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Ajit R. Jadhav

Summary

Summary of Education

- **Ph. D. (Mechanical Engineering)**
COEP, University of Pune, India
(Submitted in 2007. Defended in 2009.)
 - **M. Tech. (Industrial Metallurgy),**
IIT Madras, India (1987)
 - **B. E. (Metallurgy)** (Distinction),
COEP, University of Poona, India (1983)
- Also:*
- **Diploma in Advanced Computing**
C-DAC, Pune, India (1994)
 - *Graduate School Fellowship for Doctoral Studies*
(Materials Engineering),
The University of Alabama at Birmingham,
Birmingham, AL, USA (1990 – 1993)

Summary of Current Research Interests

My research broadly falls in the area of **Computational Science and Engineering**, more particularly, Computational Field Theory. My research emphasizes fundamentals rather than domain-specific advanced applications, inductive physical referents rather than deductive mathematical intricacies, and encompasses both quantum as well as continuum mechanics.

I am interested in certain basic field-theoretical issues from the following fields: quantum physics, computational electromagnetics and acoustics, computational solid mechanics, computer science-oriented studies of parallel processing in PC clustering environments, and the conceptual foundations of physics. It is possible to have such a wide range of subjects primarily because I focus on only the fundamentals. However, interesting end-applications always remains an active background consideration.

Summary of Work Experience

Computer-Aided Engineering: I do not make for an expert on every conceivable or practical aspect of FEM as such. However, I do know FEM sufficiently well that I could go ahead and invent an alternative to it for certain kind of field problems. As to FEM itself, during my Ph.D. research, I had implemented my own toy FEM solver. Recently, in the first half of 2009, I taught an undergraduate course on FEM at COEP, Pune. Also, in May-June 2009, I conducted one special training course on FEM for the experienced engineers working with the Central Design Organization (CDO) and the Maharashtra Engineering Research Institute (MERI), both at Nasik, India. Currently, I am working as a Consultant in Computational Mechanics at SoftTech Engineers Pvt. Ltd., Pune.

Academic Research: I have done 6+ years of research at the doctoral degree level. Out of these, about 3 years were spent in the USA. The PhD I just finished was on a new method of computational science and engineering that I have invented myself. Earlier, I had attempted a Ph.D. in materials engineering at the University of Alabama at Birmingham (UAB) in USA. At UAB, the research topic was: fracture mechanics of ceramic composites.

So far, I have published 10 peer-reviewed papers, all at international level conferences. I have delivered two invited talks at national level conferences in India. Currently, a few more papers are in the preliminary stage of preparation.

Professional Software Development: I have about 9.5 years of professional software development experience, both in startups as well as in more established companies. Out of these, about 4 years were spent in the USA. Most of this experience was in the consulting mode. In my software career, I have directly managed teams having about 5 graduate and post-graduate engineers. The places where I have worked have included Hewlett-Packard, eStamp, and Tibco in USA, and SoftTech Engineers, SunGard, Open Sesame, Frontier Software, and Querisoft in India. The main technology platform has been C++ on Windows. However, I have also used OpenSUSE 10.3. I have used MPI v2, QT v4.3 and VTK v5.2. I have also gone through a complete product cycle from concept to release. As mentioned above, recently, from June 2009, I am providing consulting services to SoftTech Engineers Pvt. Ltd., where the software development work has included adaptation of certain mesh generation software, its integration with an existing CAE product, and implementation of C++ code for post-processing (for field and contour plotting) as well as for certain solver functionality.

Engineering Industries: I have about 5.5 years of work experience in the “hard” engineering industries, a majority of it as an application engineer at Technofour, Pune. In this experience, I have managed project teams of up to 10 engineers and in all about 20 people (at the time of installation). My job directly or indirectly involved providing on-site solutions in NDT and manufacturing process problems for our 100+ customers spread all over India. The problems came from a wide range of industries: light and heavy automobiles, railways, electrical and heavy machinery, engineering components, tubes and bars manufacturers, etc. This experience later on led to writing of a monograph on eddy current NDT. But, the truly lasting value of this experience is that I could develop a first-hand “feel” for the way machines & their components “face” their service conditions—e.g., how stress fields arise in them; how they wear out & corrode; how they develop deformation & cracking, etc.

Summary of Special Achievements

I have achieved firsts in the world more than 5 times by now. Some of these results provide conceptual perspectives that are fresh in as many as 75, 187 and 200 years. These achievements have come about in many different fields, both pure and applied:

- Invention of a new approach in computational science and engineering (2003 – 2007)
- Theoretical correction of misconceptions from the classical physics of waves (2005) and that of heat/diffusion (2006)
- The resolution of the quantum wave-particle paradox of light (2005)
- Co-discovery of a new method to make ceramic-metal composites in laboratory (1992)
- Success in crack detection in cylindrical powder-metallurgical parts using the eddy current technique while the parts were still in their green (un-sintered) state, despite decades of prior reported failures to achieve so from both Europe and north America (1988)
- Discovery of a new form of arcing during electrolytic heating (1986)

Details in respect of all the above aspects follow on the next 14 pages.

