

RAJEEV KUMAR JAIMAN

Associate Professor and Seaspans Shipyards Chair
Department of Mechanical Engineering
The University of British Columbia, Vancouver
6250 Applied Science Lane
Vancouver, BC Canada V6T 1Z4
Phone: +1 604 827 0609; Fax: +1 604 822 2403
Email: rjaiman@mech.ubc.ca
Webpage: <http://www.mech.ubc.ca/rajeev-jaiman>
Lab page: <http://cml.mech.ubc.ca/>

EDUCATION

- PhD (2007), University of Illinois, Urbana-Champaign, USA
 - Thesis: Accuracy and Stability of Transient Multiphysics Simulations
 - Advisors: Prof. Loth, Prof. Geubelle, and Prof. Jiao
 - Minor: Computational Science and Engineering
- MS (2002), Aerospace Engineering, University of Illinois, Urbana-Champaign, USA
 - Thesis: Shock-Boundary Layer Interaction Control using Mesoflaps
 - Advisors: Prof. Loth and Prof. Dutton
 - Minor: Computational Science and Engineering
- BTech (2000), Aerospace Engineering, Indian Institute of Technology, Mumbai
 - Thesis: On the Finite Volume Upwind Schemes for Unstructured Meshes
 - Advisor: Prof. Shevare

RESEARCH INTERESTS

- Computational Fluid Dynamics
- Fluid-Structure Interaction
- Bluff-Body Flows and Vortex-Induced Vibration
- Flow Control and Drag Reduction
- Variational and Lattice Boltzmann Methods
- Model Order Reduction and Data-Driven Computing
- Multiphase and Turbulent Flows

PROFESSIONAL EXPERIENCE

- Associate Professor, The University of British Columbia, Vancouver, 2018-Present
- Assistant Professor, National University of Singapore, 2012-2018
- Director of CFD Development, Altair Engineering, Mountain View, 2010-2011
- Lead CFD Developer, ACUSIM Software, Mountain View, CA, 2007- 2010
- Computational Science and Engineering Fellow, UIUC, 2002, 2004
- Research Intern, GE Global Research-Niskayuna, US, May-Aug 2004
- Research Consultant, American Bureau of Shipping, Houston, Jan-May 2004
- Graduate Research Fellow, CSAR Scholarship, UIUC, 2002-2007
- CFD Consultant, Analytical and Computational Research, 2000-2001, India
- Research Intern, CDAC-Pune, India, May 2000
- Summer Intern, National Center for Software Technology, India, May 1999

SELECTED AWARDS, FELLOWSHIPS AND HONORS

- The ASEAN Outstanding Engineering Achievement Award 2018
- Institute of Engineers Singapore (IES) Prestigious Achievement Award 2018
- The Strehlow Memorial Award for Outstanding Research, 2006
- The University of Illinois Fellowship for Excellence in Graduate Research, 2005
- Computational Science and Engineering Research Fellowship, 2002 & 2004

PUBLICATIONS

Journal Articles (h-index = 22 as of August, 2019 – Source Google Scholar)

ASTERIX * indicates graduate student or research staff I advised and funded, whereby ** indicates co-advised or mentored by me.

