Dr. Ajay B Harish

Office Address
SimCenter DesignSafe
1301 S 46th Street, Building 454
Richmond, CA 94804 (USA)

Email ajaybh@berkeley.edu (Official)
Website www.ajaybharish.com

ACADEMIC EMPLOYMENT

Post-Doctoral Researcher — Jan 2020 - Present
Civil & Environmental Engineering
University of California, Berkeley (USA)
Advisor: Prof. Sanjay Govindjee

- Numerical method development and modeling of water-borne natural hazards (focus on tsunami and storm-surges) as Hydro-UQ tool
- Multiscale coupling of 2-D shallow water solvers with 3-D CFD OpenFOAM & structural solver OpenSees
- Surrogate modeling as alternative for full 3-D CFD solutions
- Uncertainity quantification for FSI problems related to water-hazards
- AI for modeling large datasets (40TB+) of hurricanes and storm-surges
- Constitutive modeling of poro-elastic materials (with Prof. R L Taylor)
- Multiscale modeling for coupling Quasi-continuum method with FEAP

Lecturer — Aug 2020 – Dec, 2020
Civil & Environmental Engineering
University of California, Berkeley (USA)

- Teaching CE126 course on Engineering Dynamics and Vibrations
- Undergraduate course for students in Junior / Senior year
- Teaching evaluation: www.ajaybharish.com/downloads/CE126_Ajay.pdf

Group Leader (Nanomechanics & Nanotribology) — Jan 2018 – Dec 2019
Institute of Continuum Mechanics
Leibniz University Hannover, NI (Germany)

- Constitutive and tribological modeling of polymer composites
- Development of numerical methods for contact and fracture modeling of polymeric materials
- Lead a group of seven masters + bachelor students

Visiting Researcher — Feb-Jul 2019, Apr, Nov, Dec, 2017
Lappeenranta University of Technology (Finland)

- Development of hyperelastic and viscoelastic material models methods for biological tissues using FEA and ANCF methodologies

Researcher, National Program for Micro Aerial Vehicles Apr 2010 – Oct 2011
NMCAD Laboratory, Indian Institute of Science, Bengaluru (India)
- Development of flapping wing MAVs

EDUCATION

Dr.-Ing (Magna cum Laude), Mechanical Engineering 2011 - 2017
Leibniz University Hannover, NI (Germany)
Thesis: Micromechanics, fracture and contact behavior of nanoparticle reinforced polymers
Advisor: Prof. Peter Wriggers

Engineer, Aeronautics 2007 - 2009
California Institute of Technology, Pasadena, CA (USA)
Thesis: Simulation of dynamic interface fracture using spectral boundary integral method

B.Tech, Mechanical Engineering 2003 - 2007
National Institute of Technology, Surathkal, KA (India)

AWARDS, HONORS & SCHOLARSHIPS

- Scholarship from LUT Research Foundation for research visit awarded twice (2017, 2019)
- Best Researcher in the area of mechanics at LUH, Awarded by the Mechanics section of Leibniz Gesellschaft (2017)
- Viktor-Rizkallah Award for best International Researcher, Awarded by Leibniz Foundation (2016)
- Finalist at the 26th Robert J. Melosh Medal competition (2015)
- Scholarship from Continental AG & Leibniz University Hannover towards Ph.D. (2011-15)
- Best poster award at GACM colloquium in Hamburg, Germany (2013)
- Russel R. Vought fellowship, California Institute of Technology (2007-08)
- NTSE state scholarship, Government of Karnataka, India (2001)
- Meritorious student award, Government of Karnataka, India (2001)

PUBLICATIONS

Software release

2. A. B. Harish, F. McKenna, S. Govindjee, G. Deierlein, P. Arduino, A. Kennedy, P. Lynette, P. McKenzie, M. Motley, "Water-borne natural hazards engineering with uncertainty quantification," https://github.com/NHERI-SimCenter/HydroUQ.git