Current Research Interests

Basics of Quantum Physics

- Continuation and extension of my Ph.D. work regarding deriving a new view of the basic quantum mechanical phenomena. Computational modeling shall continue to be used as the principal means of conducting the inquiry.
- Software in C++ in help visualize Feynman's ideas of QED as given in his tiny book for the layman. The objective is to gain clarity in differentiating my approach from Feynman's.
- Computationally, the methods related to the Quantum Monte Carlo (QMC) approach are very highly relevant. Thus, certain studies connected with QMC would be undertaken.

Foundations of Physics

- A fresh look at the action and variational principles of physics and certain associated ideas such as potential—their basic nature and history of development. Comparative studies of technical advantages and disadvantages of action and variational principles vis-à-vis the classical vector mechanical approach, and my new local and propagational approach.
- Also, the world-views, or philosophical ideas, that all such approaches implicitly assume, facilitate, or promote.

Computational Modeling for Electromagnetics, Acoustics, Optics, and Waves

- Studies and software models of phenomena from EM, optics, acoustics, and waves in general, which can help me develop my view of quantum mechanics and field theories.
- Studies that suggest practical end-applications for my new approach to field theories.
- Computationally, rather than FEM, other methods like FDTD, TLM and the scattering-based approaches are of greater relevance here

Computational Solid Mechanics

- Molecular dynamics (MD) simulations and the insights that they lead to
- Foundational ideas concerning various methods of computational science and engineering, such as FEM, FVM, FDM, etc. For example, why FDM and FVM are frequently used in fluid dynamics, but hardly, if ever, in solid mechanics.
- Stress and strain: fundamental issues. Software models that can be useful in pedagogy, and possibly in research too.
- An exploration of the possibility of proving my new conjecture (c. 2007) that tensor stress fields could be modeled using a computational technique like the random walk.
- Establishing relations between my new approach to quantum mechanics on the one hand and the continuum views of the mechanical quantities such stress on the other hand.

Basic Computational Fluid Mechanics

- A set of C++ programs especially written to help teach certain basic ideas to students. The software will try to clearly bring out certain ideas such as: differential coupling, differential nonlinearity, numerical instability, etc. Perhaps, also simplified version of the multi-grid and conjugate-gradient algorithms. However, please note, the field of CFD itself is *not* a part of my primary interests. I approach it only as a well-studied field or archetype that embodies the aforementioned mathematical and computational ideas.

Computer Science

- Simulation of cluster computing on a single PC so as to help develop a deeper appreciation of the environment which is peculiar to parallel processing using PC clusters.
- Using the simulator to design a new C++ library which will have explicit constructs for resource allocation and synchronization in a clustering environment—an improvement over MPI, in a way.

Education

Ph. D. (Mechanical Engineering)

[2003 – 2007] College of Engineering (COEP), University of Pune, India

- Official Guide: Dr. S. R. Kajale, Ph.D. (Mech. Engg.) (IIT Kharagpur); Professor & Head, Dept. of Mech. Engg. as well as the Dean of R & D, at COEP.
- My Ph. D. was on a new approach in computational science and engineering which I invented. The new approach is called “FAQ,” short for **fields as quanta**
- FAQ has many competitive advantages such as: (i) ease of parallelization; (ii) suitability to address both continuum and quantum mechanical problems; (iii) possibility of intermediate updates to the end-user; (iv) excellent computational speed; (v) a direct correspondence with the physics of the fields, permitting new insights to be obtained; etc.
- My Ph.D. research has yielded the following results:
 - The resolution of the quantum wave-particle duality paradox—a 75-years old problem from fundamental physics.
 - The correction that the obliquity factor of classical wave physics is not essential to the Huygens-Fresnel principle—an observation fresh in 187 years.
 - The denial of the instantaneous character to solutions to the partial differential diffusion equation—an observation fresh in the 200 years of Fourier’s theory.
- *Publications/Presentations*: 6 peer-reviewed research papers and 2 extended abstracts, all at international meets.
- The thesis was submitted on October 12, 2007. The examination panel was appointed in early 2009. The delay occurred, in part, owing to the difficulty in locating suitable examiners, including those from USA. The final panel consisted of distinguished full Professors from IITs; their credentials include: past Presidentship of the Indian Society of Theoretical and Applied Mechanics (ISTAM), visiting full Professorship at a distinguished university abroad, and being India’s representative to the International Union of Theoretical and Applied Mechanics (IUTAM). The final Ph.D. defence took place on September 20, 2009; the thesis was accepted without corrections.

