# Application of Artificial Neural Networks for Urban Daylight Assessments: A State of the Art Survey

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## Abstract:

Artificial neural networks (ANNs), a subset of machine learning, have emerged as transformative tools for building performance simulation, enabling efficient processing of large and complex databases. One such area is evaluating daylight performance in urban environments, where ANNs can predict solar radiation and daylight availability while accommodating the complexities of urban morphology and dynamic sky conditions. The integration of ANNs into urban daylight simulation holds the potential for improving efficiency and accuracy, while reducing computation time based on learned patterns between input and output parameters. Once trained on simulation data, ANNs enable instantaneous predictions of daylight measures based on inputs, including annual climate dataset and the design parameters of the buildings under evaluation. This paper surveys the current state of the art in Artificial neural networks (ANNs) and their applications in urban daylight simulation. The survey aims to (a) explore the potential of ANNs in the light of current approaches to daylight simulation; (b) provide an overview of research on the primary tasks involved in ANN-based daylight prediction models and the architectures adopted to organize these tasks; (c) present a taxonomy of ANN paradigms. The impact of this work on future studies of ANNs and what factors researchers should consider when combining machine learning techniques with daylight performance simulation are also discussed, along with future research directions.

## Keywords:

Daylighting, Urban Daylight Simulation, Machine Learning, Artificial Neural Networks.