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ajaybh@berkeley.edu
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Dept. Civil & Environmental Engineering
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1. A. B. Harish, S. Govindjee and F. McKenna, "CFD Notebooks (Beginner)," DesignSafe-CI. https://doi.org/10.17603/ds2-w2x6-nm09 (2020)

Journals

*Students who were involved in the work & I was advising / co-advising these students

12. A. B. Harish and P. Wriggers, "Nano-scratching for prediction of wear in filled polymers," Wear (Under review) (Manuscript available upon request)

11. A. B. Harish, S. Deshpande* and S. R. Andress*, "Mathematics of stable tensegrities," **Computer Methods in Applied Mechanics and Engineering** (Under review, https://arxiv.org/abs/2101.09616)

10. A. B. Harish and A. R. Prasad*, "Automated 3D solid reconstruction from 2D CAD using OpenCV," **Computer-Aided Geometric Design** (Under review, https://arxiv.org/abs/2101.04248)

9. V. S. R. Krishna Chinthala*, S. S. Mulay and A. B. Harish, "On the multi-physics constitutive modeling of pH-sensitive hydrogel coupling electromagnetics with mechanics and thermodynamics," **Mechanics of Materials** (Under review) (Manuscript available upon request)

8. L. Obrezkov*, P. Eliasson, A. B. Harish and M. K. Matikainen, " Usability of finite elements based on an absolute nodal coordinate formulation for deformation analysis of the Achilles tendon," **International Journal of Non-linear Mechanics**, vol. 129, 103662 (2021)

7. B. Bozorgmehri*, X. Yu*, M. K. Matikainen, A. B. Harish and A. Mikkola, "A study of contact methods in the application of large deformation dynamics in self-contact beam," **Nonlinear Dynamics**, vol. 103, pp. 581 – 616 (2021)

6. X. Yu*, M. K. Matikainen, A. B. Harish and A. Mikkola, "Procedure for non-smooth contact impact for planar flexible beams with cone complementarity problem," **Proceedings of the Institution of Mechanical Engineers Part K: Journal of Multibody Dynamics** (https://doi.org/10.1177/1464419320957450)

5. L. Obrezkov*, M. Matikainen and A. B. Harish, "A finite element for soft tissue deformation based on absolute nodal coordinate formulation," **Acta Mechanica**, vol. 231, pp. 1519 - 1538 (2020)

4. A. B. Harish and P. Wriggers, "Modeling of two-body abrasive wear of filled elastomers as a contact-induced fracture process," **Tribology International**, vol. 138, pp. 16-31 (2019)

3. D. Harursampath, A. B. Harish and D. H. Hodges, "Model reduction in thin-walled open-section composite beams using variational asymptotic method. Part I: Theory," **Thin-Walled Structures**, vol. 117, pp. 356-366 (2017)

2. D. Harursampath, A. B. Harish and D. H. Hodges, "Model reduction in thin-walled open-section composite beams using variational asymptotic method. Part II: Applications," **Thin-Walled Structures**, vol. 117, pp. 367-377 (2017)

1. A. B. Harish, P. Wriggers, J. Jungk, N. Hojdis and C. Recker "Mesoscale constitutive modeling of non-crystallizing filled elastomers," **Computational Mechanics**, vol. 57(4), pp. 653-677, (2016)

Peer-reviewed technical report

1. A. B. Harish, R. L. Taylor and S. Govindjee, "Automated Computational Modeling using FEAP," SEMM Report No. UCB/SEMM-21/01 (2021)

2. Eds. G. G. Deierlein and A. Zsarnoczay, "State-of-Art Report in Computational Modeling and Simulation for Natural Hazards," Second Edition (2021). Contribution to chapters:
   - Tropical Cyclone – Storm surge
   - Tsunami – Inundation
   - Computational Fluid Dynamics – Water
   - **DOI:** 10.5281/zenodo.2579581

Book chapters

5. A. B. Harish, R. L. Taylor and S. Govindjee, "A Poroelastic Element for FEAP Using AceGen," Current Trends and Open Problems in Computational Mechanics, Springer (2020)

