

Performance of Neural Networks vs. Radial Basis Functions When Forming a Metamodel for Residential Buildings

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Abstract : With the world climate projected to warm and major cities in developing countries becoming increasingly populated and polluted, governments are tasked with the problem of overheating and air quality in residential buildings. This paper presents the development of an adaptable model of these risks. Simulations are performed using the EnergyPlus building physics software. An accurate metamodel is formed by randomly sampling building input parameters and training on the outputs of EnergyPlus simulations. Metamodels are used to vastly reduce the amount of computation time required when performing optimisation and sensitivity analyses. Neural Networks (NNs) are compared to a Radial Basis Function (RBF) algorithm when forming a metamodel. These techniques were implemented using the PyBrain and scikit-learn python libraries, respectively. NNs are shown to perform around 15% better than RBFs when estimating overheating and air pollution metrics modelled by EnergyPlus.

Keywords : neural networks, radial basis functions, metamodeling, python machine learning libraries

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