

Qayum Khan, PhD
Remote Scholar (2018–now)
Department of Mathematics
Indiana University Bloomington

Thu 30 Nov 2023
Citizenship: U.S.A.
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QAYUM @ UCHICAGO . EDU

PROFESSIONAL STATEMENT

I conduct independent, fundamental research. (Geometric Topology of Manifolds of Dimension ≥ 4)

COMPETITIVE FUNDING

- **Workshop Grant** (\$15,000) 2013–2014
National Science Foundation (PI, [DMS-1303399](#)) *site: Indiana University*
- **Individual Research Grant** (\$103,460) 2009–2012
National Science Foundation (PI, [DMS-0904276](#)) *site: University of Notre Dame*
- **Workshop Grant** (\$10,000) 2007–2008
National Science Foundation (co-PI, [DMS-0715422](#)) *site: Vanderbilt University*

ACADEMIC APPOINTMENTS

- **Assistant Professor** (tenure-track; [closed due to financial exigency](#)) 2014–2019
Saint Louis University (MA & PhD Graduate Faculty: 2014–2019) St Louis MISSOURI
- **Visiting Assistant Professor** 2012–2014
Indiana University (Visiting Scholar: 2018–now) Bloomington INDIANA
- **Research Assistant Professor** 2009–2012
University of Notre Dame (*HJ Kenna Instructor*: 2009–2011) Notre Dame INDIANA
- **Assistant Professor** (term) 2006–2009
Vanderbilt University Nashville TENNESSEE

EDUCATION

- **Doctor of Philosophy in Pure Mathematics** 2006
Dissertation: *On connected sums of real projective spaces* thesis advisor: [James F Davis](#)
Indiana University Bloomington INDIANA
- **Master of Science×3 in Financial Math | Statistics | Pure Math** 2023 | 2022 | 1999
The University of Chicago | *University of Illinois at Chicago* | *UIC* Chicago ILLINOIS
- **Bachelor of Science in Mathematics** (highest distinction) 1998
University of Illinois at Chicago (major advisor: [Louis H Kauffman](#)) Chicago ILLINOIS
- **High School Diploma** (mathematics department award) 1995
Maine Township High School West Des Plaines ILLINOIS

ORIGINAL PUBLICATIONS

1. *Manifolds homotopy equivalent to $P^n \# P^n$* (with J Brookman and J F Davis)
Mathematische Annalen 338(4): 947–962, 2007
2. *On smoothable surgery for 4-manifolds*
Algebraic & Geometric Topology 7: 2117–2140, 2007
3. *On fibering and splitting of 5-manifolds over the circle*
Topology and its Applications 156(2): 284–299, 2008
4. *Reduction of UNil for finite groups with normal abelian Sylow 2-subgroup*
Journal of Pure and Applied Algebra 213(3): 279–298, 2009
5. *Calculation of UNil for the cyclic group of order two*
Forum Mathematicum 22(2): 221–239, 2010
6. *Dihedral manifold approximate fibrations over the circle* (with C B Hughes)
Geometriae Dedicata 148(1): 205–243, 2010
7. *Algebraic K-theory over the infinite dihedral group: an algebraic approach* . . (J F Davis, A Ranicki)
Algebraic & Geometric Topology 11(4): 2391–2436, 2011
8. *Homotopy invariance of 4-manifold decompositions: connected sums*
Topology and its Applications 159(16): 3432–3444, 2012
9. *Topological rigidity and H_1 -negative involutions on tori* (with F Connolly and J F Davis)
Geometry & Topology 18(3): 1719–1768, 2014
10. *Topological rigidity and actions on contractible manifolds with discrete singular set* (Connolly, Davis)
Transactions of the American Mathematical Society B2: 113–133, 2015
11. *Cancellation for 4-manifolds with virtually abelian fundamental group*
Topology and its Applications 220: 14–30, 2017
12. *Free transformations of $S^1 \times S^n$ of square-free odd period*
Indiana University Mathematics Journal 66(5): 1453–1482, 2017
13. *Countable approximation of topological G -manifolds: compact Lie groups G*
Topology and its Applications 235: 14–21, 2018
14. *Stable existence of incompressible 3-manifolds in 4-manifolds* (with G Smith)
Topology and its Applications 262: 50–63, 2019
15. *Countable approximation of topological G -manifolds, II: linear Lie groups G*
Journal of Topology and Analysis 14(2): 557–565, 2022
16. *Countable approximation of topological G -manifolds, III: arbitrary Lie groups G*
New York Journal of Mathematics 27: 1554–1579, 2021
17. *Cardinal-indexed classifying spaces for families of subgroups of any topological group*
Topology and its Applications 311: #107965, 2022

