Danh Nam Nguyen

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Google Scholar https://github.com/danhnam11

Summary

» 5+ years experience specializing in numerical modeling of reactive flow systems.
» 5+ years experience in developing open-source computational fluid dynamics (CFD) software for laminar/turbulent non-premixed combustion at high pressure conditions.
» 3+ years experience in developing open-source CFD software for catalytic ammonia decomposition.
» Extensive knowledge on OpenFOAM/CHEMKIN/ANSYS-Fluent softwares and C++/fortran/python and CUDA C(C++) programming.
» Strong theoretical background on Combustion, Chemical Kinetic, Heat and Mass Transfer, Fluid Mechanics, Turbulent Flows, Numerical Methods, High Performance Computing, and Machine Learning.
» Interested in devising a better problem-solving method for challenging tasks, and learning new technologies and tools if the need arises.

Research interests

» GPU-accelerated CFD simulations of reactive flows.
» AI-powered CFD simulations of reactive flows.
» Numerical study on catalytic ammonia decompositions and ammonia combustion.
» Numerical study on combustion of direct-fired supercritical carbon dioxide (sCO_2) power cycle.
» Large eddy simulation (LES) of turbulent non-premixed flames using flamelet-based models.
» Numerical study on thermal runaway of lithium-ion batteries used in electric vehicles.
» OpenFOAM code development for multi-dimensional simulations of reactive flow systems.

Education

PhD in Mechanical Engineering
Ulsan National Institute of Science and Technology
2019/03 – 2024/08 Ulsan, Republic of Korea

» **Dissertation**: Development of OpenFOAM-based Frameworks for Numerical Studies of sCO_2 Combustion and Catalytic Ammonia Combustion
» **Advisor**: Chun Sang Yoo
» **GPA**: 3.83/4.3
» **Courses**: Areosol Technology, Experimental Methods in Fluid Mechanics, Advanced Mechanical Engineering Analysis, Advanced Fluid Mechanics, Computational Thermo-Fluid Engineering, Advanced Combustion

M.S. in Thermal Engineering
Hanoi University of Science and Technology
2009/09 – 2012/08 Hanoi, Vietnam

» **Dissertation**: Development of Calculation Method and Mass Flow Meter Prototype Based on Coriolis Principle: A Complete Device
» **Advisor**: An Nguyen Nguyen

» **GPA**: 3.33/4.0

» **Courses**: Heat Pump and Saving Energy in Air Conditioning Systems, Modelling of Heat and Mass Transfer in Drying Processes, Advanced Thermal Process Control, Applied Fluid Dynamics, Measurement Engineering and Processing of Characteristic Parameters in Thermal Processes, Modeling Methods of Processes and Equipments in Heat Engineering and Refrigeration, Methods of Analyzing and Calculating the Effectiveness of Heating-Refrigeration Systems, Numerical Methods in Heat Engineering, Design of Experiment, Philosophy, Heat Transfer in Industrial Processes

B.S. in Heat and Refrigeration Engineering
Hanoi University of Science and Technology

2004/09 – 2009/07 Hanoi, Vietnam

» **Dissertation**: Development of Direct Mass Flow Meter Prototype Based on Coriolis Principle: A Priori Study

» **Advisor**: An Nguyen Nguyen

» **GPA**: 7.61/10.0

» **Class Standing**: 2/27

Research Experience

Postdoctoral Researcher
Ulsan National Institute of Science and Technology (UNIST)

Clean Combustion & Energy Research Lab

2024/09 – present Ulsan, Republic of Korea

» Developing an OpenFOAM-based framework for reacting flow simulations with the acceleration of GPU (2025/06 – present).

» Developing a new pressure-based solver for simulations of reacting flows, applicable for all Mach number with real-fluid effects (2025/06 – present).

» Applying the Physics-informed neural networks (PINNs) model to speed up CFD simulations under rocket engine conditions (2025/06 – present).

» Implementation of a new framework in OpenFOAM-6 (C++) encompassing *FPVFoam* and *realFluidPFVFoam* solvers for simulations of turbulent non-premixed flames using the flamelet progress variable (FPV) model with ideal-gas and real-fluid assumptions, respectively (2024/09 – present).

» Developed a new solver (*DTLreactingFoam*) in OpenFOAM-8 (C++) for high fidelity simulations of laminar reacting flows using detailed transport with time-correlated thermophysical properties (2024/09 – 2025/03).

Graduate Student Researcher
Ulsan National Institute of Science and Technology (UNIST)

Clean Combustion & Energy Research Lab

2019/03 – 2024/08 Ulsan, Republic of Korea

» Developed a new solver (*multiRegionCatalystFoam*) in OpenFOAM-8 (C++) for simulations of multi-region catalytic combustion processes using porous media model with detailed surface chemical mechanisms (2024/03 – 2024/08).