Selected Recent Publications in Top-Tier Journals

1. Li, G., Law, YZ, **Jaiman, R.K.**, "A novel 3D variational aeroelastic framework for flexible multibody dynamics: Application to bat-like flapping dynamics," *Computers & Fluids*, 180, 96-116, 2019
2. Miyanawala, TP and **Jaiman R.K.**, "Decomposition of wake dynamics in fluid-structure interaction", *J. of Fluid Mechanics*, 867, 723-764, 2019
3. Gurugubelli*, PS, **Jaiman, R.K.**, "Interaction of gap flow with flapping dynamics of two side-by-side elastic foils", *International Journal of Heat and Fluid Flow*, 75, 239-255, 2019
4. Zhang*, Q, **Jaiman, R.K.**, "Numerical analysis on the wake dynamics of a ducted propeller", *Ocean Engineering*, 171, 202-224, 2019
5. Yao*, W., **Jaiman, R.K.**, "Stability analysis of the wake-induced vibration of tandem circular and square cylinders", *Nonlinear Dynamics*, 95(1), 13-28, 2019
6. Law*, YZ, **Jaiman, R.K.**, "Passive control of vortex-induced vibration via spanwise grooves", *J. of Fluids and Structures*, 83, 1-26, 2018
7. Joshi*, V. and **Jaiman R.K.**, "An adaptive variational procedure for the conservative and positivity preserving Allen-Cahn phase-field model", *J. of Computational Physics*, 366, 478-504
8. Joshi*, V. and **Jaiman R.K.**, "A hybrid variational Allen-Cahn/ALE scheme for fluid-structure interaction for two-phase flows", *Int. J. of Num. Methods Eng*, 10.1002/nme.5961
9. Tan, L.B., **Jaiman, R.K.**, Tay, T.E., Tan, Vincent, Toh, W., "A comprehensive study on composite risers: material solution, local end fitting design and global response", *Marine Structures*, 61, 155-169, 2018
10. Wu*, C-H, Ma, S., Kang, C-W, Lim T-B, **Jaiman, R.K.**, Tutty, O., Weymouth, G., "Suppression of vortex-induced vibration of a square cylinder via continuous twisting at moderate Reynolds numbers", *Journal of Wind Engineering & Industrial Aerodynamics*, 177, 136-154
11. Guan*, M.Z., **Jaiman, R.K.**, "Fluid-Structure Interaction of Combined and Independent Configurations of Two Side-by-Side Square Cylinders", *Int. J. of Heat and Fluid Flow*, 72, 214-232, 2018
12. Bin*, L. and **Jaiman R.K.**, "Dynamics and stability of gap-flow interference in a vibrating side-by-side arrangement of two circular cylinders", *J. of Fluid Mechanics*, 855, 804-838, 2018
13. Li*, Y., Law, YZ, V. Joshi, **Jaiman R.K.**, "A 3D Common-Refinement Method for Non-Matching Meshes in Partitioned Variational Fluid-Structure Analysis", *J. of Computational Physics* 374, 163-187, 2018
14. Ng*, J.H., **Jaiman, R.K.**, Lim, T.T., "Interaction dynamics of longitudinal corrugations in Taylor-Couette flows", *Physics of Fluids*, 30 (9), 093601, 2018
15. Joshi*, V. and **Jaiman R.K.**, "A Positivity Preserving and Conservative Variational Scheme for Phase-Field Modeling of Two-Phase Flows", *J. of Computational Physics*, 360, 137-166, 2018
16. Wu*, C-H, **Jaiman, R.K.**, Lim T-B, Kang, C-W, Ma, S. "A new passive control technique for the suppression of vortex-induced motion in deep-draft semisubmersibles", *Applied Ocean Research*, 80, 79-100
17. Miyanawala*, T.P. and **Jaiman R.K.**, "Self-sustaining turbulent wake characteristics in fluid-structure interaction of a square cylinder", *J. of Fluids and Structures*, 77, 80-101, 2018