4. C. Weissenfels, A. B. Harish and P. Wriggers, "Strategies to apply soil models directly as friction laws in soil-structure interactions," Hollistic Simulation of Geotechnical Installation Processes, pp. 216-236, In Lecture Notes in Applied and Computational Mechanics Series, Springer. Edited by Theodoros Triantafyllidis (2017) (ISBN: 978-3-319-52589-1)

3. J. K. Eswaran, D. Harursampath, and A. B. Harish, "Asymptotic modeling of a contact problem in composites," Mechanical Behavior of Thick Composites, pp.1-29, DEStech Publications Inc. Edited by Suong V. Hoa (2016) (ISBN13: 978-1-60595-319-9)

2. A. B. Harish and D. Harursampath, "Algorithms and principles for intelligent design of flapping wing micro air vehicles," Handbook of Research on Computational Intelligence

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for Engineering, Science and Business, pp. 521-555, IGI Global. Edited by Siddhartha Bhattacharyya and Paramartha Dutta (2013) (ISBN13: 978-1-46662-518-1)

1. D. Harursampath, A. B. Harish and C. H. Suryakiran, "Online structural health monitoring of pretwisted anisotropic beams," Structural Health Monitoring: Quantification, Validation and Implementation, DEStech Publications Inc. Edited by Fu-Kuo Chang (2007)

PATENTS

2. A. B. Harish et. al., "AI-guided simulation platform" (US Patent pending, Filed 2018)

1. A. B. Harish et. al. , "Design tool for automated conversion of 2D engineering designs to 3D CAD models using machine learning" (US Patent pending, Filed 2018)

BOOKS

1. A. B. Harish, "Micromechanics, contact and fracture behavior of nanoparticle reinforced polymers" (2018) (ISBN: 978-3-941302-25-9) (Ph.D. Thesis)

TALKS AND SEMINARS

Plenary lecture

- 2018 – Green Trends in Mechanical Engineering & Sciences, Hassan, India

Conference proceedings & talks

- 2021 – Coastal Solutions Workshop, Coastal Flood Modeling, Prediction and Observations for the U.S. West Coast (Online talk), USA
- 2019 – First International Nonlinear Dynamics Conference *(talk)*, Rome, Italy
- 2019 – ECCOMMAS Multibody Dynamics Conference *(talk)*, Duisberg, Germany
- 2018 – 5th Joint International Conference on Multibody System Dynamics *(talk)*, Lisboa, Portugal
- 2017 – GACM Colloquium, Stuttgart *(talk)*, Germany
- 2017 – US National Congress on Computational Mechanics *(talk)*, Montreal, Canada
- 2017 – Research Challenges in Mechanics: Applications of Automated Computational Modeling *(poster + talk),* Hannover, Germany
- 2016 – Workshop on Multiscale Modeling and Model Reduction *(talk)*, Aachen, Germany
- 2015 – International Conference on Computational Contact Mechanics *(talk),* Hannover, Germany
- 2014 – Young Investigators Meet *(talk)*, Hannover, Germany
- 2014 - World Congress on Computational Mechanics *(talk)*, Barcelona, Spain

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- 2014 - Contact Mechanics International Symposium*(talk)*, Abu Dhabi, UAE
- 2013 - German Association for Computational Mechanics Symposium *(talk + poster)*, Hamburg, Germany
- 2013 - US National Congress on Computational Mechanics *(talk)*, Raleigh, NC, USA
- 2013 - International Conference on Computational Contact Mechanics *(talk)*, Lecce, Italy
- 2012 – 53rd AIAA / ASME / ASCE / AHS / ASC Structures, Structural Dynamics and Materials Conference *(talk)*, Honolulu, HA, USA
- 2011 – 52nd AIAA / ASME / ASCE / AHS / ASC Structures, Structural Dynamics and Materials Conference *(talk)*, Denver, CO, USA
- 2011 – 18th SPIE International Sym- posium on Smart Structures & Materials and Non-Destructive Evaluation and Health Monitoring *(talk)*, San Diego, CA, USA
- 2008 – 49th AIAA / ASME / ASCE / AHS / ASC Structures, Structural Dynamics and Materials Conference *(talk)*, Schaumburg, IL, USA

