

# Jaehyeon Seo

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## Research Interests

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Extremal graph theory, graph homomorphism inequalities, transversal substructures, and more

## Education

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<b>Combined Master's and Doctoral Program in Mathematics</b> <i>Yonsei University</i> <ul style="list-style-type: none"><li>Supervised by Joonkyung Lee</li></ul>	Mar 2023–Present Seoul, Korea
<b>Integrated Master's/PhD Program in Mathematics</b> <i>Korea Advanced Institute of Science and Technology</i> <ul style="list-style-type: none"><li>Supervised by Jaehoon Kim</li><li>Not finished</li></ul>	Mar 2020–Aug 2022 Daejeon, Korea
<b>Bachelor's in Mathematics</b> <i>Pohang University of Science and Technology</i> <ul style="list-style-type: none"><li>Magna Cum Laude</li></ul>	Feb 2016–Feb 2020 Pohang, Korea
<b>High school for science-gifted students</b> <i>Korea Science Academy of KAIST</i>	Feb 2013–Feb 2016 Busan, Korea

## Experiences

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<b>Visiting Student Researcher</b> <i>California Institute of Technology</i> <ul style="list-style-type: none"><li>Hosted by David Conlon</li></ul>	Jan 2026–Jul 2026 Pasadena, CA, US
<b>Research visitor</b> <i>Shanghai Center for Mathematical Science, Shanghai</i> <ul style="list-style-type: none"><li>Hosted by Yaobin Chen</li></ul>	Jun 9–14, 2025 Shanghai, China
<b>Researcher</b> <i>Hanyang University Industry–University Cooperation Foundation</i>	Oct 2022–Feb 2023 Seoul, Korea
<b>Visiting student</b> <i>Extremal Combinatorics and Probability Group, Institute of Basic Science</i>	Apr 2022–Aug 2022 Daejeon, Korea
<b>Exchange student</b> <i>Graz University of Technology</i>	Feb 2018–Jul 2018 Graz, Austria

## Publications and Preprints

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- Lower bounds for multivariate independence polynomials and their generalisations.** Submitted (2026). [link](#)  
With Joonkyung Lee.
- Semi-Autonomous Mathematics Discovery with Gemini: A Case Study on the Erdős Problems.** Preprint (2026). [link](#)  
With Tony Feng, Trieu Trinh, Garrett Bingham, Jiwon Kang, Shengtong Zhang, Sang-hyun Kim, Kevin Barreto, Carl Schildkraut, Junehyuk Jung, Carlo Pagano, Yuri Chervonyi, Dawsen Hwang, Kaiying Hou, Sergei Gukov, Cheng-Chiang Tsai, Hyunwoo Choi, Youngbeom Jin, Wei-Yuan Li, Hao-An Wu, Ruey-An Shiu, Yu-Sheng Shih, Quoc V. Le, Thang Luong.
- Counting homomorphisms in antiferromagnetic graphs via Lorentzian polynomials.** Submitted (2025). [link](#)  
With Joonkyung Lee and Jaeseong Oh.
- Transversal cycles and paths in tournaments.** Submitted (2024). [link](#)  
With Debsoumya Chakraborti, Jaehoon Kim, and Hyunwoo Lee.

3. **Hamilton transversals in tournaments.** *Combinatorica* 44, 1381–1400 (2024). [link](#)  
With Debsoumya Chakraborti, Jaehoon Kim, and Hyunwoo Lee.
2. **On a rainbow extremal problem for color-critical graphs.** *Random Structures & Algorithms* 64 (2024), Pages 460–489. [link](#)  
With Debsoumya Chakraborti, Jaehoon Kim, Hyunwoo Lee, and Hong Liu.
1. **On 1-Subdivisions of Transitive Tournaments.** *The Electronic Journal of Combinatorics*, Volume 29, Issue 1 (2022), P1.51. [link](#)  
With Jaehoon Kim and Hyunwoo Lee.

## Teaching Experiences

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<b>Teaching assistant</b> <i>Yonsei University</i>	Mar 2023–Dec 2025 Seoul, Korea
• Combinatorics	Fall 2025
• Discrete Mathematics	Spring 2025
• Combinatorics	Fall 2024
• Discrete Mathematics, Probability	Spring 2024
• Linear Algebra(2)	Fall 2023
• Mathematics and Programming	Spring 2023
<b>Teaching assistant</b> <i>Korea Advanced Institute of Science and Technology</i>	Mar 2020–Aug 2022 Daejeon, Korea
• Probability and Statistics, Scientific Writing (for math majors)	Spring 2022
• Calculus 1, Introduction to Graph Theory	Fall 2021
• Introduction to Linear Algebra, Introduction to Number Theory	Spring 2021
• Differential Equations and Applications, Introduction to Differential Geometry	Fall 2020
• Differential Equations and Applications	Spring 2020
<b>Excellent Student Teaching Assistant</b> <i>Pohang University of Science and Technology</i>	Mar 2019–Dec 2019 Pohang, Korea
• Calculus 2	Fall 2019
• Calculus 1	Spring 2019
<b>Teaching assistant</b> <i>KAIST Cyber Gifted Education</i>	Oct 2016–Feb 2017 Online
• Introduction to Number Theory, Linear Algebra	Fall 2016

