Artificial Intelligence for Solar Energy Harvesting in Wireless Sensor Networks

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Solar cells have been extensively investigated for wireless sensor networks (WSN). In comparison to other energy harvesting techniques, solar cells are capable of harnessing the highest amount of power density. Furthermore, the energy conversion process does not involve any moving parts and does not require any intermediate energy conversion steps. Their main drawback is the inconsistent amount of energy harvested due to the intermittency and variability of the incoming solar radiation [1]. Consequently, being able to predict the amount of solar radiation is important for making necessary decisions regarding the amount of energy that can be utilized at the sensor node. We demonstrate that artificial intelligence (AI) can be used as an effective technique for predicting the amount of incoming solar radiation at these sensor nodes. We show that a Support Vector Machine (SVM) regression technique can effectively predict the amount of solar radiation for the next 24 hours based on weather data from previous days. We reveal that this technique outperforms other state of the art prediction methods for WSNs. To assess the performance of our proposed solution, we use experimental measurements that were collected for a period of two years from a weather station installed by Beijing Sunda Solar Energy Technology Company [2]. We also demonstrate how the harvested energy can be regulated using an innovative Power Management Unit [3].

References:

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