Invited seminars

- 2021 – Engineering and Applied Science Forum
- 2019 – Malnad College of Engineering, Hassan (India), Dept. of Industrial & Production Engg
- 2019 – EcoleCentrale Mahindra, Hyderabad (India), Dept. Mechanical Engineering
- 2019 – IIT Delhi, Dept. Applied Mechanics
- 2019 – IIT Gandhinagar, Dept. Mechanical Engineering
- 2019 – IIT Hyderabad, Dept. Mechanical and Aerospace Engineering
- 2019 – IISc Bangalore, Dept. Mechanical Engineering
- 2019 – IISc Bangalore, Dept. Aerospace Engineering
- 2019 – Reva University, Dept. Mechanical Engineering
- 2019 – IIT Madras, Dept. Mechanical Engineering
- 2019 – IIT Bombay, Dept. Mechanical Engineering
- 2018 – IIT Dharwad, Dept. Mechanical Engineering
- 2018 – IIT Hyderabad, Dept. Engineering Sciences
- 2018 – Malnad College of Engineering, Hassan (India), Dept. of Industrial & Production Engg
- 2017 – Georgia Tech, Dept. Civil and Environmental Engineering

REVIEWER

- SMART Scholarship Program, Department of Defense (DoD), USA (Jan 2021)
- Fluid Dynamics Research (2021 – Present)
- International Journal of Numerical Methods in Engineering (2020 – Present)
- Marine Technology Society Journal (2020 – Present)
- International Journal of Advances in Engineering Sciences (2020 – Present)
- International Journal of Applied Mechanics (2020 – Present)
- Computational Mechanics (2020 – Present)
- Multibody System Dynamics (2020 – Present)
- International Journal of Solids and Structures (2018 – Present)

- Journal of Elasticity (2017 – Present)
- Proceedings for International Conference "Green Trends in Mechanical Engineering & Sciences," Hassan, India (2018)
- Proceedings for International workshop-conference "Research Challenges in Mechanics: Applications of Automated Computational Techniques," Hannover, Germany (2017)
- Handbook of Research on Computational Intelligence for Engineering, Science and Business, Editor: Siddhartha Bhattacharyya and Paramartha Dutta, IGI Global., USA (2011)
- Top 10 writers on Quora on the topics of FEA, CFD & numerical analysis

TEACHING

Lecturer / Independent instructor (Undergraduate course)

- **Engineering Dynamics and Vibrations (Fall, 2020)**
  - Dept. Civil and Environmental Engineering, UC Berkeley
  - Class strength has increased from 7 in Fall, 2019 to 17 in Fall, 2020
  - Teaching evaluation report available at https://www.ajaybharish.com/downloads/CE126_Ajay.pdf

Independent instructor (Online courses)

- **Linear and Nonlinear FEA – Part I & II (Primary instructor) (Oct, 2019 – Jan, 2020)**
  - The course comprises of 160h of video content for students
  - Attended by 60 participants from various parts of India, USA and Germany.

Other teaching experience as a teaching assistant

- Finite Element Method - I (Fall, 2016), LUH Hannover (DE) by Prof. Dr.-Ing. Stefan Löhnert
- Mechanics of Materials (Spring, 2009), Caltech, CA (USA) by Prof. Nadia Lapusta
- Statics and Dynamics (Fall and Winter, 2008), Caltech, CA (USA) by Prof. Nadia Lapusta
- Strength of Materials (Fall, 2006), NITK Surathkal (IN) by Mr. John Abraham

MENTORING

Students advised for research since 2011 – Present

- Doctoral candidates: 4 (On-going & Co-advising) (3 at LUT Finland, 1 at USP Brazil)
- Master by research in LUH: 4 students + 1 student (Co-advisor)
- Master by project/HiWi in LUH: 3 students
- Bachelor thesis in LUH: 3 students
- Intern students in LUH: 2 students
- Intern students at IISc: 14 students

FUNDING (Research)

