Hyung-Suk Kwon

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Curriculum Vitae
March 2026

Homepage
Google Scholar

Education

University of Michigan — **Ann Arbor, MI**
Ph.D. in Mechanical Engineering — 2018 - 2023

Dissertation Committee: Bogdan-Ioan Popa (Chair), Bogdan Epureanu, Serife Tol, Anthony Grbic
Title: Acoustic metamaterials and convolutional neural networks for broadband ultrasound sensing

University of Michigan — **Ann Arbor, MI**
M.S. in Electrical and Computer Engineering — 2021 - 2022
M.S. in Mechanical Engineering — 2016 - 2018

Korea University — **Seoul, Korea**
B.S. in Mechanical Engineering — 2009 - 2013

Experience

Toyota Research Institute of North America — **Ann Arbor, MI**
Research Scientist — Apr 2025 - present
Visiting Scientist — Dec 2023 - Apr 2025

University of Michigan — **Ann Arbor, MI**
Postdoctoral Research Fellow — Dec 2023 - Apr 2025
Graduate Research Assistant — May 2017 - Nov 2023

Republic of Korea Air Force — **Daegu, Korea**
F-16 Stress Analyst (First lieutenant) — Mar 2013 - May 2016

Skills

Acoustic experiment design, signal processing, piezoelectric transducer characterization; COMSOL Multiphysics (frequency-domain simulation), k-Wave (time-domain simulation); MATLAB (data analysis, experiment automation), Python (PyTorch for machine learning)

Publications

Peer-Reviewed Journal Papers (* : Corresponding author)

1. **HS Kwon***, Z. Yu, X. Li, E. M. Dede, and T. Lee*, "An energy focusing flexible and lightweight acoustic metamaterial for enhanced ultrasound power transfer," *Advanced Materials*, 2026
2. G. U. Patil*, **HS Kwon**, B. I. Epureanu, and B.-I. Popa, "Synthetically-trained neural networks for shape classification from measured acoustic scattering," *Journal of Sound and Vibration*, p. 119 229, 2025
3. **HS Kwon**, G. U. Patil, B. I. Epureanu, and B.-I. Popa*, "Specialized convolutional neural network models for echolocation-based perception," *IEEE Access*, vol. 13, pp. 156 811–156 823, 2025
4. T. Lee*, X. Li, Z. Yu, **HS Kwon**, and C. Daraio, "Mechanical spin waves in a nonlocal discrete magnetoelastic lattice with negative group velocity," *Advanced Physics Research*, p. 2 400 197, 2025
5. T. Lee*, **HS Kwon**, X. Li, Z. Yu, T. Kimura, Y. Tadokoro, and H. Iizuka, "Surface acoustic wave direction sensing enabled by resonant mode interference in a single micropillar resonator," *Physical Review B*, vol. 111, no. 17, p. 174 101, 2025
6. Z. Yu*, X. Li, **HS Kwon**, T. Lee, and H. Iizuka, "Significantly reduced rotation frequency for controlling near-field heat transfer between rotating objects by a nonreciprocal substrate," *ACS Photonics*, vol. 11, no. 11, pp. 4865–4872, 2024
7. Y. Cheong, **HS Kwon**, and B.-I. Popa*, "Metamaterial characterization from far-field acoustic wave measurements using convolutional neural network," *Frontiers in Physics*, vol. 10, p. 1138, 2022

8. Y. Zhai, **HS Kwon**, Y. Choi, D. Kovacevich, and B.-I. Popa*, "Learning the dynamics of metamaterials from diffracted waves with convolutional neural networks," *Communications Materials*, vol. 3, no. 1, pp. 1–7, 2022
9. Y. Zhai, **HS Kwon**, and B.-I. Popa*, "Anomalous reflection with omnidirectional active metasurfaces operating in free space," *Physical Review Applied*, vol. 16, no. 3, p. 034 023, 2021
10. **HS Kwon**, B. I. Epureanu, and B. I. Popa*, "Reconfigurable large-scale bulk metamaterials for broadband ultrasonics," *Smart Materials and Structures*, vol. 30, no. 8, p. 085 002, 2021
11. **HS Kwon** and B.-I. Popa*, "Design and experimental demonstration of broadband acoustic pressure enhancing passive metafluids," *The Journal of the Acoustical Society of America*, vol. 145, no. 6, pp. 3633–3639, 2019
12. Y. Zhai, **HS Kwon**, and B.-I. Popa*, "Active willis metamaterials for ultracompact nonreciprocal linear acoustic devices," *Physical Review B*, vol. 99, no. 22, p. 220 301, 2019
13. B.-I. Popa*, Y. Zhai, and **HS Kwon**, "Broadband sound barriers with bianisotropic metasurfaces," *Nature Communications*, vol. 9, no. 1, pp. 1–7, 2018