CONFERENCE PROCEEDINGS

- A. *The homotopy type of G/PL and the characteristic variety theorem* (with T Macko)
Oberwolfach Reports 3(3): 2212–2214, 2006
- B. *The Nil-Nil theorem in algebraic K -theory*
RIMS Kôkyûroku 1612: 99–100, 2008
- C. *Rigidity of pseudo-free group actions on contractible manifolds*
RIMS Kôkyûroku Bessatsu B39: 45–50, 2013

REFeree SERVICES (BOOKS, JOURNALS, REVIEWS)

- j **Algebraic & Geometric Topology** — *Mathematical Sciences Publishers* 2018, 2020
- b **Annals of Mathematical Studies** — *Princeton University Press* 2017–18
- j **Boletín de la Sociedad Matemática Mexicana** — *Springer* 2016
- j **Bulletin of the London Mathematical Society** — *London Mathematical Society* 2015
- j **Forum Mathematicum** — *De Gruyter* 2015
- j **Homology, Homotopy and Applications** — *International Press of Boston* 2014
- j **Journal of Topology** — *London Mathematical Society* 2008, 2018–19
- j **Journal of Topology and Analysis** — *World Scientific* 2009
- j **Kôkyûroku Bessatsu** — *Research Institute for Mathematical Sciences* 2012
- j **Mathematische Annalen** — *Springer* 2017
- r **MathSciNet** — *American Mathematical Society* 2010
- j **New York Journal of Mathematics** — nonprofit 2016
- j **Topology and its Applications** — *Elsevier* 2007, 2018, 2019
- r **zbMATH** — *Springer* 2018×2

ORGANIZER OF PROFESSIONAL MEETINGS

- *Summer School: [Surgery and the Classification of Manifolds](#)* 18–22 July 2016
 University of Calgary (with D Crowley, JF Davis, G Yu; locally D Stanley, K Bauer) Calgary CANADA
- *Seminar: [Topology-Geometry Research & Learning](#)* weekly 2015–2019
 Saint Louis University St Louis MISSOURI
- *Conference: [High Dimensional Topology](#)* 08–09 December 2012
 University of Notre Dame (with JF Davis) Notre Dame INDIANA
- *Seminar: [Topology Research](#)* weekly 2010–2012
 University of Notre Dame Notre Dame INDIANA
- *Conference: [Nil Phenomena in Topology](#)* 14–15 April 2007
 Vanderbilt University (with CB Hughes) Nashville TENNESSEE

SERVICE ON CAMPUS @ SAINT LOUIS U

- *Reviewer, University* - **Beaumont Faculty Development Fund** 15A
- *Member, College* - **Board of Graduate Education** 14C, 17—19:C*-A*
- *Member, Department* - **Graduate Programs & Admissions** 14—19:C-A
- *Member, Department* - **Colloquium Committee** 17—19:C-A
- *Organizer, Department* - **Awards & Scholarships Ceremony** 15—18:A

- *Co-examiner, Department, Doctoral* - **Dissertation Defense** manifold topology
Gerrit Smith (17A*)
- *Co-examiner, Department, Doctoral* - **Candidacy Qualifier** manifold topology
Seth Arnold (18A*), Sean Corrigan (15C), Gerrit Smith (15C*)
- *Examiner, Department, Doctoral* - **Translate Research Excerpt** french → english
Seth Arnold (17A), Gerrit Smith (16A)

