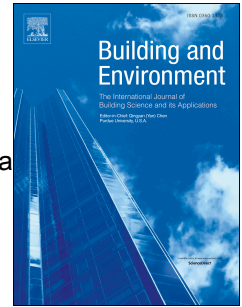


Accepted Manuscript

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PII: S0360-1323(18)30301-9

DOI: [10.1016/j.buildenv.2018.05.035](https://doi.org/10.1016/j.buildenv.2018.05.035)

Reference: BAE 5473

To appear in: *Building and Environment*

Received Date: 27 February 2018

Revised Date: 14 May 2018

Accepted Date: 16 May 2018

Please cite this article as: Tardioli G, Kerrigan R, Oates M, O'Donnell J, Finn DP, Identification of representative buildings and building groups in urban datasets using a novel pre-processing, classification, clustering and predictive modelling approach, *Building and Environment* (2018), doi: 10.1016/j.buildenv.2018.05.035.

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Identification of representative buildings and building groups in urban datasets using a novel pre-processing, classification, clustering and predictive modelling approach [☆]

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Abstract

The formulation of energy policies for urban building stock frequently requires the evaluation of the energy use of large numbers of buildings. When urban energy modelling is utilised as part of this process, the identification of building groups and associated representative buildings can play a critical role. This paper outlines a novel methodology for identifying building groups and associated representative buildings in urban datasets. The methodology utilizes a combination of building classification, building clustering and predictive modelling. First, multiple urban-scale datasets are collected, and then, classification techniques and clustering algorithms are applied to identify building clusters. Next, representative buildings (medoids) in each cluster are identified. Predictive modelling is used to expand cluster membership in the case where some buildings were excluded from the previous analysis. A number of different clustering algorithms are assessed, including K-means and hierarchical (agglomerative and divisive) and partitioning around medoids. The methodology is applied to a large dataset of mixed-use buildings in the city of Geneva, Switzerland. The results, assessed by nine validation indices, indicate the capacity of the decision support framework to identify clusters and associated representative buildings. Furthermore, post-application of predictive modelling, using a random forest approach, facilitates the incorporation of a larger portion of the building stock within the established clusters with an overall average classification accuracy of 89%. A total of 67 representative buildings were identified in the urban dataset, which consisted of 13614 mixed-use buildings in the city of Geneva.

Keywords: building grouping, representative buildings, predictive classification, urban energy modelling, building clusters, clustering

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