» Developed a new solver (*catalystFoam*) in OpenFOAM-8 (C++) for simulations of catalytic processes using particle-resolved model with detailed surface chemical mechanisms (2023/03 – 2024/08).

» Developed a new solver (*porousPBRFoam*) in OpenFOAM-8 (C++) for simulations of catalytic packed bed reactors using porous media model with detailed surface chemical mechanisms (2022/06 – 2024/03).

» Developed a new library in OpenFOAM-8 (C++) from scratch for handling various types of commonly used surface reaction rate constant models such as the basic Arrhenius form, sticking coefficient, and surface coverage dependence models (2022/06 – 2024/03).

- Developed sufficient user define functions (UDFs) of surface reaction rate and heat transfer models in ANSYS-Fluent for simulations of catalytic ammonia decomposition and combustion with detailed surface chemical mechanisms (2022/06 – 2023/01).
- Investigated on dilution effect in a simplified sCO_2 gas turbine combustor under 200 atm using 3s-SLFM (2021/03 – 2022/06).
- Developed a new framework in OpenFOAM-6 (C++) comprising *3sSLFMFoam* and *realFluid3sSLFMFoam* solvers for simulations of turbulent non-premixed flames using three-feed stream steady laminar flamelet model (3s-SLFM) with ideal-gas and real-fluid assumptions, respectively (2021/03 – 2022/06).
- Developed a new framework in OpenFOAM-6 (C++) encompassing *SLFMFoam* and *realFluidSLFMFoam* solvers for simulations of turbulent non-premixed flames using the steady laminar flamelet model (SLFM) with ideal-gas and real-fluid assumptions, respectively (2021/03 – 2022/06).
- Developed new pressure-based solvers (*realFluidFoam*) in OpenFOAM (C++) for simulations of subsonic turbulent non-reacting flows at transcritical and supercritical conditions (2021/03 – 2022/06).
- Developed a new solver (*realFluidReactingFoam*) in OpenFOAM (C++) for simulations of laminar reacting flows under supercritical conditions with the consideration of real-fluid effects using detailed transport model (2020/03 – 2021/03).
- Developed a new thermophysical model library from scratch in OpenFOAM-6 (C++) consisting of widely used real-fluid models (PR/SRK models for equation of state, JANAF-based model for thermodynamic properties, Chung's model for transport properties, mixture averaged model for mass diffusivity of individual species, Fuller's and Takahashi's models for binary diffusion coefficients) for simulations of reacting flows under high pressure conditions (2020/03 – 2021/03).
- Investigated on NOx emission characteristics of CH4 versus O2/CO2 counterflow non-premixed flames at various pressures up to 300atm using real-fluid based OPPDIF code (2019/03 – 2020/03).
- Developed CHEMKIN (OPPDIF, PREMIX) code (fortran) to account for real-fluid effects in laminar non-premixed/premixed flames under supercritical conditions, especially for direct fired supercritical carbon dioxide (sCO2) power cycle (2019/03 – 2020/03).

Research Engineer (Faculty Member)
Hanoi University of Science and Technology (HUST)
Laboratory of Heat Engineering and Refrigeration
2009/10 – 2019/03 Hanoi, Vietnam

- Analyzed typical components and properties (moisture, calorific value, volatile matter, ash contents, ash melting temperature) of solid fuels such as coal and biomass in laboratory for business services (2009/10 – 2019/03).
- Investigated experimentally and numerically on thermal efficiency optimization of gasification cook stoves based on the effect of fuel layer thickness and diameter of combustion chamber on rice husk gasification process (2016–2017).
- Investigated and developed an incineration technology by self-combusting without oil and electricity support to apply for domestic waste treatment in Vietnam with capacity of 500 kg/h (2011-2013).
- Developed a mass flow meter prototype based on Coriolis principle (2009–2010).

Teaching Experience

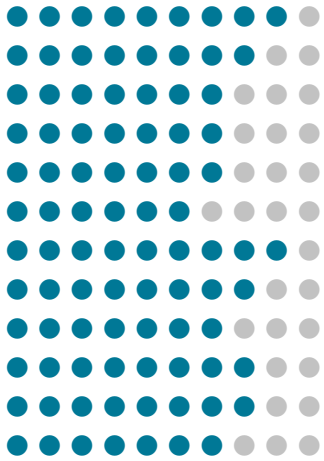
- At UNIST: Teaching Assistant in Computational Thermo-Fluid Engineering (Spring 2021, 2023), Advanced Combustion (Spring 2022)
- At HUST (5+ years): Taught undergraduate students in experimental sessions of courses: Fundamentals of Combustion, Thermal Power Plant Engineering, Measurement and Control System in Heat Engineering, Boiler (2012/06 – 2019/03)

