JOOYEON PARK

She/Her

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Research Profile

I am a postdoctoral researcher working at the intersection of multiphase flows, soft matter, and particulate materials. My research combines controlled experiments, flow visualization, image-based measurements, and scaling analysis to understand how particles, droplets, bubbles, complex fluids, and granular materials are transported, reorganized, and stabilized in complex environments. My current work focuses on Newtonian/non-Newtonian droplet impact and imbibition in granular beds and binder-mediated cohesive particle aggregates, with applications to advanced manufacturing, particle processing, environmental flows, and thermal-fluid systems.

Academic Experience and Education

Academic Experience

Postdoctoral Researcher, Department of Mechanical Engineering *09.2025 – present*
University of Maryland, College Park
Key areas: Granular physics, drop impact, cohesion

Education and Training

Ph.D., Mechanical Engineering, *Seoul National University*, South Korea *02.2017 – 08.2023*
Doctoral Research Fellowship, National Research Foundation of Korea, 2021–2023
Key areas: Particle-laden gas flows, droplet-particle interaction, multiphase flows
Thesis: Experimental study on the particle dispersion in a particle-laden jet with a crossflow

B.S., Mechanical Engineering, *Hanyang University*, South Korea *03.2013 – 02.2017*
Summa Cum Laude, 2017

Professional Experience

Research Engineer, Samsung Electronics, DS R&D Center, South Korea *09.2023 – 07.2025*
Semiconductor Process Research & Development Center
Key areas: Particle dynamics and fluid mechanics in EUV lithography processes

Research Awards and Honors

- Samsung Electronics DS CTO CREATHON Award, Samsung Electronics *2024*
- Doctoral Research Fellowship, National Research Foundation of Korea *2021–2023*
- 10 Technologies in Mechanical Engineering, Korean Federation of Mechanical Engineering Societies *2020*
- Outstanding Academic Achievement, Summa cum Laude, Hanyang University *2017*

Publications

Manuscripts are listed in reverse chronological order. Available at: https://scholar.google.com/citations?user=47e7p54AAAAJ&hl=en.

Journal Articles

[6] Y. Kang, J. Park, and H. Park. Toward the eco-friendly cosmetic cleansing assisted by the microbubbly jet. *Scientific Reports*, 14(1):8189, 2024.
DOI: https://doi.org/10.1038/s41598-024-58968-x
Y. Kang and J. Park contributed equally to this work

[5] J. Park, K. H. Lee, Y. G. Song, H. Park, and K. S. Lee. Development of optimal indoor air disinfection and ventilation protocols for airborne infectious diseases. *PLOS One*, 19(10):e0311274, 2024.
DOI: https://doi.org/10.1371/journal.pone.0311274

[4] J. Park, K. S. Lee, and H. Park. Optimized mechanism for fast removal of infectious pathogen-laden aerosols in the negative-pressure unit. *Journal of Hazardous Materials*, 435:128978, 2022.
DOI: https://doi.org/10.1016/j.jhazmat.2022.128978

[3] J. Park and H. Park. Particle dispersion induced by vortical interactions in a particle-laden upward jet with a partial crossflow. *Journal of Fluid Mechanics*, 915:A5, 2021.
DOI: https://doi.org/10.1017/jfm.2021.19

[2] Y. Kang, J. Park, and H. Park. Particle leakage through the exhalation valve on a face mask under flow conditions mimicking human breathing: A critical assessment. *Physics of Fluids*, 33(10), 2021.
DOI: https://doi.org/10.1063/5.0067174

[1] J. Park and H. Park. Vane deployer with a hydrofoil array for enhanced lift-to-drag ratio at wide range of angle of attack. *Journal of the Korean Society of Visualization*, 17(2):25–31, 2019.
DOI: https://doi.org/10.5407/jksv.2019.17.2.025 *(in Korean)*

Journal Articles Under Review

[1] S. Rajesh, R. S. Tinianov, J. Park, and A. Sauret. Axial forces in capillary liquid bridges of polymer solutions. *Submitted*
arXiv: https://doi.org/10.48550/arXiv.2604.08361

Journal Articles In Preparation

[3] J. Park, S. Rajesh, and A. Sauret. Impact of viscoelastic polymer solution droplets on a granular bed. *In preparation*

[2] J. Park, H. Park, and A. Sauret. Experimental observation of particle dynamics: particle-laden jet with humid crossflow. *In preparation*

[1] J. Park, S. Rajesh, and A. Sauret. Mechanical characteristics of binder-mediated cohesive particle aggregates. *In preparation*

Conference Presentations

[15] J. Park and H. Park. Measurement of the particle-laden jet with cross-flow under various humidity. Oral, 15th International Symposium on Particle Image Velocimetry-ISPIV, 2023. San Diego, California, USA

[14] J. Park and H. Park. Humidity effect on the particle-laden jet with crossflow. Oral, 11th International Conference on Multiphase Flow, 2023. Kobe International Conference Center, Japan

[13] Y. Kang, J. Park, and H. Park. Critical examination on particle leakage through the exhalation valve on a face mask. Oral, 75th Annual Meeting of the APS Division of Fluid Dynamics, 2022. Online

[12] J. Park and H. Park. Effects of the relative humidity on the particle-laden jet with crossflow. Oral, 75th Annual Meeting of the APS Division of Fluid Dynamics, 2022. Online

[11] J. Park and H. Park. Experimental study of the humidity effect on particle-laden jet with crossflow. Oral, The 12th National Congress on Fluids Engineering, 2022. Changwon, South Korea