Diploma in Advanced Computing

[II half of 1994] C-DAC, Pune

- Selection to within 40 out of 10,000 applicants from all over India
- I was one of the two least experienced C-programmers at the beginning of this course. (I had two months of experience with C whereas all others had 2 to 4 years of experience.) However, the two of us received the second-best marks in the class for the project work at the end of this course. The project was on software development for FEM of static electromagnetic fields.

Graduate School Fellowship (Doctoral Level)

[1990 – 1993] The University of Alabama at Birmingham, Birmingham, AL, USA

- Received this university-wide fellowship, without any research or teaching obligation, as a student of Ph. D. in Materials Engineering
- Advisor: Dr. B. R. Patterson, Ph.D. (Met. Engg.) (Florida), Associate Professor.
Co-Advisor: Dr. G. M. Janowski, Ph.D. (Met. Engg.) (Michigan Tech). Assistant Professor.
- The research topic had to be changed twice, but the last topic was final; it was on modeling and fracture mechanics of ceramic composites
- Published two papers on the co-discovery of a new method to prepare ceramic composites (one back then in 1993, and another conference paper recently in 2007)
- Had to leave the Ph.D. program after I was failed in a non-core course topic on the qualifying examination by one professor (someone other than my advisor/co-advisor). References from my advisors can be made available.

M. Tech. (Industrial Metallurgy)

[1985 – 1987] Indian Institute of Technology, Madras

- Designed the course-composition to be general by taking courses from various departments. Thus, the degree was rather only formally in industrial metallurgy.
- Project Guide: Dr.-Ing. R. Vasudevan, Ph.D. (Phys. Met.) (Aachen, Germany), Professor
- Discovered a new form of arcing—of unusual properties, and in a completely unanticipated context—during the semester-long project on electrolytic heating
- Received the ‘Excellent’ letter grade (10/10 points) for this project work

B. E. (Metallurgy)

[1979 – 1983] College of Engineering (COEP), University of Pune, India

- Received the degree in First Class with Distinction
- After the common first year, at the time of branch selection, I chose the Metallurgy branch, largely out of a perceived sense of novelty, even though the more competitive Electrical and Mechanical branches were available to me by open merit at COEP
- Project Guide: Dr. R. D. Chaudhary, Ph.D. (Met. Engg.) (Michigan State), Professor
- The topic of the project was “Bend formability”

Scholarships

- **For Ph. D. studies:** (was offered) (July and Dec., 2004) Research Scholarship, IIT Madras
- **For Ph. D. studies:** (1990 – 91) Graduate School Fellowship, University of Alabama, USA. This fellowship was offered to me even when I did not have any GRE scores available with me, because scores for all centers in India were cancelled, out of suspected mass copying. The scores came only after the admission decisions. For me, these were: *Verbal:* 710/800 (96P), *Quantitative:* 800/800 (98+ P)
- **For M Tech. studies:** (1985 – 87) Open Merit Scholarship, IIT Madras
GATE Score: 94 P in Metallurgical Engineering stream
- **During Standard VIII - XII:** (1974 – 79) I could not appear for the scholarship examination in my standard IV due to certain circumstances. So, the High-School Open Merit Scholarship Examination, held in standard VII, was the first time I could appear for a scholarship examination. I was placed to within about 150 out of more than about 100,000 students.

Extracurricular Activities

- During the undergraduate years at COEP, I participated in a wide range of extracurricular activities including: boating, trekking, sketching, painting water-color landscapes, participation in the state-level award-winning dramatics (both script-writing and stage-acting). I was also nominated to the management committee of the Student Gymkhana of COEP.
- During post-graduate studies at IIT Madras, I was elected to represent about 450 M Tech students at the Student Affairs Council of IIT Madras.

Areas of Expertise

- **Software Engineering:**
 - Mainly, C++ on Windows. The experience has involved the following: Systems programming. Writing middleware components using COM for Internet-enabled systems. OOP and Design Patterns. Graphics programming using OpenGL
- **Methods of Computational Science and Engineering:**
 - FEM, FDM, FVM
- **Engineering:**
 - Non-destructive testing, failure, and fracture. Solid mechanics. Basic engineering sciences like heat transfer, fluid mechanics, and materials science
- **Physics:**
 - Basics of quantum physics

Areas of Familiarity

- **Cluster Computing:**
 - Have implemented some cluster-computing code using MPI v2
- **Molecular Dynamics:**
 - Have some familiarity with MD modeling for mechanical properties
 - Am aware of the issues and current research directions concerning multi-scale modeling
- **Other Methods of Computational Science and Engineering:**
 - Quantum Monte Carlo (QMC), Transmission Line Matrix (TLM), Finite Difference Time Domain (FDTD), Cellular Automata (CA), Lattice-Boltzmann (LB), etc.
- **Exposure to:**
 - C++ development on OpenSUSE 10.3
 - QT 4.3, VTK 5.2, ParaView 3.3
 - OpenFOAM 1.5
 - Other languages such as: VB, Java, C#, Python, Pascal, FORTRAN, etc.

