



Rajeev Kumar

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Rajeev Kumar is a Professor of Computer Science at JNU New Delhi. He holds a PhD degree in Computer Engineering from **Univ. Sheffield**, an M.Tech. degree in Computer Sc. & Tech. from **Univ. Roorkee** (now IIT Roorkee), and an M.Sc. degree in Physics (Electronics) from **Univ. Allahabad**. His primary education was in a river-side *Gurukul*, Shri Dugdeshwar Sanskrit Mahavidyalaya at Pilibhit.

He is an academician by choice, teaching & research are his lifeline, he has four decades of experience. He served the Indian Institutes of Technology (IITs) at **Kharagpur & Kanpur** and Birla Institute of Technology & Science (BITS) **Pilani**. Prior to his academic tenure, he worked as a Scientist in Defence R & D Organization (DRDO) Dehradun and the Department of Science & Technology (DST) Hyderabad/New Delhi. He was a Visiting **Design Engineer** at National Semiconductors (NSC) **Germany**. He visited several universities in USA, UK, Germany, Switzerland, Japan, S. Korea, and Singapore.

Research: His research interests include machine learning, multimedia, scientometrics, programming language, software system, and evolutionary optimization. He has published over **220 research articles** in international journals and conferences, several in lead venues. He has supervised **fifteen doctoral and over eighty master theses** and hundred undergraduate projects. He is currently supervising seven doctoral students. He has worked on **industrial-funded projects from Microsoft and NSC**; the NSC project was in close collaboration with their USA, Germany, and Israel units. He founded **Data to Knowledge (D2K)** Lab at JNU. He is a reviewer for journals/conferences papers. He delivered several keynote addresses, invited lectures, and tutorials at conferences. His h-index, on Google Scholar is 25, which is good in his CS subareas.

Teaching: Rajeev has designed and taught several Computer Science & Engineering courses ranging from freshman to senior graduate level. He has taught programming (C/C++/C#/Java/R/Python), core and advanced (Data Struct., Algorithms, Compiler, Software Engg, Pattern Classification, Machine Learning), application (Image/Video Processing, Computer Vision, Multimedia Sys.), and specialized courses (Statistics, Evolutionary Comp, Research Method, etc.). At JNU, he introduced the *Academic Ethics* course. His teaching focuses on enhanced **engagement for active learning, thinking, creativity, and innovation**.

Academic Leadership: He served as a Senator in IITs Kharagpur/Kanpur and BITS, a member of the Court and Academic Council in JNU, and several other academic bodies, e.g., Board of Studies, Statutory Comm. of Institutes/Universities. He worked for reforms in curriculum, academic structure, regulations, and ordinances. He worked as an active member and **crisis handler with out-of-box solutions for complex problems**.

Public Policy: His contributions towards framing public policies for higher education are enormous. He reformed IITs admission examinations bringing transparency and accuracy through well-defined processes. He worked for a **common examination and counseling (JoSAA/CSAB) for admissions in India's IITs/NITs/IITs/CFTIs**. Almost all admission & competitive examinations in most disciplines have been reformed following this model. His proposal for an independent body led to the setting of the National Testing Agency (NTA). Including common examinations in NEP 2020 is a testimony of his work, leading to **CUETs** in Central Universities. His proposal for **common counselling in CUs** and others is being worked-out. He advocated for Research Advisory Comm. (RAC) and Ethics course for PhD Students in JNU. Most measures adopted by IIT Council for preventing suicides in IITs are from his proposal. India's Supreme Court hailed him as *one of the many unsung heroes who helped in improving the system*.

He defined quantitative Academic Performance Indices (**APIs**) in 2009 for engineering faculty. He co-authored/authored *output-based quantifiable* accreditation guidelines, from 2009 to 2011, for U.G. engineering programs. These have been in public use since 2011, leading to making the National Board of Accreditation (NBA) an autonomous body. This work led India to join the Washington Accord in June 2014 permanently. Revised guidelines are in public use now.

His initial learning at DRDO aimed at *technology transformation for end-users*, guided him towards *in-depth knowledge* and *simplified governance*. His academic/admin. experience of four decades spanning Univ./Insts. across India & abroad, combined with **24/7 work-ethics, reform-centric & student-oriented leadership, legal acumen ship**, and *wider* perception is an asset to the Institute he serves. ***

2-Page Brief.

▪ Education:

- **Ph.D. (Computer Engg.), Univ. Sheffield**, England. The thesis was nominated for the Distinguished Computer Science thesis award in U.K.
- **M.Tech. (Computer Sc. & Tech.), Univ. Roorkee** (now, IIT Roorkee). Awarded the Univ. Medal for being the first ranker.
- **MSc (Physics - Electronics), Univ. of Allahabad**. 3rd ranker.

▪ Experience: Teaching, Research & Development: Four Decades.

- **Professor: BITS Pilani, IIT Kharagpur, IIT Kanpur, and JNU New Delhi.**
- **Scientist: Survey of India (DST), Hyd'bad/New Delhi; DRDO (DEAL), Dehradun.**
- **Design Engineer: National Semiconductors (NSC), Germany (Visiting).**

▪ Teaching

- Cover fundamentals with emerging technologies to keep the subject material relevant and employable.
- Focus on student engagement for *active* learning, thinking, creativity, and innovation with enjoyment.
- Introduced a variety of assignments, e.g., tiny (few sentences), 2-pages, and large – covering different aspects, incl. hands-on experiences of course contents at different paces spread throughout semester.
- Introduced parallel evaluation in which students also self-evaluate, followed by closeness match.
- Taught, developed and restructured core and advanced courses for U.G. and P.G. students.
- Introduced new courses, incl. a pan-university course on Academic Ethics at JNU.
- Comfortable in teaching smaller to large classes of a few hundred students.

