# JUNSEO LEE – Curriculum vitae

Contact	$\blacksquare$ harris.junseo@gmail.com $\textcircled{\begin{array}{c} \begin{array}{c} ar$		
Research Interests	<b>Theory of quantum computation</b> – focus areas include quantum learning theory, property es- timation and testing, and quantum complexity theory, with broader interests in the intersection of <i>theoretical computer science and quantum information</i> .		
Education	Yonsei University B.S. in Electrical and Electronic Engineering Thesis: Combinatorial designs for information theory (Advisor: Hong-Yeop	Seoul, Korea Mar. 2019 – Feb. 2023 Song)	
	<b>Chungnam Science High School</b> Mathematics major, <i>Early graduation for top 20% students</i>	Gongju, Korea Mar. 2017 – Dec. 2018	
Research Experience	Alternative Military Service (Professional Research Personnel <sup>*</sup> ) Research Scientist at Norma Inc. *mandatory 3-year national service duty	Seoul, Korea Jan. 2023 - present	
	<b>Research Institute of Mathematics, Seoul National University</b> Research Scientist (Quantum Information Theory Group, Team QST) Research Assistant (Mentor: Kabgyun Jeong)	Seoul, Korea Jan. 2023 – present Mar. 2020 – Jan. 2023	
	High Dimensional Signal Processing Lab, Yonsei University Research Assistant (Mentor: Chulhee Lee)	Seoul, Korea Jul. 2022 – Dec. 2022	
	Mathematical Biology Lab, Yonsei University Lead Research Assistant (Mentor: Jeehyun Lee)	Seoul, Korea Dec. 2021 – Jun. 2022	
Academic Service	<b>Journal Reviewer:</b> Physical Review Letters, IEEE Transactions on Information Theory, Annalen der Physik		
	Selection Committee: Quantum Internship Program organized by the Korea Quantum Industry Center and the National Information Society Agency (2024, 2025)		

PUBLICATIONS [Google Scholar]

- **Preprints** (\*Equal contribution, <sup>†</sup>Corresponding author)
  - (10) M. Shin\*, <u>J. Lee\*</u>, S. Lee, K. Jeong. "Resource-efficient algorithm for estimating the trace of quantum state powers". arXiv:2408.00314 (2024). submitted to Quantum
  - (9) M. Lee, M. Shin, <u>J. Lee<sup>†</sup></u>, K. Jeong<sup>†</sup>. "Mutual information maximizing quantum generative adversarial networks". arXiv:2309.01363 (2023). submitted to Scientific Reports

# Journal Articles

- (8) M. Shin<sup>\*</sup>, S. Lee<sup>\*</sup>, <u>J. Lee<sup>\*</sup></u>, M. Lee, D. Ji, H. Yeo, K. Jeong. "Disentanglement provides a unified estimation for quantum entropies and distance measures". *Physical Review A* 110, 062418 (2024).
- (7) M. Shin, **J. Lee**, K. Jeong. "Estimating quantum mutual information through a quantum neural network". *Quantum Information Processing* **23**, 57 (2024).
- (6) J. Lee, K. Jeong. "Quantum Rényi entropy functionals for bosonic gaussian systems". Physics Letters A 490, 129183 (2023).
- (5) <u>J. Lee</u>, H. Yeo, K. Jeong. "Weighted *p*-Rényi entropy power inequality : Information theory to quantum Shannon theory". *International Journal of Theoretical Physics* **62**, 253 (2023).
- (4) J. Lee, K. Jeong. "High-dimensional private quantum channels and regular polytopes". Communications in Physics 31, 189 (2021).
- (3) K. Jeong, <u>J. Lee</u>, J. Choi, S. Hong, M. Jung, G. Kim, J. Kim, S. Kim. "Single qubit private quantum channels and 3-dimensional regular polyhedra". *New Physics: Sae Mulli* 68, 232 (2018).

# **Book Chapters**

(2) J. Lee. "Assessing quantum integer factorization performance with Shor's algorithm". In : Quantum computing : A journey into the next frontier of information and communication security (1st ed.), edited by M. Hammoudeh, A. T. Essa, A. M. Sherbeeni, C. M. Firth, A. S. Essa. CRC Press (2024).

## Patents

TALKS

(1) K. Jeong, M. Shin, J. Lee. "Method for estimating quantum mutual information through a quantum neural network". Korea Patent: App. No. 10-2024-0104765 (2024).

