

# Homoon Ryu

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Currently completing Alternative Military Service (Social Service Agent); open to research collaborations and proposals.

## Research Areas

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Graph theory, Structural graph theory, Combinatorial Matrix Theory.

I am interested in structures of graphs. I have studied graphs having specific matrices (e.g. Toeplitz matrices) as its adjacency matrix. Nowadays, I am interested in studying connectivity of graphs.

## Research Positions

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Research Institute for Basic Science in **Ajou University**, Suwon, Korea, 04/2025 – 08/2025.

## Education

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**Seoul National University**, Seoul, Korea

Ph.D. in Mathematics Education

09/2021 – 02/2025

M.A. in Mathematics Education

09/2019 – 08/2021

B.S. in Mathematics Education

03/2014 – 02/2019

**Seoul Science High School**, Seoul, Korea

03/2011 – 02/2014

## Papers

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### Preprints

6. Hojin Chu, Shinya Fujita, Boram Park, and **Homoon Ryu**. “Connectivity keeping trees in triangle-free graphs”. Submitted, arXiv:2511.06622. 2025.
5. Hojin Chu, Boram Park, and **Homoon Ryu**. “On 2-connected graphs avoiding cycles of length 0 modulo 4”. Submitted, arXiv:2507.12798. 2025.
4. Hojin Chu and **Homoon Ryu**. “Linear-Time Computation of the Frobenius Normal Form for Symmetric Toeplitz Matrices via Graph-Theoretic Decomposition”. Submitted, arXiv:2505.20811.
3. Gi-Sang Cheon, Bumtlee Kang, Suh-Ryung Kim, Seyed Ahmad Mojallal, and **Homoon Ryu**. “On Toeplitz graphs being line graphs”. Submitted, arXiv:2201.05317. 2024.
2. Hojin Chu, Suh-Ryung Kim, and **Homoon Ryu**. “Planarity of generalized ladder graphs”. Submitted, arXiv:2208.13637. 2022.
1. Gi-Sang Cheon, Bumtlee Kang, Suh-Ryung Kim, and **Homoon Ryu**. “Row graphs of Toeplitz matrices”. Submitted, arXiv:2305.02690. 2023.

### Published Papers

3. Hojin Chu and **Homoon Ryu**. “Structural properties of symmetric Toeplitz and Hankel matrices”. In: *Linear Algebra Appl.*, 708: 204–216, 2025.
2. Gi-Sang Cheon, Bumtlee Kang, Suh-Ryung Kim, and **Homoon Ryu**. “Matrix periods and competition periods of Boolean Toeplitz matrices II”. In: *Linear Algebra Appl.* 703:27–46, 2024.
1. Gi-Sang Cheon, Bumtlee Kang, Suh-Ryung Kim, and **Homoon Ryu**. “Matrix periods and competition periods of Boolean Toeplitz matrices”. In: *Linear Algebra Appl.* 672:228–250, 2023.

## Research Talks

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### International

4. Linear-Time Computation of the Frobenius Normal Form for Symmetric Toeplitz Matrices via Graph-Theoretic Decomposition, *27th International Linear Algebra Society Conference (ILAS 2025)* (June 23–27), National Sun Yat-sen University, Kaohsiung, Taiwan.
3. The Frobenius normal form of symmetric Toeplitz and Hankel matrices, *Canadian Discrete and Algorithmic Mathematics 2025 (CanaDAM 2025)* (May 20 - 23), University of Ottawa, Ottawa, Canada.
2. Periods of Boolean Toeplitz matrices II, *2023 China-Korea-Japan International Conference on Matrix Theory with Applications(2023 China-Korea-Japan ICMTA)*(December 1–4), University of Nanchang, Nanchang, China.

1. Periods of Boolean Toeplitz matrices, *24th International Linear Algebra Society Conference (ILAS 2022)*(June 20–22), University of Galway, Galway, Ireland.

## In Korea

3. Linear-Time Computation of the Frobenius Normal Form for Symmetric Toeplitz Matrices via Graph-Theoretic Decomposition, *2025 Annual Meeting of the Kangwon-Kyungki Mathematical Society (2025 KKMS)*(June 20–21), Kyung Hee University, Suwon, Korea.
2. Structural properties of a symmetric Toeplitz matrix, *2024 Korean Mathematics Society Annual Meeting (2024 KMS)*(Oct 24–Oct 26), Sungkyunkwan University, Suwon, Korea.
1. How to determine a graph Toeplitz or not?, *2024 Korean Student Combinatorics Workshop (2024 KSCW)*(July 29–August 2), Gongju, Korea.

## Teaching

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### Teaching Assistant

1. **Calculus 1**, Spring 2020, Seoul National University.
2. **Calculus 2**, Fall 2020, Seoul National University.
3. **Abstract Algebra 2**, Fall 2021, Seoul National University.
4. **Abstract Algebra 1**, Spring 2022, Seoul National University.
5. **Abstract Algebra 2**, Fall 2022, Seoul National University.
6. **Abstract Algebra 1**, Spring 2023, Seoul National University.
7. **Combinatorics**, Fall 2023, Seoul National University.
8. **Combinatorial matrix theory**, Spring 2024, Seoul National University.
9. **Linear Algebra 2**, Fall 2024, Seoul National University.

## References

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### **Prof. Suh-Ryung Kim.**

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### **Prof. Gi-Sang Cheon.**

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### **Prof. Jangsoo Kim.**

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