Software Skills

- **Main Platform:** C++ on Microsoft Windows (from NT Server 3.5 onwards)
- **C++ Libraries:** STL, OpenGL, ATL 3, MFC, ObjectSpace, Stingray Grid, Zinc GUI, etc.
- **Components Technology:** COM, including DCOM, MTS, ActiveX, OLE2
- **Networks & Protocols:** WinSock2, HTTP 1.1, XML, etc., all on server side
- **CAE Packages:**
 - Exposure to CATIA, Pro/E, ANSYS
 - Exposure to several public domain software
- **CAE and Parallel Processing Software and Libraries:**
 - QT 4.3, VTK 5.2, ParaView 3.3, EasyMesh, TetGen
 - MPI v2
 - OpenSUSE 10.3

Hands-On Software Implementation

- **Computational Engineering:**
 - Have implemented in C++:
 - A toy FEM system for stress analysis and for potential fields,
 - FAQ- and CA-based solvers
 - Have used certain readymade unstructured mesh generation programs available in the public domain such as: Triangle, EasyMesh, TetGen, etc.
- **Computational Physics:**
 - As mentioned in the “Current Research Interests” section, I am currently in the process of developing simple programs following various other approaches of

computational physics and mechanics (such as QMC, MD, etc.)

- **Cluster Computing:**

- Have implemented some cluster-computing code using MPI v2

- **Formal Computer Languages Theory:**

- Out of curiosity as to how the programming tool I used daily—the compiler—actually worked, I wrote a C++ program that generates parsing tables for the table-driven parsing of any LALR1 language such as Java, given the latter's abstract grammar specification. Also wrote subsidiary tools for the EBNF-to-BNF conversion. I wrote these programs on evenings, as a matter of hobby

Professional Work Experience (Software Development)

[6/2009 – continuing]	SoftTech Engineers	Pune, India
Consultant in Computational Mechanics		
<ul style="list-style-type: none">• Working on enhancing the FEM capabilities of a fairly well-established product called “Struds Pro.” This is a buildings structural analysis package. It helps civil engineers in conducting structural stress analysis of buildings (including earthquake analysis), and also automates certain tedious tasks concerning the detailed engineering design.• The work has involved all aspects of FEM: pre-processing (adaptation and integration of public domain mesh generation software), post processing (writing software for field plots and contour plots) and parts of solver (shape function studies, writing software for stress extrapolation from integration points, and stress recovery).• The development has involved MFC, OpenGL and FORTRAN, as well as XML. The total size of the code-base to get impacted is estimated at about 100,000 lines of C++ code.• The consultation is about to end because further work would emphasize certain civil engineering-specific developments concerning shells and plates.		
[1/2005 – 6/2005]	SunGard Offshore Services	Pune, India
Module Leader		
<ul style="list-style-type: none">• Wrote multi-threaded asynchronous sockets library in C++ in less than a month, while still following design patterns. Integrated it in a code base of 20,000 lines• Also, delivered to our US-based colleagues a set of two utilities that used MS CryptoAPI and continuous directory monitoring• Insisted on doing this lower-level job because Ph D had just begun. Left it after trying it out for 6 months because the domains of Ph D and the job didn’t match.		
[8/2001 – 3/2003]	Soft Machines (India)	Pune, India
Entrepreneur		
<ul style="list-style-type: none">• One-man development of a consumer product called “ToneBrush.” It allowed visualization of music in real time• The product was released on the Internet• Eventually, the company was closed because of a lack of sales.		
[11/2000 – 2/2001]	E-Scient Corp.	Los Gatos, CA
Consulting Software Engineer		
<ul style="list-style-type: none">• Wrote parts of an XML-based middle-layer connecting MS SQL Server and end clients. The end clients included MS IE and a Win32 application.• Reused MSXML parser objects under transactional processing context		
[6/2000 – 9/2000]	TIBCO Finance	Palo Alto, CA
Consulting Software Engineer		
<ul style="list-style-type: none">• Feature enhancements and maintenance of an industry-leading desktop client used in stock-markets and finance firms		
[7/1999 – 4/2000]	Hewlett-Packard / Agilent Technologies	Santa Rosa, CA
Consulting Software Engineer		
<ul style="list-style-type: none">• Co-design and independent development of a standalone GUI-based exe application.• The program allowed easy entry of the parameter values for certain database-automated tests. The tests were meant to be used in QA of microwave communications equipment• Wrote about 20,000 lines of code. Used Stingray Grid library. Also wrote system documentation and user documentation.		

[7/1998 – 4/1999] **E-Stamp** **Palo Alto, CA**
Consulting Software Engineer

- Fixed important bugs concerning GDI and font-printing within ActiveX components. Difficulty: These components were meant for embedding in unknown or difficult clients like MS Word. Previous team of 3 engineers took 1.5 years with only part success; this was due to hard-coding of certain printing related parameters. In contrast, I took barely 3 months and achieved complete success by revising the entire approach and without involving hard coding
- Created and helped deploy a COM component for automatic uploading of large data files (~10 to 100 MB). Used HTTP POST, overcoming its standard limitation of 64 kB.

