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Optimizing electric vehicle charging strategies using multi-layer perception-based spatio-temporal prediction of charging station load

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ABSTRACT

The production and sales of electric vehicles have been increasing in line with the gradual adaptation of consumers to electric vehicles, driven by various government policies and subsidies over the past decade. As a result, the deployment of charging facilities, which are essential for supporting electric vehicles, has also been extensive. However, despite the rapid development in scale, charging facilities face challenges such as low utilization during off-peak hours and excessive congestion during peak hours, leading to resource wastage and a diminished user charging experience. To address these issues, this study proposes a spatio-temporal prediction model for charging station load. The model introduces a global spatial enhancement module to simultaneously learn short-range and long-range spatial dependencies in the data, resulting in improved prediction accuracy. The aim of this research is to provide practical guidance in terms of conserving charging resources and enhancing user charging experience based on spatio-temporal prediction effectiveness.

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