

# Suyong Kim

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## Academic Positions

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2026–Present    **Assistant Professor – Seoul National University**  
 2024–2026     **Postdoctoral Associate – Massachusetts Institute of Technology**

## Education

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2018–2024    **Ph.D. in Mechanical Engineering – Massachusetts Institute of Technology**  
 Thesis: *Combustion Physics and Inverse Modeling of Energetic Materials*  
 Advisor: Professor Sili Deng

2015–2017    **M.S. in Mechanical Engineering – Seoul National University**  
 Thesis: *Measurement of Eccentricity Effects on Stability of a High-Speed Shrouded Centrifugal Compressor*  
 Advisor: Professor Seung Jin Song

2009–2015    **B.S. in Mechanical and Aerospace Engineering – Seoul National University**  
 Thesis: *Optimization Study of Operating Patterns and Effectiveness for a Distributed Energy System*  
 Advisor: Professor Seung Jin Song

## Journal Publications

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# co-first authors, \* corresponding authors

### *To appear*

2026            S. Deng\* and **S. Kim**, “Decoding Physics from Combustion Experiments: Quantification of Intrinsic Properties with Uncertainties from Reacting Flow Dynamics”, *Propellants, Explosives, Pyrotechnics*.

### *In peer review & submitted*

In peer review    **S. Kim**, and S. Deng\*, “Model Inversion and Uncertainty Quantification for Chemical Kinetics and Thermal Properties in Combustion Waves”, *Journal of Computational Physics*.

Submitted        H. Choi, **S. Kim**\*, and S. Deng\*, “Competing Mechanisms Governing Combustion Behavior in Carbon-Additive Energetic Materials”, *Proceedings of the Combustion Institute*.

### *In preparation*

In prep            **S. Kim**, B. Koenig, and S. Deng\*, “On the Stiffness of Kolmogorov-Arnold Network Ordinary Differential Equations”.

In prep            **S. Kim**, H. Choi, and S. Deng\*, “Tuning Flame Morphology with Controlled Degrees of Gas Generation in Energetic Nanomaterials”.

In prep            N. Tricard, **S. Kim**\*, and S. Deng\*, “Complex Chemistry Inference for Energetic Materials”.

In prep            H. Choi, **S. Kim**\*, and S. Deng\*, “Opening Aluminum Oxide Shell for Enhanced Energetic Performance of Al/CuO using Nanoscale SiO<sub>2</sub> Additives”.