MENTOR TO INDIVIDUALS @ SAINT LOUIS U

- *Advisor, Graduate, PhD Mathematics* - [Seth Arnold](#) (20C: extension year under Prof J Kalliongis), [Gerrit Smith](#) (17A)
- *Mentor, First-Year Graduate* - Aruna Bandara (to 19A), Arnab Dey-Sarkar (to 19A)
- *Advisor, Major, BS Mathematics* - Lingwei Zeng (to 19A)
- *Advisor, Major, BA Mathematics* - Nicholas Koutas (18A)
- *Advisor, Major, BA Math Teacher* - Sadita Salihovic (18A)
- *Advisor, Major, BA Applied Math* - Michael Skaer (18A), Prerak Trivedi (18A)
- *Advisor, Minor, Mathematics* - Julia Geraghty (18A), Gabriel Horas (19A), James Griffard (16C)
- *Advisor, Minor, Actuarial Math* - Michael Skaer (18A)
- *Advisor, Minor, Engineering Math* - Olivia Smithhisler (to 19A)
Roberto Ayuso-de-Andrés (17A), Theresa McGrath (16A), Kevin Stapleton (18A), Dzhuliya Vasileva (17A), Zeheng Wu (15A)

TEACHING EXPERIENCE @ SAINT LOUIS U

- *Instructor, Doctoral, Reading+Seminar* - **Exotic Spheres** [Kervaire–Milnor 1963] 16A
- *Instructor, Doctoral, Reading+Seminar* - **Homology** → **Submanifolds** [Thom II 1954] 16C
- *Instructor, Doctoral, Reading* - **Characteristic Classes** [Milnor–Stasheff 1974] 15A / 17C
- *Instructor, Masters* - **General Topology II** [Munkres 2000] 17A
- *Instructor, Masters* - **General Topology I** [Munkres 2000] 16C
- *Instructor, Upper* - **Differential Equations** [Boyce–diPrima–Meade 2017] 17C / 18A
- *Instructor, Lower* - **Principles of Mathematics** [Chartrand–Polimeni–Zhang 2012] 14C
- *Instructor, Lower* - **Calculus II** [Hughes-Hallett⁺ 2017] 15AC / 16AC / 17A / 18A
- *Instructor, Lower* - **Calculus I** [Hughes-Hallett⁺ 2017] 14C / 17C

* = committee chairperson; SEMESTER CODES: 15A = 2015 Spring, 98B = 1998 Summer, 00C = 2000 Fall

TEACHING EXPERIENCE @ U NOTRE DAME

- *Instructor, Upper* - **Introduction to Topology** 12A
- *Instructor, Upper* - **Differential Equations II** 10C / 11C
- *Instructor, Lower* - **Linear Algebra & Differential Equations I** 11A
- *Instructor, Lower* - **Accelerated Calculus II** 10AC
- *Instructor, Lower* - **Accelerated Calculus I** 09C
- *Instructor, Lower* - **Elements of Calculus II** 11C

TEACHING EXPERIENCE @ VANDERBILT U

- *Instructor, Upper* - **Differential Equations I** 08A
- *Assistant, Upper* - **Multivariate Calculus & Linear Algebra II** 09A
- *Instructor, Lower* - **Accelerated Calculus III** 07C
- *Assistant, Lower* - **Accelerated Calculus I** 08C
- *Instructor, Lower* - **Calculus III** 07A
- *Instructor, Lower* - **Calculus II** 07A
- *Instructor, Lower* - **Calculus I** 06C / 07C
- *Instructor, Lower* - **Fundamentals of Probability & Statistics** 09A

TEACHING EXPERIENCE @ INDIANA U

- *Grader, Masters* - **General Topology II** 04A
- *Grader, Masters* - **General Topology I** 03C
- *Assistant, Upper* - **Intuitive Topology** 03A
- *Instructor, Upper* - **Differential Equations I** 14A
- *Assistant, Upper* - **Honors Calculus III** 02C
- *Assistant, Lower* - **Honors Calculus II** 02C
- *Instructor, Lower* - **Calculus II** 13ABC
- *Instructor, Lower* - **Brief Survey of Calculus II** 12C
- *Grader, Lower* - **Brief Survey of Calculus I** 03C / 04A
- *Instructor, Lower* - **Precalculus with Trigonometry** 05C / 06A
- *Instructor, Lower* - **Precalculus** 04C