[5/1998 – 7/1998] **TIBCO** **Palo Alto, CA**
Consulting Software Engineer

- Participated in the design and development of a framework of C++ classes.
- The framework was meant to ease writing of TIB adapters. Each server side adapter was expected to be used in interconnecting enterprise-wide business applications like SAP with Siebel, etc. Used ObjectSpace C++ class library

[3/1998 – 4/1998] **Tumbleweed Software** **Redwood City, CA**
Consulting Software Engineer

- Reviewed a large code base (more than 20,000 lines) and provided some advice for streamlined error- and exception-handling in it.
- Miscellaneous work to show how to access DLL C++ objects in VB5 form

[8/1997 – 1/1998] **Soft Machines** **Pune, India**
Founder

- Our team of six employees and I together built a prototype and conducted simulations for a specialized industrial data logging system. The system was meant to be used for real-time monitoring of wind mills.
- However, we failed to get orders from the nodal agencies of the state government. In the meanwhile, I went to USA to try and see if I could get any projects for the Pune team. But I could get work only for myself. Consequently, all operations were closed down in August 1998.
- On technical side, we evolved a general purpose communications protocol on top of RS-232 capable of multi-way communications.

[4/1997 – 7/1997] **nirWANa** **Mountain View, CA**
Senior Software Engineer

- Used DCOM to make legacy applications like MS Excel and MS Outlook available from a preliminary applications server
- I was asked to leave the company because I pointed out market risks to the overall product idea once I got to know details about it only after reaching Mountain View, CA. I was the second employee there. Later on, the company became 60+ strong in a few months' time, and then soon enough was closed down, out of exactly the same issues.

[7/1996 – 4/1997] **Frontier Software Development** **Pune, India**
Project Leader

- The work involved the above project (nirWANa's)
- Led a team of about 3 engineers at Pune

[11/1995 – 5/1996] **Querisoft** **Pune, India**
Software Engineer

- Wrote a comprehensive test plan and executed it for a pre-beta and beta release of a security-oriented (i.e. cryptography-based) product called Troy.
- Helped in code optimization at the source-code level (a space-time trade-off)
- I was asked to leave for unknown reasons, probably something as vague as “interpersonal troubles.” I did experience a lack of support from directors and many colleagues. My openness to USA jobs was then looked down as a lack of commitment. The product we were working on, however, never made it to the market in any form.

[3/1995 – 10/1995] **Open Sesame Software** **Pune, India**
Boutiques
Software Engineer

- Ported a product called “TailorMade” from its code-base in BASIC to C++.
- The product had highly customizable modules covering distribution, accounting, logistics, manufacturing, etc.
- Used Borland C++ 4.5 with Zinc library for its GUI capabilities and OO code
- In retrospect, this was a far superior experience in the entire software industry for me, in terms of all: technology, encouragement to learning, innovativeness of ideas and implementation, and practical success.

Professional Work Experience (Engineering Industries)

- | | | |
|---|--------------------------------------|----------------------|
| [9/1993 – 6/1994] | Technofour | Pune, India |
| Consulting Metallurgical Engineer | | |
| <ul style="list-style-type: none">• Wrote a monograph of title: “Physics of Eddy Current Sorting” in which I noted down my experience of application engineering for sophisticated eddy current NDT systems.• Left to pursue C-DAC’s diploma | | |
| [3/1987 – 8/1990] | Technofour | Pune, India |
| Senior Application Engineer | | |
| <ul style="list-style-type: none">• Applied eddy current non-destructive testing (NDT) technique to a wide variety of quality evaluation problems in engineering industries at 100+ customers’ sites spread all over India• Boosted sales turnover by 50% with 33% less staff• Did applied research on detection of cracks in green powder metallurgy parts—a first in the world (1988)• Helped our director in writing standard specifications for the Bureau of Indian Standards• Became the youngest ever senior application engineer (1989)• Left to pursue Ph D at the University of Alabama at Birmingham (UAB). The Ph D was initially thought to be in ultrasonic NDT and/or fracture mechanics. | | |
| [11/1983 – 5/1984] | Thermax | Pune, India |
| Graduate Engineer Trainee | | |
| <ul style="list-style-type: none">• Successfully completed the training in all the departments including design, production, sales, service, etc.• Did not take the job in the Welding Lab offered at the end of the training because the Design department was denied to me. That was purely because my formal degree was in Metallurgy and not in Mechanical. The HR department remained firm on this decision even after their own senior mechanical design engineers (including a design department head) had made special requests to the HR. The design department made these requests because I excelled in the live design tasks given by them. | | |
| [7/1983 – 9/1983] | Mukand Iron & Steel Works | Mumbai, India |
| Graduate Trainee Engineer | | |
| <ul style="list-style-type: none">• I was selected to within 4 out of 80+ graduate engineer trainees (more than 50 of them being B’Tech IITians) for a special training program in the EDP department (i.e. what today would be called the IT department, under the CIO). I had received the highest grade of A+ on IBM’s aptitude test, then conducted by IDM. By way of on-the-job performance (which included training in programming, and systems design), I was evaluated the best among the selected trainees, on more than half of the tests/tasks.• Left because the promises made on-campus for hostel accommodation were not kept for the in-state trainees (i.e. those from the Maharashtra state) despite several rooms in the trainees’ hostels going vacant. Accommodation was a serious issue, and commuting was difficult. | | |

