Chennai Mathematical Institute

Annual Report
2010 - 2011

H1, SIPCOT IT Park
Padur Post, Siruseri,
Tamilnadu 603 103. India.

Chennai Mathematical Institute

H1, SIPCOT IT Park
Padur Post, Siruseri,
Tamilnadu 603 103. India.
Tel: +91-44-2747 0226, 2747 0227
2747 0228, 2747 0229,
+91-44-3298 3441 - 3442
Fax: +91-44-2747 0225
WWW: http://www.cmi.ac.in

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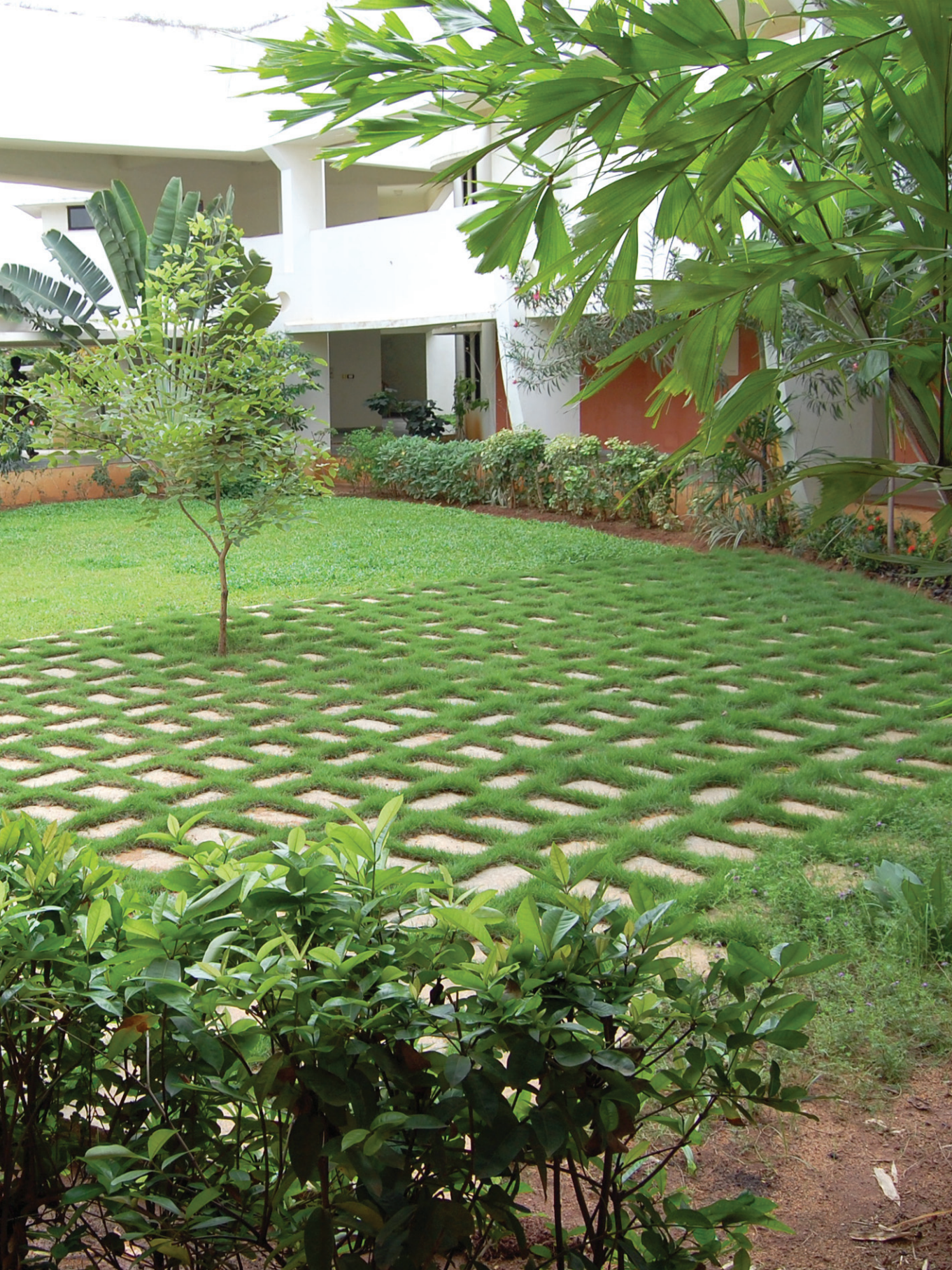
Contents



Preface

It gives me great pleasure to present the Annual Report of the Chennai Mathematical Institute for the period 2010-11.

The Chennai Mathematical Institute continues to do well and attract good faculty, students and visitors. Our alumni continue to be very well placed in universities and research institutions in India and abroad. The number of applications and the intake in our BSc and MSc courses is on the increase every year. Perhaps for the rst time it was felt that we could have admitted more students for our BSc course if we had more infrastucture.