▪ Research: Research interests include machine learning, multimedia, scientometrics, programming language, software systems, and evolutionary optimization.

- Published over 220 research articles in international journals and conf. proc. Reviewer.
- Presented papers in lead international conf. in USA, UK, Germany, Canada, Japan, S. Korea, etc.
- Invited/research talks in universities abroad, international conferences, FDPs, STCs, etc.
- Program Chair, Publication Chair, Publicity Chair, etc. in several international conferences.
- Supervised 15 doctoral, 80 master theses. Currently supervising seven doctoral students.
- Worked on industrial-funded projects from Microsoft and National Semiconductors (NSC).
- Awarded *Test of Time* award in ISCE 2022 for the paper presented in ISEC 2011.
- Founded *Data to Knowledge* (D2K) Lab in School of Computer & Systems Sciences, JNU. The D2K Lab produced quality research papers in decent Journals and conf. proceedings.
- *h-index*, on Google Scholar (from incomplete data), is 25, which is good in sub-fields of C.S.

▪ Industry Collaboration: R & D

- Member, IT Strategy Comm. & I.T. Advisory Comm., Canara Bank (2022 - Present)
- Core Design Engineer, National Semiconductors Team with members from Germany, Israel & U.S. for developing System S.W. tools, simulators, compilers, etc. for their CR16X series of processors. In this work, Prof. Richard Brown, Univ. Michigan USA was another collaborator. We made per week deliveries for their design engineers, which were regularly used by many categories of stakeholders, from system designers to application users. (2001 – 2006)

▪ Industry Collaboration: Teaching

- Developed courseware for .NET/C# as an emerging technology (Microsoft Inc. USA). (2004-07)
- Faculty, Multimedia & Object-Oriented System Courses for Wipro/S.W. Industries employees @Bangalore/Hyderabad under BITS Industry Off-Campus Collaboration Program. (1997- 2000)

Academic Leadership & Administration

- **National level:**
 - C.S. Expert: NTA (2023), ASRB (2022), DRDO (2016-18), UPSC (2014), etc.
 - Chair/Member, NBA UG/PG Accreditation Teams (2006 – 2018).
 - Chair, NBA UG Engineering Accreditation Guidelines Draft Comm. (2010 – 11).
 - Chief Examiner, GATE Computer Science, IITs (2005).
 - Professor-In-Charge, JEE Examination Centre(s), IIT Kharagpur (2001 – 04).
- **Institute/University level:** BITS Pilani, IIT Kharagpur & JNU New Delhi
 - Member, University Court, and Academic Council, JNU (2022 - Present).
 - Member, JNU Intellectual Property Management Comm. (2017)
 - Co-opted Member, JNU Anti-Plagiarism Policy Draft Comm. (2016 - 17).
 - Conceptualized JNU's Dual-degree program combining Comp Sc with Social Sc (2016-17).
 - Senator, IIT Kharagpur (2007 – 2015), BITS Pilani (1997 – 2000).
 - Member, UG Prog. Eval. Senate Sub-Comm. (UGPEC), IIT Kharagpur (2001-05, 2007-11)
 - Resource Faculty, Intensive Teaching Workshop, BITS Pilani (1997 – 2000)
 - Member, Research & Consultancy Board, BITS Pilani (1997 - 1999).
 - Member, Library Comm., BITS Pilani (1997 – 1999).
- **Faculty/Department/School level:**
 - Member, Special Comm. (a.k.a. Board of Studies), School Comp. Sys. Sc. JNU (2015 - Present)
 - Founder Director, *Data to Knowledge* (D2K) Lab, SC&SS, JNU (2016 - Present)
 - Ext. Member, Faculty of Maths & Computing, Banasthali Univ. (2019 - 22)
 - Ext. Member, Board of Studies, Dept. CSE & Dept. CS Applications, Poorvanchal Univ. (2018 - 20)
 - Member, Student - Faculty Comm., School Comp. & Sys. Sci., JNU (2015 – 2019)
 - Chair, AICTE's M.Tech. Prog. Approval Comm., School Comp. & Sys. Sci., JNU (2015 – 2016)
 - CSE Academic Comm, IIT Kharagpur (2001-15)
 - CSE Administrative Comm., IIT Kharagpur (2004-05, 2006-10)
 - Faculty Advisor/Counselor/Mentor and Faculty PGDIT and PGDST, IIT Kharagpur (2001-08)
 - Professor-in-Charge, CSE Library & Liaison with Central Library, IIT Kharagpur (2006 – 08)
 - Doctoral Scrutiny Committees (IIT Kharagpur): Assorted (2001 – 2011)
 - Member, C.S. & I.S. Group, BITS Pilani (1997 – 2000).

