Can Nerse

Centre for Audio, Acoustics and Vibration, School of Mechanical and Mechatronic Engineering
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EDUCATION

2020 Ph.D., Mechanical Engineering
Gwangju Institute of Science and Technology, Gwangju, South Korea
Thesis: A study of complex modes in nonuniformly damped systems with a wave-based framework

2015 MSc., Mechatronics
Gwangju Institute of Science and Technology, Gwangju, South Korea
Thesis: Analysis and design of multi-layer cylindrical shells for noise and vibration control

2013 BSc., Mechanical Engineering
Middle East Technical University, Ankara, Türkiye

PROFESSIONAL APPOINTMENTS

2023–2025 University of Technology Sydney, School of Mechanical and Mechatronic Engineering
Research Fellow (Level B)

2021–2023 University of Technology Sydney, Centre for Audio, Acoustics and Vibration
Postdoctoral Research Associate (Level A)

2020 Gwangju Institute of Science and Technology, School of Mechanical Engineering
Postdoctoral Research Associate

PUBLICATIONS

Refereed Journal Articles (*equal contribution)

6. Hong S*, **Nerse C***, Oberst S, Saadatfar M, “Topological mechanical states in geometry-driven hyperuniform materials”, *PNAS Nexus*, pgae510 (2024).
5. Yu J*, **Nerse C***, Chang KJ, Wang S, “A framework of flexible locally resonant metamaterials for attachment to curved structures”, *International Journal of Mechanical Sciences*, 201, 106533 (2021).
4. **Nerse C**, Wang S, Goo S, “Effect of damping distribution on coupling in non-proportionally damped systems: Conditions for optimality through a modal approach”, *International Journal of Mechanical Sciences*, 187, 105908 (2020).
3. **Nerse C**, Wang S, “On the formation of complex modes in non-proportionally damped systems”, *Journal of Sound and Vibration*, 463, 114978 (2019).
2. Kim H.-G*, **Nerse C***, Wang S, “Topography optimization of an enclosure panel for low-frequency noise and vibration reduction using the equivalent radiated power approach”, *Materials and Design*, 183, 108125 (2019).
1. Kim H, **Nerse C**, Lee J, Wang S, “Multidisciplinary analysis and multiobjective design optimization of a switched reluctance motor for improving sound quality”, *IEEE Access*, 7, 66020–66027 (2019).

Book Chapters

3. **Nerse C**, Wang S, “Modeling of complex modes with wave-based scaling”, in: S. Oberst, B. Halkon, J. Ji, T. Brown (Eds.), *Vibration Engineering for a Sustainable Future*, Volume 3, Springer International Publishing, Cham, pp. 25–29 (2021).
2. Wang S, **Nerse C**, Kim HW, “Vibro-acoustic noise analysis of a washing machine”, in: E. Wee Sit, C. Walber, P. Walter, S. Seidlitz (Eds.), *Sensors and Instrumentation*, Volume 5, Springer International Publishing, Cham, pp. 47–53 (2017).
1. **Nerse C**, Wang S, “Experimental modal analysis of rolled multi-layer cylindrical shell”, in: M. Mains (Ed.), *Topics in Modal Analysis & Testing*, Volume 10, Springer International Publishing, Cham, pp. 249–254 (2016).