**Published articles** (9 first-author papers, 1 corresponding-author paper, and 3 co-authored papers)

- 2025 **S. Kim**, A. Wang, J. Wen, and S. Deng\*, “Combustion Waves and Flame Stability in Nanocomposites”, *ACS Nano* (IF: 16.0), 19(35), 31790-31798.
- 2025 S. Deng\*, L. Wang, **S. Kim**, and B. Koenig, “Scientific Machine Learning in Combustion for Discovery, Simulation, and Control”, *Proceedings of the Combustion Institute* (IF: 5.2), 41, 105796.
- 2025 B. Koenig#, **S. Kim**#, and S. Deng\*, “ChemKANs for Combustion Chemistry Modeling and Acceleration”, *Physical Chemistry Chemical Physics* (IF: 2.9), 27(33), 17313-17330.
- 2025 B. Koenig, **S. Kim**\*, and S. Deng\*, “LeanKAN: A Parameter-Lean Kolmogorov-Arnold Network Layer with Improved Memory Efficiency and Convergence Behavior”, *Neural Networks* (IF: 6.3), 192, 107883.
- 2024 B. Cha#, A. Wang#, **S. Kim**#, J.-P. Hickey, S. Deng\*, and J. Wen\*, “Microstructural Thermal Zones in Reaction of Nanoenergetics”, *ACS Applied Materials & Interfaces* (IF: 8.2), 16(48), 66099-66107.
- 2024 **S. Kim**, and S. Deng\*, “Learning Reaction-Transport Coupling from Thermal Waves”, *Nature Communications* (IF: 15.7), 15, 9930.
- 2024 B. Koenig#, **S. Kim**#, and S. Deng\*, “KAN-ODEs: Kolmogorov-Arnold Network Ordinary Differential Equations for Learning Dynamical Systems and Hidden Physics”, *Computer Methods in Applied Mechanics and Engineering* (IF: 7.3), 432(A), 117397.
- 2024 G. Tsai#, **S. Kim**#, and S. Deng\*, “Thermal Interaction of Inert Additives in Energetic Materials”, *Proceedings of the Combustion Institute* (IF: 5.2), 40, 105459.
- 2023 **S. Kim**, and S. Deng\*, “Inference of Chemical Kinetics and Thermodynamic Properties from Constant-Volume Combustion of Energetic Materials”, *Chemical Engineering Journal* (IF: 13.2), 469, 143779.
- 2023 **S. Kim**, A. Johns, J. Wen, and S. Deng\*, “Burning Structures and Propagation Mechanisms of Nanothermites”, *Proceedings of the Combustion Institute* (IF: 5.2), 39(3), 3593-3604.
- 2021 **S. Kim**, W. Ji, S. Deng\*, Y. Ma, and C. Rackauckas\*, “Stiff Neural Ordinary Differential Equations”, *Chaos: An Interdisciplinary Journal of Nonlinear Science* (IF: 3.2), 31, 093122.
- 2019 J. Song, **S. Kim**, T. C. Park, B.-J. Cha, D. H. Lim, J. S. Hong, T. W. Lee, and S. J. Song\*, “Non-Axisymmetric Flows and Rotordynamic Forces in an Eccentric Shrouded Centrifugal Compressor – Part 1: Measurement”, *Journal of Engineering for Gas Turbines and Power* (IF: 2.1), 141(11), 111014.
- 2012 S. Oh, Y. Lee, Y. Yoo, J. Kim, **S. Kim**, S. J. Song, H. Kwak\*, “A Support Strategy for the Promotion of Photovoltaic Uses for Residential Houses in Korea”, *Energy Policy* (IF: 9.2), 53, 248-256.

**Domestic article**

- 2013 **S. Kim**, D. H. Jin, G. B. Lee, J. A. Kim\*, “Numerical Analysis for Suppressing Unsteady Wake Flow on Wind Turbine Tower using Edison\_CFD”, *Journal of Computational Fluids Engineering*, 18(1), 36-42.