Public Policies-in-Practice @ National Level

Actively involved in drafting policies for HEIs, maintaining a delicate balance between stakeholders: Government and academicians while developing impact-driven public policies. **Most are in Public Use:**

- Proposal for Common Examinations in Central Univ. (C.U.s) led to **CUET**. Including common examinations in **NEP 2020** is a testimony of this work. My proposal for Common Counselling in CUs and other Univ. is being worked out. (2020 – Present)
- Proposed measures and processes for mental well-beings, early alert generations with the involvement of several stakeholders, and grievance redressals for preventing unfortunate incidences in IITs. Most of these measures have been adopted by IITs for the prevention of suicides. (2022 - 23) This proposal was an extension of my Grievance Redressal Proposal for CFTIs. (2019)
- Authored: NBA Accreditation ABET Compliance, Guidelines for U.G. Engg. Programs, May 2011. In Public use: July 2011 to Jan. 2013. This led India to join the Washington Accord in June 2014 permanently. (2009 – 11)
- Co-Authored: NBA Revised guidelines for Accreditation U.G. Engg. Programs, July 09. In Public Use: July 2009 to June 2011. Conducted National Awareness Workshops (2008 - 09)
- Pioneered transparency, common examination (JEE), common counselling (JoSAA/CSAB), and systematic reforms in Engg. admissions for IITs/NITs/IIITs/CFTIs. The proposal led to institution of National Testing Agency (**NTA**). These concepts have been adopted by most admissions in most disciplines in the country. (2006 – 2015)

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Education & Professional Experience

Personal Information

- Nationality : Indian
- Date of birth : March 12, 1959
- Marital Status : Widower with two children:
Son (S.W. Engg: Microsoft, Google, etc.); Daughter (Faculty, GaTech)

Education

- Ph.D. in Computer Engineering (1997)
University of Sheffield, UK
Thesis "Feature Selection, Representation & Classification" nominated for best Thesis award in UK
- M.Tech. in Computer Science & Technology (1992)
University of Roorkee (now, IIT Roorkee), India
University Medalist being the first ranker
- M.Sc. in Physics (Electronics) (1979)
University of Allahabad, India
Third Rank in the University

Research Scholar

- Commonwealth Research Scholar (March 1994 – March 1997), University of Sheffield, UK
- UGC Research Scholar (July 1980 – Nov 1983), University of Allahabad, India

Employment

- June 2015 – Present: Professor, School of Computer & Systems Sciences, Jawaharlal Nehru University (JNU), New Delhi, India
- April 2007 – June 2015: Professor, Department of Computer Science & Engineering, Indian Institute of Technology (IIT), Kharagpur, India
- Dec 2000 – April 2007: Assoc. Professor, Department of Computer Science & Engineering, Indian Institute of Technology (IIT), Kharagpur, India
- Feb 2000 – Dec 2000: Professor, Department of Computer Science & Information Systems, Birla Institute of Technology & Science (BITS), Pilani, India
- April 1997 – Jan 2000: Assoc. Professor, Department of Computer Science & Information Systems, Birla Institute of Technology & Science (BITS), Pilani, India
- June 1986 – March 1995: Scientist, Defense R & D Organization (DRDO), Defense Electronics Applications Lab (DEAL), Dehradun, India
- Dec 1983 – June 1986: Scientist, Department of Science & Technology (DST), Survey of India, Hyderabad / New Delhi, India

Visiting Positions

- July 2013 – May 2014: Visiting Professor, Department of Computer Science & Engineering, Indian Institute of Technology (IIT), Kanpur, India
- June 2005 – May 2006: Visiting Assoc. Professor, Department of Computer Science & Engineering, Indian Institute of Technology (IIT), Kanpur, India
- Oct. 2001, May – July 2002: Visiting Design Engineer, National Semiconductors GmbH, Germany

Teaching

Teaching Courses (Graduate and Undergraduate)

- Foundations of Computing (C, C++, Java, Python)
- Data Structures & Algorithms (Core & Adv.)
- Compiler Construction (Core & Adv.)
- Object-Oriented Programming (C++, Java, C#)
- Object-Oriented Analysis & Design
- Programming Methodology
- Multimedia Systems
- Machine Learning (Core & Adv.)
- Artificial Intelligence
- Academic Ethics
- Research Methodology
- Programming & Data Structures (C, C++, Java)
- Design & Analysis of Algorithms
- Software Engineering (Core & Adv.)
- Object-Oriented Language Implementation
- Object-Oriented Software Engineering
- Software Architecture
- Image & Video Processing
- Pattern Classification
- Evolutionary Computing
- (Bio-)Statistics (with R) @ Life Sciences
- Technical Writing

New Courses Developed / Restructured

- Bio-Statistics [2018] @ JNU – *bringing computation with R*
- Academic Ethics [2016] @ JNU
- Software Engineering [2006] – *bringing synergy with Trusted Computing @ IIT Kharagpur*
- O.O. Sys. Implementation [2005] – *synergy in PLI, S.E., VEE for trusted computing @ IIT Kanpur*
- Foundations of Computing [2005] – *with Java @ IIT Kanpur*
- Multimedia Systems [1998, 2001] @ BITS Pilani, IIT Kharagpur
- Evolutionary Algorithm [1999] @ BITS Pilani
- Programming Language & Compiler Construction [1998] @ BITS Pilani
- Data Structures & Algorithms [1998] @ BITS Pilani
- Computational Intelligence [1998] @ BITS Pilani

Industry Teaching Collaboration: National & International

Microsoft Research USA	Object Oriented (C#/.NET centric) Courseware	2004 – 07
Wipro & S.W. Industries	Object Oriented System Development, Systems @ BITS Multimedia Pilani	1998 – 2000

Awards & Professional Recognition

- ISEC's *Test of Time* Award for the ISEC 2011 Paper (2022)
- Karmaveer Chakra (2013)
- RTI Citizen's Runner-up Award for Public Services (2009)
- Commonwealth Scholarship (1994 – 97)
- Affiliation with Professional Bodies
 - Fellow, IETE, India
 - Fellow, ISSA, India
 - Senior Member, ACM, USA
 - Senior Member, IEEE, USA

Research

Research Interests

- Machine Learning: Generalization & Outlier Detection.
- Multimedia: Medical Image Analysis & Social Networks.
- Scientometrics & Edu. Data Mining.
- Programming Languages & Software Engineering.
- Evolutionary Multiobjective Combinatorial Optimization & Nature Inspired Algorithms.