Conference Proceedings

29. Echeverria J, Navarro-Payá D, Pizzio G, Bianco L, Tucci MR, Mohapatra AR, **Nerse C**, Sili I, Grech C, Zuccaro M, Tomas T, de Julian S, Lisón P, Lopez P, Guemes J, Oberst S, Casacci LP, Barbero F, Matus JT, "The sweet sound of pollination: identifying plant responses to vibroacoustic signals produced by their pollinators", Proceedings of the 24th HFSP Awardees Meeting, 9–11 July 2025, Melbourne, VIC, Australia.
28. **Nerse C**, Oberst S, Lai JCS, Evans TA, "Design of an instrumented sandpit to monitor subterranean termite and ant activity in vibration bioassays", Proceedings of the 31st International Congress on Sound and Vibration, 6–11 July 2025, Incheon, South Korea.
27. Kumar J, **Nerse C**, Sedehi O, Halkon B, Dackermann U, Lai JCS, Oberst S, "A framework for vibration-based termite detection in timber structures", Proceedings of the 31st International Congress on Sound and Vibration, 6–11 July 2025, Incheon, South Korea.
26. Sili I, Mohapatra AR, Simona A, **Nerse C**, Navarro-Payá D, Barbero F, Pizzio G, Echeverria J, Bianco L, Casacci LP, Tucci MR, Matus JT, Oberst S, "A review on the potential interaction of vibroacoustic and electrostatic plant-pollinator communication", Proceedings of the Forum Acusticum / Euronoise, 23–26 June 2025, Málaga, Spain.
25. Bianco L, Tucci MR, Echeverria J, Mohapatra AR, **Nerse C**, Navarro-Payá D, Oberst S, Matus JT, Casacci LP, Barbero F, "Exploring the impact of flower visitors' behaviour on flight buzzing acoustic features", Proceedings of the International Society for Behavioral Ecology Congress, 29 September – 4 October 2024, Melbourne, Australia.
24. Mohapatra AR, **Nerse C**, Oberst S, Navarro-Payá D, Etxeberria J, Matus JT, Bianco L, Tucci MR, Casacci LP, Barbero F, "A study to classify wild bees' signal using time series analysis", Proceedings of the 30th International Congress on Sound and Vibration, 8–11 July 2024, Amsterdam, Netherlands.
23. Liu J, **Nerse C**, Oberst S, "Influence on classification accuracy of partially annotated underwater animal sounds by combining Mel-spectra and recurrence plots", Proceedings of the 30th International Congress on Sound and Vibration, 8–11 July 2024, Amsterdam, Netherlands.
22. Mohapatra AR, **Nerse C**, Navarro-Payá D, Etxeberria J, Matus JT, Pizzio G, Bianco L, Casacci LP, Tucci MR, Oberst S, Barbero F, "Good Vibes: How do plants recognise and respond to pollinator vibroacoustic signals?", Proceedings of the 22nd HFSP Awardees Meeting, 6–8 December 2023, Cape Town, South Africa.
21. **Nerse C**, Mohapatra AR, Oberst S, Navarro-Payá D, Etxeberria J, Matus JT, Bianco L, Tucci MR, Cumino E, Casacci LP, Barbero F, "Model updating of flowering snapdragon (Antirrhinum litigiosum) biomechanical responses to vibroacoustic stimuli", The Journal of the Acoustical Society of America 154 (4_supplement), A172–A172, AAS-ASA Joint Conference, 4–8 December 2023, Sydney, NSW, Australia.
20. Tran T, **Nerse C**, Oberst S, Halkon BJ, Sawalhi N, Sepehrirahnama S, "Vibrational timber characterisation through the use of model updating", The Journal of the Acoustical Society of America 154 (4_supplement), A75–A75, AAS-ASA Joint Conference, 4–8 December 2023, Sydney, NSW, Australia.
19. **Nerse C**, Oberst S, Navarro-Payá D, Etxeberria J, Matus JT, Bianco L, Casacci LP, Barbero F, "Propensity to efficiently transmit vibrations in snapdragons in response to vibroacoustic signalling", Proceedings of the 29th International Congress on Sound and Vibration, 9–13 July 2023, Prague, Czechia.
18. Oberst S, Sepehrirahnama S, **Nerse C**, Brodzeli Z, Lai JCS, Mankowski M, Atkinson T, Arango R, Kirker G, Evans T, "Towards a microactuator-sensing network for structural health monitoring of timber poles", IRG Annual Meeting, (IRG/WP 23-50380), pp. 1–9, 28 May – 1 June 2023, Cairns, QLD, Australia.
17. **Nerse C**, Oberst S, Moore S, MacGillivray I, "Assessment of flanking transmissions in measurements of sound transmission loss of multilayer panels", Proceedings of the 28th International Congress on Sound and Vibration, 24–28 July 2022, Singapore.
16. **Nerse C**, Oberst S, "Numerical vibration analysis of honeybee comb structures", Proceedings of the 28th International Congress on Sound and Vibration, 24–28 July 2022, Singapore.
15. **Nerse C**, Schadeberg R, Oberst S, "Novel resonator geometry for easily manufactured tunable locally resonant metamaterial", Proceedings of the Annual Conference of the Australian Acoustical Society, 21–23 February 2022, Wollongong, NSW, Australia.
14. **Nerse C**, Wang S, "Vibroacoustic characteristics of a damped box-type structure", INTER-NOISE and NOISE-CON Congress and Conference, 261(1), 5411–5418, 23–26 August 2020, Seoul, South Korea.
13. Lim C, Kim H.-G, Lee G, **Nerse C**, Wang S, "Composite optimization using OptiStruct for vibration reduction", Proceedings of the Korean Society of Mechanical Engineers Conference, 13–16 November 2019, Jeju-do, South Korea.
12. Lee G, **Nerse C**, Nguyen T, Wang S, "A study of the frequency response due to slap phenomenon in two plates", Proceedings of the Korean Society for Noise and Vibration Engineering Conference, 317–317, 23–26 October 2019, Jeju-do, South Korea.

