

# Min Hoon Kim

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## Employment

Assistant Professor, KNU, March 2022 – current.

Assistant Professor, CNU, September 2020 – February 2022.

Research Assistant Professor, Center for Research in Topology, POSTECH, October 2019 – August 2020.

Research Fellow, KIAS, September 2015 – August 2019.

## Education

Ph. D. Mathematics, POSTECH, March 2010 – August 2015.

Thesis advisor: Professor Jae Choon Cha

B. S. Chemical Engineering, Mathematics (double major) and Physics (minor), POSTECH, March 2006 – February 2010.

## Fields of research interest

Topology of low dimensional manifolds, knot and link concordance

## Grants

1. Basic Science Research Program from National Research Foundation of Korea, March 2021 – present.
2. TJ Park science fellowship, January 2017 – December 2018.
3. National junior research fellowship from National Research Foundation of Korea, September 2010 – August 2015.

## Publications

### *Journal Papers*

1. *One-bipolar topologically slice knots and primary decomposition* (joint with Se-Goo Kim and Taehee Kim), arXiv:1911.08055, to appear in International Mathematics Research Notices.
2. *Pretzel links, mutation, and the slice-ribbon conjecture* (joint with Paolo Aceto, JungHwan Park and Arunima Ray), arXiv:1805.02885, to appear in Mathematical Research Letters.

3. *The bipolar filtration of topologically slice knots* (joint with Jae Choon Cha), arXiv:1710.07803, to appear in *Advances in Mathematics*.
4. *Primary decomposition of knot concordance and von Neumann rho-invariants* (joint with Se-Goo Kim and Taehee Kim), *Proceedings of the American Mathematical Society* **149** (2021) 439–447.
5. *Homology spheres and property R* (joint with JungHwan Park), *Proceedings of the American Mathematical Society* **149** (2021) 1323–1328.
6. *The round handle problem* (joint with Mark Powell and Peter Teichner), *Pure and Applied Math Quarterly* **17** (2021) no. 1, 237–247.
7. *A family of freely slice good boundary links* (joint with Jae Choon Cha and Mark Powell), *Mathematische Annalen* **376** (2020) no. 3, 1009–1030.
8. *Irreducible 3-manifolds that cannot be obtained by zero surgery on knots* (joint with Matthew Hedden and Kyungbae Park), *Transactions of the American Mathematical Society* **372** (2019) no. 11, 7619–7638.
9. *Links with nontrivial Alexander polynomial which are topologically concordant to the Hopf link* (joint with David Kratovich and JungHwan Park), *Transactions of the American Mathematical Society* **371** (2019) no. 8, 5379–5400.
10. *On rationally sliceness of Miyazaki's fibered –amphicheiral knots* (joint with Zhongtao Wu), *Bulletin of the London Mathematical Society* **50** (2018) no. 3, 462–476.
11. *An infinite-rank summand of knots with trivial Alexander polynomials* (joint with Kyungbae Park), *J. Symplectic Geom.* **16** (2018), no. 6, 1749–1771.
12. *Rasmussen s-invariants of satellites do not detect slice knots* (joint with Jae Choon Cha), *Journal of Knot Theory and its Ramifications*, **26** (2017) no. 2, Special issue for Tim Cochran, 1740001.
13. *Whitney towers, Gropes and Casson–Gordon style invariants of links*, *Algebraic and Geometric Topology* **15** (2015), no. 3, 1813–1845.
14. *Smoothly slice boundary links whose derivative links have nonvanishing Milnor invariants* (joint with Hye Jin Jang and Mark Powell), *Michigan Math Journal* **63** (2014), 423–446.

### Preprints

1. *Non-slice 3-stranded pretzel knots* (joint with Changhee Lee and Minkyong Song), arXiv:2101.00865.
2. *Non-slice linear combinations of algebraic knots* (joint with Anthony Conway and Wojciech Politarczyk), arXiv:1910.01368.
3. *Ideal classes and Cappell-Shaneson homotopy 4-spheres* (joint with Shohei Yamada), arXiv:1707.03860.

### Book

1. *The disc embedding theorem* (co-edited with Stefan Behrens, Boldiszar Kalmar, Mark Powell and Arunima Ray), Oxford University Press, Oxford, 2021. xvii+473 pp. ISBN: 978–0–19–884131–9.