Publications

Book	1
Edited Books (Conf. Proceedings)	3
Chapters in Edited Books	4
Published Tutorials	3
Journal Research Articles	80
International Conference/Workshop Research Articles	~120
National Conference/Workshop Research Articles	~20

Theses & Student Projects Supervision

	Completed	Ongoing
Doctoral	15 (6*)	7
Graduate (by research)	4	--
Graduate (M.Tech., MPhil, MSc)	~ 80 (10*)	---
Undergraduate projects	~ 120 (20*)	--

*: In joint supervision.

Visitor @ Universities Abroad

Visitor	GaTech Atlanta, US	ML, PL	Feb-Mar 2023
Visitor	NUS, Singapore	ML, PL	June, Dec. 2022
Visitor	UPenn, Rice Univ, USA	Prog. Lang., ML	May 2022
Visitor	NUS, Singapore	Multimedia, ML	July 2019
Visitor	Rice Univ., USA	Machine Learning	Mar. 2018
Visitor	Univ. Sheffield, UK	Evo. Algo. Comb. Optim.	July 2007
Visitor	GIST, S. Korea	Evo. Algo. Comb. Optim.	Mar. 2007
Visitor	TU Darmstadt, Germany	Prog. Lang., Multimedia	Sep. 2006
Visitor	Aizu Univ., Japan	Evo. Algo. Comb. Optim.	Jan.2005
Visitor	UIUC, USA	Multimedia, Evo. Algo	July 2003
Visitor	ETHZ Switzerland	Multi-obj. Evo. Algo.	June 2002
Visitor	MIT, CMU: USA	Machine Vision	July 1996
PhD, TA	Sheffield Univ., U.K.	Comp. Engg.	Mar 1994 to Apr 1997

Projects, Consultancy & Services

Academia Industry Research Projects

University Grants Commission	Educational Data Mining	2018 - 19	INR 500K
Min. Human Resource Dev., Government of India	Virtual Lab – Programming & Data Structure Lab	2010 – 12	INR 1500 K
Min. Human Resource Dev., Government of India	NPTEL Video Course Development – Compiler, Multimedia	2010 – 13	---
Microsoft Corp., USA	Object Oriented (C#/.NET centric) Courseware Development	2004 – 07	USD 22 K
Min. Human Resource Dev., Government of India	Multiobjective Evolutionary Algorithms for Combinatorial Optim.	2002 – 07	INR 1000 K
National Semiconductors Corp., Germany/USA	Software Tools for Embedded Systems (co-PI)	2003 – 06	USD 100 K
National Semiconductors Corp., Germany/USA	Software Tools for C.R. Processors (co-PI)	2001 – 03	USD 225 K
IIT Kharagpur	Convergence of Multiobjective Optim.	2001 – 03	INR 100 K

Industry R & D Consultancy

Advisor	IT Strategy, IT Operations, Canara Bank India	Online Banking SW Data Analytics Tools, etc	2023 - Present 2022 - Present
Design Engineer	NSC Germany	SW System Tools: Compiler, Simulator etc.	May – July 2002 Oct. 2001

External Services: recent few

- Expert, NTA – TCS Tech. Eval. Comm. (2023)
- Expert, Tech. Comm., Agriculture Scientists Recruitment Board (ASRB), Dept. Agri. Res. Edu. (2022)
- Ext. Member, Faculty Maths & CS, Banasthali Univ. (2019 - 22), Poorvanchal Univ. (2018 - 20)
- Member, Apex Committee for DRDO Awards 2016, Dept. Def. R & D, Govt. of India
- Chairman/Expert Member, National Accreditation Board (NBA) Visiting Committees to Engineering Institutions (2007 onwards)
- CSE Expert, UPSC, New Delhi
... (several more)

Tutorials, Seminars, FDPs & Talks

Tutorials

- Evo. Multi-criteria Optim. @ GECCO-07, London; GECCO-08, Atlanta; GECCO-09, Montréal.
- Architecture exploration for embedded system design @ HiPC-04, Bangalore.
- Multimedia system design for QoS @ HiPC-03, Hyderabad.
- Multimedia system @ ITPC-03, Kathamandu.

Invited Talks / Seminars / FDPs /STCs

Machine Learning & Data Analytics

- D2K: Machine Learning & Data Intelligence @ FDP, IIIT Noida, Jan. 2023.
- Evolution of a perceptron to massively connectionist deep learning architecture with applications @ UPES Dehradun, Dec. 2021.
- Evolving a perceptron to massively connectionist deep learning architecture with applications @ Rajiv Gandhi University, Itanagar, Sep. 2021
- Intro. to Prob. Theory in ML @ NIT Jalandhar, Sep. 2020
- The Pedagogy of AI for Multidisciplinary Students @ Huawei A.I. Educator Symp, Mumbai, Dec. 2019
- ML: Research Directions and Applications @ FDP, KEIT Ghaziabad, June 2019.
- AI: Issues and Current Trends @ World TelComm. & Info. Society Day, C-DoT Delhi, June 2018.
- ML: Issues & Research Directions @ ML Workshop, IMS Ghaziabad, Jan. 2018.
- Trends in Outlier Detection: Issues & Challenges @ Data Mining STC, NSIT Delhi, Nov. 2017.
- Data-mining by meta-learning @ IARCS Course, 2004.
- Meta-learning of high-dim. spaces for scaling and generalization in data mining @ IIIT-H, 2000.
- Scaling and generalization in data mining by meta learning of data patterns @ IETE Pilani, 1999.
- Hybrid computational intelligent systems @ KanGAL, IIT Kanpur, 1997.
- Hierarchical organization of intelligent models @ TIET Patiala, 1997.
- Hybrid Intelligent models @ BITS Pilani, 1997.

