



## **Wind Profile Prediction in an Urban Canyon: a Machine Learning Approach**

Roberto Castello, Dasaraden Mauree, Gianluca Mancini, Tullio Nutta, Tianchu Zhang, and Jean-Louis Scartezzini  
Solar Energy and Building Physics Laboratory, Ecole Polytechnique Fédérale de Lausanne, Switzerland  
(roberto.castello@epfl.ch, dasaraden.mauree@epfl.ch, gianluca.mancini@epfl.ch, tullio.nutta@epfl.ch, tianchu.zhang@epfl.ch, jean-louis.scartezzini@epfl.ch)

Resolving the wind profile in an urban canyon environment means dealing with the turbulent nature of the stream and the presence of non-negligible flux exchanges with the atmosphere inside the canopy which make any deterministic model solution computationally very intensive. In this paper, a statistical data learning approach is explored, which predict the wind speed in an urban canyon at different heights. The optimal experiment location is provided by an urban canyon located at the Swiss Federal Institute of Technology campus in Lausanne, thanks to the presence of several meteorological measuring stations. Different machine learning approaches are compared in order to predict the wind speed in two directions at different heights inside the urban canyon: an optimized ridge regression outperformed random forest in terms of performance. Particularly high accuracy in predicting the wind speed in the highest part of the canyon is shown. However, none of the algorithms proposed is able to accurately capture the variation of the wind speed close to the ground.