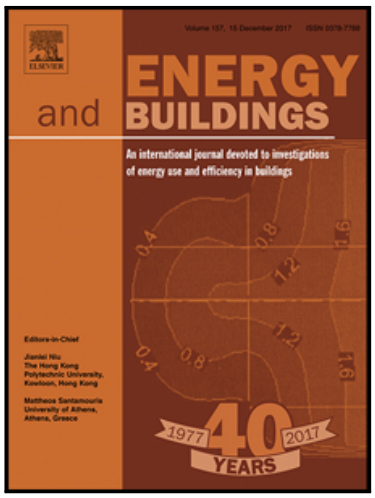

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Bayesian classification and inference of occupant visual preferences in daylit perimeter private offices

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ABSTRACT

The objective of this paper is to understand the complex interactions related to visual environment control in private offices of perimeter building zones and to develop a new method for learning occupant visual preferences. In the first step of our methodology, we conduct field observations of occupants' perception and satisfaction with the visual environment when exposed to variable daylight and electric light conditions, and we collect data from room sensors, shading and light dimming actuators. Consequently, we formulate a Bayesian classification and inference model, using the Dirichlet Process (DP) prior and multinomial logistic regression, to develop probability distributions of occupants' preference, such as prefer darker, prefer brighter, or satisfied with current conditions. Based on field observations, we encode within the model structure that occupants' visual preferences are influenced by a combination of measured physical and control state variables describing the luminous environment, as well as latent human characteristics. The latter represent hidden random variables used to determine the optimal number of possible clusters of individuals with similar visual preference characteristics in the studied office building population. In the final step, we learn the visual preferences of new occupants in the dataset, by inferring their cluster values, and we derive the personalized profiles, using a mixture of the general probabilistic sub-models.

Keywords: Bayesian modeling, Classification, Inference, Shading and lighting systems, Visual preferences.