

# YI NI

## CURRICULUM VITAE

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Birth year: 1981

Birthplace: Shiyan, Hubei, People's Republic of China

Citizenship: People's Republic of China. US permanent resident.

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### **Research interests**

Low-dimensional geometry and topology.

Particular interests: Heegaard Floer homology and its applications, gauge theory, symplectic geometry, Khovanov homology.

Casual interests: hyperbolic geometry, combinatorial topology, geometric group theory, foliations and laminations, dynamics.

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### **Professional History**

2015–	Professor of Mathematics,	California Institute of Technology
2017–2021	Graduate Option Representative,	Department of Mathematics, Caltech
2009–2015	Assistant Professor of Mathematics,	California Institute of Technology
2007–2009	CLE Moore Instructor,	Massachusetts Institute of Technology
2007–2012	Five-Year Fellow,	American Institute of Mathematics

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### **Visiting Positions**

April–June 2011	Visitor,	Simons Center for Geometry and Physics
Spring 2010	Research Member,	MSRI
2007–2008	Adjunct Assistant Professor,	Columbia University
July 2007	Clay Liftoff Fellow,	Clay Mathematics Institute

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## Educational History

Ph.D. Princeton University, 2007.

Thesis advisor: David Gabai

M.S. Peking University, 2003.

Thesis advisors: Boju Jiang, Shicheng Wang

B.S. Peking University, 2001.

Thesis advisor: Qingchun Tian

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## Awards

- 2013 NSF CAREER Award (DMS-1252992)
  - 2012 Alfred P. Sloan Research Fellowship
  - 2008–Now NSF grant numbers DMS-0805807 (changed to DMS-1021956 in 2010),  
DMS-1103976, DMS-1811900
  - 2007 Clay Liftoff Fellowship, Clay Mathematics Institute
  - 2007 Chinese Government Award for Outstanding Self-Financed Students Abroad
  - 2007 Five-Year Fellowship, American Institute of Mathematics
  - 2003–2007 Graduate School Centennial Fellowship, Princeton University
  - 2002 Yang Fuqing and Wang Yangyuan Fellowship, Peking University
  - 1997–2001 Mingde Fellowship, Peking University
  - 1997 Gold Medal, 38th International Mathematical Olympiad, Argentina
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## Bibliography

- [1] (with John Baldwin and Steven Sivek) *Floer homology and right-veering monodromy*, submitted, available at arXiv:2204.04093.
- [2] *Null-homotopic knots have Property R*, Math. Proc. Cambridge Philos. Soc. 175 (2023), no. 1, 217–223.
- [3] *Knot Floer homology and fixed points*, submitted, available at arXiv:2201.10546.
- [4] *A note on knot Floer homology and fixed points of monodromy*, Peking Math. J. 6 (2023), no. 2, 635–643.

- [5] (with Xingru Zhang) *Characterizing slopes for torus knots, II*, J. Knot Theory Ramifications 32 (2023), no. 3, Paper No. 2350023, 13 pp.
- [6] *The next-to-top term in knot Floer homology*, Quantum Topol. 13 (2022), no. 3, 579–591.
- [7] *A characterization of  $T_{2g+1,2}$  among alternating knots*, Acta Math. Sin. (Engl. Ser.), 37 (2021), no. 12, 1841–1846.
- [8] *Exceptional surgeries on hyperbolic fibered knots*, submitted, available at arXiv:2007.11774.
- [9] *Property G and the 4-genus*, to appear Trans. Amer. Math. Soc. Ser. B, available at arXiv:2007.03721.
- [10] (with Chao Wang, and Shicheng Wang) *Extending periodic automorphisms of surfaces to 3-manifolds*, to appear Comm. Anal. Geom., available at arXiv:2003.11773.
- [11] (with William Ballinger, Tynan Ochse, and Faramarz Vafaee) *The prism manifold realization problem III*, Proc. Lond. Math. Soc. (3) 125 (2022), no. 3, 841–878.
- [12] (with William Ballinger, Tynan Ochse, and Faramarz Vafaee) *The prism manifold realization problem II*, Comm. Anal. Geom. 29 (2021), no. 6, 1279–1334.
- [13] *Virtual Betti numbers and virtual symplecticity of 4-dimensional mapping tori, II*, Sci. China Math. 60 (2017), 1591–1598.
- [14] (with William Ballinger, Chloe Ching-Yun Hsu, Wyatt Mackey, Tynan Ochse, and Faramarz Vafaee) *The prism manifold realization problem*, Algebr. Geom. Topol. 20 (2020), no. 2, 757–816.
- [15] (with Faramarz Vafaee) *Null surgery on knots in L-spaces*, Trans. Amer. Math. Soc. 372 (2019), no. 12, 8279–8306.
- [16] (with Xingru Zhang) *Finite Dehn surgeries on knots in  $S^3$* , Algebr. Geom. Topol. 18 (2018), 441–492.

