

Ajit R. Jadhav

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Education:

- **Ph. D. (Mechanical Engineering).** COEP, University of Pune (2003–2007, defended 2009). Thesis topic: “A new approach to computer modeling and analysis of certain fundamental field problems from engineering sciences.” Guide: (Late) Professor S. R. Kajale (PhD, IIT Kharagpur), HoD (Mech. Engg.) and Dean (R&D) at COEP during my PhD, and at the time of my PhD defence, Director of SGGS IET, Nanded.
- **D.A.C.** C-DAC, Pune (1994). Project: “FEM of electrostatic fields.” It received the second-best marks in a class of national-level selection; my project partner and I were the two least experienced C programmers in the class at the beginning of the course.
- *Graduate School Fellow*, Dept. of Materials Engg., University of Alabama at Birmingham (UAB), USA (1990–1993). GPA: 3.16/4.00. Research topic: “Fracture of ceramic composites.” Could not complete the PhD degree itself because of an odd set of reasons. Guide: Professor B. R. Patterson (PhD, Florida).
- **M. Tech. (Industrial Metallurgy).** IIT Madras (1985–1987). CGPA: 8.25/10.00. Project: “Application oriented studies of electrolytic heating.” This project received the letter-grade of ‘Excellent’, i.e., 10/10 points. Guide: Professor R. Vasudevan (Dr.-Ing., Aachen).
- **B. E. (Metallurgy).** COEP, University of Poona (1979–1983). Marks: 66%. Class: First Class with Distinction. Project: “Bend formability.” Guide: (Late) Professor R. D. Chaudhari (PhD, Michigan State).

Work Experience:

► **Total Experience: 21 years of professional working experience, consisting of: about 11.5 years in software industries + about 5.5 years in core-engineering industries + about 5 years in teaching. Separately, about 10 years of research experience after M.Tech., during the doctoral studies.**

- August 2015–April 2016: *Professor.* G. H. Raisoni College of Engineering & Management, Wagholi, Pune (affiliated to the S. P. Pune University). Taught Thermodynamics to SE and ME students, CFD and FEA to BE students, and a CFD module to ME students. Guidance of BE projects (3 groups of 4 students each) and TE seminars (12 students).
- 2014 (Jan–Dec.): *Professor, and College Dean of R&D.* MGM’s College of Engineering and Technology, Navi Mumbai (affiliated to the University of Mumbai). Taught courses on FEA and Heat Transfer to undergraduate students.
- 2013 (July–Aug.): *Professor.* SES’s Yadavrao Tasgaonkar Institute of Engineering and Technology, Karjat (affiliated to the University of Mumbai). In-depth interaction with the

ME students for finalization of their project topics.

- 2012 (Feb.–June): *Visiting Faculty*. Symbiosis Institute of Technology, Pune. Taught an introductory course on FEM to M.Tech. (Mechanical) students.
- June 2009–Dec. 2011: *Consultant in Computational Mechanics*. SoftTech Engineers, Pune, and after the takeover of its structural products division, CSC World (India), Pune. Apart from certain work in core mechanics and FEM, for software development proper, the role was that of a Systems Architect. Reported directly to the CEO, with VP (Software Development) and VP (Structural Engineering) as team-members.
- 2009 (Spring semester): *Visiting Faculty*. COEP, Pune. Independent charge (from syllabus design to evaluation and grading) for a 3rd year B.Tech. course on FEM.
- 2005 (Jan.–June): *Module Leader*. SunGard, Pune.
- 2002–2003: *Proprietor*. Soft Machines, Pune. Built a small software product called “ToneBrush,” involving real-time visualization of music being played on a PC. It involved windowed-FFT and further signal processing.
- 1998–2001: *Consulting Software Engineer*. Independent consultant responsible for my own contracts, working in the San Francisco Bay Area. End-clients: eStamp; Hewlett-Packard; Tibco; etc. The H1B visa was sponsored by Imagine Technologies (Fremont, CA), and upon its closure, by softUltimate (Boston, MA).
- 1997 (June–August): *Software Engineer*. nirWana Inc. (Mountain View, CA, USA)
- 1995–1997: *Software Engineer to Project Leader* in the following 100% export-oriented units in Pune: Open Sesame Software Boutiques; QueriSoft Systems; Frontier Software Development
- 1993–1994: *Consulting Engineer*. Technofour, Pune.
- 1987–1990: *Senior Application Engineer*. Technofour, Pune. Also, 1989–1990: *Lecturer*. B. V. College of Engineering, Pune.
- 1984–1985: *Lecturer*. B. V. College of Engineering, Pune.
- 1983–1984: *Trainee Engineer*. Thermax, Pune, and Mukand Iron & Steel, Bombay.

