

# Hyungseok (Hyu) Kim

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## EDUCATION

<b>Massachusetts Institute Of Technology</b>	2023
Ph.D. in Mechanical Engineering and Statistics, GPA: 4.8/5.0 Advisor: Cullen R. Buie	
<b>Massachusetts Institute Of Technology</b>	2020
S.M. in Mechanical Engineering, GPA: 4.9/5.0 Advisor: Cullen R. Buie	
<b>Seoul National University</b>	2017
B.S. in Mechanical and Aerospace Engineering, <i>summa cum laude</i> Advisor: Ho-Young Kim	

## APPOINTMENTS

<b>Massachusetts Institute of Technology</b> , Cambridge, MA	
<i>Postdoctoral associate</i> , Department of Chemical Engineering	01/2024 -
<ul style="list-style-type: none"><li>• Professor Richard D. Braatz, Professor Allan S. Myerson, PI</li><li>• Center for Continuous mRNA Manufacturing</li></ul>	
<i>Postdoctoral associate</i> , Department of Mechanical Engineering	07/2023 - 12/2023
<i>Research assistant</i> , Department of Mechanical Engineering	09/2017 - 06/2023
<ul style="list-style-type: none"><li>• Professor Cullen R. Buie, PI</li><li>• Bioreactor systems development for studying microbial CO<sub>2</sub> fixation</li></ul>	
<i>Graduate student</i> , Institute of Data, Systems, and Society	05/2021 - 06/2023
<ul style="list-style-type: none"><li>• Statistics and Data Science Center</li><li>• Developed statistical dimension reduction in multivariate analysis</li></ul>	
<b>Lawrence Livermore National Laboratory</b> , Livermore, CA	
<i>Visiting student</i>	09/2022
<ul style="list-style-type: none"><li>• <math>\mu</math>Biospheres Scientific Focus Area (Dr. Xavier Mayali)</li></ul>	
<b>PrognomiQ, Inc.</b> , San Mateo, CA	
<i>Summer intern</i> , Data Science Team	05/2022 - 08/2022
<ul style="list-style-type: none"><li>• Dr. Chinmay Belthangady, Supervisor</li><li>• Deep learning implementation for protein mass spectrometry analytics</li></ul>	
<b>Seoul National University</b> , Seoul, South Korea	
<i>Undergraduate researcher</i> , Department of Mechanical Engineering	2015 - 2017
<ul style="list-style-type: none"><li>• Microfluids and Soft Matter Laboratory (Professor Ho-Young Kim)</li></ul>	

## PUBLICATIONS

\* co-first, † co-corresponding

**H Kim\***, VL Brisson\*, JR Casey, C Swink, KA Rolison, AN Golini, TR Northen, D Veličković, PK Weber, CR Buie, X Mayali, RK Stuart, “Spatially structured competition and facilitation alters algal carbon

flow to bacteria,” (bioRxiv) *under review*.

**H Kim\***, S Kim\*, JA Kimbrel, MM Morris, X Mayali and CR Buie, “Multidimensional scaling informed by  $F$ -statistic: Visualizing grouped microbiome data with inference,” (arXiv) *submitted*.

**H Kim**, NM Stover, MC Pons Royo, S Ahmadi, A Hatas, AS Myerson and RD Braatz, “Immobilization of plasmid DNA and enzymes for synthesizing messenger RNA: A review,” *in preparation*.

S Chen, P-H Huang, **H Kim**, Y Cui, CR Buie, “MCount: An automated colony counting tool for high-throughput microbiology,” *PLoS ONE* **20**(3):e0311242 (2025).

Q Wang\*, **H Kim\***, TM Halvorsen, S Chen, CS Hayes and CR Buie, “Leveraging microfluidic dielectrophoresis to distinguish compositional variations of lipopolysaccharide in *Escherichia coli*,” *Frontiers in Bioengineering and Biotechnology* **11**:991784 (2023).

CA Vaiana, **H Kim**, J Cottet, K Oai, Z Ge, K Conforti, AM King, AJ Meyer, H Chen, CA Voigt<sup>†</sup> and CR Buie<sup>†</sup>, “Characterizing chemical signaling between engineered “microbial sentinels” in porous microplates,” *Molecular Systems Biology* **18**:e10785 (2022).

**H Kim**, JA Kimbrel, CA Vaiana, JR Wollard, X Mayali<sup>†</sup> and CR Buie<sup>†</sup>, “Bacterial response to spatial gradients of algal-derived nutrients in a porous microplate,” *The ISME Journal* **16**, 1036–1045 (2022). **Editor’s choice**. Appeared in: Phys.org, F1000, AZO Life Sciences, LLNL News.

C Yun\*, JW Choi\*, **H Kim\***, D Kim and H-Y Kim, “Sliding on ice: real contact area, melted film thickness, and friction force,” *International Journal of Heat and Mass Transfer* **160**, 120166 (2020). Appeared in: Advances in Engineering.

## PATENTS

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M Liu, C Belthangady, B Wilcox, P Ma, J-Y Lee, H Kim (2023). Direct classification of raw biomolecule measurement data, PrognomiQ, Inc.

## CONFERENCE PRESENTATIONS

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H Kim, VL Brisson, JR Casey, JA Kimbrel, KA Rolison, CA Vaiana, PK Weber, RK Stuart, X Mayali, CR Buie, “Understanding microbial processes of algal-fixed carbon using a co-culture porous microplate,” presented at the 2024 AIChE Annual Meeting, San Diego, CA, October 27-31, 2024.

