Kai Xu[1]

Contact: kaixu@ias.edu
Website: kaixu631.github.io

Current position

Postdoctoral member, IAS Princeton, Sep 2026 – Aug 2028
Supervisor: Aaron Naber

Past positions

Charles B. Morrey, Jr. Math Fellow, UC Berkeley, Jul 2025 – Jun 2026
Supervisor: Richard Bamler

Education

Ph.D. in Mathematics, Duke University, Aug 2020 – May 2025
Thesis: "The weak inverse mean curvature flow: existence theories and applications"
Advisor: Hubert Bray

B.S. in Mathematics, Peking University, Sep 2016 – Jul 2020
Thesis: "Domination relations in four-dimensional geometries"
Supervisor: Yi Liu

Publications and preprints

1. *Infinity-harmonic functions and inverse mean curvature flow clusters*
   Preprint (2026), arxiv:2607.06698, submitted.
2. *Proper solutions of the 1/H-flow and the Green kernel of the p-Laplacian*
   Joint with L. Benatti, L. Mari, M. Rigoli, A. Setti, arxiv:2512.14591, **Ann. Inst. H. Poincaré C Anal. Non Linéaire**, to appear.
3. *Connected sum of manifolds with spectral Ricci lower bounds*
   Joint with G. Antonelli, arxiv:2505.18320, **Proc. Amer. Math. Soc.**, to appear.
4. *3-Manifolds with positive scalar curvature and bounded geometry*
   Joint with O. Chodosh, Y. Lai, **Comm. Pure Appl. Math.** 79 (2026), no. 5, 1299–1314.
5. *Codimension 2 drawstrings with scalar curvature lower bounds*
   Joint with D. Kazaras, preprint (2025), arxiv:2501.09149, submitted.
6. *A sharp spectral splitting theorem*
   Joint with G. Antonelli, M. Pozzetta, preprint (2024), arxiv:2412.12707, submitted.

[1] Last update: 2026.10.25

7. *Inverse mean curvature flow with outer obstacle*
   Geom. Topol. 30 (2026), 3069-3144.
8. *New spectral Bishop-Gromov and Bonnet-Myers theorems and applications to isoperimetry*
   Joint with G. Antonelli, arxiv:2405.08918, **J. Eur. Math. Soc.**, to appear.
9. *Scalar curvature and volume entropy of hyperbolic 3-manifolds*
   Joint with D. Kazaras, A. Song, arxiv:2312.00138, **J. Eur. Math. Soc.**, to appear.
10. *Drawstrings and flexibility in the Geroch conjecture*
    Joint with D. Kazaras, arxiv:2309.03756, **J. Differential Geom.**, to appear.
11. *A topological gap theorem for the π2-systole of positive scalar curvature 3-manifolds*
    Duke Math. J. 174 (2025), No. 8, 1647-1664.
12. *Isoperimetry and the properness of weak inverse mean curvature flow*
    Calc. Var. Partial Differential Equations 63, 216 (2024).
13. *Dimension constraints in some problems involving intermediate curvature*
    Trans. Amer. Math. Soc. 378 (2025), 2091-2112.
14. *On closed surfaces with nonnegative curvature in the spectral sense*
    J. Geom. Anal. 36 (11), paper No. 379.

Invited talks

1. Dec 2026: Geometric analysis seminar, University of Maryland.
2. Nov 2026: Geometric analysis seminar, Rutgers University.
3. Nov 2026: Virtual analysis and PDE seminar (online).
4. Oct 2026: Geometric analysis seminar, Yale University.
5. Oct 2026: Geometric analysis seminar, CUNY.
6. Oct 2026: Fields Institute Geometric Analysis Colloquium.
7. Sep 2026: Geometric analysis and topology seminar, Courant Institute.
8. Aug 2026: International Conference on Basic Science.
9. Jul 2026: Peking-Westlake geometry analysis seminar (online).
10. Jun 2026: Tsinghua Geometry and Analysis Conference.
11. Apr 2026: Geometric Analysis Seminar, University of Notre Dame.
12. Apr 2026: Soul and shape: metric structures and geometric analysis, University of Oklahoma.
13. Mar 2026: Geometry Seminar, Stanford University.
14. Dec 2025: Department colloquium, Caltech.
15. Nov 2025: Mathematical Physics Seminar, UC Davis.
16. Nov 2025: Geometry and Analysis Seminar, UC Santa Cruz.
17. Jul 2025: Convergence or Scalar Curvature workshop (online).
18. May 2025: Geometric analysis seminar, National Center for Theoretical Sciences.
19. May 2025: Simons Workshop on Geometric Analysis, New York University / Courant Institute.
20. Apr 2025: Geometry-Topology seminar, University of Pennsylvania.
21. Apr 2025: Geometry seminar, Lehigh University.
22. Feb 2025: Differential geometry seminar, UC Irvine.
23. Feb 2025: Differential geometry seminar, UC Berkeley.
24. Nov 2024: Graduate student seminar, SLMath.

25. Oct 2024: Analysis seminar, Cornell University.
26. Apr 2024: Geometric analysis seminar, Peking University / BICMR (online).
27. Apr 2024: Geometry seminar, Michigan State University.
28. Mar 2024: Geometric analysis and topology seminar, New York University / Courant Institute.
29. Mar 2024: Geometry seminar, Chinese University of Hong Kong.
30. Feb 2024: BIRS workshop "Recent advances in comparison geometry", IASM Hangzhou, China.
31. Nov 2023: Geometry and topology seminar, Duke University.
32. Oct 2023: Geometric analysis seminar, University of Chicago.
33. Oct 2023: Geometry seminar, Westlake University (online).
34. Oct 2023: Geometry seminar, Stanford University.
35. Jul 2023: CUHK-CUNY Compactness and scalar curvature workshop (online).
36. Oct 2022: Geometry seminar, North Carolina State University.

Teaching

UC Berkeley:

Fall 2025: Math 104 (real analysis), section 009.

Spring 2026: Math 185 (complex analysis), sections 003, 006.

Duke University:

Spring 2025: Math 421 (differential geometry) & 621 (graduate differential geometry), grading.

Fall 2024: Math 333 (complex analysis) & 611 (algebraic topology), grading.

Summer 2024: Math 353 (ordinary and partial differential equations), TA.

Spring 2024: Math 218D (linear algebra), discussion leader.

Fall 2023: Math 111L (calculus), lab TA.

Summer 2023: Math 353 (ordinary and partial differential equations), TA.

Spring 2023: Math 111L (calculus), lab TA.

Fall 2022: Math 553 (asymptotic and perturbation methods), 555 (ODE), grading.

Spring 2022: Math 621 (differential geometry) & 411 (topology), grading.

Fall 2021: Math 111L (calculus), lab TA.

Service

Summer 2022: DoMath program at Duke, project manager.

Awards and Fellowships

Aug 2026: Frontiers of Science Award, International Congress of Basic Science, Beijing.

May 2025: Ridin Prize for outstanding Ph.D. dissertation, Duke University.

Oct 2019: Yizheng Alumnus Scholarship, Peking University.

Jun 2019: Scholarship in the Elite Education Program of Pure Mathematics, Peking University.