## Outreach

<b>Teaching assistant</b> <i>POSTECH Potential Development Camp for High School Students</i> ( <i>POSTECH 잠재력개발과정</i> )	Jan 2018 Pohang, Korea
• Tutoring high school students for undergraduate level mathematics	

## Awards and Grants

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- International Joint Training Support of Outstanding Graduate Students in BK21FOUR: Jan 2026–Jul 2026  
(4단계 BK21사업 우수대학원생 국제공동연수)
- Best student from the Brain Korea (BK) evaluation in the department: Spring 2024, Spring 2025
- 2024 Spring Poster Presentation, School of Mathematics and Computing, Yonsei University: Excellence award
- POSTECH Department of Mathematics, Dean's list: Fall 2016, Spring 2017, Fall 2017, Spring 2019
- 2016 POSTECH Programming Contest: Excellence prize
- National Scholarship (science and engineering), Korea Student Aid Foundation, Feb 2016–Feb 2020

## Talks

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- **2026 SIAM Conference on Discrete Mathematics**, UCSD San Diego, CA, US  
*Lower bounds for multivariate independence polynomials and their generalisations* Jun 23, 2026
- **Graduate Student Combinatorics Conference 2026**, UIC Chicago, IL, US  
*Lower bounds for multivariate independence polynomials and their generalizations* Mar 28, 2026
- **Math Graduate Student Seminar**, Caltech Pasadena, CA, US  
*Extremal questions on independent sets, colorings, and graph homomorphisms* Feb 24, 2026
- **RS&A 2025**, TU Wien Vienna, Austria  
*Counting homomorphisms in antiferromagnetic graphs via Lorentzian polynomials* Aug 5, 2025
- **FPSAC 2025**, Hokkaido University Sapporo, Japan  
*Counting homomorphisms in antiferromagnetic graphs via Lorentzian polynomials* (poster) Jul 21, 2025
- **Combinatorics Student Seminar**, Shanghai Center for Mathematical Science Shanghai, China  
*Graph homomorphism inequalities and Lorentzian polynomials* Jun 11, 2025
- **CanADAM 2025**, University of Ottawa Ottawa, Canada  
*Graph homomorphism inequalities and Lorentzian polynomials* May 21, 2025
- **4th East Asia Workshop on Extremal and Structural Graph Theory**, Sun-Yat Sen University Guangzhou, China  
*Graph homomorphism inequalities and Lorentzian polynomials* Mar 30, 2025
- **Sinchon Seminar of Graduates 5**, Ewha Womans University Seoul, Korea  
*Graph homomorphisms and Lorentzian polynomials* Dec 27, 2024
- **KIAS Graduate Student Meeting in Pure Mathematics**, KIAS Seoul, Korea  
*Graph homomorphisms and Lorentzian polynomials* Oct 21, 2024
- **2024 Combinatorics Workshop**, Chungbuk National University Cheongju, Korea  
*Hamilton transversals in tournaments* Aug 29, 2024
- **2024 Korea Student Combinatorics Workshop**, Gongju Traditional Korean Village Gongju, Korea  
*Extremal graph theory and rainbow substructures* Jul 30, 2024
- **2023 KMS Spring Meeting**, Daejeon Convention Center Daejeon, Korea  
*Rainbow oriented Hamiltonian paths and cycles in tournaments* Apr 29, 2023
- **KAIST Math Graduate Student Seminar**, KAIST Online  
*How can we find a rainbow subgraph?* Mar 24, 2022
- **Discrete Math Seminar**, IBS DIMAG Daejeon, Korea  
*A rainbow Turán problem for color-critical graphs* Jan 18, 2022
- **2021 Combinatorics Workshop**, The Bloomvista Yangpyeong, Korea  
*On multicolor extremal problems* Dec 21, 2021

## Professional Activities

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- Co-organizer, Korean Student Combinatorics Workshop 2026 Winter [link](#) Feb 2–6, 2026
- Co-organizer, Korean Student Combinatorics Workshop 2025 [link](#) Aug 20–24, 2025
- Co-organizer, Discrete Analysis Seminar at Yonsei University [link](#) Apr 2023–Present

## Peer Review Activities

- SIAM Journal on Discrete Mathematics 2026
- Combinatorics, Probability and Computing 2025
- SIAM Journal on Discrete Mathematics 2025
- Journal of Graph Theory 2024

## Student Seminars

- Co-organizer, Discrete Analysis & Insights Seminar at Yonsei [link](#)
  - Student-led seminar at Yonsei University, primarily focusing on extremal combinatorics
- Participant, Deep Seminar in Combinatorics [link](#)
  - Student-led seminar at KAIST
- Participant, Seminars on Gowers Norms [link](#)

