

# Machine learning applications for a better demand controlled ventilation system experience in buildings: a review

## Abstract

**Purpose:** At the beginning of the Corona Virus Disease 2019 (COVID-19) pandemic, a digitalized construction environments surfaced in the heating, ventilation and air conditioning (HVAC) systems in the form of a modern delivery system called demand controlled ventilation (DCV). Demand controlled ventilation has the potential to solve the building ventilation's biggest problem of managing indoor air quality (IAQ) for controlling COVID-19 transmission in indoor environments. However, the improper evaluation and information management of infection prevention on dense crowd activities such as measurement errors and volatile organic compound (VOC) generation failure rates, is fragmented so the aim of this research is to integrate this and explore potentials with machine learning algorithms (MLAs). **Design/methodology/approach:** The method used is a thorough systematic literature review (SLR) approach. The results of this research consist of a detailed description of the DCV system and digitalized construction process of its IAQ elements. **Findings:** The discussion revealed that DCV has a potential for being further integrated by perceiving it as a MLAs and hereby enabling the management of IAQ level from the perspective of health risk function mechanism (i.e. VOC and CO<sub>2</sub>) for maintaining a comfortable thermal environment and save energy of public and private buildings (PPBs). The appropriate MLA can also be selected in different occupancy patterns for seasonal variations, ventilation behavior, building type and locations, as well as current indoor air pollution control strategies. Furthermore, the conceptual framework showed that MLA application such as algorithm design/Model Predictive Control (MPC) integration can alleviate the high spread limitation of COVID-19 in the indoor environment. **Originality/value:** Finally, the research concludes that a large unexploited potential within integration and innovation is recognized in the DCV system and MLAs which can be improved to optimize level of IAQ from the perspective of health throughout the building sector DCV process systems. The requirements of CO<sub>2</sub> based DCV along with VOC concentrations monitoring practice should be taken into consideration through further research and experience with adaption and implementation from the ventilation control initial stage of the DCV process.

## Keywords

COVID-19; DCV; Digitalized construction environments; MLA; Optimization