- [17] *Fintushel–Stern knot surgery in torus bundles*, J. Topol. 10 (2017), no. 1, 164–177.
- [18] (with Xingru Zhang) *Detection of knots and a cabling formula for  $A$ -polynomials*, Algebr. Geom. Topol. 17 (2017), 65–109.
- [19] (with Zhongtao Wu) *Correction terms,  $\mathbb{Z}_2$ -Thurston norm, and triangulations*, Topology Appl. 194 (2015), 409–426.
- [20] (with Xingru Zhang) *Dehn surgery on knots in  $S^3$  producing Nil Seifert fibred spaces*, What’s next?, 244–258, Ann. of Math. Stud., 205, Princeton Univ. Press, Princeton, NJ, [2020].
- [21] (with Eileen Li) *Half-integral finite surgeries on knots in  $S^3$* , Ann. Fac. Sci. Toulouse Math. (6) 24 (2015), no. 5, 1157–1178.
- [22] (with J. Elisenda Grigsby) *Sutured Khovanov homology distinguishes braids from other tangles*, Math. Res. Lett., 21 (2014), no. 6, 1263–1275.
- [23] (with Joshua Greene) *Non-simple genus minimizers in lens spaces*, to appear Algebr. Geom. Topol., available at arXiv:1305.0517.
- [24] (with Tian-Jun Li) *Virtual Betti numbers and virtual symplecticity of 4-dimensional mapping tori*, Math. Z. 277 (2014), 195–208.
- [25] (with Xingru Zhang) *Characterizing slopes for torus knots*, Algebr. Geom. Topol. 14 (2014), 1249–1274.
- [26] (with Zhongtao Wu) *Heegaard Floer correction terms and rational genus bounds*, Adv. Math. 267 (2014), 360–380.
- [27] (with Matthew Hedden) *Khovanov module and the detection of unlinks*, Geom. Topol. 17 (2013), 3027–3076.
- [28] *Some applications of Gabai’s internal hierarchy*, Adv. Math. 250 (2014), 467–495.
- [29] (with Yi Liu, Hongbin Sun and Shicheng Wang) *On slope genera of knotted tori in the 4-space*, Pacific J. Math. 261 (2013), no. 1, 117–144.

- [30] *Homological actions on sutured Floer homology*, Math. Res. Lett. 21 (2014), no. 5, 1177–1197.
- [31] (With Zhongtao Wu) *Cosmetic surgeries on knots in  $S^3$* , J. Reine Angew. Math. 706 (2015), 1–17.
- [32] *Dehn surgeries on knots in product manifolds*, J. Topol. 4 (2011), no. 4, 799–816.
- [33] *Thurston norm and cosmetic surgeries*, Low-dimensional and Symplectic Topology, Proceedings of Symposia in Pure Mathematics, vol. 82, Amer. Math. Soc., Providence, RI, (2011), 53–63.
- [34] (with Matthew Hedden) *Manifolds with small Heegaard Floer ranks*, Geom. Topol. 14 (2010), 1479–1501.
- [35] *Non-separating spheres and twisted Heegaard Floer homology*, Algebr. Geom. Topol. 13 (2013), no. 2, 1143–1159.
- [36] (with Yinghua Ai), *Two applications of twisted Floer homology*, Int. Math. Res. Not. 2009 (2009), no. 19, 3726–3746.
- [37] (with Michel Boileau and Shicheng Wang), *On standard forms of 1–dominations between knots with same Gromov volumes*, Commun. Contemp. Math. 10 (2008), no. 1 supp., 857–870.
- [38] *Dehn surgeries that yield fibred 3–manifolds*, Math. Ann. 344 (2009), no. 4, 863–876.
- [39] *Heegaard Floer homology and fibred 3–manifolds*, Amer. J. of Math. 131 (2009), 1047–1063.
- [40] *Knot Floer homology detects fibred knots*, Invent. Math. 170 (2007), no. 3, 577–608. *Erratum*, Invent. Math. 177 (2009), no. 1, 235–238. **(PhD Thesis)**
- [41] *Link Floer homology detects the Thurston norm*, Geom. Topol. 13 (2009), 2991–3019 (electronic).
- [42] *Closed 3–braids are nearly fibred*, J. Knot Theory Ramifications 18 (2009), no. 12, 1637–1649.