CMI has close academic cooperation with several institutions across the world including the Institute of Mathematical Sciences, Chennai and abroad. Our collaboration with the Ecole Normale Suprerieure of France continues with vigour with the three top students from BSc Mathematics and Computer Science going to Paris every summer for two months, while four students of the ENS come to CMI each year to teach in the undergraduate programme. CMI also sends its top three Physics graduates to the Ecole Polytechnique, France, for a summer internship. During this year, CMI has signed MoUs with the Indian Statistical Institute, Kolkata and Instituto Tecnologico Autonomo de Mexico for research collaboration.

CMI also has similar MoUs with the Universite de Paris-Sud, Orsay, France, the ENS at Cachan, France and Universite Pierre et Marie Curie (Paris VI). CMI is a full partner in the European Project ALGANT in Algebra, Geometry and Number Theory involving several European and one Canadian University.

CMI organized an ICM satellite conference on Mathematical Logic and Set Theory in August 2010. CMI also organized Automata, Concurrency and Timed Systems (ACTS) III conference in January 2011. Advanced Instructional School on Lie Algebras was held at CMI in July 2011. This is a regular activity of the National Board for Higher Mathematics and was conducted in association with Institute of Mathematical Sciences, Chennai.

Nobel laureates David Gross and Sir Anthony Leggett visited CMI in January this year and gave interesting talks. Professor David Gross spoke on "Physics and Mathematics at the Frontier" and Sir Anthony Leggett gave a talk on "Prospects for topological quantum computing".

Professor Michel Brion, Institut Fourier, Grenoble, France offered a course of lectures entitled "Chevalley structure theorem on algebraic groups, and beyond" during January 2011. Professor Maurice Herlihy from Brown University offered a three lecture mini-course on Applying Combinatorial Topology to Distributed Computing during February 2011. Prof Alladi Sitaram, Raja Ramanna Fellow, Indian Institute of Science delivered a set of five lectures on Introduction to Fourier series and Fourier transforms during February 2011.

During the last few years the Ministry of Human Resource Development has established Indian Institutes of Science Education and Research (IISERs) in five cities, with the aim of imparting high quality science education at undergraduate and graduate levels so that more students are attracted to science. The DAE has also established the National Institute of Science Education and Research (NISER) at Bhubaneshwar with similar goals.

I would like to stress that CMI had started undergraduate education in mathematics and computer science several years ago with similar objectives and the programme has been very successful, judging by the quality of students it has produced. CMI has also launched an undergraduate programme in physics few years ago. Last year, we started a Masters programme in applications of mathematics and this year we are starting the Ph D programme in Physics. We hope that the Government of India will continue to support our activities.

CMI gets its major funding from the Department of Atomic energy via the National Board for Higher Mathematics. The UGC has given us funds for the construction of an additional building which is nearing completion. In addition to the generous support from the DAE, CMI also receives support from private sources. I take this opportunity to thank the Shriram Group of Companies and Tata Consultancy Services for their support.

Dr. R. Swaminathan made a generous endowment in the memory of his uncle Mr. K. Lakshmanan and Mrs. Usha Rubugunday made a similar endowment in memory of her husband. This has led to annual Lakshmanan and Rubugunday memorial lectures at CMI. This year Prof R. Balasubramanian delivered the "K. Lakshmanan Memorial Distinguished Lecture" on "Partition functions" and Prof A Sitaram delivered

the “R.K. Rubugunday Distinguished Lecture” titled “ A glimpse into non-Euclidean harmonic analysis”.

During the past year, Shri K. Madhav Sarma, who was the Secretary of the CMI trust passed away. He had contributed a great deal to the growth of CMI and in particular, had been instrumental in establishing the campus at Siruseri. His family has made a donation for an annual lecture in his memory.

Thanks to the support from the government as well as private donors, we have established CMI as a much desired destination to work in the mathematics and allied areas. I am confident that CMI will continue to grow as a centre of excellence in mathematical sciences.

Rajeeva L Karandikar
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Faculty Profiles

Rajeeva Karandikar

Rajeeva Karandikar received his B.Sc. from Indore University, Indore (1976), M.Stat. form Indian Statistical Institute, Kolkata (1978) and Ph.D. from Indian Statistical Institute, Kolkata (1981).

He has been an Associate Professor at the Indian Statistical Institute, Delhi (1984-89), a Professor at the Indian Statistical Institute, Delhi (1989-2006), a Professsor-in-Charge at the Indian Statistical Institute, Delhi (2000-2002), Head, Delhi Center at the Indian Statistical Institute, Delhi (2000) and (2004-2006) and an Executive Vice-President at Cranes Software International Limited.

His research interests are: Probability theory and Stochatic Processes, Applications of Statistics and Cryptography.

C.S. Seshadri

C.S. Seshadri received his B.A. Hons. (Mathematics) degree from Madras University (1953) and his Ph.D. from Bombay University (1958).

He was at the School of Mathematics, Tata Institute of Fundamental Research, Bombay from 1953 to 1984 starting as a Research Scholar and rising to a Senior Professor. He was then a Senior Professor at the Institute of Mathematical Sciences, Madras (1984-89).

