Resume

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Educational Background

'21/09 - '24/01 **Harbin Institute of Technology, Shenzhen, China**

- Master of Civil and Environmental Engineering

'17/09 - '21/06 **Nanchang University, Nanchang, China**

- Bachelor of Civil Engineering

Work Experience

'24/06 - now **Research Associate**

- University: National University of Singapore

Research Intersests

① **Thermal Comfort & Computer Vision**

- Based on the techniques of Computer vision, dynamically adjusting the indoor temperature to improve thermal comfort and reduce energy consumption.

Skills

- Python & MATLAB

Previous Publications (Urban Wind Field)

① **Physics-informed Neural Network & Network Structure Design**

- **H.X. Gao**, G. Hu*, D.Q. Zhang, W.J. Jiang, K.T. Tse, K.C.S. Kwok*, A. Kareem, 2024. Urban Wind Field Prediction Based on Sparse Sensors and Physics-informed Graph-assisted Auto-Encoder. *Computer-Aided Civil and Infrastructure Engineering* (JCR Q1, IF=9.6).
- **Highlights:**

○ A novel neural network architecture comprising a graph neural network as an auxiliary structure and a convolution-based Auto-Encoder structure as the main structure is proposed.
○ The proposed structure efficiently employs sparse input wind speed sensor data to extract hidden high-dimensional features and accurately reconstructs the wind field at any wind attack angle in real-time.
○ A physical loss form that is compatible with convolutional neural networks is proposed.
○ The proposed physical loss effectively reduces prediction errors and enhances model stability.

② **Physics-informed Neural Network & Network Structure Design**

- **H.X. Gao**, G. Hu*, D.Q. Zhang, W.J. Jiang, W.L. Chen*, 2024. Multi-elevation Mountain Wind Field Prediction Based on Deep Learning. *Applied Energy* (JCR Q1, IF=11.2).

◗ **Highlights:**
○ A novel graph neural network architecture embedding the mountain terrain information is proposed.
○ A physical loss function that is geared towards point prediction based solely on prediction results is proposed.
○ The combination of physical loss and novel graph neural network effectively utilizes anemometer data from low elevations to predict anemometer data in high elevations.
○ An improved UNet structure with a transfer learning training scheme is proposed, which efficiently predicts wind fields at high elevations based on predicted anemometer data at corresponding elevations and predicted wind fields at low elevations.

③ **CFD & Mode Decomposition & Machine Learning**

◗ **H.X. Gao**, J.L. Liu, P.F. Lin, G.* Hu, L. Patruno, Y.Q. Xiao, K.T. Tse, K.C.S. Kwok, 2023. An Optimal Sensor Placement Scheme for Wind Flow and Pressure Field Monitoring. *Building and Environment* (JCR Q1, IF=7.4).

◗ **Highlights:**
○ An optimal sensor placement scheme for monitoring wind flow and pressure field is proposed.
○ The effectiveness of scheme was evaluated in urban wind flow field and building wind pressure field.
○ The scheme is capable of managing various wind attack angles and obstacles within the field.
○ The scheme ensures that sensors are arranged in feasible locations for actual engineering implementation.

④ **PIV Experiment**

◗ **H.X. Gao**, J.L.* Liu, P.F. Lin**, C. Li, Y.Q. Xiao, G. Hu, 2022. Pedestrian Level Wind Flow Field of Elevated Tall Buildings with Dense Tandem Arrangement. *Building and Environment* (JCR Q1, IF=7.4).

◗ **Highlights:**
○ The effect of elevation floor on the wind environment at pedestrian height around dense tall buildings is revealed.
○ Changes in drag exerted on the building due to elevation are also speculated.

⑤ **Team Works**

◗ D.Q. Zhang, Z.Q. Liu, X.Y. Jiang, W.J. Jiang, **H.X. Gao**, Hu, G.*, , C. Li, Y.Q. Xiao, G. Hu*, 2023. Numerical study of flow characteristics of tornado-like vortices considering both swirl ratio and aspect ratio. *Journal of Wind Engineering and Industrial Aerodunamics*.

◗ D.Q. Zhang, G. Hu, J. Song, **H.X. Gao**, H. Ren, W.L. Chen, 2023. A novel spatio-temporal wind speed forecasting method based on the microscale meteorological model and a hybrid deep learning model *Energy*.

◗ W.J. Jiang, P.F. Lin, Y. Liang, **H.X. Gao**, D.Q. Zhang, G. Hu, 2023. A novel hybrid deep learning model for multi-step wind speed forecasting considering pairwise dependencies among multiple atmospheric variables *Energy*.

◗ W.J. Jiang, B. Liu, Y. Liang, **H.X. Gao**, P.F. Lin, D.Q. Zhang, G. Hu, 2024. Applicability analysis of transformer to wind speed forecasting by a novel deep learning framework with multiple atmospheric variables *Applied Energy*.