Stanford

Alexander D. Kaiser

Instructor, Cardiothoracic Surgery

Curriculum Vitae available Online

Bio

BIO

Alexander Kaiser, PhD, is an applied mathematician and computational scientist who researches modeling and simulation of heart valves, focused on congenital heart valve disease and its surgical treatment. His recent research explores simulation-guided design of aortic valve repair of complex congenital heart defects. He has developed novel, nearly first-principles modeling methods for heart valves called elasticity-based design. These methods produce robust and realistic flows in fluid-structure interaction simulations. Dr. Kaiser is an Instructor in Cardiothoracic Surgery at Stanford University working with Michael Ma and Alison Marsden. He completed his PhD in Mathematics with Charles Peskin at the Courant Institute of Mathematical Sciences at New York University, where he was awarded the Kurt O. Friedrichs Prize for Outstanding Dissertation in Mathematics.

ACADEMIC APPOINTMENTS

- Instructor, Cardiothoracic Surgery
- Member (Staff), Cardiovascular Institute
- Member, Maternal & Child Health Research Institute (MCHRI)

HONORS AND AWARDS

- K25 Mentored Quantitative Research Development Award, National Heart Lung and Blood Institute, National Institutes of Health (2024)
- American Heart Association Career Development Award, American Heart Association (2024)
- Kurt O. Friedrichs Prize for Outstanding Dissertation in Mathematics, Courant Institute of Mathematical Sciences, New York University (2018)
- Math Master’s Thesis Prize, Courant Institute of Mathematical Sciences, New York University (2014)
- Benchmark Capital Fellowship in Congenital Cardiovascular Bioengineering, The Wall Center, Stanford University (2020)
- Mechanisms and Innovation in Cardiovascular Disease, T32 training fellowship, National Heart Lung and Blood Institute, National Institutes of Health via Stanford CVI (2018)
- Thomas Tyler Bringley Fellowship, Courant Institute of Mathematical Sciences, New York University (2016)
- NSF Graduate Research Fellowship, National Science Foundation (2013)

PROFESSIONAL EDUCATION

- Doctor of Philosophy, New York University , Mathematics (2017)
- Master of Science, New York University , Mathematics (2013)
- Bachelor of Arts, University of California, Berkeley , Mathematics (2009)