Education, Sc. & Tech., E-Office & Governance

- Ethical Writing: Learning form experiences of day-to-day live examples @ ICARS Delhi, June 2020.
- Scientometrics and Publication Ethics @ VJTI Mumbai, Dec. 2019.
- E-Governance with AI / ML @ Refresher Course, UGC-HRDC, JNU, July 2018, Aug. 2019.
- Crisis in HEIs in India: A Technological Perspective @ Press Club of India, JNUTA, Nov. 2018.
- Evolution of Paperless PhD: A journey from stone-age to paperless age, in Seminar series on Decoding Sc. & Tech. for everyone @ JNU, Oct. 2018.
- Academy Autonomy: Gurukuls and Today's HEI @ ISSCA Workshop, Delhi Univ., Feb. 2018.
- Academic Autonomy vs. Quality in Education: from Gurukul to Today's Institutions. A plenary talk in Workshop for Growth of Science & Technology, VBS Purvanchal Univ., Sep. 2017.
- Personal Computers to Personalized Computing for Socializing and Banking: A Paradigm Shift in Computing & Comm. Research, Ind. Social Science Congress (ISSC), Andhra Univ., Mar. 2015.

Programming Languages & Software Systems

- Software Engineering and Runtime Systems @ NIT Rourkela, May 2009.
- Object oriented software engg. : concepts and practices @ NIT Durgapur, Thapar Univ., 2008.
- Virtual execution environment for trusted computing @ NIT Rourkela, October 2008.
- Object oriented software engineering: A Lecture series @ IIITU Noida, September 2008.
- Programming pearls and pitfalls @ IIITU Noida, January 2008.
- Multiple polymorphic arguments in object-oriented lang. @ IIT Delhi, TU-Darmstadt, 2006.
- Object oriented language implementation course – a working proposal @ Microsoft, 2006.

- Reusable plug-in software components for dependable systems @ EuroIndia, 2004.
- Software tools for extensible CompactRisc processors @ National, Munich, June 2002.
- Message dispatch in object-oriented systems @ IIIT Hyderabad, 2000.

Evolutionary Multiobjective Combinatorial Optimization (EMCO)

- EMCO: Issues and Research Directions @ UGC HRDC, JNU, Sep. 2015.
- EMCO: A keynote talk @ ICCV, Noida, Sep. 2008.
- EMCO - solving hard problems @ Gwangju IST, S. Korea, Mar. 2007.
- Solving hard problems in EMO - a practitioner's approach @ KanGAL, IIT Kanpur, 2006.
- Convergence in multiobjective genetic optim. & combinatorial prob. @ IlliGAL UIUC, 2003.
- Convergence in multiobjective genetic optim. using rank-histograms @ ETH Zurich, June 2002.
- Population driven computational paradigm for search and optimization @ BITS Pilani, 2000.
- A practical approach to EMO @ IIT Roorkee, 1997.

Multimedia & Embedded Systems

- Video coding – history & practices: Keynote talk @ Int. Conf. S.P., SATI Vidisha (2016).
- Video transcoding: algorithms and architectures @ TU-Darmstadt, 2006.
- Networked multimedia @ DPN Conf., Kharagpur, 2004.
- Globalization through miniaturized multimedia devices @ Allahabad Univ. (2004).
- Embedded System Design @ Galgotias Noida, 2004.
- Design space exploration tools for embedded systems @ CEERI (2004), EuroIndia (2004).
- Transcoding and QoS for multimedia traffic @ MONET, UIUC (2003).
- Teaching with tech.: multimedia in computer aided learning @ Kendriya Vidyalaya (2003).
- On QoS: reality check @ HiPC Trusted Internet Workshop, 2002.
- Triplet geometric representation: novel local invariants for robust recognition @ CMU, 1996.

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Research Publications (in reverse chronology)

Book

- [1] Soham S. Chakraborty, Rajeev Kumar, and PP Chakrabarti (2012) *Static Analysis and Optimization of Object-Oriented Systems – Concepts and Approaches*. Lap Lambert Academic Publishing GmbH, Germany. ISBN 978-3-8484-1353-9.

Edited Books (Conf. Proceedings)

- [2] Sanjay Kumar Jena, Rajeev Kumar, Ashok Kumar Turuk, and Manoranjan Dash (2011) *Proc. Int. Conf. Communication, Computing, and Security (ICCCS)*, Rourkela, India, Feb. 12-14, 2011. ACM.
- [3] Sanjay Ranka, Srinivas Aluru, Rajkumar Buyya, Yeh-Ching Chung, Sumeet Dua, Ananth Grama, Sandeep K. S. Gupta, Rajeev Kumar, Vir V. Phoha (2009) *Proc. Contemporary Computing – 2nd Int. Conf., IC3 2009*, Noida, India, August 17-19, 2009. Springer.
- [4] Ajit Pal, Ajay Kshemkalyani, Rajeev Kumar, and Arobinda Gupta (2005) *Distributed Computing - Proc. Int. Workshop Distributed Computing (IWDC)*. LNCS vol. 3741, Dec. 2005. ISBN 3-540-309-59-4. Springer.