Current Research Interests:

- **Mathematics of Diffusion:** Rigorous demonstration of an error in the generally accepted proof for the uniqueness of the solution—a first in 200+ years. Finite signal velocity in diffusion.
- **Fluids Simulation for Computer Graphics:** Simplified fluids simulation for fast and sufficiently realistic rendering of the flow effects in computer graphics and games, using approaches like the Smoothed Particle Hydrodynamics (SPH), and the Lattice-Boltzmann Method (LBM).
- **Simulation for Micro-Scale Water Resources Engineering:** Development of software and simulation for problems like: selection of check-dam locations (for storage or seepage), studies of salt-water intrusion (i.e. reverse-seepage) in coastal areas.
- **Casting Simulation:** CFD simulation of mold-filling during gravity sand casting of grey

iron/steel, using OpenFOAM (FVM) and Smoothed Particle Hydrodynamics (SPH). Experimental validation using the so-called “water modeling.”

- **Simulation of Rheological Flows:** Mathematical models and software (in C++ and Python) for certain highly complex rheological flows that occur during ceramics processing. The flow characteristics include: shear-thinning (i.e. non-Newtonian) fluid + unsteady heat conduction + liquid-to-solid phase change + moving fronts and free-surface effects. Also, experimental validation thereof using simpler scenarios.
- **Foundations of Quantum Physics:** Implications of the diffusion-related result. Computational simulations of certain themes core to the foundations of quantum mechanics.

Areas of Knowledge/Expertize

- **Computational Mechanics:** Complete product life-cycle of software development for an FEM-based commercial software product for modeling, structural analysis and design of buildings. Knowledge of both FEM and CFD up to the software implementation level. Currently in progress: Implementation of research-level FVM (VOF) and SPH solvers that are small enough to test new ideas.
- **Mechanical Engineering:** Basic Engineering Sciences: Fluid Mechanics, Heat Transfer, and Solid Mechanics. Also, Failure Analysis and NDT.
- **Physics:** Foundations of Quantum Mechanics. See my blog posts for the ideas generation.
- **Software Engineering:** Mainly, C++ on Windows. The experience has involved the following: Graphics programming using OpenGL. OOP and Design Patterns. Systems programming. Writing server-side middleware components using COM for Internet-enabled systems. C++ libraries used: STL, ATL, QT, Stingray Grid, ObjectSpace, Zinc, etc. Implementation of a “yacc”-like parsing tables-generator for LALR(1) languages.

Areas of Familiarity and Exposure:

- **Traditional Approaches in CFD:** Multi-phase CFD using Finite Volume Method (FVM) and Volume of Fluid (VOF) method with OpenFOAM. Also, Python packages such as FiPy, SfePy, etc.
- **Newer Approaches in CFD:** Smoothed Particle Hydrodynamics (SPH) with LAMMPS, Lattice-Boltzmann Method (LBM) with Palabos.
- **Commercial CAE Packages:** ANSYS (Academic)(2014)
- **C++ and Python on Linux:** Familiar with the platform and build issues special to Linux and Windows. Have attended a special training program on QT (2008).
- **Parallel Processing:** Exposure to cluster computing with MPI v. 2, and also some exposure to GPGPU. Have attended a workshop on GPGPU for scientific computing (2012)

Publications and Talks:

- 6 papers and 3 extended abstracts, all in peer-reviewed international conferences of repute (e.g., held for 50+ and 20+ years, with acceptance rates as low as 33%–17%). 1 journal paper in MPIF, the premier professional body for powder metallurgy in the USA.
- One privately circulated application engineering monograph.
- A couple of invited talks at national seminars.

Training Course Conducted:

- Conducted a 10-day introductory course on FEM for engineers of 3 to 30 years of experience, at CDO (Central Design Organization) and MERI (Maharashtra Engineering Research Institute), Nasik, in May–June, 2009. Co-Faculty (for one day) was a Professor from IIT Bombay.

Extra-Curricular Activities:

- A range of activities during undergraduate student days such as boating, trekking, sketching people, painting landscapes in water-colors, and dramatics.
- Representation on the student bodies at both COEP and IIT Madras.
- Contribution of several widely discussed technical threads at the Harvard-based forum of mechanics: iMechanica.