H Kim, Q Wang, RK Stuart, X Mayali and CR Buie, “Single-cell electrokinetics reveals surface-mediated attachment between algae and bacteria,” presented at the 27th International Conference on Miniaturized Systems for Chemistry and Life Sciences (MicroTAS), Katowice, Poland, October 15-19, 2023.

V Brisson, H Kim, C Swink, X Mayali, TR Northen, CR Buie and RK Stuart, “Resource partitioning of algal exometabolites among phycosphere bacteria,” presented at the 2023 Joint Genome Institute (JGI) Annual Genomics of Energy & Environment Meeting, Berkeley, CA, August 21-23, 2023.

V Brisson, H Kim, CR Buie, X Mayali and RK Stuart, “Diatom-bacteria interactions: the role of diatom exometabolites in shaping the microbiome,” presented at the Molecular Life of Diatoms 7, San Diego, CA, July 16-20, 2023.

M Morris, V Brisson, H Kim, J Kimbrel, A Wessel, A Navid, C Buie, P Weber, T Northen, R Stuart and X Mayali, “Identifying genomic and metabolic underpinnings of algal-bacterial interactions,” presented at the 2023 Genomic Sciences Program Annual Principal Investigator (PI) Meeting, Washington, DC, April 17-19, 2023.

- H Kim, M Morris, T Samo, R Stuart, CR Buie and X Mayali, “Microscale characterization tools for algal-bacterial interaction and cell sinking,” presented at the 2022 Genomic Sciences Program Annual Principal Investigator (PI) Meeting, Virtual, February 28-March 2, 2022.
- H Kim, JA Kimbrel, CA Vaiana, JR Wollard, X Mayali and CR Buie, “Porous co-culture microplate for studying bacterial responses to host-derived resource gradients,” presented at the 2021 Engineering Biology Research Consortium (EBRC) Annual Meeting, Virtual, April 26-27, 2021.
- H Kim, JA Kimbrel, T Samo, J Wollard, C Ramon, R Stuart, PK Weber, CR Buie and X Mayali, “Impacts of physical proximity and metabolite diffusion on algal-bacteria interactions,” presented at the 2021 Genomic Sciences Program Annual Principal Investigator (PI) Meeting, Virtual, February 22-24, 2021.
- H Kim, JA Kimbrel, JR Wollard, X Mayali and CR Buie, “A hydrogel co-culture platform reveals community responses to bacteria to algal host and nutrients under diffusion-controlled environment,” presented at the 24th International Conference on Miniaturized Systems for Chemistry and Life Sciences (MicroTAS), Virtual, October 4-9, 2020.
- H Kim, JA Kimbrel, T Samo, R Stuart, J Wollard, D Veličković, C Anderton, CR Buie and X Mayali, “Examining the role of physical proximity and diffusion of metabolites in algal-bacterial interactions,” presented at the 2020 Genomic Sciences Program Annual Principal Investigator (PI) Meeting, Washington, DC, February 24-26, 2020.
- Q Wang, H Kim and CR Buie, “Microfluidic dielectrophoresis enables rapid characterization of lipopolysaccharide glycoforms in gram-negative bacteria,” presented at the 2019 Gordon Research Seminar on Physics and Chemistry of Microfluidics, Hong Kong, China, June 15-16, 2019.
- H Kim, C Yun, D Kim and H-Y Kim, “Interfacial melting of ice under a high-speed slider: real-time visualization and friction modeling,” presented at 69th Annual Meeting of the APS Division of Fluid Dynamics, Portland, OR, November 20-22, 2016.

## INVITED TALKS

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Massachusetts Institute of Technology, Advanced Manufacturing Systems	October 2023
Massachusetts Institute of Technology, Physics of Living Systems	September 2023
Lawrence Livermore National Laboratory, $\mu$ Biospheres Scientific Focus Area	July 2023
Massachusetts Institute of Technology, Statistics and Data Science Center	May 2023
Lawrence Livermore National Laboratory, $\mu$ Biospheres Scientific Focus Area	March 2022

## FELLOWSHIPS AND AWARDS

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Kwanjeong Educational Foundation Fellowship	2019
Kwanjeong Educational Foundation Fellowship	2017
Thesis Presentation Award, Seoul National University	2016
Achievement Awards, Republic of Korea Marine Corps	2015
National Scholarship for Science and Engineering, South Korea	2011

## SERVICE AND PROFESSIONAL ACTIVITIES

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<i>Supervisor</i> , MIT Undergraduate Research Opportunities Program	2024-
<i>Completed Participant</i> , MIT Kaufman Teaching Certificate Program	2024
<i>Reviewer</i> , Frontiers in Marine Science	2023
<i>Reviewer</i> , Marine Pollution Bulletin	2023
<i>Reviewer</i> , The 5th International Workshop on Environment and Geoscience	2022

<i>President</i> , MIT Korean Graduate Student Association in Mechanical Engineering	2020
<i>Board Member</i> , External Affairs Coordination, MIT Korean Graduate Student Association	2018
<i>Co-chair</i> , Kwanjeong Educational Foundation Student Association	2017
<i>Sergeant</i> (veteran), 2nd Marine Corps Division, Republic of Korea Marine Corps	2015
<i>Violinist</i> , 39th Concert by Seoul National University Philharmonic Orchestra	2011

## SKILLS AND PROGRAM LANGUAGES

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**Hands-on.** Cell culture, flow cytometry, bioassays, microscopy, microfluidics, machine tools.

**Languages.** Python (PyTorch, TensorFlow), R, Unix shell; some use of MATLAB, Fortran.

**Others.** Git, AWS, TeX, Adobe Illustrator, SolidWorks.