11. Yu J, **Nerse C**, Lee G, Wang S, Chang KJ, "Mass production applicable locally resonant metamaterials for NVH applications", Proceedings of the 26th International Congress on Sound and Vibration, 7–11 July 2019, Montreal, Canada.
10. Yu J, **Nerse C**, Lee G, Wang S, "Mass production-applicable locally resonant metamaterial", Proceedings of the Korean Society for Noise and Vibration Engineering Conference, 20–23 February 2019, Pyeongchang, South Korea.
9. Kim H.-G, **Nerse C**, Wang S, "A study on topography optimization to reduce the radiated noise from the mechanical system powered by high performance rotating machinery", Proceedings of the Korean Society of Mechanical Engineers Conference, 1220–1221, 12–15 December 2018, Gangwon-do, South Korea.
8. Baek H, **Nerse C**, Kim H.-G, Wang S, "Topology optimization of damping material attached on a plate with joint using structural intensity", Proceedings of the Korean Society for Noise and Vibration Conference, 206–206, 17–20 October 2018, Yeosu, South Korea.
7. Kim H.-G, **Nerse C**, Goo S, Wang S, "Design optimization of cover panel of engine-included system using topography optimization", Proceedings of the 6th International Conference on Engineering Optimization, 17–19 September 2018, Lisboa, Portugal.
6. **Nerse C**, Wang S, "The effect of damping distribution on coupling between multiple panel–cavity systems", Proceedings of the 17th Asia Pacific Vibration Conference, 13–15 November 2017, Nanjing, China.
5. **Nerse C**, Wang S, "Structural–acoustic coupling in non-proportionally damped systems", Proceedings of the Korean Society for Noise and Vibration Engineering Conference, 234–234, 18–20 October 2017, Yesan, South Korea.
4. Oh S, Kim HW, **Nerse C**, Wang S, "Sound-based washing machine fault diagnosis using similarity matrix", Proceedings of the Korean Society for Noise and Vibration Engineering Conference, 158–158, 26–28 April 2017, Gwangju, South Korea.
3. **Nerse C**, Wang S, Kim HW, "Operational noise analysis of a washing machine using source-path-receiver approach", Proceedings of the Korean Society for Noise and Vibration Conference, 107–107, 26–28 April 2017, Gwangju, South Korea.
2. **Nerse C**, Lee J, Wang S, "Study of rolled multi-layer cylindrical shell in frequency domain", Proceedings of the 16th Asia Pacific Vibration Conference, 24–26 November 2015, Hanoi, Vietnam.
1. **Nerse C**, Wang S, Lee J, "Experimental and numerical modal analysis of cylindrical shell", Proceedings of the Korean Society for Noise and Vibration Conference, 954–956, 22–25 April 2015, Jeju-do, South Korea.

