ML & AI applications to wind engineering

Summary outline

Complex wind-structure interactions, high Reynolds number effects of structures, nonlinear aerodynamic modeling, control on wind effects, fluid mechanics, etc., are the main challenges in wind engineering. In the past several decades, massive data have been accumulated through wind tunnel tests, CFD-based numerical simulations and structural health monitoring (SHM), which generate invaluable data resources. In recent years, with the development of machine learning (ML) and artificial intelligence (AI), ML and AI has achieved great success in science and engineering fields, due to powerful ability of nonlinear representation, optimization algorithm, generalization performance and flexible network architecture. Emerging data-driven approaches based on machine learning algorithms shed light to fix these challenges in wind engineering. Therefore, the application of ML and AI in wind engineering has involved all aspects of wind engineering field, such as modeling of wind environment, aerodynamic and aeroelastic forces, wind-induced vibrations, aerodynamic optimization and control, and wind disaster assessment.

The purpose of the mini-Symposium is to provide a platform for international scholars and engineers to exchange research progresses and state-of-the-art technologies in ML & (AI) applications in wind engineering. Major topics include but not limited to ML & AI applications in wind field modelling, nonlinear aerodynamic and aeroelastic forces modelling, wind-induced vibrations modeling, aerodynamic optimization and control, wind disaster assessment, field monitoring data mining. Other applications of ML & AI in wind engineering are also welcome.

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