Dong Chen

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EDUCATION

National University of Singapore (NUS), Singapore Aug 2022–April 2026

***Ph.D.**, Mechanical Engineering*

- Major GPA: 4.25/5.00

University of Science and Technology of China (USTC), Hefei, China Sep 2019 – Jun 2022

***M.S.**, Power Engineering and Engineering Thermal Physics*

- Major GPA: 3.44/4.30

Northeast Forestry University (NFU), Harbin, China Sep 2015 – Jun 2019

***B.S.**, Building Environment and Energy Application Engineering*

- Major GPA: 87.12/100, Ranking: 3/59

RESEARCH EXPERIENCES

Coolest LAB Group, NUS

Project 1: Physics-Informed Machine Learning Framework for Modeling Aug 2022 – Jun 2024

- The proposed APCNNs demonstrate superior predictive accuracy and lower computational costs compared to traditional PCNNs across real-world data center datasets.
- The APCNN-based framework for intelligent control in air-free cooling data centers outperforms conventional prediction methods, reducing the Mean Absolute Error by ~20% for short-term (15-minute) forecasts and by ~80% over a seven-day horizon.
- Rigorous mathematical proofs verify that the APCNN maintains physical consistency across all modeled processes.

Project 2: Physics-Informed ML-Based Model Predictive Control for Data Centers Jun 2024 – Oct 2025

- Developed an APCNN-assisted MPC (APCNN-MPC) controller that reduces energy consumption by ~20% under both normal operation and previously unseen high-load conditions, while maintaining stable thermal performance.
- Demonstrated that APCNN-MPC consistently outperforms traditional ML and time-series baselines, achieving higher energy efficiency with more accurate and stable temperature regulation.
- Extended the framework to a long-horizon physics-informed ML-Adaptive MPC (PIML-AMPC), delivering ~24% annual cooling-energy savings compared with fixed-setpoint control.
- Proposed a robust, deployment-oriented control strategy by integrating learning-based prediction with physics-based knowledge, enabling reliable energy optimization under realistic operating variability.

Project 3: Deep Reinforcement Learning Control for Data Centers Oct 2025– April 2026

- Developed an end-to-end DRL control platform for hybrid-cooled data centers, enabling closed-loop training and evaluation with realistic system dynamics and operational constraints.
- Implemented and benchmarked state-of-the-art DRL algorithms (SAC, TD3, and PPO), achieving ~15% energy savings while maintaining stable thermal performance.
- Advanced safe DRL for data-center control by incorporating safety-aware control design (e.g., constraint handling and violation monitoring), improving reliability and deployment readiness under diverse operating conditions.

Energy and Heat transfer laboratory, USTC

Project 1: Rapid heating of liquid CO_2 to the supercritical state using solid propellant Sep 2019 – Mar 2021

- Investigated numerically and experimentally the process of constant-volume heating of liquid CO_2 to its supercritical state by solid propellant.
- Attained a maximum phase conversion speed of ~4.0 kg/s by optimizing the design of working condition.
- Provided useful information for the analysis of the performance of a pneumatic launch with supercritical CO_2 as the working medium such as its reliability, propelling speed, stability.

Project 2: Rapid and uniform heating of liquid CO_2 using a porous ceramic heater Jun 2021 – Jun 2022

- Proposed an innovative heating method for liquid CO_2 heating by using a porous ceramic heater with an electrically conductive coating.
- Numerically investigated the heating process of liquid CO_2 to its supercritical state.
- Lowered the cost and increased the safety of the system.

Thermal Science Laboratory, NFU

Project: A cooling performance study of an innovative groove-structured radiant panel Sep 2017 – Jun 2019

- Built an experimental platform
- Experimentally investigated the cooling performance of the new panel
- Economically friendly, potentially be used for indoor cooling

PUBLICATIONS

- **D. Chen**, et al. Offline deep reinforcement learning for data-driven decision making in data center operations. (in preparation).
- **D. Chen**, et al. policy learning for hybrid-cooled data centers using deep reinforcement learning. (under review).
- **D. Chen**, et al. Physics-informed machine learning-based adaptive predictive control for energy-efficient hybrid-cooled data centers management. (under review).
- **D. Chen**, C.K. Chui, P.S. Lee. Physics informed machine learning based predictive control for intelligent operation of edge datacenters. *Applied Energy*. 2025.
- **D. Chen**, C.K. Chui, P.S. Lee. Adaptive physically consistent neural networks for data center thermal dynamics modeling. *Applied Energy*. 2024.
- **D. Chen**, H. Ye, H.X. Yao. Theoretical and experimental study on constant volume heating of CO_2 by solid propellant. *Applied Thermal Engineering*. 2022.
- G. Lv, C. Shen, Z. Han, W. Liao, **D. Chen**. Experimental investigation on the cooling performance of a novel grooved radiant panel filled with heat transfer liquid. *Sustainable Cities and Society*. 2019.
- Z. Han, **D. Chen**, et al. Experimental Study on Cooling Performance of a Liquid Filled Cold Radiant Panel Based on Grooved Structure. *Building Science*. 2018.

AWARDS

- PhD Scholarship at National University of Singapore in 2022
- First Class Graduate Scholarship in 2020, USTC (Top 10%)
- Extraordinary scholarship in 2018 (2/59)
- First-Class Prize in National University Student Social Practice and Science Contest on Energy Saving & Emission Reduction in 2018
- Third-Class Prize in National University Student Mathematics Competition in 2017
- Third-Class Prize in National University Student English Competition in 2017
- Provincial First-Class Prize in National University Student Mathematical Modeling Competition in 2017

PROFESSIONAL SKILLS

- Programming Languages: C/C++, Python, Matlab,.
- Commercial software: Origin, EnergyPlus, Modelica, ANSYS Fluent.