TEACHING EXPERIENCE @ U ILLINOIS CHICAGO

- *Assistant, Lower* - **Calculus II** 00ABC / 02A
- *Assistant, Lower* - **Business Calculus II** 01C
- *Assistant, Lower* - **Business Calculus I** 01A
- *Assistant, Lower* - **Precalculus** 99AC
- *Assistant, Lower* - **Intermediate Algebra** 98C

INVITED RESEARCH PRESENTATIONS

• Stable existence of incompressible 3-manifolds in 4-manifolds

- Conference: *Topology of Manifolds: Interactions between High and Low Dimensions* 16 January 2019
MATRIX International Mathematical Research Institute Creswick AUSTRALIA
- Topology Seminar (*1st video* & *2nd video* & *3rd video*) 09 March 2016 & 17 October 2016 & 15 March 2017
National Academy of Sciences Kiev UKRAINE
- Topology Seminar 23 February 2017
Ohio State University Columbus OHIO
- Topology Seminar 24 March 2016
Indiana University Bloomington INDIANA

• Countable approximation of topological G -manifolds

- Workshop in Geometric Topology 30 May 2019
University of Wisconsin Milwaukee WISCONSIN
- Noncommutative Geometry Festival: NCG and Representation Theory 01 May 2019
Washington University Saint Louis MISSOURI
- Spring Topology & Dynamics Conference: Geometric Topology 16 March 2019
University of Alabama Birmingham ALABAMA

• The Nil-Nil theorem in algebraic K -theory

- Topology Seminar (*video*) 09 January 2017
National Academy of Sciences Kiev UKRAINE
- Topology Seminar 29 September 2009
University of Notre Dame Notre Dame INDIANA
- Topology Seminar 29 April 2009
Miami University Oxford OHIO
- Topology & Group Theory Seminar 15 October 2008
Vanderbilt University Nashville TENNESSEE
- Oberseminar Topologie 01 July 2008
Universität Bonn Bonn GERMANY
- Topologiseminar 13 June 2008
Universitetet i Oslo Oslo NORWAY
- Conference: *Transformation Groups and Related Topics* 21 May 2008
Research Institute for Mathematical Sciences Kyoto JAPAN
- Graduate Seminar 16 May 2008
Okayama University of Science Okayama JAPAN
- AMS Central Meeting: Algebraic K -theory and Nil-groups 05 April 2008
Indiana University Bloomington INDIANA
- AMS Eastern Meeting: Geometric Topology 15 March 2008
Courant Institute of Mathematical Sciences Manhattan NEW YORK
- Topology Seminar 04 March 2008
The Ohio State University Columbus OHIO

• Cancellation for 4-manifolds with virtually abelian fundamental group

- Topology Seminar (*video*) 06 July 2016
National Academy of Sciences Kiev UKRAINE
- Topology Seminar (*the virtually cyclic case*) 10 November 2004
Indiana University Bloomington INDIANA

• Rigidity of pseudo-free group actions on contractible manifolds

- Topology Seminar (*video*) 23 December 2015
National Academy of Sciences Kiev UKRAINE
- Conference: *High Dimensional Topology* 09 December 2012
University of Notre Dame Notre Dame INDIANA
- AMS Central Meeting: Interactions between Geometry and Topology 20 October 2012
University of Akron Akron OHIO

- *Midwest Topology Seminar* 28 April 2012
Purdue University West Lafayette INDIANA
- *Topology Seminar* 10 April 2012
University of Illinois Urbana ILLINOIS
- *Spring Topology & Dynamics Conference: Geometric Topology* 22 March 2012
Universidad Nacional Autónoma de México Mexico City MEXICO
- *AMS Western Meeting: Transformation Groups in Topology* 03 March 2012
University of Hawai'i Honolulu HAWAII
- *Conference: Transformation Groups and Combinatorics* 15 June 2011
Research Institute for Mathematical Sciences Kyoto JAPAN
- *Oberseminar Topologie (and Graduate Preseminar)* 24 May 2011
Universität Bonn Bonn GERMANY
- *Conference: New Directions in Algebraic K-theory* 17 May 2011
Mathematisches Forschungsinstitut Oberwolfach Oberwolfach GERMANY
- *Conference: Classifying Spaces for Families of Subgroups* 04 December 2010
The Ohio State University Columbus OHIO
- *Topology Seminar* 21 October 2010
Indiana University Bloomington INDIANA
- *Conference: Transformation Groups and Surgery Theory* 01–02 September 2010
Research Institute for Mathematical Sciences Kyoto JAPAN
- *Topology Seminar* 11 May 2010
The Ohio State University Columbus OHIO
- *Topology Seminar* 04 May 2010
University of Notre Dame Notre Dame INDIANA