Working Experience in Industry

Engineer
Duc Minh MTV Company Ltd.
Technical Department
2009/10 – 2016/10 Hanoi, Vietnam

- Technical Manager (2013 – 2016)
- Designed and installed: industrial and municipal solid waste incinerators, drying systems, electrical controlling systems in thermal systems and HVAC systems using Programmable Logic Controllers (2009 – 2013)

CFD & Coding Skills



Publications

International Journal Articles

- **Nguyen, D.N.,** Lee, J. H., Yoo, C.S., DTLreactingFoam: An efficient CFD tool for laminar reacting flow simulations using detailed chemistry and transport with time-correlated thermophysical properties, *Computer Physics Communications* (under review).
- **Nguyen, D.N.,** Yoo, C.S., An OpenFOAM-based solver for modeling low Mach number turbulent flows at high pressure with real-fluid effects, *Computer Physics Communications* 312 (2025) 109600. https://doi.org/10.1016/j.cpc.2025.109600
- **Nguyen, D.N.,** Jung, K.S., Shim, J.W., Yoo, C.S., Real-fluid thermophysicalModels library: An OpenFOAM-based library for reacting flow simulations at high pressure, *Computer Physics Communications* 273 (2022) 108264. https://doi.org/10.1016/j.cpc.2021.108264
- Jung, K.S., Bak H.S., **Nguyen, D.N.,**, Lee, B.J., Yoo, C.S., NOx emission characteristics of CH4 versus O2/CO2 counterflow non-premixed flames at various pressures up to 300atm, *Fuel* 299 (2021) 120411. https://doi.org/10.1016/j.fuel.2021.120411

International Articles (in Preparation/Preprint)

- **Nguyen, D.N.,** Yoo, C.S., 3sSLFMFoam: A package for simulations of turbulent non-premixed flames using three-feed stream steady laminar flamelet model in OpenFOAM (in preparation)
- **Nguyen, D.N.,** Lee, J.H., Yoo, C.S., surfaceChemistryModels: A new library for simulations of reacting flows using surface reactions in OpenFOAM (in preparation)
- **Nguyen, D.N.,** Lee, J.H., Yoo, C.S., catalystFoam: An OpenFOAM-based solver for simulations of catalytic processes (in preparation)

Vietnamese Domestic Journal Articles

- **Nguyen Danh Nam**, Le Duc Dung, Nguyen Huu Linh, The effect of rice husk bed layer and internal diameter of gasification cook-stove on its thermal efficiency, *Thermal energy review* 138 (2017) 13–17 (in Vietnamese).

» Dam Thi Lan, Nguyen Duc Quyen, **Nguyen Danh Nam**, Developing a prototype to enhance combustion efficiency and reduce emissions in domestic solid waste incinerators, *Thermal energy review* 133 (2017) 22–26 (in Vietnamese).

» Dam Thi Lan, Nguyen Duc Quyen, **Nguyen Danh Nam**, A solution to minimize concentrations of toxic gases, particularly dioxin and furan, in the combustion chamber of small solid waste incinerators, *Journal of Science and Technology in Civil Engineering* 20 (2014) 91–96 (in Vietnamese).

» Nguyen Nguyen An, **Nguyen Danh Nam**, Developing a complete mass flow meter prototype working based on the Coriolis principle, *Thermal energy review* 112 (2013) 21–24 (in Vietnamese).

» Nguyen Nguyen An, **Nguyen Danh Nam**, Constructing mechanical parts of a mass flow meter prototype working based on the Coriolis principle, *Thermal energy review* 104 (2012) 14–17 (in Vietnamese).

» Nguyen Nguyen An, **Nguyen Danh Nam**, A correlation of direct mass flow rate measurements based on the Coriolis principle. *Thermal energy review* 94 (2010) 6–9 (in Vietnamese).

International Conferences/Presentations/Posters

» **Nguyen, D.N.,** Lee, J.H., and Yoo, C.S., Development of a new OpenFOAM-based framework for simulations of laminar reacting flows, 15th Asia-Pacific Conference on Combustion, Singapore, May 18–22, 2025. Link

» Lee, J.H., **Nguyen, D.N.,** Seo, H.W., Ahn H.J., and Yoo, C.S., A package for reacting flow simulations with surface chemistry in open-source CFD platform, 15th Asia-Pacific Conference on Combustion, Singapore, May 18–22, 2025. Link

» **Nguyen, D.N.,** Lee, J.H., Seo, H.W., Ahn H.J., and Yoo, C.S., Development of a new library in OpenFOAM for simulations of reacting flows with surface reactions, 19th International Conference on Numerical Combustion (ICNC), Kyoto, Japan, May 9–11, 2024. Link

» **Nguyen, D.N.,** Lee, J.H., and Yoo, C.S., Development of a real-fluid based OpenFOAM solver for transcritical and supercritical flows, 29th International Colloquium on the Dynamics of Explosions and Reactive Systems (ICDERS), SNU Siheung, Korea, Jully 23–28, 2023. Link

