Wai Tong Chung

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Education

Stanford University   Stanford, CA
Ph.D. in Mechanical Engineering. *Advisor: Prof. Matthias Ihme*.   Sept. 2018 - Exp. June 2024
Research Focus: *Machine Learning, AI for Science, High-Performance Computing, Energy.*
Thesis (WIP): *Overcoming Small Datasets in High-Dimensional ML Studies of Multi-physics Flow Phenomena.*
Courses: *Deep Learning, Computer Vision, Mining Massive Datasets, Linear Algebra, Parallel Computing,
          Numerical Methods, The AI Awakening, Fluid Mechanics, Physical Gas Dynamics, etc.*

Imperial College London   United Kingdom
B.Eng. M.Eng. in Mechanical Engineering *with First Class Honours*.   Sept. 2013 - Aug. 2017
Thesis: *Two-dimensional Probability Density Function Model for HCCI Combustion.*

Experience

Stanford University   Stanford, CA
Machine Learning Research Assistant   Sept. 2018 - Exp. June 2024
Investigating ML for multi-physics energy, propulsion, and wildfire modeling.
ME 375 Wildfire Science Teaching Assistant   Mar 2023 - June 2023
Developed/delivered a new graduate-level course on empirical/computational/ML-based wildfire modeling.
Lawrence Livermore National Laboratory   Livermore, CA
Deep Learning Research Intern   June 2022 - Sept. 2022
Explored deep learning methods for climate modeling and COVID-19 drug discovery.
JPMorgan Chase & Co.   United Kingdom
Financial Messaging Software Engineer   Sept. 2017 - Aug. 2018
Developed, deployed, and tested a Java-based global financial messaging application.
Imperial College London   United Kingdom
Environmental Engineering Research Assistant   June 2017 - Aug. 2017
Prototyped light and acoustic sensor networks for flood warning systems in Nepal.
JPMorgan Chase & Co.   United Kingdom
Software Engineer Intern   June 2016 - Aug 2016
Developed, deployed, and tested a Java-based global financial messaging application.
PTL Technology   Malaysia
Mechnical Engineer Intern   July 2014 - Sept. 2014
Contributed to hospital constuction site work, and drafted medical gas pipeline floor plans.

Research Work

Refereed Journal Articles on Machine Learning

P. Sharma[†], **W.T. Chung**[†], B. Akoush, M. Ihme. A Review of Physics-informed Machine Learning in Fluid Mechanics. *Energies* 16(5):2343, 2023. [[.pdf](#)]

W.T. Chung, K.S. Jung, J.H. Chen, M. Ihme. BLASTNet: A Call for Community-Involved Big Data in Combustion Machine Learning. *Appl. Energy Combust. Sci.* 12:100087, 2022. [[.pdf](#)]

M. Ihme[†], **W.T. Chung**[†], A.A. Mishra[†]. Combustion Machine Learning: Principles, Progress, and Prospects. *Prog. Energy Combust. Sci.* 91:101010, 2022. [[.pdf](#)]

[†]*Equal Contribution.*

W.T. Chung, A.A. Mishra, M. Ihme. Interpretable Data-driven Methods for Subgrid-scale Closure in LES for Transcritical LOX/GCH4 Combustion. *Combust. Flame* 239:111758, 2022. [.pdf]

W.T. Chung, A.A. Mishra, N. Perakis, M. Ihme. Data-assisted Combustion Simulations with Dynamic Submodel Assignment using Random Forests, *Combust. Flame* 227:172-185, 2021. [.pdf]

Refereed Workshop Papers on Machine Learning

W.T. Chung, K.S. Jung, J. H. Chen, M. Ihme. The Bearable Lightness of Big Data: Towards Massive Public Datasets in Scientific Machine Learning. In: *ICML AI4Science Workshop*, 2022. [.pdf]

D.D. Wu, **W.T. Chung**, M. Ihme. Machine Learning for Safely Landing on Mars. In: *NeurIPS ML4PS Workshop*, 2022. [.pdf]

W.T. Chung, A.A. Mishra, N. Perakis, M. Ihme. Accelerating High-fidelity Combustion Simulations with Classification Algorithms. In: *AAAI MLPS Spring Symp.*, 2021. [.pdf]

W.T. Chung, A.A. Mishra, N. Perakis, M. Ihme, Random Forests for Accelerating Turbulent Combustion Simulations. In: *NeurIPS ML4PS Workshop*, 2020. [.pdf]

Refereed Journal Articles on Computational Science and Engineering

W.T. Chung, N. Ly, M Ihme. LES of HCCI Combustion of Iso-octane/air in a Flat-piston Rapid Compression Machine. *Proc. Combust. Inst.* 39(4):5309-5317, 2023. [.pdf]

J. Guo, D. Brouzet, **W.T. Chung**, M. Ihme. Analysis of Ducted Fuel Injection at High-pressure Transcritical Conditions using Large-eddy Simulations. *Int. J. Engine Res (in press)*, 2023. [.pdf]

W.T. Chung, P.C. Ma, M. Ihme. Examination of Diesel Spray Combustion in Supercritical Ambient Fluid using Large-eddy Simulations. *Int. J. Engine Res.* 21(1):122-133, 2020. [.pdf]

Conferences

M. Ihme, **W.T. Chung**, A.A. Mishra, P. Sharma. Guiding the Blind: Injecting Knowledge into Combustion Machine Learning. *KAUST Research Conference: AI for Energy,* Thuwal, Saudi Arabia, 2023. [video]

W.T. Chung, M. Ihme. Learning Combustion Closure Models using the Open-source BLASTNet Database. *U.S. Natl. Combust. Meet.*, College Station, TX, 2023.