Edited Book Articles

- [5] Sonal Tuteja and Rajeev Kumar (2020) An Architecture for Data Unification in E-commerce using Graph. In: Kapur P. et al. (eds) *Strategic System Assurance and Business Analytics. Asset Analytics (Performance and Safety Management)*, chapter 30, pages 407-417. Springer, Singapore. doi: 10.1007/978-981-15-3647-2_30
- [6] Akanksha Mukhriya and Rajeev Kumar (2018) Exploring Ensembles for Unsupervised Outlier Detection: An Empirical Analysis. In: Chakraverty S., Goel A., Misra S. (eds) *Towards Extensible and Adaptable Methods in Computing*, pages 225 – 237. Springer. doi: 10.1007/978-981-13-2348-5_17
- [7] Rajeev Kumar and PK Singh (2007) Pareto Evolutionary Algorithm Hybridized with Local Search for Biobjective TSP. In *Hybrid Evolutionary Systems: Chap 6, 2007*. Studies in Computational Intelligence Series, Springer.
- [8] Rajeev Kumar (2004) On Machine Learning with Multiobjective Genetic Optimization. In Carlos A. Coello Coello, and Gary B. Lamont (Eds.), *Applications of Multiobjective Evolutionary Algorithms*, Chap. 17: 393 - 425, December 2004. ISBN 981-256-106-4. World Scientific.

Published Tutorials

- [9] Rajeev Kumar (2009) A Tutorial on "Evolutionary Multiobjective Combinatorial Optimization (EMCO)" -- A Specialized Tutorial. In *Proc. Genetic and Evolutionary Computation Conference (GECCO-2009)*, Montréal, pp. 3413-3436, 09 July 2009. ACM.
- [10] Rajeev Kumar (2008) A Tutorial on "Evolutionary Multiobjective Combinatorial Optimization." A Specialized Tutorial. In *Proc. Genetic and Evolutionary Computing Conference (GECCO)*, Atlanta, pp. 2805 - 2828, 13 July 2008. ACM.
- [11] Rajeev Kumar (2007) A Tutorial on "Evolutionary Multiobjective Combinatorial Optimization." A Specialized Tutorial. In *Proc. Genetic and Evolutionary Computing Conference (GECCO)*, London, pp. 3366 - 3390, 08 July 2007. ACM.

Research Articles in Peer-Reviewed Journals, Conf. Proceedings & Newsletters:

- [12] Om Prakash and Rajeev Kumar (2024) A unified generalization enabled ML architecture for manipulated multi-modal social media. *Multimedia Tools & Applications* (23 pages). Springer. <https://doi.org/10.1007/s11042-023-16198-9> (Published Online Aug. 08, 2023)
- [13] Akanksha Mukhriya and Rajeev Kumar (2023) Combination fairness with scores in outlier detection ensembles. *Information Sciences* **645**: 119337 (17 pages), Oct. 2023. Elsevier. <https://doi.org/10.1016/j.ins.2023.119337>

- [14] Gargi Mishra and Rajeev Kumar (2023) An individual fairness based outlier detection ensemble. *Pattern Recognition Letters* **171**: 76–83, July 2023. Elsevier. <https://doi.org/10.1016/j.patrec.2023.05.010>
- [15] Neha Kumari and Rajeev Kumar (2023) Finding recursive generics in Java source code using machine learning. *Int. Journal Engineering Trends & Technology* **71**, July 2023. Seventh Sense Res. Group. (with APC)
- [16] Sonal and Rajeev Kumar (2023) Query driven graph models in E-commerce. *Innovations in Systems & Software Engineering* **19**, 177–195, June 2023. Springer. <https://doi.org/10.1007/s11334-021-00421-7>
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Doctoral (PhD) Thesis Supervision

In progress @ JNU

- [1] Neha Kumari. A safe generic type system for Java. (by Oct. 2023)
- [2] Om Prakash. Machine intelligence with multi-modal media for social welfare. (by Dec. 2023)
- [3] Akhilesh Rawat. Assessing generalization in deep learning architecture with medical image analysis. (by Dec. 2023)
- [4] Gouranga Duari. Hierarchical clustering of outliers. (by Jan. 2024)
- [5] Bhupendra Kumar. Pattern discovery & clustering in ordinal survey data: algorithms and applications. (by Jan. 2024)
- [6] Farheen. Deep learning for sequential data: architecture, algorithms, & applications.
- [7] Irfan Zaboo. FSA Extraction from Sequential Neural Networks.

Graduated @ JNU

- [8] Priti Kumari. Scientometrics of C.S. research publications. July 2023.
- [9] Akanksha Mukhriya. Ensemble learning for unsupervised outlier detection: algorithms and applications. Oct. 2022.
- [10] Neeraj Pathak. Hybrid evolutionary algorithms for solving hard combinatorial problems. Aug. 2022.
- [11] Sonal Tuteja. Graph model for schema and data mapping. July 2022.
- [12] Roopam Sadh. Knowledge discovery from quantitative survey data with pattern clustering and machine learning. March 2022.
- [13] Sonam Chhikara. Information theoretic image steganalysis for LSB steganography. (deceased Dec. 2019).

