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# Frontiers of nanoelectronics: intrinsic Josephson effect and prospects of superconducting spintronics

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## Abstract

*The twenty-first century is marked by an explosive growth in the flow of information, which is necessary to process, archive, and transmit data through communication systems. For that purpose, big data centers with powerful supercomputers have been created all over the world, consuming a huge amount of electricity. For example, just one of thousands of big data centers worldwide, located in the town of Lulea, Sweden [1] consumes 9% of the electricity of the entire country. On the other hand, during the last four decades, the triumphal development of microelectronics and computers, based on traditional semiconductor chips, was enabled by the exponential growth of the number of transistors in chips and the shrinkage of the size of individual transistors, following the empirical Moore's Law, which is now showing slowing-down and failure signs [2].*

***Keywords:*** *artificial neural networks; functional nanostructures; intrinsic Josephson effect; nanoelectronics; spintronics*

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