, the vision of seamless nano-macro integration will remain theoretical.[80,81] Building on the discussion of nanosensor classifications and their communication frameworks bridging the nano-to-macro interface, it becomes evident that the true potential of these technologies is realized through their integration within broader ICT ecosystems. The synergy between nanoscale sensing and advanced ICT infrastructure enables real-time monitoring, intelligent decision-making, and adaptive system responses across various domains. The following section delves into the applications of ICT, emphasizing its transformative impact, integration strategies with nanosensor networks, and the emerging prospects that define the next frontier of smart and connected systems.

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prospects

The application landscape of nanosensors within ICT is broad and multidisciplinary, yet practical deployments remain uneven across sectors.[82] In healthcare, nanosensors embedded in wearable systems have transformed real-time monitoring of biomarkers such as glucose

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