

Generative AI for Energy Harvesting Internet of Things Network: Fundamental, Applications, and Opportunities.

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Abstract: *Internet of Things (IoT) devices are typically powered by small-sized batteries with limited energy storage capacity, requiring regular replacement or recharging. To reduce costs and maintain connectivity in IoT networks, energy harvesting technologies are regarded as a promising solution. Notably, due to its robust analytical and generative capabilities, generative artificial intelligence (GenAI) has demonstrated significant potential in optimizing energy harvesting networks. Therefore, we discuss key applications of GenAI in improving energy harvesting wireless networks for IoT in this article. Specifically, we first review the key technologies of GenAI and the architecture of energy harvesting wireless networks. Then, we show how GenAI can address different problems to improve the performance of the energy harvesting wireless networks. Subsequently, we present a case study of unmanned aerial vehicle (UAV)-enabled data collection and energy transfer. The case study shows distinctively the necessity of energy harvesting technology and verify the effectiveness of GenAI-based methods. Finally, we discuss some important open directions. Index Terms—Generative AI, energy harvesting, UAV, diffusion model, optimization.*

Keywords: Generative AI, IOT, Energy, Networks, Prediction, energy-Harvesting