**Presentations**

# equal contribution, \* corresponding authors

**Conference presentations**

- 2026 H. Choi, **S. Kim**<sup>\*</sup>, S. Deng<sup>\*</sup>, “Competing mechanisms governing combustion behavior in carbon-additive energetic materials”, 41<sup>th</sup> International Symposium on Combustion, Kyoto, Japan (ISoC 2026).
- 2026 H. Choi, **S. Kim**<sup>\*</sup>, S. Deng<sup>\*</sup>, “Enhanced Chemical Reactions of Energetic Materials with Nano-scale Silica Additives” Spring Meeting of the Eastern States Section of the Combustion Institute, North Carolina, USA (ESSCI 2026).
- 2026 H. Choi, **S. Kim**<sup>\*</sup>, S. Deng<sup>\*</sup>, “Altering Thermal and Chemical Mechanisms of Energetic Materials with Carbon Additives” Spring Meeting of the Eastern States Section of the Combustion Institute, North Carolina, USA (ESSCI 2026).
- 2025 D. Keisar, B. Koenig, J. Cas, **S. Kim**, O. R. Caylan, S. Deng, “Fast, Prior-Free Learning of Sorbent Isotherms and Kinetics from Transient Response using KAN-ODE” 2025 AIChE Annual Meeting, Massachusetts, USA (AIChE 2025) – *Best Poster Award*.
- 2025 B. Koenig<sup>#</sup>, **S. Kim**<sup>#</sup>, S. Deng, “Combustion Chemistry Modeling with Kolmogorov-Arnold Network Ordinary Differential Equations” 14<sup>th</sup> U.S. National Combustion Meeting, Massachusetts, USA (USNCM 2025).
- 2024 G. Tsai<sup>#</sup>, **S. Kim**<sup>#</sup>, S. Deng, “Thermal Interaction of Inert Additives in Energetic Materials”, the Combustion Institute’s 40<sup>th</sup> International Symposium – Emphasizing Energy Transition, Milan, Italy (ISoC 2024).
- 2024 **S. Kim**, S. Deng, “Modeling Chemical Kinetics and Combustion Properties from Constant-Volume Combustion of Energetic Materials”, Spring Meeting of the Eastern States Section of the Combustion Institute, Georgia, USA (ESSCI 2024).
- 2024 G. Tsai<sup>#</sup>, **S. Kim**<sup>#</sup>, S. Deng, “Inert Additive Scaling Effects on Flame Propagation in Nanothermites,” Spring Meeting of the Eastern States Section of the Combustion Institute, Georgia, USA (ESSCI 2024).
- 2023 **S. Kim**, S. Deng, “Inferring Transport Properties and Chemical Kinetics of Reactive Materials from Flame Dynamics”, 50<sup>th</sup> Materials Research Society Fall Meeting, Massachusetts, USA (MRS 2023).
- 2023 **S. Kim**, A. Wang, J. Wen, S. Deng, “Effects of Reactivity and Thermal Transport on Burning Propagation of Nanothermites”, 13<sup>th</sup> U.S. National Combustion Meeting, Texas, USA (USNCM 2023).
- 2022 **S. Kim**, A. Johns, J. Wen, S. Deng, “Burning Structures and Propagation Mechanisms of Nanothermites”, 39<sup>th</sup> International Symposium on Combustion, Vancouver, Canada (ISoC 2022).
- 2022 **S. Kim**, A. Johns, J. Wen, S. Deng, “Non-Uniform Burning Propagation of Nanothermites”, Spring Meeting of the Eastern States Section of the Combustion Institute, Florida, USA (ESSCI 2022).
- 2022 **S. Kim**<sup>#</sup>, J. Saadi<sup>#</sup>, K. Pendowski, J. Chen, C. Ly, D. Sweeney, M. Yang, S. Deng, “Participatory & Computational Design of Improved Cookstoves”, ETHOS Conference, Virtual (ETHOS 2022).
- 2019 J. Song, **S. Kim**, T. C. Park, B-J. Cha, D. H. Lim, J. S. Hong, T. W. Lee, and S. J. Song, “Non-Axisymmetric Flows and Rotordynamic Forces in an Eccentric Shrouded Centrifugal Compressor – Part 1: Measurement”, Proceedings of ASME Turbo Expo, GT2019-90237, Arizona, USA (Turbo Expo 2019).
- 2019 **S. Kim**, J. Song, T. C. Park, K. Kim, and S. J. Song, “Measurement of Shrouded Radial Compressor Stability under Eccentric Conditions,” Global Power and Propulsion Society, GPPS-TC-2019-0068, Zurich, Switzerland (GPPS 2019).
- 2018 **S. Kim**, J. Song, B. Cha, T. C. Park, K. Kim, T. Lee, J. Hong, D. Lim, and S. J. Song, “Effects of Non-Axisymmetric Inflow on Vaneless Diffuser Rotating Stall”, Asian Congress on Gas Turbines, ACGT2018-TS50, Japan (ACGT 2018).

- 2012 **S. Kim**, D. H. Jin, and J. A. Kim, “Numerical Analysis for Suppressing Unsteady Wake Flow on Wind Turbine Tower”, The 1<sup>st</sup> EDISON Fluid-Thermo CFD Challenge, The Autumn Conference of Korean Society for Computational Fluids Engineering, 18(1), 33-36, Korea.

### ***Workshop***

- 2022 **S. Kim**<sup>#</sup>, J. Saadi<sup>#</sup>, K. Pendowski, J. Chen, C. Ly, D. Sweeney, M. Yang, S. Deng, “Participatory & Computational Design of Improved Cookstoves”, The Health of The Planet Showcase, MIT Mechanical Engineering, Massachusetts, USA.
- 2014 **S. Kim**, and S. J. Song, “Analytical Evaluation of Economic Feasibility of Cogeneration System in Building”, Seoul National University (SNU)—University of Tokyo (UT) Work Shop 2014, Japan.

### ***Invited talk***

- 2025 **S. Kim**, “Simulation-Experiment-AI: A New Angle for Thermal Engineering”, Seoul National University, Republic of Korea.
- 2023 **S. Kim**, “Learning Chemical Kinetics and Transport Properties of Energetic Materials from Combustion Dynamics”, Seoul National University, Republic of Korea.