- [43] *A note on knot Floer homology of links*, Geom. Topol. 10 (2006), 695–713 (electronic).
- [44] *Sutured Heegaard diagrams for knots*, Algebr. Geom. Topol. 6 (2006), 513–537 (electronic).
- [45] (with Michel Boileau and Shicheng Wang), *Pseudo-Anosov extensions and degree one maps between hyperbolic surface bundles*, Math. Z. 256 (2007), 913–923.
- [46] *Uniqueness of PL minimal surfaces*, Acta Math. Sin. (Engl. Ser.) 23 (2007), no. 6, 961–964.
- [47] (with Boju Jiang, Shicheng Wang and Qing Zhou), *Embedding infinite cyclic covers of knot spaces into 3-space*, Topology 45 (2006), no. 4, 691–705.
- [48] (with Boju Jiang and Shicheng Wang), *3-Manifolds that admit knotted solenoids as attractors*, Trans. Amer. Math. Soc. 356 (2004), no. 11, 4371–4382.

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## Teaching Experience

Caltech Ma 109c, Differential Topology, Spring 2023.

Ma 151b, Algebraic Topology, Winter 2023.

Ma 151b, Algebraic Topology, Winter 2022.

Ma 1c, Calculus on Manifolds (Analytical Track), Spring 2021.

Ma 191a, Topics in Symplectic Geometry, Fall 2020.

Ma 1c, Calculus on Manifolds (Analytical Track), Spring 2020.

Ma 151b, Algebraic Topology, Winter 2020.

Ma 151c, Algebraic Topology, Spring 2019.

Ma 191b, The Topology of Smooth 4-Manifolds, Winter 2019.

Ma 151a, Algebraic Topology, Fall 2017.

Ma 191a, Introduction to Heegaard Floer Homology, Fall 2017.

Ma 151c, Algebraic Topology, Spring 2017.

Ma 191a, Introduction to knot theory, Fall 2016.

Ma 151c, Algebraic Topology, Spring 2016.

Ma 1c, Vector Calculus (Practical Track), Spring 2016.  
Ma 191b, Instanton Floer homology and its applications, Winter 2016.  
Ma 1b, Linear Algebra (Practical Track), Winter 2016.  
Ma 1c, Vector Calculus (Practical Track), Spring 2015.  
Ma 1c, Vector Calculus (Practical Track), Spring 2014.  
Ma 191b, Smooth 4-manifolds and Seiberg–Witten Theory, Winter 2014.  
Ma 1c, Vector Calculus (Practical Track), Spring 2013.  
Ma 109b, Introduction to Geometry and Topology, Winter 2013.  
Ma 191a, Topics in Symplectic Geometry, Fall 2012.  
Ma 151b, Algebraic Topology, Winter 2012.  
Ma 151a, Algebraic Topology, Fall 2010.  
Ma 192c, Introduction to 4-dimensional topology, Spring 2010.

#### **MIT**

18.03, Differential Equations, Recitation Sections R19 and R26, Spring 2009.

#### **Columbia University**

MATH V1201, Calculus III, Spring 2008.

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## **Conference and Colloquium talks**

Colloquium, Institute of Mathematics, Academy of Mathematics and Systems Science, Chinese Academy of Sciences, Beijing, China. August 2023.

