Fang-Rong ZHAN | Curriculum Vitae

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https://zhanfangrong.cn

Education

Department of Mathematics, Jinan University **Sep 2019-Jun 2023 (Expected)**
B.Sc. in Mathematics *Guangzhou, Guangdong, China*
GPA: 3.92 (rank 2/30)

Research Interests

Geometry and Topology, especially in low-dimensional topology

Research Experiences

Combinatorial Knot Theory **June — August 2022**
Advisor: Prof. Marion CAMPISI, San Jose State University

- Read C. A. Adams's *The Knot Book*. Studied ways to present knots and invariants of knots. Exposed to some special types of knots. Studied several papers involving the stick number of a knot. Prepared a presentation of the paper.
- Derived relationship between the stick number of a knot in cubic lattice and in simple hexagonal lattice with combinatorial approach.

The Equivariant Differential form of Equivariant Euler class **March 2022 — Present**
Advisor: Prof. Bai-Ling WANG, Australian National University

- Planed to write down equivariant Euler class in finite dimensional case and virtual Euler class in infinite dimensional case with equivariant differential forms.
- Currently reading Tu's *Introductory Lectures on Equivariant Cohomology* and Kai Cieliebak et al's *Equivariant moduli problems, branched manifolds, and the Euler class*,Topology 42 (2003) 641 –700.

Morse Theory and Its Applications **Jan — Dec 2021**
Advisor: Porf. Hai-Long HER, Jinan University

- Foster deeper knowledge towards algebraic topology and differential geometry.
- Studied how Morse functions relates to the topology of a manifold, as well as how to define Morse homology. Exposed to various application of Morse theory, including Bott's periodicity theorem.
- Summary published on https://zhanfangrong.cn/.

Summer School and Mini-Course

Introduction to K-theory and Index Theory **Nov 2022 — Present**
Jinan University

- Topological K-theory and Atiyah-Singer index theorem.

Summer School on Geometry and Topology **July 2022**
Sichuan University

- Topics on Algebraic Topology
  - Homology, cohomology, bundles and characteristic classes, K-theory.

Mini-Course on Gauge Theory **Dec 2021 — Jan 2022**
Jinan University

- Text: S. K. Donaldson et al's *The Geometry of 4-Manifold*.
- The differential geometry of principal bundles. Gauge transform. Yang-Mills connection.
- My note published on https://zhanfangrong.cn.

Summer School on Differential Geometry **Aug 2021**

Beijing International Center for Mathematical Research, Peking University

- Complex Geometry
  - Text: Ch.0-1 from Griffiths-Harris's *Principles of Algebraic Geometry*; R. O. Wells's *Differential Analysis on Complex Manifolds*.
  - Functions of serveral complex variables, sheaf theory & Čech cohomology, complex manifold, holomorphic line bundles, Kähler manifold, Hodge theory, Kodaira vanishing theorem.
  - Got full marks.
- Riemannian Geometry
  - Rauch comparision, manifolds with non-positive curvature, Toponogov comparison theorem, Bishop-Gromov Relative Volumn Comparison

Mini-Course on Symplectic Geometry **Dec 2020**

Jinan University

- Text: *Introduction to Symplectic Topology* by McDuff & Salamon.
- Symplectic linear space, symplectic manifold, Hamiltonian action, Arnold's conjecture, Floer homology.

Seminar and Reading Group

Teichmuller Theory **Fall 2022 — Present**

Sun Yat-Sen University

- Studied Beltrami differentials, Teichmuller's Uniqueness Theorem.

2D Yang-Mills Theory **Spring 2022**

Jinan University

- Advisor: Prof. Hai-Long HER.
- Read Atiyah-Bott's '82 paper *The Yang-Mills Equations over Riemann Surfaces* and gave talks.

Representation Theory **Spring 2021**

Sun Yat-Sen University

- Advisor: Prof. Chang-Zheng LI.
- Read Lec. 1-7 from *Representation Theory (GTM129)* by W. Fulton & J. Harris.
- Studied the representation of $\mathfrak{S}_d, \mathfrak{A}_d, \mathrm{GL}_2(\mathbb{F}_q)$.

Galois Theory **Fall 2020**

Jinan University

- Read Ch. 1-5 from *Fields and Galois Theory* by J. S. Milne.
- Exposed to Galois theory and the application towards the insolvability of high-degree polynomial.
- Organized by me and appeared as the key speaker.

Awards & Scholarship

2022.11: Jinan University Third Prize Scholarship, 800 RMB

2022.11: 2022 ACM International Collegiate Programming Contest, East-Asian Regional(Shenyang Site; JiNan Site), gold prizes

2021.11: The 13th Chinese Mathematics Competition(Guangdong), 3rd prize

2021.10: 2021 "LI Yu-Bei" Excellent Student Scholarship for Dept. of Math. of JNU, 3000 RMB

2021.06: 2021 Jinan University Programming Contest, 2nd prize

2021.05: 2021 ACM International Collegiate Programming Contest, East-Asian Regional(Yinchuan Site), bronze prize

2020.06: 2020 Jinan University Programming Contest, 1st place

Skills & Others

Programming: C++(Advanced), LaTeX(Proficient), Matlab(Proficient), Mathematica(Basic), LEAN(Beginner)

Language: Chinese(Mandarin, Teochew: Native; Cantonese: Basic), English(fluent), Japanese(Basic)