Teaching	Research Internship Supervisor• SW4343: Software Field Placement 1Factorial Field Placement 1	all 2024, Korea Aerospace University
	<ul> <li>Teaching Assistant</li> <li>YCS1009: Change the World through Programming</li> <li>YCS1002: Software Programming</li> <li>EEE1108: Engineering Information Processing</li> </ul>	Fall 2022, Yonsei Fall 2022, Yonsei Fall 2021, Yonsei
	<ul> <li>Course Tutor</li> <li>MAT2016: Engineering Mathematics 3 – ODEs and linear a</li> <li>MAT1012: Engineering Mathematics 2 – Multivariable and</li> </ul>	algebra Spring 2022, Yonsei vector calculus Fall 2021, Yonsei
Honors and Awards	<ul> <li>Scholarships, Grants and Funding</li> <li>Full-Tuition Scholarship, Hyundai Motor Foundation</li> <li>Student Research Grant, Hyundai Motor Foundation</li> <li>Academic Travel Grant, Hyundai Motor Foundation</li> <li>Teaching Scholarship for Software Courses, Yonsei University</li> </ul>	$\begin{array}{c} 2021,\ 2022\\ 2021,\ 2022\\ QIP\ 2022-Caltech\\ ty \qquad \qquad 2021,\ 2022 \end{array}$
	<ul> <li>Academic Excellence Awards</li> <li>High Honor Student, Yonsei University</li> <li>Honor Student, Yonsei University</li> </ul>	2022 2020, 2021
	Additional Honors and Awards2021, 2• Best Tutor Award, Innovation Center for Teaching and Learning, Yonsei University2021, 2• Selected Paper Award, Finance and Economics Contest, DB Group2• Third Prize, Undergraduate Research Project Exhibition, Korean Physical Society2• Bronze Award, The Humantech Paper Award, Samsung Electronics2• Excellent Translator Award, NAVER Connect Foundation2• Gold Award, Korean Olympiad in Informatics (Regional Qualifiers)2	
	<ul> <li>Certifications &amp; Achievements</li> <li>Advanced Achievement, IBM Quantum Spring Challenge</li> <li>Advanced Achievement, QHack Coding Challenges, Xanadu</li> <li>Advanced Data Analytics Semi-Professional, Korea Data Age</li> <li>IBM Certified Associate Developer (Quantum Computation)</li> </ul>	a Quantum Technologies 2023 gency 2023 a) 2023

#### Research Talks (Invited, Contributed and Posters)

#### "Resource-efficient algorithm for estimating the trace of quantum state powers"

- Invited talk at Electronics and Telecommunications Research Institute (Dec. 18th, 2024)
- Invited talk at Seoul National University QST Seminar (Dec. 13th, 2024)
- Invited talk at IBM-Yonsei Qiskit Fall Fest 2024 (Nov. 7th, 2024)
- Invited talk at the 4th Korea Institute of Science and Technology Information-Korea University-• Seoul National University Joint Workshop (Oct. 15th, 2024)
- Contributed talk at the Annual Meeting of Korean Mathematical Society (Oct. 25th, 2024)
- Poster at the 28th Quantum Information Processing Conference (QIP 2025)

## "Disentangling quantum neural networks for unified estimation of quantum entropies and distance measures"

- Contributed talk at the Spring Meeting of the Korean Physical Society (Apr. 25th, 2024)
- Contributed talk at the Annual Meeting of the Quantum Information Society of Korea (Apr. 23rd, 2024)

• Poster at the 27th Quantum Information Processing Conference (QIP 2024)

## "Estimating quantum mutual information through a quantum neural network"

- Invited talk at National Institute of Science Education and Research Bhubaneswar (Aug. 18th, 2023)
- Poster at the 18th Conference on the Theory of Quantum Computation, Communication and Cryptography (TQC 2023)

# "Quantum Rényi entropy functionals for bosonic gaussian systems"

- Contributed talk at the Annual Meeting of the Korean Society for Industrial and Applied Mathematics (Dec. 3rd, 2021)
- Poster at the 25th Quantum Information Processing Conference (QIP 2022)

## "Mutual information maximizing quantum generative adversarial network"

- Invited talk at North Carolina State University Triangle Quantum Computing Seminar (Nov. 3rd, 2023)
- Poster at the 27th Quantum Information Processing Conference (QIP 2024)

## "High-dimensional private quantum channels and regular polytopes"

- Invited talk at the 2nd Korea Institute of Science and Technology Information-Korea University-Seoul National University Joint Workshop (Sep. 22nd, 2023)
- Invited talk at Seoul National University QST Seminar (Aug. 27th, 2021)
- Contributed talk at Center for Quantum Network's Channel Capacity Winter Kick-off Workshop (Jan. 15th, 2023)
- Contributed talk at the Winter Meeting of the Optical Society of Korea (Feb. 17th, 2022)
- Contributed talk at the Fall Meeting of the Korean Physical Society (Oct. 21st, 2021)
- Poster at the 25th Quantum Information Processing Conference (QIP 2022)

## Lectures & Tutorials (Invited)

## "Introduction to quantum machine learning"

• Invited lecture at AWS Healthcare & Research Team (Mar. 27th, 2025)

#### "Topics in theoretical quantum computer sciences"

• Invited lecture at Shinil High School (Aug. 28th, 2024)

# Others (e.g., lab seminars, journal clubs)

#### "The NLTS theorem and the quantum PCP conjecture"

• Invited seminar at Center for Quantum Network's Channel Capacity Summer Workshop (Jul. 25th, 2024)

#### "Quantum machine learning models for drug library generation"

• Invited seminar at Yonsei University Quantum Computing and Monte Carlo Workshop (Aug. 30th, 2024)

#### "Minimal data may be sufficient for quantum artificial intelligence"

• Invited talk at Seoul National University QST Seminar (Jun. 30th, 2023)