» **Nguyen, D.N.,** and Yoo, C.S., Development of three-feed stream steady laminar flamelet model in OpenFOAM: assessment for a reacting jet issuing into a hot and diluted coflow, 14th Asia-Pacific Conference on Combustion, Kaohsiung, Taiwan, May 13–18, 2023. Link

» **Nguyen, D.N.,** Lee, J.H., Seo, H.W., Ahn H.J., Kim, B.S., and Yoo, C.S., The experiment and numerical investigations on hydrogen production from ammonia cracking: a priori study, 14th Asia-Pacific Conference on Combustion, Kaohsiung, Taiwan, May 13–18, 2023. Link

» **Nguyen, D.N.,** Lee, J.H., and Yoo, C.S., An OpenFOAM-based framework for sCO2 oxy-fuel combustion using real-fluid based three feed stream steady laminar flamelet model, 39th International Symposium on Combustion, Vancouver, Canada, July 24–29, 2022 (Poster). Link

Korean Domestic Conferences/Presentations/Posters (in English)

» **Nguyen, D.N.,** Lee, J.H., Seo, H.W., Ahn H.J., and Yoo, C.S., Development of an OpenFOAM-based library for surface chemistry: an application for ammonia decomposition, 67th KOSCO Symposium, Yeosu, Korea, May 23–24, 2024. Link

» **Nguyen, D.N.,** Lee, J.H., Seo, H.W., Ahn H.J., and Yoo, C.S., A modified form of Takahashi's microkinetic model for simulations of catalytic hydrogen production via ammonia decomposition, 65th KOSCO Symposium, Gangneung, Korea, May 11–13, 2023. Link

» **Nguyen, D.N.,** Lee, J.H., Yoo, C.S., Development of real-fluid based three-feed stream flamelet model in OpenFOAM for sCO2 oxy-fuel combustion, The 12th National Congress on Fluid Engineering, Changwon, Korea, June 22–24, 2022. Link

» **Nguyen, D.N.,** Lee, J.H., Yoo, C.S., A real-fluid based three-feed stream flamelet model for simulations of a simplified sCO2 combustor, 63th KOSCO Symposium, Gyeongju, Korea, May 19–21, 2022. Link

» **Nguyen, D.N.,** Jung, K.S., Shim, J.W., Yoo, C.S., realGasReactingFoam: an OpenFOAM-based solver for compressible reacting flow at high pressure, 61th KOSCO Symposium (Virtual Conference), Korea, May 13–14, 2021. Link

» **Nguyen, D.N.,** Jung, K.S., Shim, J.W., Yoo, C.S., A new method to implement real gas models for thermophysicalmodels library in OpenFOAM, KSCFE (Virtual Conference), Korea, May 7th, 2021. Link

» Jung, K.S., Bak H.S., **Nguyen, D.N.,** Lee, B.J., Yoo, C.S., A numerical study of the NOx emission characteristics of methane counterflow flame under direct-fired supercritical oxyfuel combustion condition, 59th KOSCO Symposium, Jeju, Korea, Nov. 14–16, 2019. Link

Research Grants / Contracts

» Experimental and numerical studies on thermal efficiency optimization of gasification cook stoves based on effects of fuel layer thickness and diameter of combustion chamber on rice husk gasification process; Role: Principal Investigator; Code: T2016-PC-142; Funded by HUST, 2016–2017.

» Development of a mass flow meter prototype working based on Coriolis principle; Role: Principal Investigator; Code: T2010-109; Funded by HUST, 2009–2010.

Honers / Awards

» **Abroad Ph.D. Scholarship**, UNIST, 2019–2024.

» **Certificate of Merit for Creative Labor**, The Vietnam General Confederation of Labor Executive Committee, 2014.

» **Certificate of Merit**, The Ho Chi Minh Communist Youth Union Executive Committee, 2014.

» **Third Prize**, Annual award for technical creation to project " *Investigation and development of a new incineration technology applicable for small capacity domestic waste treatment (500 kg/h) in Vietnam without using oil and electricity* ", The Vietnamese Fund for Supporting Technological Creations (VIFOTEC), 2013.

» **Third Prize**, Annual award for scientific research of undergraduate students, VIFOTEC, 2009.

» **Third Prize**, Annual award for scientific research of undergraduate students, Minister of Education and Training, 2009.

» **First Prize**, Annual competition for scientific research of undergraduate students, HUST, 2009.

» **Scholarship for outstanding students**, POLYCO Group (partner of HUST), 2008.

» **Scholarship for outstanding students**, HUST, 2008 (8th semester).

» **Scholarship for outstanding students**, HUST, 2007 (7th semester).

Languages

Vietnamese (native) English (fluent)

Referee

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