Curriculum Vitae

Xiaoxiang Chai

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Address: KIAS, 85 Hoegiro, Dongdaemun-gu, Seoul 02455, South Korea

Education

2015 - July 2018, PhD in Mathematics, Department of Mathematics

The Chinese University of Hong Kong, Hong Kong

Advisor: Prof. Martin Man-chun Li; Co-advisor: Prof. Luen-fai Tam

Thesis title: *Some aspects of the minimal surface theory*

2012 - 2015, Master of Science (advisor: Prof. Jiaxin Hu)

Tsinghua University, Beijing, China

Master Thesis title: *First Eigenvalue Problem of Dirichlet forms*

2008 - 2012, Bachelor of Science, Sun Yat-sen University, Guangzhou, China

Work Experience

Mar 2019 - Now, Research fellow at Korea Institute for Advanced Study

Host: Mar 2019 - Feb 2020, Prof. Choe Jaigyoung

Feb 2020 - now, host Prof. Inkang Kim

Research Interests

Minimal surfaces

- Min-max methods, free boundary minimal surface;

- Geometric measure theory, mean curvature flow etc.

Relativity and related geometry

- Positive mass theorem, geometry of scalar curvature.

Publications

1. Willmore type inequality using monotonicity formulas. Pacific Journal of Mathematics **307** (1), 53-62, (2020). arXiv: 1811.05617v2.

2. Evaluation of the mass of an asymptotically hyperbolic manifold. The Journal of Geometric Analysis **32** (7), 1-18, (2022). arXiv: 1811.09778.

3. (with Inkang Kim) Scalar curvature, mean curvature and harmonic maps to the circle. Annals of Global Analysis and Geometry, **62**, 201–219 (2022). arXiv: 2103.09737.

Preprints

1. (with Martin Li) A mixed boundary value problem for Jang's equation and the existence of free boundary marginally outer trapped surfaces. 2019-2022. Available at https://chxiaoxn.github.io/fb-mots.pdf

2. A tilted spacetime positive mass theorem. 2022. Available at https://chxiaoxn.github.io/tilt-spacetime-positive-mass-theorem.pdf

3. (with *Gaoming Wang*) Dihedral rigidity in hyperbolic 3-space. arXiv:2208.03859. (This paper contains a previous result *Mass and polyhedra in asymptotically hyperbolic manifolds* arXiv:2102.10715)

4. (with *Xueyuan Wan*) Band width estimates of CMC initial data sets arXiv: 2206.02624. (This supersedes previous papers 2107.12782, 2107.12784)

5. (with *Xueyuan Wan*) The mass of an asymptotically hyperbolic end and distance estimates. arXiv: 2207.06141.

6. A curvature estimate for stable marginally outer trapped hypersurface with a free boundary. arXiv: 2205.05890.

7. Inverse mean curvature flow with a free boundary in hyperbolic space. arXiv: 2203.08467.

8. Asymptotically hyperbolic manifold with a horospherical boundary. arXiv: 2102.08889.

9. Minkowski formula of conformal Killing-Yano 2-forms. arXiv: 2101.08966.

10. Positive mass theorem and free boundary minimal surfaces. arXiv: 1811.06254.

11. Two quasi-local masses evaluated on surfaces with boundary. arXiv: 1811.06168.

Academic activities

1. 22 Aug, 2022. Invited talk *Gromov dihedral rigidity in hyperbolic 3-space*. Department of mathematics, Peking University.

2. 10 June, 2022. Invited talk *Free boundary surface in scalar curvature geometry*. Department of Mathematics, Xiamen University.

3. Apr 14, 2022. Invited talk *Inverse mean curvature flow with a free boundary in hyperbolic space*. Department of Mathematics, Pusan National University, Busan, South Korea.

4. March 1-3, 2022. Invited talk *mixed boundary value problems in Gromov dihedral rigidity*. Conference of *Geometric analysis on manifolds, fractals and metric spaces*, Yamagata University, Japan.

5. April 14, 2021. *Harmonic maps on the cube to the circle and applications to the dihedral rigidity*. Duke University, USA.

6. Aug 13, 2020, invited talk *Free boundary MOTS: existence theory*. Nankai University.

7. Nov 8-11, 2019. Participation *of Geometric Analysis Seminar for Young Scholars*. Sun Yat-sen University.

8. Oct 22-24, 2019. Jeonbuk National University, Korea. Academic visit. Host: Prof. Hojoo Lee.

9. Sep 23-26, 2019, International Conference on Analysis and PDEs on Manifolds and Fractals, Nankai University. Invited talk on *Positive mass theorem and free boundary minimal surfaces*.

10. Jun 3, 2019. KIAS Three W Seminar on *Constructing a minimal surface in a sphere with an arbitrary metric*.

11. Sep 2018, Department of Mathematics, Fudan University, academic visit.

12. Sep 2018, Department of Mathematics, Nankai University, academic visit.

13. Aug 2018, Department of Mathematics, Peking University, invited talk on *Positive mass theorem and free boundary minimal surfaces*.

14. June, 2018, Department of Mathematics, Sun Yat-Sen University (Zhuhai Campus), invited talk on *Positive mass theorem and free boundary minimal surfaces*.

Teaching Assistant Duties

1. 2017 - 2018 Term 2, MATH1010I University Mathematics, CUHK.
2. 2017 - 2018 Term 1, MATH1010 University Mathematics, CUHK.
3. 2016 - 2017 Term 1, MATH1010 University Mathematics, CUHK.
4. 2015 - 2016 Term 1, MATH1510 Calculus for Engineers, CUHK.
5. 2015 - 2016 Term 1, MATH1020 General Mathematics, CUHK.
6. 2014 - 2015 Term 2, Complex function theory (10420252),Tsinghua University.
7. 2014 - 2015 Term 1, Methods of Mathematical Physics (10420262), Tsinghua University.
8. 2013 - 2014 Term 2, Linear Algebra (10421102), Tsinghua University.
9. 2013 - 2014 Term 1, Linear Algebra (10421113), Tsinghua University.
10. 2012 - 2013, Calculus A (10421065), Tsinghua University.

Awards

2014, Awards of Excellence, Department of Mathematics, Tsinghua University.