[10] Y. Kang, J. Park, and H. Park. Particle leakage through the exhalation valve on a face mask under flow conditions mimicking human breathing. Oral, The 2021 Fall Conference of the Korean Society of Visualization, 2021. Korea Maritime & Ocean University, Busan, South Korea

[9] J. Park and H. Park. Fine particle source tracking in a particle-laden upward jet with a crossflow. Oral, The 16th Conference of the International Society of Indoor Air Quality & Climate, 2020. Online

[8] Y. Kang, J. Park, and H. Park. Evaluation of particle filtration control by unidirectional flow valve type device. Oral, The 16th Conference of the International Society of Indoor Air Quality & Climate, 2020. Online

[7] J. Park and H. Park. Empirical model approach to track particle source in an upward particle-laden jet with a crossflow. Oral, The 11th National Congress on Fluids Engineering, 2020. Ramada Plaza Hotel, Jeju, South Korea

[6] Y. Kang, J. Park, and H. Park. Critical evaluation of particle filtration control by unidirectional-flow valve type device in facial mask. Oral, The 11th National Congress on Fluids Engineering, 2020. Ramada Plaza Hotel, Jeju, South Korea

[5] J. Park and H. Park. Particle-laden upward jet in a crossflow: particle dispersion and tracking of particle source. Oral, 72nd Annual Meeting of the APS Division of Fluid Dynamics, 2019. Seattle, WA, USA

[4] J. Park and H. Park. Analysis of particle dispersion and concentration in particle-laden jet. Oral, The 2018 Fall Annual Meeting of the Korean Society of Mechanical Engineers, 2018. Kangwonland, Kangwon, South Korea

[3] J. Park and H. Park. Vertical particle-laden flow with a horizontal crossflow. Oral, 71st Annual Meeting of the APS Division of Fluid Dynamics, 2018. Atlanta, GA, USA

[2] J. Park and H. Park. Experimental analysis of preferential concentration in particle-laden jet flows with a cross-flow. Oral, The 2018 Spring Annual Meeting of the Korean Society of Mechanical Engineers, 2018. UNIST, Ulsan, South Korea

[1] J. Park and H. Park. Visualization of particle-laden jet flow under cross-flows. Poster, The 2017 Fall Annual Meeting of the Korean Society of Mechanical Engineers, 2017. ICC, Jeju, South Korea

Patents

[3] K. S. Lee, K. C. Koo, H. Park, J. Park, Y. Kang, S. G. Park, D. S. Choi, S. I. Kim, and S. J. Lee. Tent-type mobile infectious disease clinic, 2023. US Patent 11771610B2

[2] K. S. Lee, K. C. Koo, H. Park, J. Park, Y. Kang, S. G. Park, D. S. Choi, S. I. Kim, and S. J. Lee. Booth-type mobile infectious disease clinic, 2023. US Patent 11813201B2

[1] K. S. Lee, K. C. Koo, H. Park, J. Park, Y. Kang, S. G. Park, D. S. Choi, S. I. Kim, and S. J. Lee. Vehicle-type mobile infectious disease clinic, 2023. US Patent 11850190B2

Mentorship

Current graduate student being mentored at University of Maryland

- Jingqi (Owen) Tu, Ph.D. student, Mechanical Engineering, University of Maryland, College Park. *2025–present*
  Research mentoring on data analysis and manuscript writing for suspension drop impact on mesh and wine-pattern formation on paper.

Past graduate research mentoring at Seoul National University

- Yeeun Kang, M.S. student at the time; currently Ph.D. student, Mechanical Engineering, Seoul National University. *2019–2023*
  Research mentoring and collaboration on experimental design, data analysis, and manuscript writing for particle dynamics near a flapping valve and particle dispersion in oscillatory channel flows.

Past undergraduate research mentoring at Seoul National University

- Sang-Hoon Yeo, undergraduate student, Mechanical Engineering, Seoul National University. *2019*
  Thesis research mentoring on solid particle dynamics in airflows through a tilt-type window.

Teaching Experience

- **Laboratory Instructor / Teaching Assistant, Dept. of Mechanical Engineering** *Seoul National University*
  Mechanical Engineering Laboratory 2: Flow Measurements Spring 2018, Fall 2019
  Prepared and led lectures and laboratory sessions, developed course materials, designed exam problems, guided students through flow-measurement experiments, and assisted with grading.

- **Teaching Assistant, Department of Mechanical Engineering** *Seoul National University*
  Inviscid Flows Fall 2019
  Viscous Flows Fall 2017
  Teaching duties included problem-solving sessions, grading, and student mentoring.

Selected Research Projects

- Experimental analysis and control of micro-sized solid particle behavior considering the effects of air humidity and temperature (*6/2021 – 5/2023*)
  National Research Foundation of Korea, KRW 40M ($27K)
  Role: Principal Investigator; led experimental design, data analysis, and reporting.

- Optimization and experimental verification of a mobile negative pressure room for early detection and containment of airborne infectious disease suspected cases (*9/2020 – 12/2022*)
  Ministry of Health and Welfare, KRW 2.234B ($1.5M)
  Role: Proposal and research report writer; lead researcher.

- Development of the "Vane Deployer" for stable operation of an automated oil recovery system in marine environments (*1/2019 – 12/2019*)
  Korea Coast Guard
  Role: Research report writer; lead researcher.

- Experimental investigation of solid particle behavior in a jet with crossflow *(3/2017–2/2019)*
  Seoul Metropolitan Government
  Role: Research report writer; lead researcher.

- Experimental investigation of bubble and particle dynamics in a fluidized bed (*3/2017 – 12/2018*)
  National Research Foundation of Korea
  Role: Researcher.