Pure Mathematics Forum, Wuhan University, Wuhan, China. August 2023.

PKU Mathematics Forum, Peking University, Beijing, China. August 2023.

Hongguoyuan International Forum on Frontiers in Mathematics, Beijing Jiaotong University. August 2022.

Knots in Washington 49.5, online talk. December 2021.

Lectures in the workshop “Perspectives on Dehn Surgery”, ICERM, Brown University. July 2019.

The 12th East Asian School of Knots, Links and Related Topics, Tokyo University. February 2017.

Colloquium, University of California, Los Angeles. February 2017.

3-Manifold workshop, Issac Newton Institute for Mathematical Sciences, Cambridge University. February 2017.

Princeton Low-Dimensional Topology Workshop (aka “Sarkar conference”), Princeton University. June 2015.

What's Next? The mathematical legacy of Bill Thurston, Cornell University. June 2014.

Colloquium, Rice University. March 2014.

Topology and Invariants of Smooth 4-Manifolds, University of Minnesota, Twin Cities, MN. August 2013.

Special Session on Topology, Geometry and Mathematical Physics, ICCM 2013, Taipei. July 2013.

Low-dimensional Topology and Geometry in Toulouse, on the occasion of Michel Boileau's 60th birthday, Toulouse, France. June 2013.

Young Mathematician Forum, Peking University, Beijing, China. June 2013.

Symplectic and Low Dimensional Topologies in Interaction, Simons Center for Geometry and Physics, Stony Brook, NY. December 2012.

Georgia Topology Conference, Athens, GA. May 2012.

Workshop on Topics in Dehn Surgery, University of Texas, Austin, TA. April 2012.

Tokyo Workshop on Low-dimensional Topology, Tokyo Institute of Technology, Japan. March 2012.

Geometry & Topology Down Under, A Conference in Honour of Hyam Rubinstein, the University of Melbourne, Australia. July 2011.

The Fifth Yamabe Memorial Symposium, University of Minnesota, Twin Cities, MN. October 2010.

Low-Dimensional Topology and Categorification, Stony Brook University, NY. June 2010.

Workshop on 3-manifolds, East China Normal University, Shanghai, China. July 2009.

2009 Georgia International Topology Conference, University of Georgia, Athens, GA. May 2009.

Colloquium, California Institute of Technology, Pasadena, CA. November 2008.

The 40th Texas Geometry and Topology Conference, University of Texas, Austin, TA. October 2008.

Colloquium, Peking University, China. June 2008.

Knots in Washington XXVI, Washington, DC. April 2008.

First Illinois-Indiana Symplectic Geometry Conference, Indianapolis, IN. March 2008.

Colloquium, University of Minnesota, Twin Cities, MN. September 2007.

Georgia Topology Conference, Athens, GA. May 2007.

Plenary talk, The Third East Asian School of Knots, Links and Related Topics, Osaka, Japan. February 2007.



Special Session on Recent Developments in Floer Homology, 113th Annual Meeting of the American Mathematical Society, New Orleans, LA. January 2007.

Invited lectures, International Summer school in geometric topology, Dalian, China. July 2006.

Special Session on Symplectic and Contact Topology, the American Mathematical Society 2006 Spring Eastern Section Meeting, Durham, NH. April 2006.

NSF FRG workshop on Holomorphic Curves in Low Dimensional Topology, Pajaro Dunes, CA. November 2005.

The Second East Asian School of Knots, Links and Related Topics, Dalian, China. August 2005.

Colloquium, Peking University, China. May 2005.

## Seminar talks

Topology Seminar, East China Normal University, Shanghai, China. August 2023.

Online Topology Seminar, Shanghai Jiaotong University, Shanghai, China. September 2022.

Online Topology Seminar, East China Normal University, Shanghai, China. November 2021.

Online Topology Seminar, University of Southern California. October 2021.

Online Algebra-Topology Seminar, University of Alabama. September 2021.

Online Topology Seminar, Princeton University. February 2021.

Online Geometry and Topology Seminar, CIRGET, Université du Québec à Montréal. October 2020.

Online Topology Seminar, Stanford University. September 2020.