Professional Work Experience (Teaching)

[May - June, 2009] Founder	Jadhav Research	Pune, India
<ul style="list-style-type: none">• Conducted a Special Training Program on the Finite Element Method (FEM) for the working engineers at CDO (Central Design Organization) and MERI (Maharashtra Engineering Research Institute) at Nasik during May 25 to June 1, 2009.• The average experience of the trainees was about 25 years. More than 5 of the 22 trainees had MTechs from IITs/NITs. All the trainees appreciated the course; a few references can be made available on request.		
[1/2009 – 4/2009] Visiting Faculty	College of Engineering, Pune (COEP)	Pune, India
<ul style="list-style-type: none">• Independent responsibility for course design, teaching, and grading for a third-year B.Tech. course on Finite Element Modeling. See the presentation slides used in this course at my Web site here: http://www.JadhavResearch.info/training.htm• Also had offered a course on Interactive Computer Graphics to the M.Tech. (Mech.) (Design Engineering) students. However, no registrations occurred in this semester.		
[1/1990 – 5/1990] Lecturer	B.V. College of Engineering	Pune, India
<ul style="list-style-type: none">• Taught Materials Science (second-year) and Production Metallurgy (third-year)• Left to pursue Ph.D. at UAB, USA.		
[7/1984 – 5/1985] Lecturer	B.V. College of Engineering	Pune, India
<ul style="list-style-type: none">• Taught Materials Science (second-year), and many other first/second year courses.• Developed their Metallurgy lab as its first in-charge• Left to pursue M Tech at IIT Madras		

Guidance of Student Projects

M.E. Metallurgy [1994 – 1995]	College of Engineering, Pune (COEP), University of Pune	Pune, India
<ul style="list-style-type: none">• Guided one student of M.E. Metallurgy at COEP, University of Pune.• This project was about eddy current characterization of precipitation hardening. This project won the first rank in the University of Pune.• A notable aspect here was that we had explicitly emphasized reasoning in reference to the length-scales over which the relevant causal factors operated. This was at a time when the term “multi-scale modeling” had not yet come in vogue.		
Master of Computer Science [1998 – 1999]	Nowrosjee Wadia College, University of Pune	Pune, India
<ul style="list-style-type: none">• Provided a project to two students of MCS at the Wadia College, University of Pune.• This project was about Internet-based remote monitoring of wind-based electricity generators (WEGs). The project was well appreciated by the external examiners, and it was placed within top 5% in the University.		

Publications and Talks

Papers

Jadhav, A. R. & Kajale, S. R. **“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 (2006)

Jadhav, A. R. & Kajale, S. R. **“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 (2006)

Jadhav, A. R. & Kajale, S. R. **“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 (2005)

Jadhav, A. R. & Kajale, S. R. **“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 (2005)

Jadhav, A. R. & Kajale, S. R. **“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 (2005)

Jadhav, A. R. & Chikate, P. P. **“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 (2003)

Bhargava, P., Jadhav, A. R. & Patterson, B. R. **“Powder processing and microstructural evolution of Al-Al₃Ti in-situ composites,”** in Proc. of the PM-07 International Conference to be held at Noida, India, pub. The Powder Metallurgy Association of India, Mumbai, India (2007)

Bhargava, P., Powell, J. F., Jadhav, A. R., Patterson, B. R. & Janowski, G. M., **“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 (1993)

Extended Abstracts

Jadhav, A. R. & Kajale, S. R. **“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 (2007)

Jadhav, A. R. & Kajale, S. R. **“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 (2007)

Monograph

Jadhav, A. R., “**Physics of Eddy Current Sorting**,” Technofour, Pune, India (1994)

Invited Talks

Jadhav, A. R. “**High-Performance Cluster-Based Computing for Engineering Design.**” A talk delivered at the “SAE Conference on Advances in Automotive Design and Styling,” a national level SAE conference in India held at the Automotive Research Association of India (ARAI), Pune, on February 18, 2008 (2008)

Jadhav, A. R. “**Methods of Computational Mechanics**” A talk delivered at “Auto Design 2007,” a national level seminar organized by CAD CAM Peoples’ Association, held at the International Convention Center, Pune, on February 25 (2007)

