

Ethungshan Shitiri

Group Leader at NaNoNetworking Center at Catalunya (N3Cat),

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EXECUTIVE SUMMARY

- PhD holding wireless R&D engineer with 10+ years of experience in advanced wireless communication technologies, currently leading research on ultra-low-power nanoscale systems for in-body diagnostics and next-generation health monitoring systems.
- Published 25+ papers in top-tier journals and secured €0.5M+ in competitive funding, including the prestigious 2024 Marie Curie Postdoctoral Fellowship.
- Proven leader in global collaborations with 25+ organizations across 15 countries, driving breakthroughs in intra-body nanonetworks, molecular communication, and nanoscale sensing technologies that are shaping the future of diagnostics and wireless systems.
- Outstanding PhD Thesis Award, Qualcomm Innovation Award, and Best Paper Award.

PROFESSIONAL EXPERIENCE

Group Leader and EU Marie Curie Post-doctoral Research Fellow

NaNoNetworking Center at Catalunya
Universitat Politècnica de Catalunya (UPC)

01/03/2023-Present

Barcelona, Spain

- **Leading the HUMAN group at N3Cat**, focusing on developing nanoscale systems that can reduce diagnostic latency by 1000x and enable real-time sensing in biomedical applications.
- **Principal Investigator (PI) of the BeNiFlt Project** (€165,313), advancing early detection of chronic diseases and progression monitoring using intra-body nanonetworks and near-field passive wireless communication.
- **Spearheading interdisciplinary collaborations** with 25+ organizations across 15 countries, driving impactful research in future and advanced communication systems.
- **Supervising PhD, MS, and BS students**, including Erasmus exchange students, while fostering a collaborative research environment.
- **Securing competitive funding** through high-impact proposals aligned with strategic priorities, such as, Horizon Europe Marie Skłodowska-Curie Actions, European Defense Funding, European Innovation Council Pathfinder.

Brain Korea Post-doctoral Research Fellow

Kyungpook National University (KNU)

01/09/2018-28/02/2023

Daegu, South Korea

- **Led** the design of a low-complexity modulation technique that decreased detection errors in molecular communication systems, enhancing efficiency and reliability.
- **Developed innovative** localization protocols to address distance-related performance issues in molecular communication networks, improving system effectiveness.
- **Contributed** to coordination protocols for targeted drug delivery systems, advancing real-world applications of molecular communications.
- **Published research findings in leading journals** and presented them at international conferences, showcasing thought leadership in the field.
- **Secured a \$280,000 research grant from the National Research Foundation (NSF) of Korea** as co-lead, demonstrating expertise in proposal development and project execution.

- Ph.D. Research Assistant** 01/03/2014-30/08/2018
Daegu, South Korea
Kyungpook National University (KNU)
- **Developed** synchronization and MAC protocols for molecular communication systems, achieving a 95% channel utilization rate and reducing packet collision probability by an order of magnitude.
 - **Designed** time-stamp-free synchronization techniques that improved the performance of ultra-low-power nanoscale devices by 3+ orders of magnitude.
 - **Independently** built MATLAB simulators for communication protocol evaluations, demonstrating strong programming and problem-solving skills.
 - **Led a \$240,000 research grant from NSF of Korea**, managing all aspects from planning to successful execution.
 - **Mentored** junior researchers and collaborated on interdisciplinary projects, building a productive research environment.

- MS Research Assistant** 01/08/2011-25/05/2013
Bangalore, India
Christ University (Institut supérieur d'électronique de Paris, Paris, France)
- **Conducted a comprehensive analysis** of LTE resource block management techniques, identifying key opportunities to enhance system performance.
 - **Designed** a dynamic power control mechanism for adapting to wireless channel conditions, improving energy efficiency in mobile networks.
 - **Developed** and tested a MATLAB-based resource block simulator, providing actionable insights for optimizing LTE uplink systems.
 - **Collaborated** with international peers, enhancing cross-cultural research skills and fostering knowledge exchange.
 - **Organized** the inaugural Magnovite technical festival, elevating it to an internationally recognized event that connected students with real-world engineering challenges.

EDUCATION

- Ph.D. in Electronics Engineering** 24/08/2018
Daegu, South Korea
Kyungpook National University
Thesis: A Time-synchronized Molecular Communication in Nanonetworks.
Awarded the **Outstanding Thesis Award** for groundbreaking contributions to nanoscale communication systems.
- M.S. in Electronics and Communication Engineering** 25/05/2013
Bangalore, India
Christ University
Thesis: Mobiles Energy Consumption in LTE Uplink Networks.
Awarded the second-best MS thesis for enhancing mobile devices energy efficiency.
- B.S. in Electronics and Communication Engineering** 01/12/2010
Tamil Nadu, India
Thanthai Periyar Govt. Institute of Technology
Thesis: Color Face Detection using H-Cb-Cr Skin Model.
Specialized in image processing and signal systems.
- Pre-University in Sciences** 01/04/2005
Jotsoma, Nagaland
Kohima Science College

LEADERSHIP EXPERIENCE

- Universitat Politècnica de Catalunya** Barcelona, Spain
Post-Doctoral Researcher 01/03/2023- Present

- Directing the HUMAN group comprising of undergraduate and post graduate students to push the boundaries of in-body nanoscale nanonetworks.
- Organizing scientific talks by inviting experts in the field of computer science and wireless communications.
- Supervising PhD, MS, and BS students and hosting international students through the Erasmus program.
- Representing the group to stakeholders, such as, impactful conferences, high-level multinational research consortiums.

Kyungpook National University

Post-Doctoral Researcher

Daegu, South Korea

01/09/2018-28/02/2023

- Successfully managed and executed multiple research projects, consistently meeting deadlines and exceeding desired outcomes.
- Demonstrated strong leadership skills by effectively mentoring and guiding junior-level colleagues, ensuring they remained on track and achieved their targets.
- Proven ability to successfully lead fully-funded research projects, utilizing excellent project management skills to ensure successful completion.
- Organized and coordinated highly successful events for the exchange and dissemination of current trends in wireless communications, promoting the advancement of the field.

AWARDS AND HONORS

- 2024 Marie Curie Postdoctoral Fellowship – Awarded with a score of 97/100 to conduct groundbreaking research in intra-body nanonetworks.
- 2021 Best Paper Award, KICS Fall Conference, South Korea – Recognized for innovative work in molecular communication systems.
- 2018 Outstanding Thesis Award, Kyungpook National University – Honored for exceptional contributions to nanoscale communication research.
- 2016 KNU-Qualcomm Paper Innovation Award – Awarded for advancing molecular communication techniques.
- 2014 KNU Honors Scholarship, Kyungpook National University – Granted for academic excellence in doctoral studies.

PROJECTS

Project Title	Grantor	Period	Grant	Participation
BeNiFlt: Fully Biocompatible Intrabody Nanoscale Communication System to Foster Novel In-Body Diagnostics and Monitoring Systems	European Commission	2024.04.01 – 2026.03.31	€ 165,313	Principal Investigator
Targeted Drug Delivery using Cooperative Molecular Communications between Multiple Nanomachines	National Research Foundation of Korea	2021.03.01 – 2024.02.28	\$ 280,000	Scientific lead

Synchronization and Medium Access Control in Molecular Communication Networks	National Research Foundation of Korea	2017.03.01 – 2020.02.29	\$ 210,000	Scientific lead
Development of Distributed Underwater Monitoring & Control Networks	Korea Institute of Marine Science and Technology Promotion	2015.03.01 – Present	\$ 1,000,000	Team member
Resource Coding and Allocation in Mobile and Sensor Networks	Conventions Industrielles de Formation par la Recherche, France	2013.01.01 – 2013.04.30	–	Team member

TECHNICAL SKILLS

Communication Engineering	Software Tools	Analytical
<ul style="list-style-type: none"> Multiple Access Control Protocols Energy-efficient Signaling Protocols Synchronization Techniques Biological Oscillators Power Control Techniques Resource Allocation Techniques System-level Simulations 	<ul style="list-style-type: none"> MATLAB LaTex Microsoft Office Microsoft Visio Inkscape 	<ul style="list-style-type: none"> Mathematical Modeling Statistical Data Analysis Numerical Analysis

Other Skills

- Peer Mentoring
- Team Leadership
- Critical Thinking

LANGUAGES

Language	Fluent	Advanced	Intermediate	Beginner
English		✓		
Korean				✓
Lotha	✓			
Hindi			✓	

RESEARCH ACTIVITIES/PARTICIPATION

Technical Program Committee Member

- The Workshop on Molecular Communications '18, '24, IEEE Sensors '23, '24, IEEE GlobeCom '23, '24, IEEE ICC '24, '25, BalkanCom '24, '25, ACM NaNoCom '24.

Peer-reviewer

Journals:

- IEEE: Internet of Things, Communications Magazine, Wireless Communication Letters, Access, Transactions on Molecular, Biological, and Multi-Scale Communications, Transactions on NanoBioscience
- Elsevier: Biomedical Signal Processing and Control, Nano Communication Networks, Physical Communication
- IET: Nanobiotechnology
- Frontiers: Communications and Networks

Conferences:

- The Workshop on Molecular Communications, IEEE Sensors, IEEE GlobeCom, IEEE ICC, BalkanCom, ACM NanoCom.

INTERESTS

Research

- In-body nano-scale networks
- Molecular Communications
- Design Space Exploration of systems
- Bio-inspired ICT systems
- AI/ML for wireless communications systems
- Internet of BioNanoThings

Teaching

- Nanoscale Communications
- Molecular Communications
- Communication Systems
- Signals and Systems
- Wireless Communications
- Detection and Estimation Theory

PROFESSIONAL MEMBERSHIPS/AFFILIATIONS

- Association of Computing Machinery (ACM), since 2023
- IEEE Nanotechnology Council, since 2020
- IEEE Computer Society Technical Committee on Computer Communications, since 2017
- IEEE Communications Society, since 2016
- Institute of Electrical and Electronics Engineers (IEEE), since 2016
- Korean Institute of Communications and Information Sciences (KICS), since 2015

PUBLICATIONS

Selected Refereed Journal Articles

1. A. Yadav, A. Kumar, Ethungshan Shitiri, S. Kumar and H. -S. Cho, "Non-Data-Aided SNR Estimation for Molecular Communication Systems in the Internet of Bio-Nano Things," in IEEE Internet of Things Journal, 23 September 2024.
2. **Ethungshan Shitiri** and Ho-Shin Cho, "Low-Complexity Minimum Received Energy-based Threshold Concentration Shift Keying for Molecular Communications Systems with Multiple Transmitters," IEEE Internet of Things, 29 January 2024.
3. Junho Cho, Faisal Ahmed, Ethungshan Shitiri, and Ho-Shin Cho, "Reinforcement Learning-Based Power Control for MACA-Based Underwater MAC Protocol," in IEEE Access, vol. 10, pp. 71044-71053, 05 July 2022.
4. Tania Islam, Ethungshan Shitiri, and Ho-Shin Cho, "In-Body Sequential Multidrug Delivery Scheme Using Molecular Communication," in IEEE Access, vol. 10, pp. 39975-39985, 12 April 2022.
5. **Ethungshan Shitiri**, H. Birkan Yilmaz and Ho-Shin Cho, "Probability Distribution of a Signal's Peak Time in a Molecular Diffusive Media," in IEEE Communications Letters, 27 September 2021.
6. **Ethungshan Shitiri** and Ho-Shin Cho, "A TDMA-Based Data Gathering Protocol for Molecular Communication via Diffusion-Based Nano-Sensor Networks," IEEE Sensors, 22 June 2021.
7. **Ethungshan Shitiri** and Ho-Shin Cho, "Timing Alignment in Molecular Communication-based Nanonetworks," in IEEE Communications Magazine, vol. 59, no. 5, pp. 54-60, 03 June 2021.
8. **Ethungshan Shitiri**, H. Birkan Yilmaz, Ho-Shin Cho, "A Time-Slotted Molecular Communication (TS-MOC): Framework and Time-Slot Errors," IEEE Access, vol. 7, pp. 78146 - 78158, 12 June 2019
9. **Ethungshan Shitiri**, Athanasios V. Vasilakos, Ho-Shin Cho, "Biological Oscillators in Nanonetworks — Opportunities and Challenges," MDPI Sensors, vol. 18, no. 5, pp. 1544, 13 May 2018
10. **Ethungshan Shitiri** and Ho-Shin Cho, "A Biochemical Oscillator Using Excitatory Molecules for Nanonetworks," IEEE Transactions on NanoBioscience, vol. 15, no. 7, pp. 765-774, 18 Oct. 2016

Book Chapter

1. **Ethungshan Shitiri** and Ho-Shin Cho, *Synchronization for Molecular Communications and Nanonetworking*, Nanoscale Networking and Communications Handbook, CRC Press, 15 July 2019

Conference Presentations

International

1. **Ethungshan Shitiri**, Akarsh Yadav, Sergi Abadal, Eduard Alarcon, and Ho-Shin Cho. 2024. Enhanced Drug Delivery via Localization-Enabled Relaying in Molecular Communication Nanonetworks. In Proceedings of the 11th NANOCOM '24.
2. **Ethungshan Shitiri**, Eneko Ibarluzea Saria, Satvika Santhoshi Marakala, Filip Lemic, Sergi Abadal, and Eduard Alarcon. 2024. Work-in-Progress: Intra-Body Nanonetworks for In Vivo Biomarker Detection in Capillaries. In Proceedings of the 11th NANOCOM '24.
3. Niklas Moser, Eloi Gomez, Sergi Abadal, Eduard Alarcon, Filip Lemic, **Ethungshan Shitiri**, "Liquid Biopsy Using Intra-Body Nanonetworks: Perspective and Approach," The 8th Workshop on Molecular Communications 2024, April 10 -12, Oslo, Norway
4. Chandra Sukanya Nandyala, **Ethungshan Shitiri**, and Ho-Shin Cho, " AUV-Aided Isolated Sub-Network Prevention for Underwater Wireless Sensor Networks," 14th International Conference on Ubiquitous and Future Networks, ICUFN, Paris, France, July 2024.
5. Faisal Ahmed, **Ethungshan Shitiri**, and Ho-Shin Cho, "Reinforcement Learning-Based MAC for Reconfigurable Intelligent Surface-Assisted Wireless Sensor Networks," 13th International Conference on Ubiquitous and Future Networks, ICUFN, Barcelona, Spain, July 2022.
6. Junho Cho, Faisal Ahmed, **Ethungshan Shitiri** and Ho-Shin Cho, "Power Control for MACA-based Underwater MAC Protocol: A Q-Learning Approach," 2021 IEEE Region 10 Symposium (TENSYMP), August 2021.
7. **Ethungshan Shitiri**, H. Birkan Yilmaz, and Ho-Shin Cho, *Analysis of Akaike's Information Criterion for Propagation Delays in a Free-Diffusion Channel*, Fourth Workshop on Molecular Communications (MolCom), Linz, Austria, April 2019
8. **Ethungshan Shitiri**, Ho-Shin Cho, *Achieving in-phase synchronization in a diffusion-based nanonetwork with unknown propagation delay*, Fourth International Conference on Nanoscale Computing and Communication (NanoCom), Washington DC, USA, September 2017
9. In-Seop Park, **Ethungshan Shitiri**, Ho-Shin Cho, *An orthogonal coded hybrid MAC protocol with received power based prioritization for M2M networks*, Eighth International Conference on Ubiquitous and Future Networks (ICUFN), Vienna, Austria, July 2016

Domestic

1. **Ethungshan Shitiri** and Ho-Shin Cho, *Effects of Detection Threshold on Concentration Shift Keying for Molecular Communications with Multiple Transmitters*, KICS Fall Conference, South Korea, 2021. (Best Paper Award)
2. Faisal Ahmed, **Ethungshan Shitiri**, and Ho-Shin Cho, *On a Reconfigurable Intelligent Surface-aided Relay Network Architecture for Underwater Acoustic Sensor Networks*, KICS Fall Conference, South Korea, 2021
3. Tania Islam, **Ethungshan Shitiri**, Ho-Shin Cho, *A Sequential Drug Release Scheme among Multiple Nanomachines*, KICS Fall Conference, South Korea, 2021
4. Tania Islam, **Ethungshan Shitiri**, Ho-Shin Cho, *Synchronization among Multiple Nanomachines for Simultaneous Targeted Drug Delivery*, KICS (The Korean Institute of Communications and Information Sciences) Winter Conference, Jeongseon, South Korea, 2019
5. **Ethungshan Shitiri** and Ho-Shin Cho, *Impact of Propagation Delay and Nanomachine Position on the Synchronization Error Ratio*, KICS Summer Conference, Jeju, South Korea, 2017
6. **Ethungshan Shitiri** and Ho-Shin Cho, *A low complexity synchronization scheme for nanonetworks*, KICS Winter Conference, Jeongseon, South Korea, 2017
7. **Ethungshan Shitiri** and Ho-Shin Cho, *Synchronization using Excitatory Molecules in Nanonetworks*, JCCI (The Joint Conference on Communications and Information), Sokcho, South Korea, 2016

8. **Ethungshan Shitiri** and Ho-Shin Cho, *Molecular Oscillator: A bio-inspired oscillator for Molecular Nanonetworks*, KICS Summer Conference, Jeju, South Korea, 2015

REFERENCES

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