Manuscripts in Submission

3. **Nerse C**, Sepehrirahnama S, Lai JCS , Evans TA, Oberst S, "The illusion of infinity: acoustic black holes in wood deceive termites" (in submission, *PNAS*)
2. Brodzeli Z, **Nerse C**, Halkon BJ, Canning J, Oberst S, "Optically interrogated liquid crystal-based, charge-mode accelerometer telemetry" (under review, *Advanced Devices & Instrumentation*).
1. Tucci MR, Mohapatra AR, Sili I, Navarro-Payá D, Bianco L, **Nerse C**, Echeverria J, Pizzio G, Casacci LP, Matus JT, Oberst S, Barbero F, "From flight to communication: mechanisms and functions of wingbeat-generated sounds in insects" (major revision, *Journal of Experimental Biology*).

Manuscripts in Preparation

- **Nerse C**, Oberst S, MacGillivray I, Moore S, "Broadband multimodal metadamping by a locally resonant network"
- **Nerse C**, Oberst S, MacGillivray I, Moore S, "Acoustic metamaterial cartridges for broadband sound absorption"
- **Nerse C**, Mohapatra AR, Bianco L, Echeverria J, Navarro-Payá D, Tucci MR, Casacci LP, Matus JT, Oberst S, Barbero F, "Biomechanical responses to vibro-acoustic stimuli in Antirrhinum"
- Masters B, **Nerse C**, Oberst S, "Scanning millimetre-sized biogenic structures for automated mesh generation"

AWARDS AND HONORS

2020	President Award (Honors, 1st place in Engineering), Gwangju Institute of Science and Technology
2019	Publication Prize, Gwangju Institute of Science and Technology
2014	Dean's List, Gwangju Institute of Science and Technology
2013	Korean Government Graduate Scholarship (ca. A$110k for 6 years)
2013	Ranked in Top 100 (among 270,000) in National Graduate Entrance Exam (ALES)

GRANTS AND FELLOWSHIPS

In the past 3 years, I have received funding of research projects valued in total more than $420k; of which $390k were cash, and $320k (ca 75%) externally funded. This funding includes highly reputable international funds (HFSP) and competitive internal funding, with a selection in the following:

2024 Blue-Sky Research Scheme Grant, UTS Faculty of Engineering and Information Technology
"Bio-informed sensing and actuation with topological metasurfaces by knitting technology", **Lead-CI**

2024 Cross-Faculty Collaboration Grant, University of Technology Sydney
"Acoustic well-being by metasurfaces manufactured by 3D knitting technology: Creating quiet zones in communal spaces by acoustic curtains", **Lead-CI**

2023 Scientists for Scientists Grant, Human Frontier Science Program
"Bioacoustics – electrical communication", **Co-CI**

2022 Early Career Researcher Sprint Initiative Grant, University of Technology Sydney
"A review of computational capabilities for forecasting and adaptation to climate stress on infrastructure", **Sole-CI**

CONFERENCE PARTICIPATION

Oral Presentation

2025 The 31st International Congress on Sound and Vibration, 6–11 July, Incheon, South Korea
"Design of an instrumented sandpit to monitor subterranean termite and ant activity in vibration bioassays"

2023 Australian Acoustical Society and the Acoustical Society of America Joint Conference, 4–8 December, Sydney, NSW, Australia
(1) "Vibrational timber characterisation through the use of model updating"
(2) "Model updating of flowering snapdragon (Antirrhinum litigiosum) biomechanical responses to vibroacoustic stimuli"