Internet: Research Notes and Communications

Notes and Communications at iMechanica—the Harvard-based Web of mechanics and mechanicians: <http://www.iMechanica.org>. I became a member in February, 2007. The following are some of the threads where I have made contributions:

- “[Stress or strain: which one is more fundamental?](#)” (2007) A thread initiated by self
- “[The meaning of the concept of potential in mechanics \(and in physics\)](#)” (2009) A thread initiated by self
- “[Variational formulations in fracture mechanics](#)” (2008) Comments in the Journal Club theme of August 15, 2008, ed. by Adrian Lew
- “[Why not use FDM in solid mechanics?](#)” (2007) A thread initiated by self
- “[FEM is not a local method \(and it isn’t global either\)](#)” (2009) A thread initiated by self
- “[Why lionize mathematics in physics/engineering?](#)” (2007) A thread initiated by self
- “[Mathematics for mechanics](#)” (2008) Comments in a thread initiated by Siddharth Avachat
- “[One-way wave equations for imaging, multiscale modeling, and absorbing BCs](#)” (2009) Comments in the Journal Club edition of August, 2009, ed. by Murthy Guddati
- “[A point and a particle](#)” (2009) Comments in a thread initiated by Rui Huang
- “[Forces and Newton’s laws of motion](#)” (2007) Comments in a thread initiated by Henry Tan
- “[Sih’s strain energy density approach in fracture—why is it not popular?](#)” (2007) Comments in a thread initiated by Dhruv Bhate
- “[Question: Is the local energy dictating dislocation emission constant for single crystal?](#)” (2007) Comments in a thread initiated by Kejie Zhao
- “[Puzzle: What caused this failure?](#)” (2009) Comments in a thread initiated by Biswajit Banerjee

The Chronological Sequence

1979 – 1983	<ul style="list-style-type: none"> • Student of B.E. (Metallurgy) at COEP. Received the degree in the Distinction Class
1983 – 1984	<ul style="list-style-type: none"> • Training in Mukand, Mumbai. Left due to accommodation problems in Mumbai • Training in Thermax, Pune. Left because design department was denied.
1984 – 1985	<ul style="list-style-type: none"> • Taught at B. V. College of Engineering, Pune. Developed their Metallurgy lab.
1985 – 1987	<ul style="list-style-type: none"> • Student of M. Tech. (Industrial Metallurgy) at IIT Madras • <i>The first time that I achieve a first in the world:</i> Discovery of a new form of arc
1987 – 1990	<ul style="list-style-type: none"> • Application engineering at Technofour, Pune, traveling all over India. • <i>The second time that I achieve a first in the world:</i> Crack detection in green P/M parts • Taught for a semester at B.V. College of Engineering, Pune
1990 – 1993	<ul style="list-style-type: none"> • Student of Ph. D. (Materials Engineering) at University of Alabama • <i>The third time that I achieve a first in the world:</i> Co-discovery of a new method to make ceramic composites. But was failed in the qualifying examination.
1993 – 1994 (I half)	<ul style="list-style-type: none"> • Consulting Metallurgical Engineer at Technofour, Pune. • Wrote the monograph on eddy current sorting
1994 (II half)	<ul style="list-style-type: none"> • Student of Diploma in Advanced Computing at C-DAC, Pune • Began pursuing this out of curiosity and interest in computational mechanics. Did a project in software development for FEM of electrostatic fields
1995 – 1997 (I half)	<ul style="list-style-type: none"> • Could not get a job in the field of CAE or computational mechanics for reasons best known to the employees/recruiters • Was promoted in jobs from Software Engineer to Project Leader in the following companies at Pune: Open Sesame, Querisoft, Frontier Software Development
1997 (I half)	<ul style="list-style-type: none"> • Senior Software Engineer at nirWANa, SF Bay Area, USA, on H1B visa sponsored by them. Within 3 months, I was fired by them. The company closed down soon.
1997 (II half)	<ul style="list-style-type: none"> • Founded Soft Machines in Pune. Hired five engineers. Built software for wind-mills.
1998 – 1999	<ul style="list-style-type: none"> • Senior Consulting Software Engineer in San Francisco Bay Area, USA. My H1B visa was sponsored by Imagine Technologies, Fremont, CA, and I was responsible for my own contracts. The end clients were: Tumbleweed Software, TIBCO, and E-Stamp. However, Imagine Technologies itself closed down in February 1999.
1999 – 2001	<ul style="list-style-type: none"> • The next H1B visa was sponsored by softUltimate, Inc., Boston, MA, on the same terms of independent consulting. The end clients were: E-Stamp, Hewlett-Packard (Agilent), TIBCO Finance and E-Scient. Returned to India in August 2001, having to cut short the green card process because of the non-availability of contracts
2002 (I Half)	<ul style="list-style-type: none"> • I gained the initial confidence that the FAQ method would certainly work out waves and that it might work out for tensor fields too. • Decided to pursue future career only in computational mechanics. • My first failed attempt to get admission to Ph D (Mech. or Met.) at IIT Bombay, despite support by a faculty member who didn't know me beforehand. • Was made aware of the movement about computational science in general, by a helpful professor from an unrelated department
2002 (II Half)	<ul style="list-style-type: none"> • At Pune, as many as twelve professors decline to guide me for a Ph D in Mech.
2003 (I Half)	<ul style="list-style-type: none"> • My second failed attempt to get admission to Ph D (Mech.) at IIT Bombay • Dr. Chikate at University of Pune tentatively agrees to guide my Ph D. • Completed developing the product “ToneBrush” and launched it on the Internet. The number of free downloads were increasing, but sales failed to pick up at all.
2003 (II Half)	<ul style="list-style-type: none"> • My first failed attempt to get admission to Ph D (Mech. or Met.) at IISc Bangalore. Without advance information that there would be a written test, I competed with 80+ fresh ME/MTech's (in mech or aero) on a written multiple-choice test on mechanical engg. topics, and cleared it (being found within top 25% of them).