18. Zhong, L.**, Mysa, R.C, **Jaiman R.K** and Khoo, B.C. "Freely Vibrating Circular Cylinder in the Vicinity of Fully Developed Scour Holes at Low Reynolds Numbers", *Computers and Fluids*, 163, 97-120, 2018
19. Gurugubelli*, P.S., R. Ghoshal*, V. Joshi*, **Jaiman, R.K.**, "A Variational Projection Scheme for Nonmatching Surface-to-Line Coupling between 3D Flexible Multibody System and Incompressible Turbulent Flow", *Computers and Fluids*, 165, 160-172, 2018
20. R. Ghoshal*, A. Yenduri*, A. Ahmed, X. Qian, **Jaiman, R.K.**, "Coupled nonlinear instability of cable subjected to combined hydrodynamic and ice loads", *Ocean Engineering*, 148, 486-499, 2018
21. K. Narendran*, M.Z. Guan*, P.F. Ma, A. Choudhary, A.A. Hussain, **Jaiman, R.K.**, "Control of vortex-induced motion in multi-column offshore platform by near-wake jets", *Computers and Fluids*, 2018 In press.
22. Yao, W.* and **Jaiman R.K.** "Model Reduction and Mechanism for the Vortex-Induced Vibrations of Bluff Bodies", *J. of Fluid Mechanics*, 827, 357-393, 2017
23. Yao, W.* and **Jaiman R.K.** "Feedback Control of Vortex-Induced Vibrations Using Eigensystem Realization Algorithm", *J. of Fluid Mechanics*, 827, 394-414, 2017
24. Mysa, R.C*, Law, Y.Z. and **Jaiman R.K.**, "Interaction Dynamics of Upstream Vortex with Vibrating Tandem Circular Cylinder at Subcritical Reynolds Number", *J. of Fluids and Structures*, 75, 27-44, 2017
25. V. Joshi*, **Jaiman R.K.**, "A Variationally Bounded Scheme for Delayed Detached Eddy Simulation: Application to Vortex-Induced Vibration of Offshore Riser", *Computers and Fluids* 157, 84-111, 2017
26. Zhong, L.**, **Jaiman R.K** and Khoo, B.C. "Coupled Dynamics of Vortex-Induced Vibration and Stationary Wall at Low Reynolds Number", *Physics of Fluids*, 29, 093601, 2017
27. V Joshi*, **Jaiman, R.K.** "A Positivity Preserving Variational Method for Multi-dimensional Convection-Diffusion-Reaction Equation", *Journal of Computational Physics*, 339, 247-284, 2017.
28. Y Z Law*, **Jaiman, R.K.**, "Wake Stabilization Mechanism of Low-Drag Suppression Devices for Vortex-Induced Vibration", *J. of Fluids and Structures*, 70, 428-449, 2017
29. MZ Guan*, **Jaiman, R.K.**, "Flow-induced vibration of two side-by-side square cylinders with combined translational motions", *J. of Fluids and Structures*, 69, 265-292, 2017
30. A. Yenduri*, R. Ghoshal, **Jaiman, R.K.**, "A new partitioned staggered scheme for flexible multibody interactions with strong inertial effects," *Computer Methods in Applied Mechanics and Engineering*, Vol. 315, pp. 316-347, 2017
31. K.A. Raman*, **R.K. Jaiman**, TS Lee, HT Low, "Dynamics of simultaneously impinging drops on a dry surface: Role of impact velocity and air inertia", *Journal of Colloid and Interface Science*, Vol. 486, pp. 265-276, 2017
32. B. Liu*, **R.K. Jaiman**, "Interaction dynamics of gap flow with vortex-induced vibration in side-by-side cylinder arrangement", *Physics of Fluids* 28 (12), 127103
33. Li, Z.*, W. Yao, K. Yang, **Jaiman, R.K.**, B.C. Khoo, "On the vortex-induced oscillations of a freely vibrating cylinder in the vicinity of a stationary plane wall", *J. of Fluids and Structures*, 65, 495-526, 2016
34. W. Yao*, **Jaiman, R.K.**, "A harmonic balance technique for the reduced-order computation of vortex-induced vibration", *J. of Fluids and Structures*, 65, 313-332, 2016
35. K.A. Raman*, **R.K. Jaiman**, TS Lee, HT Low, "A numerical study on electrowetting-induced jumping and transport of droplet", *International Journal of Heat and Mass Transfer*, Vol. 99, pp. 805-821, 2016
36. K.A. Raman*, **R.K. Jaiman**, TS Lee, HT Low, "Rebound suppression of a droplet impacting on an oscillating horizontal surface", *Physical Review E*, 94 (2), 023108, 2016

BOOK, BOOK CHAPTER AND SURVEY

- J H Ng, R K Jaiman, T T Lim "Direct Numerical Simulations of Riblets in a Fully-Developed Turbulent Channel Flow: Effects of Geometry", IUTAM Advances in Computation, Modeling and Control of Transitional and Turbulent Flows (2016): Edited by: Tapan K Sengupta, Sanjiva K Lele, Katepalli R Sreenivasan, Peter A Davidson
- **Jaiman, R.K.** "Numerical Modeling and Control of Fluid-Structure Interaction", Springer Book Series (In preparation)
- **Jaiman, R.K.** "Mechanics of Fluid-Structure Interaction", Springer Book Series (In preparation)

INVENTION DISCLOSURES AND PATENTS

- "Passive C-hinged fairing for VIV of long cylindrical structures", R.K. Jaiman, Y.Z. Law (In preparation)
- "Water-jet blowing for load reduction and VIV suppression in offshore floating platform", R.K. Jaiman, M.Z. Guan, K. Narendran, T.P. Miyanawala, (In preparation)
- "A novel shear-layer attachment (SLA) based column for offshore semi-submersible platform", R.K. Jaiman, M.Z. Guan, K. Narendran (In preparation)

