

Ye Ji

Mathematical Modelling & Isogeometric Analysis

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Research Profile

Mathematical modeler and numerical analyst specializing in **geometry-aware discretization** and **isogeometric analysis (IGA)**. My research develops **mathematically robust CAD-to-CAE frameworks** that ensure consistency between geometric representation, parameterization, discretization, and numerical analysis for complex physical and engineering systems. Key themes include **PDE-based parameterization**, **injectivity/regularity guarantees**, **multi-sided and multi-patch spline parameterizations**, and **fast solvers** (e.g., preconditioned Anderson acceleration). I am currently a reviewer for **Mathematical Reviews (AMS)**.

Research Highlights

- **Analysis-suitable parameterization for Isogeometric Analysis:** optimization-based and PDE-based volumetric constructions with parameterization quality control for complex domains.
- **Geometry-to-simulation pipelines:** boundary parameter matching (including Schwarz–Christoffel tools) and multi-sided domain parameterizations enabling reliable IGA workflows.
- **Solver acceleration:** preconditioned Anderson acceleration to improve efficiency and robustness of parameterization Partial Differential Equation (PDE) solvers.
- **Industrial-grade spline meshing:** spline-based structured mesh generation technology for screw machine simulations (SplineMesh / ScorgTM).

Academic Positions

01/2024– Postdoctoral Researcher, Delft University of Technology, Department of Applied Mathematics, Present Numerical Analysis, The Netherlands.

Education

2019–2023 **Ph.D. Mathematics**, Dalian University of Technology, School of Mathematical Sciences, China.
2017–2019 **M.Sc. Mathematics**, Dalian University of Technology, School of Mathematical Sciences, China.
2013–2017 **B.Sc. Mathematics**, Dalian University of Technology, School of Mathematical Sciences, China.

Research Experience

10/2021– Visiting Ph.D. Researcher, Delft University of Technology, Department of Applied Mathematics, 12/2023 Numerical Analysis, The Netherlands.

Selected Peer-reviewed Publications

2025 Y. Yang, **Y. Ji**, M. Möller, C. Ayas. **Computational efficient process simulation of geometrically complex parts in metal additive manufacturing**. *International Journal of Heat and Mass Transfer*, 248 (2025), 127059.

2025 L. Yang, W. Wang, **Y. Ji**, C.-G. Zhu, C.-C. Wang. **Spacetime isogeometric topology optimization with additive manufacturing constraints**. *Computer Methods in Applied Mechanics and Engineering*, 441 (2025), 117976.

2024 **Ye Ji**, Matthias Möller, Ying-Ying Yu, Chun-Gang Zhu. **Boundary parameter matching for isogeometric analysis using Schwarz–Christoffel mapping**. *Engineering with Computers*, 1–19 (2024).

2023 **Ye Ji**, Kewang Chen, Matthias Möller, Cornelis Vuik. **Improved PDE-based elliptic parameterization for IGA using preconditioned Anderson acceleration**. *Computer Aided Geometric Design*, 102 (2023), 102190. **(GMP 2023 Best Paper Award)**

2023 **Ye Ji**, Meng-Yun Wang, Ying-Ying Yu, Chun-Gang Zhu. **Curvature-based r-adaptive IGA with injectivity-preserving multi-sided domain parameterization***Journal of Systems Science & Complexity*, 36 (2023), 53–76.

2022 **Ye Ji**, Meng-Yun Wang, Yu Wang, Chun-Gang Zhu. **Curvature-based r-adaptive planar NURBS parameterization method for isogeometric analysis using bi-level approach**. *Computer Aided Design*, 150 (2022), 103305.

2022 **Ye Ji**, Meng-Yun Wang, Mao-Dong Pan, Yi Zhang, Chun-Gang Zhu. **Penalty function-based volumetric parameterization method for isogeometric analysis**. *Computer Aided Geometric Design*, 94 (2022), 102075.

2021 **Ye Ji**, Ying-Ying Yu, Meng-Yun Wang, Chun-Gang Zhu. **Constructing high-quality planar NURBS parameterization for isogeometric analysis by adjustment control points and weights**. *Journal of Computational and Applied Mathematics*, 396 (2021), 113615.

2021 Ying-Ying Yu, **Ye Ji**, Jing-Gai Li, Chun-Gang Zhu. **Conditions for injectivity of toric volumes with arbitrary positive weights***Computers & Graphics*, 97 (2021), 88–98. (CAD/Graphics 2021 Best Paper Award)

Selected Talks

Delivered 30+ invited and conference presentations; selected highlights below.

Oct. 2025 **Invited Talk**, *Analysis-suitable parameterization for Isogeometric Analysis*, Institut für Leichtbau und Struktur-Biomechanik, TU Wien, Vienna, Austria.

Sep. 2025 **Oral**, *IGA-LBM: Isogeometric lattice Boltzmann method*, IGA 2025, Eindhoven, Netherlands.

Sep. 2025 **Short Course**, *SplineMesh v2.0: Spline Mesh technology for screw machines*, Short Course & Forum on CFD in Rotary Machines, London, United Kingdom.

Sep. 2024 **Oral**, *Structured mesh generation for screw machines simulations*, International Conference on Screw Machines 2024, Dortmund, Germany.

Jun. 2024 **Oral**, *IGA-suitable parameterization for complex fluid simulations*, ECCOMAS Congress 2024, Lisboa, Portugal.

Sep. 2023 **Oral**, *Spline-based parameterization using preconditioned Anderson acceleration*, Compressors and their Systems, London, United Kingdom.

Jul. 2023 **Oral**, *PDE-based parameterization for IGA with preconditioned Anderson acceleration*, GMP 2023, Genova, Italy.

Jun. 2023 **Oral**, *Fast and robust solvers for local/global domain parameterizations within G+Smo*, IGA 2023, Lyon, France.

Teaching, Mentoring, and Supervision

Lecturer Co-developer and lecturer of a graduate special course on **Isogeometric Analysis** at TU Delft (Q3–Q4 2026), jointly prepared with Prof. Matthias Möller (TU Delft) and Prof. Stefanie Elgeti (TU Wien); covering geometry-aware discretisation and advanced numerical methods for IGA.

Supervision Supervision/co-supervision of PhD and Master's research in IGA and spline geometry. *Examples*: (i) PhD co-supervision (TU Delft) on semi-analytical IGA for thermal/process simulation in metal additive manufacturing (resulting in IJHMT 2025); (ii) multiple MSc/PhD projects on multi-sided parameterization, extended IGA, and spline approximation.

Research Software and Infrastructure

- **G+Smo (Geometry + Simulation Modules)**: member of the core development team of the open-source C++ IGA library, supporting geometry processing, discretization, and simulation workflows.
- **SplineMesh / ScorgTM**: lead developer of spline-based structured mesh generation modules for industrial modeling (screw machines), focusing on robustness, quality, and integration with simulation pipelines.

Service and Professional Activities

Refereeing Reviewer for *Computer-Aided Design*, *Computer Aided Geometric Design*, *Scientific Reports*, *Engineering with Computers*, *Advances in Engineering Software*, *Finite Elements in Analysis & Design*.

2022–Now Reviewer for **Mathematical Reviews**, American Mathematical Society.
2020–Now Life member, China Society for Industrial and Applied Mathematics (CSIAM).

Honors and Awards (Selected)

2025 Conference Best Paper Award, CSIAM GDC 2025 (China Society for Industrial and Applied Mathematics Geometric Design and Computing Conference; major national conference in geometric design and computing, Yantai, China).

2024 Conference Best Paper Award, ICSM 2024 (International Conference on Screw Machines; international research conference on screw machine technology, TU Dortmund, Germany).

2023 Conference Best Paper Award, GMP 2023 (Geometric Modeling and Processing Symposium; leading international conference on geometric modeling and processing, Genova, Italy).

2023 Best Team Award, AWS Challenge at the SIAM Hackathon 2023 (international team-based hackathon in computational science, associated with SIAM CSE23, Amsterdam, Netherlands).

2022 & 2016 National Scholarship (twice), Ministry of Education of China (national award for outstanding academic and research achievement; awarded to approximately 0.2% of students nationwide).

2021 Conference Best Paper Award, CAD/Graphics 2021 (International Conference on Computer-Aided Design and Computer Graphics; peer-reviewed conference on CAD, graphics, and visualization, Xian, China).

Skills

Programming C/C++ (modern CMake-based projects), Python (scientific computing), MATLAB, Julia, L^AT_EX.

Numerical Partial Differential Equations, Finite Element Methods, Isogeometric Analysis, Structured Grid Methods Generation.

Geometry & B-splines and NURBS, Parametric Curves/Surfaces, Mesh Generation, Geometric Mapping and Modeling Regularity Analysis.

Languages Mandarin (native), English (fluent).