	<ul style="list-style-type: none"> • Closed down the “ToneBrush” product site out of a lack of sales. • Failed to get either jobs or patent sponsorships at reputed public companies in Pune. • Published the very first paper on FAQ without any official Ph D admission or patents sponsorship in hand.
2004 (I Half)	<ul style="list-style-type: none"> • My second failed attempt to get admission to Ph D (Mech. or Met.) at IISc Bangalore. I also clear a written test in UG maths, programming and electromagnetics at the Supercomputer Education and Research Center (SERC) of IISc. In the interview, the chairman offers me admission with enhanced fellowship, but only if I would work on their ongoing project. I respectfully decline the offer. • Firm Ph.D. admission with scholarship is offered at IIT Madras, but in Metallurgy, not Mechanical, thereby possibly modulating the scope of the possible research on FAQ. Hence, I respectfully declined it.
2004 (II Half)	<ul style="list-style-type: none"> • Admission to Ph D in the Mechanical branch finally goes through at the University of Pune.
2005 (I Half)	<ul style="list-style-type: none"> • Job as a Module Leader at SunGard, Pune. This was a lower-level position which I insisted on, because the Ph D would be just beginning, and there wouldn’t be time to do well in two primarily un-connected domains. Left the job to focus on Ph. D. after completing the minimum six months requirement.
2005 (II Half)	<ul style="list-style-type: none"> • <i>Two more firsts in the world:</i> I published three papers. One of the theoretical results seems to be a first in 75 – 105 years. Another is a first in 187 years.
2006	<ul style="list-style-type: none"> • <i>One more first in the world:</i> A new argument to deny instantaneous action at a distance (IAD) in diffusion. A new discriminant to detect IAD. My ideas seem to take a conceptually new view of the theories that are 199—202 and 102 years old. Published 2 papers
2007	<ul style="list-style-type: none"> • The new conjecture about random walks for tensor fields announced (Jan., 2007) • Began blogging at iMechanica (February, 2007). The thread on the fundamental nature—the hierarchical order—of stress vs. strain, which I initiated there, goes to be within top 10 out of 5000+ serious technical threads at that site. • The Pre-submission Seminar (held upon the completion of the actual Ph.D. research work) held at COEP on April 12, 2007. Submitted the final PhD Thesis to the University of Pune on October 12, 2007
2008	<ul style="list-style-type: none"> • Began a teaching job at Sinhgad Institute of Technology, Lonavala, Pune (Aug.). Had to leave the job prematurely out of certain difficulties regarding the Institute-owned commute buses, a matter which, I believe, was deliberately arranged. (Sept.) • Was verbally told (in Nov.) to have been selected as a Full Professor in Bharati Vidyapeeth University, Pune, but never did receive the appointment letter in writing.
2009	<ul style="list-style-type: none"> • Became a Visiting Faculty at COEP, Pune. This was after having <i>not</i> been selected for a permanent position there by a committee which, apparently, concluded that I—an alumnus of COEP—would be of too high a level to teach students at COEP. The committee was headed by the then Dean of R & D of IIT Bombay, and the process involved a couple of emeritus professors from IITs who seemed to have strong views that MD simulations cannot be useful in our mechanical engineering department. I fought the issue, and so was allowed to take one course on an experimental basis. Thus taught a UG course on FEM, well received by the students themselves. Course notes are available at my Web site. • Conducted a special training program on FEM for the working engineers at CDO and MERI during May 25 to June 1, 2009. The average experience of the trainees was ~25 years; a few were young MTechs from IITs. All appreciated the course. • In June, began consulting in Computational Mechanics at SoftTech Engineers Pvt. Ltd., Pune, India • Successfully defended the Ph.D. thesis (which was accepted without any corrections) on September 20, 2009.