Manuscripts in Progress

1. **HS Kwon***, Z. Yu, X. Li, E. M. Dede, and T. Lee*, "Effects of a Near-Surface Air Bubble on Water-to-Air Sound Transmission" (In preparation)

Presentations

Oral Sessions (* : Presenter)

1. **HS Kwon***, Z. Yu, X. Li, E. Dede, and T. Lee, "Energy focusing flexible acoustic meta-structure for enhanced ultrasound power transfer," *189th Meeting of the Acoustical Society of America*, Honolulu, Hawaii (December 2025)
2. G. Patil*, **HS Kwon**, B. Epureanu, and B.-I. Popa, "Simulation to reality learning for geometry inference of finite acoustic scatterers," *189th Meeting of the Acoustical Society of America*, Honolulu, Hawaii (December 2025)
3. **HS Kwon***, G. Patil, B. Epureanu, and B.-I. Popa, "Modular convolutional neural networks for adaptable ultrasound sensing and echo analysis," *188th Meeting of the Acoustical Society of America*, New Orleans, Louisiana (May 2025)
4. G. Patil*, **HS Kwon**, B. Epureanu, and B.-I. Popa, "Artificial echolocation: Leveraging neural networks for ultrasound-based shape recognition," *International Mechanical Engineering Congress & Exposition*, Portland, Oregon (November 2024)
5. **HS Kwon***, B. I. Epureanu, and B.-I. Popa, "Metamaterial lens for real-time ultrasound beam steering using single-channel scalar control," *179th Meeting of the Acoustical Society of America*, Online due to pandemic (December 2020)
6. Y. Zhai*, B.-I. Popa, and **HS Kwon**, "Design of broadband active sound isolators based on acoustic bianisotropic metamaterials," *177th Meeting of the Acoustical Society of America*, Louisville, Kentucky (May 2019)
7. **HS Kwon*** and B.-I. Popa, "Acoustic pressure enhancing metamaterials through impedance contrast," *177th Meeting of the Acoustical Society of America*, Louisville, Kentucky (May 2019)
8. B.-I. Popa*, Y. Zhai, and **HS Kwon**, "Acoustic bianisotropic metasurfaces for broadband non-reciprocal sound transport," *176th Meeting of the Acoustical Society of America*, Victoria, British Columbia, Canada (November 2018)

Poster Sessions

1. G. U. Patil*, **HS Kwon**, P. Mohan, P. Jayakumar, B. Epureanu, and B.-I. Popa, "Ultrasound perception in physical environments from synthetically trained neural networks," *Automotive Research Center Annual Program Review*, Ann Arbor, Michigan (June 2024)
2. **HS Kwon***, B.-I. Popa, B. Epureanu, P. Jayakumar, and P. Mohan, "Ultrasound based perception using ml algorithms trained in synthetic environments," *Automotive Research Center Annual Program Review*, Ann Arbor, Michigan (May 2023)
3. **HS Kwon***, B.-I. Popa, B. Epureanu, K. Sebeck, and M. Egilmez, "Autonomous vehicle navigation with ultrasound beams," *Automotive Research Center Annual Program Review*, Ann Arbor, Michigan (May 2020) [Awarded 2nd place in Student Poster Competition]
4. **HS Kwon***, B.-I. Popa, B. Epureanu, R. Thyagarajan, and M. Egilmez, "Ultrasonic sensors for autonomous vehicles," *Automotive Research Center Annual Program Review*, Ann Arbor, Michigan (May 2019) [Chosen as a top 5 finalist in Student Poster Competition]

Patents

1. B. I. Popa, B. Epureanu, and **HS Kwon**, *Metamaterial-based acoustic sensor beamforming*, US Patent 12,190,857, Jan. 2025

Awards

2nd Place, Automotive Research Center Student Poster Competition — Jun 2020

Top 5 Finalist, Automotive Research Center Student Poster Competition — May 2019

Teaching

ME424 Engineering Acoustics — **University of Michigan**
Graduate Student Instructor — Fall 2021
- Held office hours, prepared homework solutions, and graded homework assignments

Services

Teaching Volunteer — 2023-2024 Academic Year
Taught math and coding to K-12 students once a week at the Peace Neighborhood Center

Peer Reviewer
The Journal of the Acoustical Society of America (JASA), JASA-Express Letters, Applied Physics Letters, Journal of Applied Physics

Membership
Acoustical Society of America, Institute of Electrical and Electronics Engineers (IEEE)

References

Dr. Taehwa Lee
Principal Research Scientist at Toyota Research Institute of North America
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Prof. Bogdan-Ioan Popa
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