- Successful funding of **€20000** from Continental AG (Germany) as Co-PI on "Nano-scratching for characterization of nanostructured polymers" (Feb – Dec, 2019)

- Successful funding application for Conference-Workshop on "Research Challenges in Mechanics: Applications of Automated Computational Modeling":
  - €500 for funding young researchers attending the conference, International Association of Applied Mathematics and Mechanics (Mar, 2017)
  - €3500 for organization of Conference-Workshop, Graduate Academy at Leibniz University Hannover, Hannover, Germany (Mar, 2017)

START-UP & CONSULTING EXPERIENCES

- External technical consultant, JMTC Hamburg, Germany (Feb 2015 – Dec 2019)
- CEO, CTO and Co-Founder, Engineer Materials Inc Bengaluru, India (Jun 2017 – Dec 2019)
- Freelance writer, SimScale GmbH Munich, Germany (Aug – Dec 2018)
- CTO & Co-Founder, SymboSim Inc Bengaluru, India (Jan – May 2017)
- Technical writer, SimScale GmbH Munich, Germany (Jul 2016 – Jan 2017)
- Software developer, Blueberry Technologies, Bengaluru, India (Jul 2009 – Dec 2010)

ORGANIZATION OF CONFERENCE / MINI-SYMPOSIUM / WORKSHOPS

Conference

- International Workshop-Conference on "Research Challenges in Mechanics: Applications of Automated Computational Modeling (RCM 2017)," Hannover, Germany

Short courses

- "Automation in Finite Element Method," at IIT Madras (Aug 2019)
- "Automation in Finite Element Method" at IIT Hyderabad (Nov 2018)

Mini-symposium

- "Computational contact and interface mechanics," GACM (2019)
- "New challenges on computational contact mechanics and interface models," ECCM (2018)
- "Multibody system dynamics and nonlinear transient dynamics with FEM: Methods and applications," ECCM (2018)

OTHERS

- Life member, Caltech Alumni Association
- Member, German Association of Computational Mechanics (2013 - 2019)
- Student member, Southern California Earthquake Centre (2008 - 09)
- Student member, American Institute of Aeronautics and Astronautics (2007 - 09)
- President, Indischer Verein Hannover & Indian Academic Society of Hannover (2013)
- Developer and Web administrator, Project Indian Students in Germany of Indian Embassy in Berlin (2015-17)

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ajaybh@berkeley.edu
+1-408-203-3029

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University of California, Berkleey
SimCenter, Richmond Field Station, Richmond (USA)

REFERENCES

Prof. Sanjay Govindjee[+]
Professor, Civil & Environmental Engg
University of California, Berkeley (USA)
s_g@berkeley.edu
+1-510-642-6060
http://faculty.ce.berkeley.edu/sanjay

Prof. Dr.-Ing. habil. Peter Wriggers*
Vice-President (Research)
Professor, Mechanical Engineering
Leibniz University Hannover (Germany)
wriggers@ikm.uni-hannover.de
+49-511-762-2220
http://www.ikm.uni-hannover.de

Prof. Robert L Taylor[§]
Professor of the Graduate School
University of California, Berkeley (USA)
rlt@ce.berkeley.edu
+1-510-642-3066
http://faculty.ce.berkeley.edu/rlt

Prof. Jean Francois Molinari**
Professor, Civil Engineering
EPFL (Switzerland)
jean-francois.molinari@epfl.ch
+41-216932411, +41-216932450
https://people.epfl.ch/jean-francois.molinari

Prof. Patrick Lynette[§,+]
Professor, Civil & Environmental Engineering
University of Southern California
plynett@usc.edu
+1-213-740-3133
http://coastal.usc.edu/plynett

Prof. Pedro Arduino[§,+]
Professor, Civil & Environmental Engg
Univ. Washington, Seattle (USA)
parduino@u.washington.edu
+1-206-543-6777
http://faculty.washington.edu/parduino

+Post-doctoral advisor; *****Doctoral advisor; ******Member on doctoral committee; **§**Latest collaborators. More references available upon request