## Invited talks

1. *Freely slice good boundary links*, June 1, 2021, Topology seminar, UC Santa Barbara.
2. *Freely slice links*, May 7, 2021, Topology seminar, Pusan National University.
3. *One-bipolar topologically slice knots and primary decomposition*, October 23, 2020, KMS Annual Meeting, Virtual Conference.
4. *Freely slice links*, February 18, 2020, Mini-Symposium: Knot Theory in Okinawa, OIST, Okinawa, Japan.
5. *Non-slice linear combinations of iterated torus knots*, February 10, 2020, The 15th East Asian Conference on Geometric Topology, RIMS, Kyoto University, Kyoto, Japan.
6. *Freely slice links*, December 17, 2019, KIAS, Seoul, South Korea.
7. *Cappell-Shaneson homotopy 4-spheres*, December 16, 2019, Korea University, Seoul, South Korea.
8. *Freely slice links*, December 6, 2019, University of Warsaw, Warsaw, Poland.
9. *Freely slice links*, October 26, 2019, 2019 KMS Annual meeting, Hongik University, Seoul, South Korea.
10. *Freely slice good boundary links*, July 29, 2019, The Chinese University of Hong Kong, Shatin, Hong Kong.
11. *Freely slice good boundary links*, June 18, 2019, Knot concordance and low-dimensional manifolds, Le Croisic, France.
12. *Freely slice good boundary links*, January 22, 2019, The 14th East Asian Conference on Geometric Topology, Peking University, China.
13. *The bipolar filtration of topologically slice knots*, November 30, 2018, Columbia University, New York, United States.
14. *Freely slice good boundary links*, November 26, 2018, Brandeis University, Waltham, United States.
15. *Freely slice good boundary links*, November 19, 2018, University of Texas at Austin, Austin, United States.
16. *Freely slice good boundary links*, November 8, 2018, University of Wisconsin at Eau Claire, Eau Claire, United States.
17. *A family of freely slice good boundary links*, November 5, 2018, Georgia Tech, Atlanta, United States.
18. *An introduction to the disk embedding conjecture*, November 5, 2018, Georgia Tech, Atlanta, United States.
19. *A family of freely slice good boundary links*, October 29, 2018, Rice University, Houston, United States.
20. *A family of freely slice good boundary links*, October 22, 2018, University of Georgia, Athens, United States.
21. *A family of freely slice good boundary links*, October 18, 2018, Michigan State University, East Lansing, United States.
22. *A family of freely slice good boundary links*, October 16, 2018, North Carolina State University, Raleigh, United States.

23. *A family of freely slice good boundary links*, October 2, 2018, University of Virginia, Charlottesville, United States.
24. *A family of freely slice good boundary links*, September 26, 2018, Indiana University, Bloomington, United States.
25. *A family of freely slice good boundary links*, September 15, 2018, Pohang University of Science and Technology, Pohang, South Korea.
26. *The bipolar filtration of topologically slice knots*, June 14, 2018, Geometric structures on 3 and 4 manifolds, Inter-University Center, Dubrovnik, Croatia.
27. *An infinite-rank summand of knots with trivial Alexander polynomial*, May 21, 2018, Ehwa Womans University, Seoul, South Korea.
28. *Ideal classes and Cappell-Shaneson homotopy 4-spheres*, March 29, 2018, Durham University, Durham, United Kingdom.
29. *Introduction to  $L^2$ -invariants and knot concordance*, March 6, 2018, The Chinese University of Hong Kong, Shatin, Hong Kong.
30. *The disparity between smoothly and topologically slice knots*, March 1, 2018, The Chinese University of Hong Kong, Shatin, Hong Kong.
31. *Ideal classes and Cappell-Shaneson homotopy 4-spheres*, January 29, 2018, The 13th East Asian School of Knots and Related Topics, KAIST, Daejeon, South Korea.
32. *The bipolar filtration of topologically slice knots*, December 4, 2017, Oxford university, Oxford, United Kingdom.
33. *The bipolar filtration of topologically slice knots*, November 27, 2017, Max-Planck-Institut für Mathematik, Bonn, Germany.
34. *Irreducible 3-manifolds that cannot be obtained by zero surgery on knots*, November 14, 2017, The 2nd Pan-Pacific International Conference on Topology and Applications, Busan, South Korea.
35. *Bipolar filtration of topologically slice knots*, October 26, 2017, Princeton university, Princeton, USA.
36. *Bipolar filtration of topologically slice knots*, October 2, 2017, Durham university, Durham, United Kingdom.
37. *Irreducible 3-manifolds that cannot be obtained by zero surgery on knots*, September 4, 2017, University of Tsukuba, Tsukuba, Japan.
38. *Bipolar filtration of topologically slice knots*, July 11, 2017, The Chinese University of Hong Kong, Shatin, Hong Kong.
39. *Bipolar filtration of topologically slice knots*, May 17, 2017, KAIST, Daejeon, South Korea.
40. *Bipolar filtration of topologically slice knots*, April 25, 2017, Michigan State University, Michigan, USA.
41. *Irreducible 3-manifolds which can not be obtained by 0-surgery on a knot*, April 20, 2017, Université du Québec à Montréal, Montreal, Canada.
42. *Bipolar filtration of topologically slice knots*, March 29, 2017, Differential Topology 17, The University of Electro-Communications, Chofu, Japan.
43. *On the bipolar filtration of topologically slice knots*, February 15, 2017, The 12th East Asian School of Knots and Related Topics, University of Tokyo, Japan.