2023 The 29th International Congress on Sound and Vibration, 9–13 July, Prague, Czechia
"Propensity to efficiently transmit vibrations in snapdragons in response to vibroacoustic signalling"

2022 The 28th International Congress on Sound and Vibration, 24–28 July, Singapore
(1) "Numerical vibration analysis of honeybee comb structures"
(2) "Assessment of flanking transmissions in measurements of sound transmission loss of multilayer panels"

2022 Annual Conference of the Australian Acoustical Society, 21–23 February, Wollongong, Australia
"Novel resonator geometry for easily manufactured tunable locally resonant metamaterial"

2020 INTER-NOISE and NOISE-CON Congress and Conference, 23–26 August, Seoul, South Korea
"Vibroacoustic characteristics of a damped box-type structure"

2019 The 18th Asia Pacific Vibration Conference, 18–22 November, Sydney, NSW, Australia
"Modeling of complex modes with wave-based scaling"

2017 The 17th Asia Pacific Vibration Conference, 13–15 November, Nanjing, China
"The effect of damping distribution on coupling between multiple panel–cavity systems"

2017 The Korean Society for Noise and Vibration Engineering Conference, 18–20 October, Yesan, South Korea
"Structural–acoustic coupling in non-proportionally damped systems"

2017 The Korean Society for Noise and Vibration Conference, 26–28 April, Gwangju, South Korea
Invited Talk "Operational noise analysis of a washing machine using source-path-receiver approach"

2017 IMAC-XXXV, 30 January–2 February, Garden Grove, CA, USA
"Vibro-acoustic noise analysis of a washing machine",

2016 IMAC-XXXIV, 25–28 January, Orlando, FL, USA
"Experimental modal analysis of rolled multi-layer cylindrical shell",

2015 The 16th Asia Pacific Vibration Conference, 24–26 November, Hanoi, Vietnam.
"Study of rolled multi-layer cylindrical shell in frequency domain"

2015 The Korean Society for Noise and Vibration Conference, 22–25 April, Jeju-do, South Korea
"Experimental and numerical modal analysis of cylindrical shell"

TEACHING EXPERIENCE

University of Technology Sydney

Embedded Mechatronics Systems [UG]	Autumn 2023 [F2F], 2024 [F2F], 2025 [F2F]
Dynamics and Control [UG]	Autumn 2021 [Hybrid], Spring 2021 [Hybrid]

Gwangju Institute of Science and Technology

Optimal Design [UG/PG]	Spring 2017 [TA in Korean/English]
Sound and Vibration [UG]	Spring 2016 [TA in Korean/English]

RESEARCH EXPERIENCE

Biogenic Dynamics Laboratory, University of Technology Sydney (with Sebastian Oberst)

- Established an interdisciplinary group for the development of bio-informed sensors and actuators using spider silk and synthetic fibres with automatic knitting technology.
- Formulated computation tools and metamaterials and developed a digital twin of transmission loss suite at UTS Tech Lab, in a research grant funded by the Defence Science and Technology Group.
- Collaborated with Univ. Turin and CSIC-Univ. Valencia researchers to measure early plant responses under buzzing sounds of insects, using field tests and finite element analysis to find ecological attractors for increased pollination efficiency in snapdragons.
- Co-developed hyperuniform 2D metamaterial, in collaboration with ANU and the University of Sydney researchers.
- In a key industry collaboration, co-developed optical vibration sensor technology for measurement of low-amplitude vibrations in structural health monitoring applications.
- Collaborated with Aurecon Group to evaluate timber pole and power infrastructure vulnerabilities under the impact of climate change.