Online Topology Seminar, Massachusetts Institute of Technology. September 2020.

Online Topology Seminar, Michigan State University. September 2020.

Online Topology Seminar, East China Normal University, Shanghai, China. June 2020.

Gauge Theory and Topology seminar, Harvard University. September 2019.

Topology Seminar, Peking University, Beijing, China. December 2018.

Geometry and Topology Seminar, University of California, Irvine. October 2017.

Topology Seminar, Peking University, Beijing, China. June 2017.

Topology Seminar, Chinese University of Hong Kong, Hong Kong, China. October 2013.

Topology Seminar, Boston College, Boston, MA. November 2012.

Topology Seminar, Fudan University, Shanghai, China. September 2012.  
 Topology Seminar, Peking University, Beijing, China. August 2012.  
 Geometry Seminar, University of California, Irvine. May 2012.  
 Topology Seminar, East China Normal University, Shanghai, China. December 2011.  
 Differential Geometry Seminar, University of Sydney. July 2011.  
 Topology Seminar, Princeton University. May 2011.  
 Topology Seminar, Stony Brook University, NY. April 2011.  
 Topology-Geometry Seminar, Rutgers University, New Brunswick, NJ. March 2010.  
 Research Seminar, MSRI, Berkeley, CA. February 2010.  
 Physics and Geometry Seminar, California Institute of Technology, Pasadena, CA.  
 October 2009.  
 Claremont Topology Seminar, Pomona College. October 2009.  
 Joint LA Topology Seminar, University of California, Los Angeles. October 2009.  
 Gauge Theory and Topology seminar, Harvard University. March 2009.  
 3- and 4- Manifold Seminar, Michigan State University. November 2008.  
 Geometry seminar and Topology seminar, University of Michigan, Ann Arbor. September  
 and October 2008.  
 Geometry and Topology seminar, Boston College. September 2008.  
 Geometric Topology seminar, Columbia University. February 2008.  
 Topology seminar, Rice University. November 2007.  
 Topology seminar, University of Michigan, Ann Arbor. November 2007.  
 Gauge Theory and Topology seminar, Harvard University. April 2007.  
 Topology seminar, State University of New York, Buffalo. November 2006.  
 Topology/Geometry seminar, Rutgers University, New Brunswick. October 2006.  
 Topology seminar, University of California, Riverside. October 2006.  
 Geometry and Topology seminar, California Institute of Technology. October 2006.  
 Gauge theory/Symplectic geometry seminar, Columbia University. September 2006.  
 Topology seminar, Princeton University. September 2006.  
 Topology seminar, Peking University, China. June 2006.  
 Séminaire de géométrie et topologie, CIRGET, Université du Québec à Montréal,  
 Canada. March 2006.  
 Topology seminar, George Washington University. November 2005.  
 Geometric Topology seminar, Columbia University. October 2005.  
 Topology seminar, Center of Mathematical Sciences, Zhejiang University, China. July  
 2005.

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## Other relevant activities

Organizer/co-organizer,

Caltech Geometry and Topology seminar, Joint LA Topology seminar, the  $N + 7$ th,  $N + 8$ th,  $N + 10$ th,  $N + 11$ th Southern California Topology Colloquium (SCTC).

Technician,

Geometry and the Imagination, a conference in honor of Bill Thurston's 60th Birthday, June 7–11, 2007.

Graduate Admission Committee member, Department of Mathematics, Caltech (2012–2014, 2017–now) Student Prize Committee member, Department of Mathematics, Caltech (2016–now) Postdoc Hiring Committee member, Department of Mathematics, Caltech (2016–now)

NSF review panelist, NSF CAREER panelist.

Referee for

Advances in Mathematics, Advances in Mathematics (China), Algebraic and Geometric Topology, Annals of Mathematics, Communications in Contemporary Mathematics, Compositio Mathematica, Forum of Mathematics, Sigma, Geometry and Topology, Geometry and Topology Monographs, Illinois Journal of Mathematics, International Mathematics Research Notices, Journal of Topology, Mathematical Research Letters, Proceedings of the American Mathematical Society, SCIENCE CHINA Mathematics, Topology and its Applications, Transactions of the American Mathematical Society