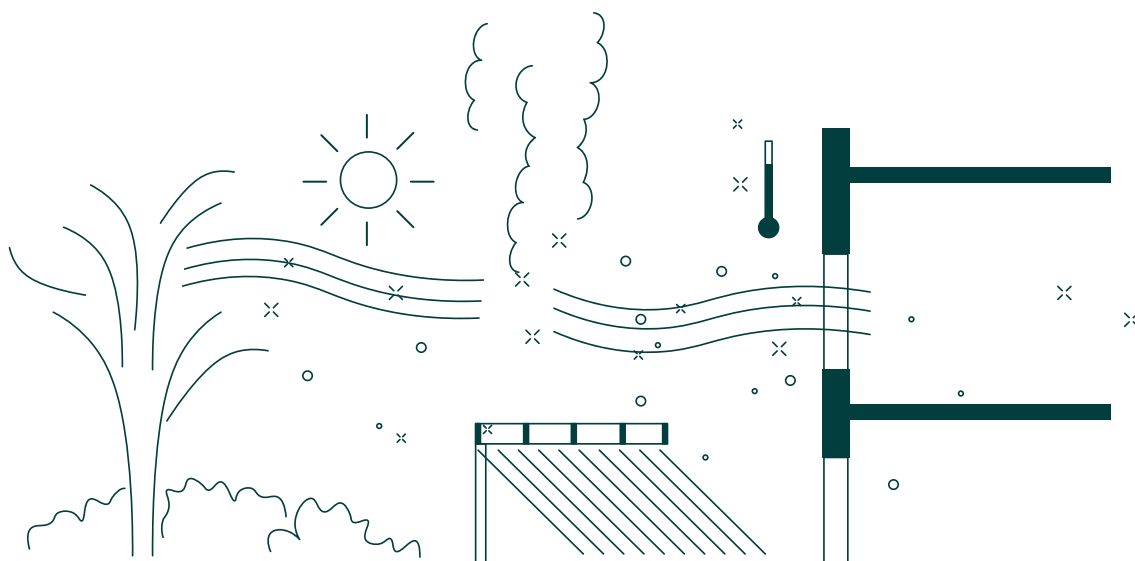




in-SiEqES 2026

June 11th & 12th

International Symposium of
Environmental Quality in Educational Spaces

Escuela Técnica Superior de Arquitectura.
Universidad Politécnica de Madrid

Avenida Juan de Herrera, 4, 28040 Madrid



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Environmental quality is widely recognised as one of the most decisive factors in public health. Its relevance is particularly critical in the case of children, as it directly affects both their physical and cognitive development. Indeed, different researches showed how the exposure to inadequate environmental conditions during early life stages may compromise health outcomes, learning capacity, and overall well-being. Consequently, improving environmental quality in educational settings is not only a matter of comfort, but an essential public health priority.

In this context, the International Symposium of Environmental Quality in Educational Spaces (in-SiEqES) emerges as a necessary initiative to foster dialogue, cooperation, and knowledge exchange. The growing importance of this topic highlights the urgent need to create a dedicated forum where researchers, professionals and stakeholders can share experiences, identify challenges, and collaboratively explore innovative solutions and alternatives. Such a space is particularly valuable given the increasing yet often fragmented body of research and practical experiences developed in recent years across different disciplines and regions.

The symposium is organised within the framework of the research project Lime4Health (PID 2021-123023OA-I00), which focuses on the evaluation of indoor and outdoor pollutant concentrations in primary schools in the Community of Madrid. The project also investigates the influence of building finishings and user habits on environmental quality, as well as their impact on children's health. While grounded in this specific research context, the scope of the symposium is deliberately broadened to address environmental quality in a comprehensive manner.

Beyond air quality, the symposium incorporates key aspects that have traditionally been evaluated independently, such as thermal comfort, lighting conditions, and acoustic quality. These factors are fundamental in shaping the daily experiences of children in schools, influencing not only their well-being but also their ability to concentrate, learn, and perform academically. By adopting a holistic perspective, the symposium aims to advance a more integrated understanding of environmental quality in educational spaces. Furthermore, through a multidisciplinary approach, the symposium seeks to bring an inclusive and collaborative framework that will facilitate the sharing and discussion of scientific advances, practical applications, and policy-oriented strategies.

In addition, taking into account the significant body of expertise in this subject at international level, another aim of in-SiEqES is to create an international forum for the exchange of state-of-the-art knowledge and experience on environmental quality in primary educational environments, both indoor and outdoor. The symposium will emphasise evidence-based research, as well as the presentation of practical experiences and implemented solutions, all while maintaining a strong focus on implications for students' health, well-being, and learning outcomes.

Ultimately, the International Symposium of Environmental Quality in Educational Spaces aspires to contribute meaningfully to the improvement of environmental conditions in educational centres. By promoting healthier, safer, and more sustainable environments, it supports the creation of optimal learning spaces that enhance children's development and quality of life.

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TOPIC 1

HEALTH AND ENVIRONMENTAL QUALITY

A MACHINE LEARNING PRACTICE OF THE PREDICTION OF OCCUPANTS' SYMPTOMS BASED ON THE IN/OUTDOOR ENVIRONMENT QUALITY

Student houses; Indoor air quality; Measurement; Survey; Classification Learning.

Yong Yu^a, Marco Gola^a, Gaetano Settimo^b, Stefano Capolongo^a

Introduction

Indoor environmental quality in residential buildings can influence occupants' discomfort and health-related symptoms, yet objective environmental indicators do not always match users' perceived comfort. Machine learning has been increasingly used for IEQ prediction, but fewer studies address symptom prediction using both indoor and outdoor measurements. This study explores how environmental sensing and occupant-reported data can support symptom-risk prediction in student housing.

Objectives

This study aims to investigate the relationship between indoor/outdoor environmental quality and occupants' self-reported symptoms in university student residences. It further evaluates whether machine learning classification models can predict common symptoms and support future personalised indoor environmental control strategies.

Methodology

Fieldwork was conducted intermittently from May 2024 to June 2025 in two student residences. Low-cost sensors measured temperature, relative humidity, air pressure, CO₂, PM_{2.5} and PM₁₀ in indoor and paired outdoor locations across 7 monitoring periods covering 3 seasons. Questionnaires collected demographic, perception, symptom, occupancy and window operation data. 7 most-frequently reported symptoms were selected as prediction targets in classification learning. 7 individual Bagged tree classification models were trained using environmental features, measurement information and self-reported variables, with the first six periods used for training and the final period for validation. And a combined model was evaluated for the conditions when occupants were in discomfort with at least 1 symptom.

Main results

The models for the 7 symptoms showed promising performance in predicting symptom occurrence despite the limited sample size and included environmental parameters. Individual models achieved high accuracy after threshold optimisation and predictor selection. In validation, the combined model correctly predicted all seven symptoms correct in 55.6% of cases and six corrects in 44.4%. For cases with at least 1 symptom, 33.3% were fully correct predicted and 66.7% had six correct predictions, indicating potential for early discomfort detection, and the possibility to avoid the users' discomfort in advance.

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