• **Free transformations of $S^1 \times S^n$ of prime period**

- *Topology Seminar (video)* 18 December 2015
National Academy of Sciences Kiev UKRAINE
- *Conference: Geometric Topology* 25 June 2015
Texas Christian University Fort Worth TEXAS
- *Conference: New Topics on Transformation Groups* 26 May 2015
Research Institute for Mathematical Sciences Kyoto JAPAN
- *Spring Topology & Dynamics Conference: Geometric Topology* 16 May 2015
Bowling Green State University Bowling Green OHIO
- *Topology Seminar* 24 & 28 October 2014
Saint Louis University St Louis MISSOURI
- *Oberseminar Topologie* 01 July 2014
Universität Bonn Bonn GERMANY
- *Topology Seminar* 22 April 2014
Indiana University Bloomington INDIANA
- *AMS Southeastern Meeting: Geometric Topology* 22 March 2014
University of Tennessee Knoxville TENNESSEE

• **Involutions on tori with isolated fixed points**

- *Departmental Colloquium* 14 February 2014
Saint Louis University St Louis MISSOURI
- *Departmental Colloquium* 11 February 2014
Ball State University Muncie INDIANA
- *Departmental Colloquium* 05 February 2014
George Mason University Fairfax VIRGINIA
- *Departmental Colloquium* 03 December 2012
Binghamton University (SUNY) Vestal NEW YORK
- *Departmental Colloquium* 20 November 2012
Miami University Oxford OHIO
- *Departmental Colloquium* 15 November 2012
New Mexico State University Las Cruces NEW MEXICO
- *Departmental Colloquium* 03 May 2012
Hunter College (CUNY) Manhattan NEW YORK
- *Departmental Colloquium* 06 April 2012
Bowling Green State University Bowling Green OHIO
- *Departmental Colloquium* 14 February 2011
University of Hawai'i Honolulu HAWAII

- **Rigidity for connected sums of certain 4-manifolds**

- *Topology Seminar* 14 November 2012
New Mexico State University Las Cruces NEW MEXICO
- *Conference: [Geometry and Topology in Samos](#)* 12 June 2012
University of the Aegean Karlovasi GREECE
- *AMS Southeastern Meeting: Geometric Aspects of Algebraic Topology* 27 March 2010
University of Kentucky Lexington KENTUCKY
- *Topology Seminar* 23 February 2010
University of Illinois Urbana ILLINOIS
- *Trimester Program: [Rigidity](#)* 22 October 2009
Hausdorff Research Institute for Mathematics Bonn GERMANY

- **Dihedral manifold approximate fibrations over the circle**

- *Topology Seminar* 15 May 2009
Okayama University Okayama JAPAN
- *Graduate Seminar* 14–15 May 2009
Okayama University of Science Okayama JAPAN
- *Topology & Group Theory Seminar* 18 February 2009
Vanderbilt University Nashville TENNESSEE

- **Splitting and fibering 5-manifolds over the circle**

- *Topology & Group Theory Seminar* 19 September 2007
Vanderbilt University Nashville TENNESSEE
- *Conference: [Topological and Geometric Rigidity](#)* 02 August 2007
Banff International Research Station Banff CANADA

- **On the calculation of UNil for finite groups**

- *Conference: [Geometry, Topology and Their Interactions](#)* 08 January 2007
Universidad Nacional Autónoma de México Morelia MEXICO
- *Topology Seminar* 27 October 2005
Miami University Oxford OHIO
- *Topology Seminar* 25 October 2005
Indiana University Bloomington INDIANA

- **Manifolds homotopy equivalent to $\mathbb{RP}^n \# \mathbb{RP}^n$** (Part 2: Jeremy Brookman)
Conference: [Algebraic K- and L-theory of Infinite Groups](#) 01 July 2005
International Centre for Mathematical Sciences Edinburgh SCOTLAND