He has been a Visiting Professor at the University of Paris, France; Harvard University, Cambridge, U.S.A.; Institute for Advanced Study, Princeton, U.S.A.; University of California at Los Angeles, Los Angeles, U.S.A.; Brandeis University, U.S.A.; University of Bonn, Bonn, Germany; Kyoto University, Kyoto, Japan.

He has given invited talks at many international conferences including the International Congress of Mathematicians, Nice, France, 1970.

He has received the Shanti Swarup Bhatnagar Award (1972) and the Srinivasa Ramanujan Medal of Indian National Science Academy (INSA). He was awarded the D.Sc. Degree (Honoris Causa) of Banaras Hindu University, Varanasi (1985). He has been awarded the Shanti Swarup Bhatnagar Medal (1995) of INSA and Srinivasa Ramanujan Birth Centenary Award (1995-96) of Indian Science Congress Association (ISCA). He has received G.M. Modi Science Award (1995), The Trieste Science Prize of the Academy of Sciences for the Developing World in (2006) and H.K. Firodia Award for Excellence in Science & Technology, Pune (2008).

He has also been awarded Padma Bhushan by the President of India (2009).

He is a Fellow of the Indian Academy of Sciences, Indian National Science Academy and a Fellow of the Royal Society. He has been appointed National Research Professor of the Ministry of Human Resource Development Government of India in 2006. His research interests are: Algebraic Geometry and Algebraic Groups.

Shiva Shankar

Shiva Shankar received his B.Tech. (Electrical Engineering) from the Indian Institute of Technology, Delhi (1978) and his Ph.D. from SUNY, Stony Brook (1983).

He has been an Assistant Professor, at the Department of Applied Mathematics, SUNY, Stony Brook (1983-84), a Visiting Fellow at the School of Mathematics, Tata Institute of Fundamental Research, Bangalore (1984-88), an Associate Professor at the Department of Electrical Engineering, Indian Institute of Technology, Bombay (1988-2000).

Visiting Positions include Institute of Mathematical Sciences, Chennai, and at Mathematics Institute, University of Groningen.

His research interests are: Partial Differential Equations, Mechanics and Control Theory.

V. Balaji

V. Balaji received his B.A. Hons. (Mathematics) from University of Delhi (1982), his M.A. (Mathematics) degree from University of Delhi (1984), his Ph.D. from University of Madras (1991).

He has been an NBHM Post-doctoral Fellow at the Chennai Mathematical Institute (1989-92).

His research interest is: Algebraic Geometry.

Madhavan Mukund

Madhavan Mukund received his B.Tech. (Computer Science) degree from the Indian Institute of Technology, Bombay (1986) and his Ph.D. from Aarhus University, Aarhus, Denmark (1992).

He is a member of the Executive Council and the Secretary of the Indian Association for Research in Computing Science (IARCS).

His research interests are: Partial order based models for concurrent systems and Logics for specifying and verifying concurrent systems.

Pramathanath Sastry

Pramathanath Sastry received his B.Sc. (Hons) in Mathematics from University of Delhi, New Delhi (1982), Master of Statistics from the Indian Statistical Institute, New Delhi (1984) and Ph.D. (Mathematics) from Purdue University, U.S.A. (1990).

He has been a Teaching Assistant, a Research Assistant at Purdue University, U.S.A. (1984-1990), a Visiting Assistant Professor at University of Missouri, U.S.A. (1990-1991), a Visitng Fellow at the Tata Institute of Fundamental Research, Mumbai (1991-1992), a Fellow at SPIC Science Foundation (1992-1995), a Reader at SPIC Science Foundation (1995-1996), a Reader at Harish-Chandra Research Institute, Allahabad (1996-1999), a Reader F at Harish- Chandra Research Institute, Allahabad (1999-2001), a Visiting Assistant Professor at Purdue University, U.S.A. (1999-2001), an Asst. Assoc. Professor (Term) at the University of Toronto, Canada (2001-2006), CLA at McMaster University, Canada (2006) and an Assistant Professor at East Carolina University, U.S.A. (2007-2009).

His research interest is Algebraic Geometry.

K. Narayan Kumar

K. Narayan Kumar received his M.Sc. (Tech.) in Computer Science from Birla Institute of Technology and Science, Pilani (1990). He received his Ph.D. degree from the University of Bombay (1997).

His research interests include Logic, Automata theory and Concurrency.

V.V. Sreedhar

V.V. Sreedhar received his BSc degree from Andhra University, Visakhapatnam, MSc degree in Physics from the Indian Institute of Technology, Madras and received his PhD degree in physics from Saha Institute of Nuclear Physics, Jadavpur University, Calcutta.

He has been an Assistant Professor in the Department of Physics at the Indian Institute of Technology, Kanpur, a Post-doc at the School of Theoretical Physics, Dublin Institute of Advanced Studies, Dublin, Ireland and a Post-doctoral researcher at the Institute for Theoretical Physics, Uppsala University, