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 **01/03/2023-Present**
NaNoNetworking Center at Catalunya
Universitat Politècnica de Catalunya (UPC) *Barcelona, Spain*

- **Leading the HUMAN group at N3Cat,** focusing on developing nanoscale systems that can reducing diagnostic latency by 1000x and enable real-time sensing in biomedical applications.
- **Principal Investigator (PI) of the BeNiFIt 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 **01/09/2018-28/02/2023**
Kyungpook National University (KNU) *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**
Kyungpook National University (KNU) *Daegu, South Korea*

- **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**
Christ University (Institut supérieur d'électronique de Paris, Paris, France) *Bangalore, India*

- **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**
Kyungpook National University *Daegu, South Korea*
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**
Christ University *Bangalore, India*
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**
Thanthai Periyar Govt. Institute of Technology *Tamil Nadu, India*
Thesis: Color Face Detection using H-Cb-Cr Skin Model.
Specialized in image processing and signal systems.

Pre-University in Sciences **01/04/2005**
Kohima Science College *Jotsoma, Nagaland*

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 **Daegu, South Korea**
Post-Doctoral Researcher *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
BeNiFIt: 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
- Multiple Access Control Protocols
- Energy-efficient Signaling Protocols
- Synchronization Techniques
- Biological Oscillators
- Power Control Techniques
- Resource Allocation Techniques
- System-level Simulations

Software Tools
- MATLAB
- LaTex
- Microsoft Office
- Microsoft Visio
- Inkscape

Analytical
- 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, ‘25, IEEE Sensors ‘23, ‘24, IEEE GlobeCom ‘23, ‘24, IEEE ICC ‘24, ‘25, ‘26, BalkanCom ‘24, ‘25, ACM NaNoCom ‘24, ‘25.

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. Mika Leo Hube, Filip Lemic, Ethungshan Shitiri, Gerard Calvo Bartra, Sergi Abadal, and Xavier Costa Pérez. 2025. Set Transformer Architectures and Synthetic Data Generation for Flow-Guided Nanoscale Localization. In Proceedings of the 12th Annual ACM International Conference on Nanoscale Computing and Communication (NANOCOM '25).
2. **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.
3. **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.
4. 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
5. 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.
6. 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.
7. 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.
8. **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
9. **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
10. 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