## **Teaching Experience**

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### ***Instructor of Record***

- Spring 2026      Advanced Mechanical Engineering Analysis      *Seoul National University*

### ***Teaching Assistantship***

- Fall 2023      Thermal-Fluids Engineering 1 (2.005)      *Massachusetts Institute of Technology*
- Spring 2015      Applied Fluid Mechanics      *Seoul National University*
- Spring 2012      Basic Physics 1      *Seoul National University*
- Spring 2011      Basic Physics 1      *Seoul National University*
- Winter 2010      Pre-School College Mathematics      *Seoul National University*
- Fall 2010      Basic College Mathematics 2      *Seoul National University*
- Spring 2010      Basic Physics 1      *Seoul National University*

## **Advising and Mentoring Experience**

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### ***Academic Committee***

To be included

### ***Graduate Student Mentoring***

- 2024–2026      Hyein Choi (M.S. and Ph.D. Student, MIT) – Energetic materials combustion
- 2024–2025      Benjamin Koenig (Ph.D. Candidate, MIT) – Scientific machine learning
- 2023–2026      Nicolas Tricard (Ph.D. Candidate, MIT) – Inverse problem
- 2022–2024      Gwendolyn Tsai (M.S., MIT) – Energetic materials combustion

***Undergraduate Research Opportunities Program (UROP)***

2025	Wren Berlanga (B.S., MIT) – Hydrogen production (B.S. thesis)
2024–2025	Henry R. Smith (B.S., MIT) – Additive manufacturing (B.S. thesis)
2022	Evan Bell (B.S., MIT) – Additive manufacturing
2022	Pedro Alonso Hernandez (B.S., MIT) – Energetic materials combustion
2021–2023	Jason Chen (B.S., MIT) – Computational fluid dynamics
2020–2021	Meghana Vemulapalli (B.S., MIT) – Computational fluid dynamics
2020–2022	Averitt Johns (B.S., MIT) – Energetic materials combustion
2020	Sophie Longawa (B.S., MIT) – Energetic materials combustion

***MIT Summer Research Program (MSRP)***

2022	Ian Michael Rivera Tosado (B.S., UPenn) – Energetic materials combustion
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***Senior Undergraduate Research Fellowship Program (SURF)***

2024–2025	Yaojun Li (B.S., Tsinghua university) – Hydrogen production
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**Selected Awards**

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2022–2023	<b>Mathworks Mechanical Engineering Fellowship</b> , <i>MathWorks</i>
2018–2024	<b>KEF Scholarship</b> , <i>Kwanjeong Educational Foundation</i>
2018–2019	<b>MIT SMA2 Fellowship</b> , <i>Massachusetts Institute of Technology</i>
2016–2017	<b>BK 21 Plus Scholarship</b> , <i>Ministry of Education, Korea</i>
2016–2017	<b>Academic Excellence Scholarship</b> , <i>Seoul National University</i>
2015–2016	<b>Academic Excellence Scholarship</b> , <i>Seoul National University</i>
2009–2015	<b>National Scholarship for Science and Engineering</b> , <i>Ministry of Education, Korea</i>

**Services**

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***Academic Services*****Editorial Board**

- *FirePhysChem* (Young Editorial Board Member, 2025–2027)

**Journal Reviewer**

- **AI and scientific computing**  
*Computer Methods in Applied Mechanics and Engineering*  
*Computer Science Review*  
*Neural Networks*  
*Communications in Nonlinear Science and Numerical Simulation*  
*Knowledge-Based Systems*  
*Engineering Applications of Artificial Intelligence*  
*Computers and Chemical Engineering*  
*Computers & Geosciences*

- **Combustion and energy**  
*Proceedings of the Combustion Institute*  
*Applications in Energy and Combustion Science*  
*Applied Energy*  
*FirePhysChem*
- **Multidisciplinary**  
*ACS Omega*  
*Communications Engineering*  
*Scientific Reports*  
*Results in Engineering*
- **Others**  
*Journal of Hydrology*  
*Physical Communications*

#### **Conference Service**

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| 2025 | <b>Conference staff</b> , USNCM 2025, MA, USA.                 |
| 2019 | <b>Student assistant</b> , MRS 2019 Fall Meeting, MA, USA.     |
| 2016 | <b>Student assistant</b> , ASME Turbo Expo 2016, Seoul, Korea. |
| 2014 | <b>Student assistant</b> , ACGT 2014, Seoul, Korea.            |