Graduated @ IIT Kharagpur

- [14] Mahesh Shirole. Concurrency Test Scenario Generation using UML Transition Sequences. Feb. 2021.
- [15] Soma Saha. Unifying Heuristics and Evolutionary Computing for Characterizing and Solving Certain Combinatorial Optimization Problems, Sep. 2014.
- [16] Pravanjan Choudhury. Task Scheduling on Embedded Multiprocessors, Jan. 2013. (*with Prof. P.P. Chakrabarti*)
- [17] Subrat Kumar Panda. Simulation-Based Verification of Pipelined Processors, May 2010. (*with Prof. P.P. Chakrabarti*)
- [18] Vasant Patil. Efficient Algorithms for Video Transcoding, October 2009.
- [19] Dipankar Das. Functional and Performance Verification for Multiprocessor Embedded Applications, July 2009. (*with Prof. P.P. Chakrabarti*)
- [20] Sandip Aine. Design and Control of Anytime Algorithms, September 2008. (*with Prof. P.P. Chakrabarti*)
- [21] Pramod Singh. Multiobjective Combinatorial Optimization with Hybridization of E.A., March 2008. (*with Prof. P.P. Chakrabarti*)
- [22] Durga Prasad Mohapatra. Dynamic Slicing of Object-Oriented Programs, September 2005. (*with Prof. R. Mall*)
- [23] Ashok Turuk. QoS Provisioning in WDM Networks, February 2005.

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Master Thesis Supervision: MTech, MS & MPhil

Graduated @ JNU

- [1] Biraja Mishra. Anomaly Detection from Medical Time-Signals with Deep Learning. June 2023.
- [2] Law Kumar. Hybridized Anomaly Detectors for Social Networks. June 2023.
- [3] Sai Teja Tangudu. Cost-Sensitive Learning for Class Imbalance Data. June 2023.
- [4] Khumaningthou Khumanthem. Interpreting outlier detection scores in ensembles. Jan. 2023.
- [5] Saurabh Tewari. Social network for blended learning model. Jan. 2023.
- [6] Junaciya K. Assessing generalization in medical image data. Oct. 2022.
- [7] Anish Sharma. Automata modelling with recurrent neural networks. Sep. 2022.
- [8] Trishita Mukherjee. Anomaly detection in complex graphs. Aug. 2022.
- [9] Pooja Singh. Assessing generalization in imbalanced datasets. Aug. 2022.
- [10] Gargi Mishra. Fairness in outlier detection ensembles. Aug. 2022.
- [11] Surabhi Shrivastav. Abnormality detection in medical images with deep learning. Oct. 2021.
- [12] Suresh Vyas. Meta-learning in ensembles. Oct. 2021.
- [13] Anjali Gautam. Time series prediction with deep learning. Sep. 2021.
- [14] Dipanjana De. Modelling automata by sequential neural networks. Aug. 2021.
- [15] Om Prakash. Anomaly detection in social networks. July 2021.
- [16] Akhilesh Rawat. Outlier detection in high dimensional datasets. June 2021.
- [17] Aditya Kumar. Assessing generalization in deep learning networks. April 2021.
- [18] Priti Kumar. Scientometrics of computer science publications in journals and conferences. July 2018.
- [19] Neha Kumari. A framework for runtime type genericity in Java generics. July 2018.
- [20] Akanksha Mukhriya. Unsupervised outlier detection ensembles. July 2016.
- [21] Neeraj Pathak. Hybrid evolutionary bi-objective optimization. July 2016.

Graduated @ IIT Kharagpur

- [22] Mounika Kommuri, Test-case generation for concurrent sequence transitions, May 2012.
- [23] Surender Kumar, Static analysis of generic object oriented programs, May 2012.
- [24] S. Harikrishnan, Space efficient multi-method dispatch in object oriented languages, May 2012.
- [25] Gyan Baboo, Multiobjective combinatorial optimization with EA, May 2012.
- [26] Swadhin Barisal, Safer Java Programming Language Environment, May 2011.
- [27] Krunal Modi, Graph Topology Generation, May 2011. (with Nilanjan Banerjee, UArk)
- [28] Amit Suthar, Generation of test cases from UML diagrams using EAs, May 2010.
- [29] Abhiram Kasina, Trusted Computing, May 2010.
- [30] Mohammad Aslam, Multiobjective combinatorial optimization with GP, May 2010
- [31] Sri Harsha Dandibhotle, Multiobjective combinatorial optimization with EAs, May 2010
- [32] Siddharth Tiwary, Register Allocation May 2009. (with Jens Palsberg, UCLA)
- [33] Anchal Nema, Concurrent Programs, May 2009.
- [34] Neeraj Kumar, OO Testing, May 2009.
- [35] Kundan Singh, Synchronization and Race Condition, May 2009
- [36] Paresh Tolay, Multiobjective combinatorial optimization for Graph Coloring with GP, May 2009.
- [37] Bipul Kumar Bal, Multiobjective combinatorial optimization for BDMST with GP, May 2009
- [38] Krishna Banka, Multiobjective combinatorial optimization with GP, May 2008
- [39] Ashwin Joshi, Multiobjective combinatorial optimization with GP, May 2008
- [40] Soham Chakraborty, Type analysis & optimization of O.O. Systems, Feb. 2008. [with PPChak]
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Consultancy & Sponsored Projects

- [1] *Sponsored Project* : Educational Data Mining
Funded by : UGC, Govt. of India
Period : 2018 – 19 *Amount* : INR 500 K
Principal Investigator : Rajeev Kumar *Co-Investigator* : ---

This sponsored project was aimed at developing a framework for educational data mining for HEIs. In this work, Deep/Machine Learning (DL/ML) techniques were employed for knowledge extraction from voluminous data pertaining to HEIs. This project developed tools and techniques for Data-to-Knowledge (D2K) extraction.