LINKS

- Personal site: https://alexkaiser.github.io/

Teaching

STANFORD ADVISEES

Postdoctoral Research Mentor

Karoline Marie Bornemann

Publications

PUBLICATIONS

- **Simulations Predict Improved Valve Performance Without Direct Leaflet Intervention After Neonatal Truncus Arteriosus Repair.** *The Journal of thoracic and cardiovascular surgery*
  Bornemann, K. M., Choi, P. S., Huber, J., Reed, A. K., Sharir, A., Maskatia, S. A., Marsden, A. L., Ma, M. R., Kaiser, A. D.
  2026
- **Simulation-Based Design of Bicuspidization of the Aortic Valve.** *The Journal of thoracic and cardiovascular surgery*
  Kaiser, A. D., Haidar, M. A., Choi, P. S., Sharir, A., Marsden, A. L., Ma, M. R.
  2024
- **Modeling the mitral valve.** *International journal for numerical methods in biomedical engineering*
  Kaiser, A. D., McQueen, D. M., Peskin, C. S.
  2019: e3240
- **Simulation-guided design of leaflet height in bicuspidization of the aortic valve.** *JTCVS open*
  Kaiser, A. D., Choi, P. S., Sharir, A., Marsden, A. L., Ma, M. R.
  2025; 28: 434-443
- **A fluid-structure interaction model of the zebrafish aortic valve.** *Journal of biomechanics*
  Kaiser, A. D., Wang, J., Brown, A. L., Zhu, E., Hsiai, T., Marsden, A. L.
  2025; 190: 112794
- **Combined simulation and ex vivo assessment of free-edge length in bicuspidization repair for congenital aortic valve disease.** *JTCVS open*
  Choi, P. S., Sharir, A., Ono, Y., Shibata, M., Kaiser, A. D., Palagani, Y., Marsden, A. L., Ma, M. R.
  2024; 22: 395-404
- **Effect of graft sizing in valve-sparing aortic root replacement for bicuspid aortic valve: The Goldilocks ratio.** *JTCVS techniques*
  Choi, P. S., Sharir, A., Ono, Y., Shibata, M., Kaiser, A. D., Zhu, Y., Marsden, A. L., Woo, Y. J., Ma, M. R., Kim, J. B.
  2024; 25: 1-7
- **Comparison of Immersed Boundary Simulations of Heart Valve Hemodynamics Against In Vitro 4D Flow MRI Data.** *Annals of biomedical engineering*
  Kaiser, A. D., Schiavone, N. K., Elkins, C. J., McElhinney, D. B., Eaton, J. K., Marsden, A. L.
  2023
- **DynaRing: A Patient-Specific Mitral Annuloplasty Ring With Selective Stiffness Segments.** *Journal of medical devices*
  Frishman, S., Kight, A., Pirozzi, I., Maddineni, S., Imbrie-Moore, A. M., Karachiwalla, Z., Paulsen, M. J., Kaiser, A. D., Woo, Y. J., Cutkosky, M. R.
  2022; 16 (3): 031009
- **Controlled Comparison of Simulated Hemodynamics Across Tricuspid and Bicuspid Aortic Valves.** *Annals of biomedical engineering*
  Kaiser, A. D., Shad, R., Schiavone, N., Hiesinger, W., Marsden, A. L.
  2022
- **A design-based model of the aortic valve for fluid-structure interaction.** *Biomechanics and modeling in mechanobiology*
  Kaiser, A. D., Shad, R., Hiesinger, W., Marsden, A. L.
  2021
- **Patient-Specific Computational Fluid Dynamics Reveal Localized Flow Patterns Predictive of Post-Left Ventricular Assist Device Aortic Incompetence.** *Circulation. Heart failure*

Shad, R., Kaiser, A. D., Kong, S., Fong, R., Quach, N., Bowles, C., Kasinpila, P., Shudo, Y., Teuteberg, J., Woo, Y. J., Marsden, A. L., Hiesinger, W.
2021: CIRCHEARTFAILURE120008034

- **Use of patient-specific computational models for optimization of aortic insufficiency after implantation of left ventricular assist device.** *The Journal of thoracic and cardiovascular surgery*
  Kasinpila, P. n., Kong, S. n., Fong, R. n., Shad, R. n., Kaiser, A. D., Marsden, A. L., Woo, Y. J., Hiesinger, W. n.
  2020

- **Gaussian-Like Immersed Boundary Kernels with Three Continuous Derivatives and Improved Translational Invariance**
  Bao, Y., Kaiser, A. D., Kaye, J., Peskin, C. S.
  arXiv preprint. https://arxiv.org/abs/1505.07529v3.
  2017

- **Automated simplification of large symbolic expressions** *JOURNAL OF SYMBOLIC COMPUTATION*
  Bailey, D. H., Borwein, J. M., Kaiser, A. D.
  2014; 60: 120–36

- **A Principled Kernel Testbed for Hardware/Software Co-Design Research** *USENIX Workshop on Hot Topics in Parallelism*
  Kaiser, A. D., Williams, S., Madduri, K., Ibrahim, K., Bailey, D. H., Demmel, J. W., Strohmaier, E.
  2010

- **A Kernel Testbed for Parallel Architecture, Language, and Performance Research**
  Strohmaier, E., Williams, S., Kaiser, A., Madduri, K., Ibrahim, K., Bailey, D., Demmel, J. W., Simos, T.
  edited by Psihoyios, G., Tsitouras, C.
  AMER INST PHYSICS.2010: 1297–1300

- **TORCH - Computational Reference Kernels: A Testbed for Computer Science Research**
  Kaiser, A. D., Williams, S., Madduri, K., Ibrahim, K., Bailey, D. H., Demmel, J. W., Strohmaier, E.
  Tech Report LBNL-4172E. https://escholarship.org/uc/item/8n36z5tn.
  2010

- **Undetected Errors in Quasi-cyclic LDPC Codes Caused by Receiver Symbol Slips** *Proceedings of IEEE Global Conference on Communications*
  Kaiser, A. D., Dolinar, S., Cheng, M. K.
  2009