SELECTED INVITED TALKS AND KEYNOTE PRESENTATIONS

1. "Multiphysics Simulations in the Age of Data, " Invited Seminar at UFL –Gainesville, Feb 2019
2. "A novel deep learning model for fluid-structure interaction", Invited Keynote at 16th Pan American Congress of Applied Mechanics (International) 2019, Ann Arbor, Michigan
3. "Model Order Reduction and Control Strategies for Fluid-Structure Interaction", US Congress on Computational Mechanics (USNCCM), July 2017, Montreal, Canada.
4. "Advances in Computational Methods for Self-Excited Vibrations and Flapping Dynamics", Keynote at World Congress on Computational Mechanics (WCCM), July 2016, Seoul, South Korea.
5. "Numerical Modeling of Self-Excited Vibrations and Flapping Dynamics", *International Workshop on Fluid-Structure Interaction Problems June 2016*, Institute of Mathematical Sciences (IMS), Singapore
6. "Advances in Computational Modeling of Flow-Induced Vibrations in Offshore Engineering" *ICNAME2015 Conference*, Harbin Engineering University, 2015
7. "Computational Fluid-Structure Interactions: Self-excited Vibrations" *MIT*, June 8, 2015.
8. "Advances in Computational Modeling of Flow-Induced Vibrations in Offshore Engineering" *UMASS Amherst*, June 9, 2015.
9. "Review of Recent Developments in Vortex-Induced Vibration and Flapping Dynamics" *U of Houston*, June 2014.
10. "Advances in Numerical Modeling of Vortex-Induced Vibration for Offshore Engineering", *Rice University*, 2014.

PROFESSIONAL ACTIVITIES, ACADEMIC SERVICE AND AFFILIATIONS

Reviewer for a broad range of professional journals, e.g.

Applied Ocean Research, Ocean Engineering, J. of Offshore Mechanics and Arctic Engineering, J. of Fluid Mechanics, Physics of Fluids, J. of Computational Physics, J. of Fluids and Structures, Computer Methods in Applied Mechanics and Engineering, International Journal for Numerical Methods in Fluids, AIAA Journal, International Journal of Computational Fluid Dynamics, ASME Journal of Applied Mechanics, Computers and Fluids, International Journal Theoretical and Computational Fluid

Dynamics, Int. Journal of Applied Mechanics, Finite Elements in Analysis and Design, Journal of Wind Engineering & Industrial Aerodynamics, International Journal for Numerical Methods in Biomedical Engineering, International Journal of Heat and Mass Transfer

Memberships on scholarly societies

- American Institute of Aeronautics and Astronautics (Member since 2004)
(Senior member, consideration for Associate Fellow)
- American Physical Society (Member since 2012)
- American Society of Mechanical Engineers (Member since 2015)
- Society of Naval Architects and Marine Engineers (Member since 2019)
- US Association of Computational Mechanics (Member since 2005)
- International Association of Computational Mechanics (Member since 2007)
- Society of Industrial and Applied Mathematics (Member since 2018)

Selected Professional/Conference Leadership Activities

- Organizer of Mini-symposium "Advanced Computing: Optimization, Big Data and Machine Learning", ASME conference division on Offshore Mechanics and Arctic Engineering, 2018
- Organizer of Mini-symposium titled "Flow-Induced Vibrations: Models and Techniques", US Congress on Computational Mechanics, Montreal, Canada, July 17-20, 2017.
- Organizer of Mini-symposium titled "Design, Analysis and Applications of Fluid-Structure Interaction Techniques" in World Congress on Computational Mechanics (WCCM)/APCOM2016, Seoul, Korea during July 24-29, 2016.
- Organizer of Symposium entitled "Recent Advances in Numerical Modeling of Fluid-Structure Interaction" in ICCM at Berkeley, California, August 2016.
- Organizer of "Recent Advances in Numerical Modeling of Fluid-Structure Interaction",
- Technical organizer and session chair of ASME conference division on Offshore Mechanics and Arctic Engineering from 2013- Present
- Co-organizer of International Workshop on Fluid-Structure Interaction Problems, June 2016
- Co-organizer of 5th Asia Pacific Congress on Computational Mechanics and 2nd International Symposium on Computational Mechanics, Dec 2013
- Session Chairman for International Marine Simulator (MARSIM) 2012 Singapore
- Session Organizer at ASME Offshore Mechanics and Arctic Engineering, 2009

Software Packages Developed

Simflow (General purpose 3D parallel variational fluid-structure interaction for high Reynolds number flows in aerospace and offshore engineering)

The key differentiator with respect to existing FSI solver (both in academia and industry) is to handle numerical instabilities and convergence issues associated with strong added mass effects for ultra-light buoyant floating bodies undergoing strong fluid-structure interaction. The accuracy and robustness of parallel variational FSI solver have been established for a wide range of problems in offshore and aerospace engineering problems at high Reynolds number.

Dynflex (Flexible multibody dynamics solver)

A nonlinear flexible multibody variational solver for multiple rigid and flexible bodies with kinematic constraints is developed for a wide range of engineering applications. Practical applications of the framework are recently demonstrated for floating-body connected with cables/beams and bat-like flexible wing with rigid links.