Intelligent System Design Laboratory, Gwangju Institute of Science and Technology (with Semyung Wang)

- Pioneered manufacturable metamaterial technologies, in collaboration with Hyundai Motors and LG Electronics, and explored cost-effective technologies like metal-insert injection moulding.
- Collaborated with a membrane technology group to assess the impact of porous membranes used in face masks and respirators on the speech intelligibility.
- Developed sound focusing technologies for safety and energy-saving, adapting them to residential and industrial applications in National Research Foundation of Korea grants.

PATENT AND INVENTION DISCLOSURE

3. PCT 20229029, Optical accelerometer/vibration sensor (with Zourab Brodzeli and Sebastian Oberst)

2. Invention Disclosure 2019-09 양산 가능한 국부 공진 메타물질, applied through Hyundai Motor Company (with Junmin Yu, Semyung Wang, Kyoung-jin Chang), patent obtained by Hyundai Motor Company (KR20220129275A Vibration dampening device, US 11,862,137 B2 Device for reducing vibration).

1. Invention Disclosure 2019-07, 양산 가능한 메타물질 기반의 흡진 재료 / Mass-manufacturable absorbing metamaterials, applied through Hyundai Motor Company (with Junmin Yu, Semyung Wang, Kyoung-jin Chang).

SERVICE

Internal **University of Technology Sydney**
Lab Coordinator - Biogenic Dynamics Laboratory (2021–2025)
Graduate Admission Committee (2024–2025)
Capstone Showcase Committee (2021–2024)
Organiser - FEIT Student Expo (2021–2024)
Consultancy - CAAV/UTS Tech Lab (2021–2025)

Gwangju Institute of Science and Technology
Lab Manager - Intelligent System Design Laboratory (2019–2020)
Organiser - GIST Student Expo (2015–2018)

External **Referee**
Journal of Sound and Vibration, Mechanical Systems and Signal Processing, Journal of the Acoustical Society of America, Applied Acoustics, PLoS One, Scientific Reports.

THESIS SUPERVISION

Current	Jai Kumar -, (Ph.D., co-supervising with A/Prof. Sebastian Oberst)
2023	Junmin Yu, (Ph.D., co-supervised with Prof. Semyung Wang) "Commercialisation of metamaterial for industrial structure applications"
2021	Toan Minh Nguyen, (M.Sc., co-supervised with Prof. Semyung Wang) "A framework for design and optimization of bolted connection assemblies using the simplified finite element model"
2020	Giseok Lee, (M.Sc., co-supervised with Prof. Semyung Wang) "A study on the frequency response change due to slap-slip phenomenon between two plates"
2019	Hayoung Baek, (M.Sc., co-supervised with Prof. Semyung Wang) "Passive vibration control of a flat panel via topology optimization of damping material using structural intensity"

MEDIA COVERAGE

- An article by The Guardian on our work in the HFSP grant:
https://www.theguardian.com/environment/2025/may/21/plants-produce-more-nectar-when-they-hear-bees-buzzing-scientists-find
- A media spotlight on our PNAS Nexus paper:
https://www.linkedin.com/posts/uts-centre-for-audio-acoustics-and-vibration_utscaav-utscaav-worldbeeday-activity-7330415268239683585-3jxS?utm_source=share&utm_medium=member_desktop&rcm=ACoAABE56bMBhpoHoT-ZnV5kDh-0k-C8BIvgPbo

LANGUAGES

Turkish	Native
English	Reading, Writing, Speaking (Fluent)
Korean	Reading, Writing, Speaking (Fluent)
Japanese	Reading, Writing, Speaking (Conversational)

PROFESSIONAL MEMBERSHIPS

The Korean Society of Noise and Vibration Engineering (KSNVE) – active (since 2014)
The International Institute of Acoustics and Vibration (IIAV) – active (since 2020)
Society for Experimental Mechanics (SEM) – (2015-2018)

REFERENCES

Sebastian Oberst
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University of New South Wales
Canberra, ACT 2600, Australia
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Perth, WA 6009, Australia
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University of Sydney
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