44. *On the bipolar filtration of topologically slice knots*, January 17, 2017, Kyung Hee University, Seoul, South Korea.
45. *Cappell-Shaneson homology surgery and high dimensional knot and link concordance*, November 29, 2016, Hausdorff Institute for Mathematics, Bonn, Germany.
46. *Ideal classes and Cappell-Shaneson homotopy 4-spheres*, November 25, 2016, Hausdorff Research Institute for Mathematics, Bonn, Germany.
47. *On the bipolar filtration of topologically slice knots*, October 31, 2016, Hausdorff Research Institute for Mathematics, Bonn, Germany.
48. *An infinite-rank summand of knots with trivial Alexander polynomial*, August 19, 2016, Mini-workshop on knot theory, IBS Center for Geometry and Physics, Pohang, South Korea.
49. *Vanishing of Hom-Wu invariants for strongly –amphicheiral knots*, March 7, 2016, The Chinese University of Hong Kong, Shatin, Hong Kong
50. *Rasmussen s-invariants of satellites do not detect slice knots*, January 27, 2016, The 11th East Asian School of Knots and Related Topics, Osaka City University, Japan.
51. *Cheeger-Gromov  $\rho$ -invariant and complexity of lens space*, January 28, 2015, The 10th East Asian School of Knots and Related Topics, Shanghai, China.
52. *Whitney towers, gropes and Casson-Gordon type invariant of links*, August 25, 2014, Knots and Low Dimensional Manifolds (a satellite conference of Seoul ICM 2014), BEXCO Center, Busan, Korea.
53. *Whitney towers, gropes and Casson-Gordon type invariant of links*, September 19, 2013, Mini-workshop on knot concordance, Tokyo Institute of Technology, Tokyo, Japan.
54. *Introduction to bipolar filtration*, September 18, 2013, Mini-workshop on knot concordance, Tokyo Institute of Technology, Tokyo, Japan.
55. *Whitney towers, gropes and Casson-Gordon type invariant of links*, June 11, 2013, Universität zu Köln, Oberseminar, Köln, Germany.
56. *Torsion elements in rational knot concordance groups*, January 15, 2013, The 9th East Asian School of Knots and Related topics, University of Tokyo, Tokyo, Japan.
57. *Whitney tower concordance and Casson-Gordon type invariant of links*, January 11, 2012, The 8th East Asian School of Knots and Related topics, KAIST, Daejeon, Korea.
58. *Torsion elements in Rational Knot concordance group*, January 10, 2011, The 7th East Asian School of Knots and Related Topics, Hiroshima University, Hiroshima, Japan.

## Long-term visits

1. Intensive joint research with Professor Kent E. Orr, September 1 – November 30, 2018, Indiana University, Bloomington, United States.
2. Junior trimester program "Topology", September 1 – December 20, 2016, Hausdorff Research Institute for Mathematics, Bonn, Germany.
3. Semester on 4-manifolds and their combinatorial invariants, April 1 – June 30, 2013, Max-Planck-Institut für Mathematik, Bonn, Germany.

## Conferences and seminars co-organized

1. Low-dimensional topology workshop, April 30 – May 2, 2019, KIAS, Seoul, Korea.
2. Invariants in low-dimensional topology, May 10–12, 2017, KIAS, Seoul, Korea.
3. Conference on 4-manifolds and knot concordance, October 17–21, 2016, Max-Planck-Institut für Mathematik, Bonn, Germany.
4. KIAS topology seminar, August 2015 – August 2019.

## Teaching experiences

### *2021 spring semester*

- Calculus 1
- Topology 1
- Introduction to mathematics

### *2020 fall semester*

- Topology 2
- Topological Data Analysis (graduate course)

### *Teaching assistant*

I have served as a teaching assistant at POSTECH for the following courses:

2011 Spring, Math 110 Calculus.

2012 Fall, Math 421 General Topology.

2014 Spring, Math 230 Probability and Statistics.

2015 Spring, Math 110 Calculus.

## References

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