EXPOSITORY TALKS

- **Compact Hausdorff groups are pro-Lie**
Topology-Geometry Seminar 25 September 2018 & 02 October 2018
Saint Louis University St Louis MISSOURI

- **Metric spaces are paracompact: Mary Ellen Rudin's short proof**
Topology-Geometry Seminar 04 September 2018
Saint Louis University St Louis MISSOURI

- **Classical introduction to K -theory**
Topology Seminar (video) 29–30 December 2016
National Academy of Science Kiev UKRAINE

- **Lectures 02 — 07 — 08 — 11**
Summer School: Surgery and the Classification of Manifolds 18–20 July 2016
University of Calgary Calgary CANADA

- **Finiteness of the stable homotopy groups of spheres**
Exotic Spheres Seminar 25 February 2016 & 03 March 2016
Saint Louis University St Louis MISSOURI

- **Gromov's link criterion and Wise's example**
Cube Complexes Seminar 02 April 2013
Indiana University Bloomington INDIANA

- **Calculation with the p -chain spectral sequence**
Topology & Group Theory Seminar 10 October 2007
Vanderbilt University Nashville TENNESSEE

- **Splitting homotopy equivalences between manifolds**
Topology & Group Theory Seminar 30 August 2006 & 06 September 2006
Vanderbilt University Nashville TENNESSEE

- **Homotopy type of G/PL and characteristic variety theorem** (Part 1: Tibor Macko)
Conference: The Hauptvermutung for High-Dimensional Manifolds 16 August 2006
Mathematisches Forschungsinstitut Oberwolfach Oberwolfach GERMANY

- **Controlled topology** (Part 2: Michael Weiss)
Winter School: The MIT Talbot Workshop 01 March 2006
Massachusetts Institute of Technology North Conway NEW HAMPSHIRE

AFFILIATIONS & HONORS

- American Mathematical Society (member) 1998–now
- USA Junior Oberwolfach Fellow (supported by National Science Foundation) . . . 2006, 2009, 2015
- Slavic National Honor Society (*Dobro Slovo* — college-level russian language) 2018–life
- American Mensa IQ society (member, affiliated to [Chicago-area chapter](#)) 2019–life
- Chicago Language Café (north-city meetup for foreign-language conversation) 2019–2020
- National Language Service Corps (member for russian @ 2021 OPI = 1+) 2020–life

CURRENT LANGUAGE SKILLS

- **Human** : hindi (listen), english (native), spanish (semifluent), french (so-so), russian (nearly fluent), ukrainian (beginner via Duolingo 2022, but had visited repeatedly across prewar Ukraine)
- **Computer** : sufficient in Assembly, Basic, C; was paid for Java (of first 1000 professionals); scripted languages — sufficient in text-layout languages HTML and LaTeX, as well as JavaScript;

sufficient in R and SAS — used for coursework in applied statistics

advanced in Python & SQL & C++ — includes application to *Data Science*: an emergent research field combining bayesian statistics, high-dim euclidean geometry, & large-data computing. International Competitions — hackerrank.com/qayum_khan.usa — kaggle.com/qayumkhan

REFERENCE LETTER WRITERS

- [Russell Blyth](#), Professor semi-flipped teaching mentor
Department of Mathematics & Statistics, Saint Louis University St Louis MISSOURI
- [Sylvain E Cappell](#), J Silver Professor
Courant Institute of Mathematical Sciences, New York University Manhattan NEW YORK
- [Francis X Connolly](#), Professor Emeritus second post-doctoral mentor
Department of Mathematics, University of Notre Dame du Lac Notre Dame INDIANA
- [James F Davis](#), Professor doctoral advisor
Department of Mathematics, Indiana University Bloomington INDIANA
- [Kyunghee Han](#), Assistant Professor of Theoretical Statistics 2021–2022 masters advisor
Department of Math/Stat/MCS, University of Illinois at Chicago Chicago ILLINOIS
- [C Bruce Hughes](#), Professor Emeritus first post-doctoral mentor
Department of Mathematics, Vanderbilt University Nashville TENNESSEE
- [Shmuel Weinberger](#), A MacLeish Professor
Department of Mathematics, The University of Chicago Hyde Park ILLINOIS