## Selected Academic Events

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### Outside of Korea

- [2026 SIAM Conference on Discrete Mathematics](#), UCSD [link](#) San Diego, CA, US. Jun 22–25, 2026
- [Flags in the Mountains](#), Colorado State University Mountain Campus [link](#) Bellvue, CO, US. Jun 1–5, 2026
- [Graduate Student Combinatorics Conference 2026](#), UIC [link](#) Chicago, IL, US. Mar 27–29, 2026
- [22nd International Conference on Random Structures & Algorithms \(RS&A 2025\)](#), TU Wien [link](#) Vienna, Austria. Aug 4–8, 2025
- [37th International Conference on Formal Power Series and Algebraic Combinatorics \(FPSAC 2025\)](#), Hokkaido University [link](#) Sapporo, Japan. Jul 21–25, 2025
- [Canadian Discrete and Algorithmic Mathematics conference \(CanaDAM\) 2025](#), University of Ottawa [link](#) Ottawa, Canada. May 20–23, 2025
- [4th East Asia Workshop on Extremal and Structural Graph Theory](#), Sun-Yat Sen University [link](#) Guangzhou, China. Mar 27–31, 2025
- [Summit280](#), Eötvös University [link](#) Budapest, Hungary. July 8–12, 2024
- [30th British Combinatorial Conference \(BCC 2024\)](#), Queen Mary University of London [link](#) London, UK. Jul 1–5, 2024
- [3rd East Asia Workshop on Extremal and Structural Graph Theory](#), The Southern Beach Hotel & Resort Okinawa [link](#) Okinawa, Japan. Nov 1–5, 2023

### AI-related

- [AI and Mathematics](#), KIAS [link](#) Seoul, Korea. Aug 3–7, 2026  
*Invited to the fourth week on “Algebra, Combinatorics, and Topology”*
- [Summer School on Formalization in Lean](#), ICARM [link](#) Pittsburgh, PA, US. Jul 7–18, 2026
- [2025 KIAS Winter School on Mathematics and AI](#), Park Roche [link](#) Jeongseon, Korea. Dec 2–5, 2025  
*Attended team sessions on ML and Discrete Mathematics, focusing on FunSearch*
- [Machine Learning and Mathematics](#), KIAS [link](#) Seoul, Korea. Jul 7–11, 2025
- [AI for Mathematics Workshop on Formalization](#), KIAS [link](#) Seoul, Korea. Dec 17, 2024
- [Samsung Global Research Symposium: Mathematical Theory of AI](#), InterContinental Seoul COEX [link](#) Seoul, Korea. Aug 1–3, 2023

### Schools

- [IBS-DIMAG Winter School on Graph Minors](#), IBS DIMAG [link](#) Daejeon, Korea. Feb 3–19, 2025  
*Sebastian Wiederrecht and Maximilian Gorsky, Graph Minor Structure Theorem*
- [ECOPRO–CAS–SDU Joint Winter Course](#), IBS ECOPRO [link](#) Daejeon, Korea. Jan 6–10, 2025  
*Huy Tuan Pham, Recent developments in probabilistic combinatorics: New synergies*
- [IBS–SDU Frontiers of Combinatorics, Part 2](#), IBS ECOPRO [link](#) Daejeon, Korea. Aug 5–9, 2024  
*Tung Nguyen, Recent work on the Erdős–Hajnal conjecture*
- [2024 Summer School on Combinatorial Algorithms](#), KAIST [link](#) Daejeon, Korea. Jul 22–26, 2024  
*Chien-Chung Huang, Combinatorial Optimization*  
*Sebastian Wiederrecht, From treewidth to grid minor theorem*
- [IBS–CAS–SDU Joint Course](#), IBS ECOPRO [link](#) Daejeon, Korea. Feb 26–Mar 1, 2024  
*Bjarne Schülke, Hypergraph Turán problems*

### 2025

- [5th East Asia Workshop on Extremal and Structural Graph Theory](#), Fraser Place Namdaemun [link](#) Seoul, Korea. Nov 27–30, 2025
- [1st Early Career Workshop in Extremal Combinatorics](#), IBS ECOPRO [link](#) Daejeon, Korea. Oct 20–30, 2025
- [KIAS-KAIST Workshop on current challenges in mathematics](#), KIAS [link](#) Seoul, Korea. Aug 25–28, 2025
- [2025 Korean Student Combinatorics Workshop](#), The-K Hotel Gyeongju [link](#) Gyeongju, Korea. Aug 20–24, 2025
- [Discrete Analysis at Yonsei](#), Yonsei University [link](#) Seoul, Korea. Jun 16–20, 2025

### 2024

- [2024 Korean Student Combinatorics Workshop](#), Gongju Traditional Korean Village [link](#) Gongju, Korea. Jul 30–Aug 2, 2024
- [2024 IBS-DIMAG Workshop on Combinatorics and Geometric Measure Theory](#), IBS [link](#) Daejeon, Korea. Jul 14–19, 2024
- [3rd Korea–China Young Scholar’s Symposium on Discrete Mathematics](#), Utop Ubless Hotel Jeju [link](#) Jeju, Korea. Jun 24–27, 2024

### 2023

- [2023 KIAS Summer Workshop on Graph Theory](#), KIAS [link](#) Seoul, Korea. Aug 8–9, 2023