W.T. Chung, M. Ihme. Data-assisted Combustion Modeling in LES of a Laser-ignited GCH4/GOX Rocket. *Int. Conf. Numer. Combust.*, La Jolla, CA, 2022.

D.D. Wu, **W.T. Chung**, M. Ihme, K. Edquist. Physics-informed Modeling of Multi-nozzle Plume Physics with Quantifiable Uncertainties from Supersonic Retropropulsion Tests. *Int. Planet. Probe Workshop*, Santa Clara, CA, 2022.

D.D. Wu, **W.T. Chung**, M. Ihme, K. Edquist. Machine Learning with Supersonic Retropropulsion Wind Tunnel Test Data. *Annu. Meet. Am. Phys. Soc., Div. Fluid Dyn.*, Indianapolis, IN, 2021.

W.T. Chung, M. Ihme. Training on Lossy Compressed Data in Combustion Machine Learning. *Meet. West. States Combust. Inst.*, Stanford, CA, 2022.

W.T. Chung, A.A. Mishra, M. Ihme. Subgrid-scale models with Interpretable Machine Learning in LES of Transcritical Reacting Flows. *Annu. Meet. Am. Phys. Soc., Div. Fluid Dyn.*, Phoenix, AZ, 2021.

W.T. Chung, A.A. Mishra, N. Perakis, M. Ihme. Deep Learning-based Assignment of Combustion Submodels for Large-eddy Simulation, *Annu. Meet. Am. Phys. Soc., Div. Fluid Dyn.*, Virtual, 2020.

Accepted Grants

Google Award for Inclusion Research Grant (Awarded $60,000). PI: M. Ihme, 2022. [info]

NERSC Award Grant (Awarded 11.2M core-hours). PI: M. Ihme, 2022. [info]

NASA Early Stage Innovations Grant (Awarded $650,000). PI: M. Ihme, 2021. [info]

Honors and Awards

Stanford CS323: *The AI Awakening* **Best Final Project Prize** (of 87 Students)	2023
Stanford Human-Centered AI **Affinity Group Award**	2023
Stanford Human-Centered AI **Graduate Fellowship**	2022-2023
WSSCI Student **Travel Award** for *Int. Symp. Combust.*	2022
Stanford School of Engineering **Graduate Fellowship**	2018-2019
Imperial College Mechanical Engineering **Most Outstanding Thesis Prize** (of 138 Students)	2017
Imperial College Mechanical Engineering **Dean's List** (Top 10% of 138 Students)	2017
Imperial College Engineering **Undergraduate Research Award**	2017

Professional Activities

Invited Speaker. Addressing Gaps in Scientific Data within ML studies of Thermo-fluid Systems. In: *Stanford Thermal and Fluid Sciences Industrial Affiliates Conference*, 2023.
Invited Speaker. Potential and Challenges of ML in Industrial and Environmental Reacting Flows. In: *K1st World Symposium*, 2022. [video]
Invited Speaker. Towards Massive Public Datasets in Scientific ML. In: *Stanford HAI Grad Seminar*, 2022.
Invited Speaker. Data-assisted Simulations using a Classification Algorithm. In: *Stanford Thermal and Fluid Sciences Industrial Affiliates Conference*, 2020.

Reviewer for *Synergy of Scientific and Machine Learning Modeling Workshop at ICML*, 2023.
Reviewer for *ReScience C (ML Reproducibility Challenge)*, 2023.
Reviewer for *ASME Turbomachinery Technical Conference & Exposition*, 2023.
Reviewer for *International Journal of Engine Research*, 2023.
Reviewer for *ML and the Physical Sciences Workshop at NeurIPS*, 2021, 2022.
Reviewer for *AI for Science: Progress and Promises Workshop at NeurIPS*, 2022.

Session Chair for Turbulent Combustion at the *U.S. Natl. Combust. Meet.*, 2022.
Session Chair for Numerical/Computational Combustion at the *Int. Symp. Combust.*, 2022.

AI/ML Technical Lead for *Stanford Fx Lab (PI: M. Ihme)*, 2022-Present.
Lead organizer for *Stanford HAI Climate-Centered AI Seminar Series*, 2023.
Co-organizer for *Stanford Mechanical Engineering Student Committee*, 2019-2022.
Co-organizer for *Imperial College London Mechanical Engineering Society*, 2016-2017.

Open-source Projects

BLASTNet simulation dataset. [blastnet.github.io]
Multi-GPU deep learning tutorials for 3D datasets. [github.com/blastnet/kaggle_tutorials]
Intro. to ML tutorials. [github.com/IhmeGroup/CombML_Tutorials]

Skills

Programming
Proficient: `Python`, `PyTorch (Lightning)`, `TensorFlow`, `MATLAB`.
Familiar: `C++`, `C`, `Gym`, `PySpark`, `MPI`, `FORTRAN`, `Java`, `Arduino`.

Languages
Proficient: English, Malay.
Familiar: Mandarin, Cantonese.