Scholarly Achievements/Honours:

- Maharashtra State Government Open Merit High-School Scholarship during VII–X and its continuation in XI–XII.
- Government of India’s Open Merit-based Scholarship during M. Tech. studies at IIT Madras.
- Graduate School Fellowship for the first year of the doctoral studies at the University of Alabama at Birmingham (UAB), USA. (This fellowship was awarded by UAB’s Graduate School, i.e., it was across all faculties of the university, including the faculties of engineering, science, medicine, arts, law, management, etc.)
- During the recent Ph.D. (at the University of Pune), research results providing conceptual ideas or perspectives fresh in as many as 75, 187, and 200+ years. The most dramatic of these involve new insights concerning the quantum wave-particle paradox. See Web site and blog for further details.
- Nomination of the Ph. D. thesis for the National-Level Innovative Student Project Award of the Indian National Academy of Engineering (INAE), New Delhi, India

Papers:

Peer-Reviewed Published Papers:

- Bhargava, P., Powell, J. F., *Jadhav, A. R.*, Patterson, B. R. & Janowski, G. M. (1993) “Microstructural evolution of Al-Al₃Ti in-situ composites,” in Advances in Powder Metallurgy and Particulate Materials, vol. 6, pp 109–120, pub. MPIF, Princeton, NJ, USA
- *Jadhav, A. R.* & Chikate, P. P. (2003) “A new numerical approach for modeling the ideal fluid flow on computer,” in Proc. of the 48th Congress of the Indian Society of Theoretical & Applied Mechanics (An International Meet) held at BIT, Ranchi, pp. 142–150, pub. IIT Kharagpur, India
- *Jadhav, A. R.* & Kajale, S. R. (2005) “Obliquity factor is not essential to the Huygens-Fresnel principle,” in e-Proc. of the 50th Congress of the Indian Society of Theoretical & Applied Mechanics (An International Meet) held at and pub. IIT Kharagpur, India
- *Jadhav, A. R.* & Kajale, S. R. (2005) “Resolution of the wave-particle paradox of light using a new approach, part I: Theoretical considerations,” in e-Proc. of the 50th Congress of the Indian Society of Theoretical & Applied Mechanics (An International Meet) held at and pub. IIT Kharagpur, India
- *Jadhav, A. R.* & Kajale, S. R. (2005) “Resolution of the wave-particle paradox of light using a new approach, part II: Computer modeling for the double-slit interference pattern,” in e-Proc. of the 50th Congress of the Indian Society of Theoretical & Applied Mechanics (An International Meet) held at and pub. IIT Kharagpur, India
- *Jadhav, A. R.* & Kajale, S. R. (2006) “The diffusion equation does not imply instantaneous action at a distance,” in Proc. of the 51st Congress of the Indian Society of Theoretical & Applied Mechanics (An International Meet) held at AUCE, Visakhapatnam, pub. IIT Kharagpur, India, pp. 62–72
- *Jadhav, A. R.* & Kajale, S. R. (2006) “FAQ modeling of a melting snowman,” in e-Proc. of the 51st Congress of the Indian Society of Theoretical & Applied Mechanics (An International Meet) held at AUCE, Visakhapatnam, pub. IIT Kharagpur, India

Peer-Reviewed Conference Presentations:

- Bhargava, P., *Jadhav, A. R.* & Patterson, B. R. (2007) “Powder processing and microstructural evolution of Al-Al₃Ti in-situ composites,” presented in Proc. of the PM-07: International Conference held at Noida, India, pub. The Powder Metallurgy Association of India, Mumbai, India
- *Jadhav, A. R.* & Kajale, S. R. (2007) “FAQ modeling of tensor fields, part I: Context, and general considerations,” presented and abstract published at CMASM 2007 i.e. the 14th International Conference of the Forum for Interdisciplinary Mathematics, held at IIT Madras, India
- *Jadhav, A. R.* & Kajale, S. R. (2007) “FAQ modeling of tensor fields, part II: A case study of a plane stress problem,” presented and abstract published at CMASM 2007 i.e. the 14th International Conference of the Forum for Interdisciplinary Mathematics, held at IIT Madras, India

Peer-Reviewed Extended Abstracts Withdrawn *After* Acceptance:

- *Jadhav, A. R.* (2010) “ToyDNS: a pedagogical software for illustrating key concepts from elasticity,” paper withdrawn after acceptance at ICTACEM 2010 (an international conference) held at IIT Kharagpur. Extended abstract accepted in September 2010, and then withdrawn due to time constraints to complete it while serving in the industrial job at SoftTech.
- *Jadhav, A. R.* (2013) “Oscillations in a manometer-like cavity having sharp corners: part I. physical experimentation,” paper withdrawn after acceptance at the 58th ISTAM (an International Conference) held at Bengal Engineering and Science University, Howrah, in December 2013. Extended abstract accepted in August 2013, and then withdrawn due to insufficient personal funds to complete the research.
- *Jadhav, A. R.* (2013) “Oscillations in a manometer-like cavity having sharp corners: part II. OpenFOAM simulations,” paper withdrawn after acceptance at the 58th ISTAM (an International Conference) held at Bengal Engineering and Science University, Howrah, in December 2013. Extended abstract accepted in August 2013, and then withdrawn due to insufficient personal funds to complete the research.

Chronological Sequence:

From	To	Occupation	Organization
07/1979	05/1983	Student	B.E. (Metallurgy) (Distinction), COEP, Pune
07/1983	09/1983	Trainee Engineer	Mukand Iron and Steel, Bombay
11/1983	05/1984	Trainee Engineer	Thermax, Pune
07/1984	05/1985	Lecturer	B. V. College of Engineering, Pune
07/1985	01/1987	Student	M. Tech. (Industrial Metallurgy), IIT Madras.
03/1987	08/1990	Senior Application Engineer	Technofour, Pune.
11/1989	05/1990	Lecturer (Part-Time)	B. V. College of Engineering, Pune
09/1990	08/1993	Student	Graduate School Fellow, University of Alabama at Birmingham (UAB), AL, USA (Unfructified Ph.D. in fracture mechanics of ceramic composites)
09/1993	06/1994	Consulting Engineer	Technofour, Pune
07/1994	01/1995	Student	P.G. Diploma in Adv. Computing, C-DAC, Pune
03/1995	10/1995	Software Engineer	Open Sesame Software Boutiques, Pune
12/1995	05/1996	Software Engineer	Querisoft Systems, Pune
07/1996	03/1997	Project Leader	Frontier Software Development (India), Pune
04/1996	08/1997	Software Engineer	nirWANa Inc., Mountain View, CA, USA
09/1997	—	Founder & MD	Founding of Soft Machines (I) Pvt. Ltd., Pune. Built prototype for industrial data logging.
01/1998	03/1999	Software Engineer	Imagine Technologies, Fremont, CA, USA. Places of work: Tumbleweed Software, TIBCO, E-Stamp
04/1999	08/2001	Senior Software Consultant	softUltimate, Burlington, MA, USA. Places of work: E-Stamp, Hewlett-Packard/Agilent, Tibco Finance, E-Scient
09/2001	06/2003	Founder & MD	Soft Machines (I), Pune. Created “ToneBrush”
04/2003	10/2007	Student	Ph.D. (Mechanical Engg.) at COEP, Uni. of Pune. (Formal registration in 01/2005.)
01/2005	06/2005	Module Leader	SunGard Offshore Services (India), Pune
—	11/2005	—	Formal closure of Soft Machines (I) Pvt. Ltd., Pune.
01/2009	05/2009	Visiting Faculty	Taught FEM to 3rd year BTech at COEP, Pune
05/2009	06/2009	Faculty	Taught a 10-day course on FEM to experienced engineers at CDO & MERI, Nasik.
—	09/2009	—	Ph.D. Defence. COEP, University of Pune.
06/2009	04/2011	Consultant in Computational Mechanics	Worked in the Struds product group at SoftTech Engineers, Pune. Reported directly to the CEO with VP (S/W Dev.) and VP (Structural Engg.) in the team.
05/2011	12/2011	Technical Consultant	CSC World (India), Pune, a subsidiary of CSC, Leeds, UK. They acquired the Struds product group from SoftTech Engineers mentioned above
02/2012	06/2012	Visiting Faculty	Taught an introductory M.Tech. course on FEM at Symbiosis Institute of Technology, Pune
07/2013	08/2013	Professor	Interacted with ME students on project topics at Y.T. Institute of Engg. & Technology, Karjat
01/2014	12/2014	Professor & College Dean (R&D)	Taught UG courses on FEM and Heat Transfer at MGM's College of Engg. & Tech., Navi Mumbai
08/2015	04/2016	Professor	Taught SE-, BE-, and ME-level courses on CFD, FEA and Thermodynamics, at G. H. Rasoni College of Engineering & Management, Pune. Guidance of BE projects (3 groups of 4 students each) and TE seminars (12 students).