- [2] *Sponsored Project* : Programming and Data Structures Virtual Lab
Funded by : MHRD, Govt. of India
Period : 2010 – 12 *Amount* : INR 1500 K
Principal Investigator : Rajeev Kumar *Co-Investigator* : ---

The course is the basic core course which is usually done by every engineering student of all engineering branches in their first year of study. A student is introduced to the basic concepts of programming and an algorithmic approach to problem solving. Since this is the first course in programming, the lab plays a very important role in understanding the programming concepts and problem solving using computer. In the absence of a lab, this course remains an abstract course. Through the lab, a student understands the intricacies of programming and problem solving.

For programming, the general and most versatile, C-language is being used currently. However, the next phase of Virtual Lab can have Java programming language as the medium of the problem solving.

- [3] *Consultancy Project* : Object Oriented (C#/.NET centric) Courseware Development
Funded by : Microsoft Corp., USA (under Global CFP)
Period : 2004 – 07 *Amount* : USD 22 K
Principal Consultant : Rajeev Kumar *Co-Consultant* : ---

The course is designed primarily to bring synergy and interplay among the following components – Object Oriented Technology (OOT) for better programming methodologies and code reuse, Programming Language Design and Implementation (PLDI) for better understanding of language semantics, Virtual Execution Environment (VEE) for an insight of the runtime system providing extensible and safer computing towards code certification, and Software Engineering (S.E.) for trusted and reusable system.

The course was introduced as a graduate level course at IIT Kanpur and is offered since then at IIT Kharagpur. Many research articles are the outcome of this activity.

- [4] *Sponsored Project* : Multiobjective Evolutionary Algorithms for Combinatorial Optim.
Funded by : MHRD, Govt. of India
Period : 2002 – 07 *Amount* : INR 1000 K
Principal Investigator : Rajeev Kumar *Co-Investigator* : ---

Most combinatorial problems are computationally *hard*. In a multiobjective setting, the major challenge is to obtain a set of many representative diverse solutions across the desired/optimal Pareto-front. In simple treatments, multiple objectives are combined in an *ad hoc* manner to yield a scalar objective. Other conventionally used optimization heuristics model the multiobjective problem in a single objective domain treating all but one of the objectives as constraints. In this project, the standard single objective problems (with or without constraints), e.g., spanning tree, 0/1 knapsack, traveling salesman, graph coloring etc., are recasted into their respective biobjective optimization problems. Empirically, it is shown that the solutions obtained with multiobjective evolutionary algorithms (MOEA) as black-box optimization tools, cover a larger range and are superior, in terms of diversity and convergence, to the deterministic heuristics.

Outcome of this sponsored research project is reflected in many research publications. Another, important spin-off of this research activity is that the tutorial on "Evolutionary

Multiobjective Combinatorial Optimization (EMCO)," which became a regular feature at ACM's GECCO till 2009, the lead conference in this area.

- [5] *Consultancy Project* : Software Tools for Embedded Systems
Funded by : National Semiconductors Corp., Germany/USA
Period : 2003 – 06 *Amount:* USD 100 K
Principal Consultant : Prof. P.P. Chakrabarti *Co-Consultant* : Rajeev Kumar
- [6] *Consultancy Project* : Software Tools for C.R. Family of Processors
Funded by : National Semiconductors Corp., Germany/USA
Period : 2001 – 03 *Amount:* USD 225 K
Principal Consultant : Prof. P.P. Chakrabarti *Co-Consultant* : Rajeev Kumar

These two consultancy projects were due to the collaborative research between IIT Kharagpur and the Compact RISC (C.R.) Processing groups of National Semiconductor Corporation (NSC) located at Germany and Israel. University of Michigan (UoM) was another partner in this activity looking into the hardware related aspects whereas IIT Kharagpur concentrated on software related issues.

Twin projects were focused on development of software tools for rapid reduction in the time to market a custom solution based on the C.R. family of processors. This included software development tools, architecture exploration and evaluation tools and Instruction Set Architecture (ISA) verification tools. The aim was to help NSC develop tools that would speed up the development of new architectures (like functional and performance simulators), produce systems software tools (like Debuggers, Assemblers, Linkers, Compilers) for customers and rapidly explore the design space by providing tools for extensible C.R. processors (ISA verification and software toolset for CR-X). This effort also aimed at developing the Software Quality Assurance (Q.A.) framework for the tools produced by this activity.

The project activity had three primary parts, namely tools for CR16C, extension of the toolset to handle CR16C family of processors, and development of scalable toolset concept for the extensible C.R. (CR-X). The CR-X activity also aimed at developing a mechanism so that the toolset can be automatically generated for C.R. based processors. Generation of tests and testing the software in a proper Q.A. framework was a very important goal. The platform for development was Linux. The effort aimed at maximum use of available GNU following the GNU rules/coding standards.

While working on these twin projects, the project team encountered many interesting issues and challenges, solutions to some of those culminated in several research publications.

- [7] *Sponsored Project* : Convergence of Multiobjective Evolutionary Algorithms
Funded by : IIT Kharagpur
Period : 2001 – 03 *Amount:* INR 100 K
Principal Investigator : Rajeev Kumar *Co-Investigator* : ---

In multiobjective optimizations, solutions which are non-dominated at some stage in the computations, become dominated by a superior solution at some later stage. Moreover, for most of the real-world problems, the desired/optimal Pareto front is *unknown*. This project was aimed at extending the previous work (GALESIA, 1997) and to incorporate the notion of convergence in multiobjective evolutionary algorithms (MOEA).

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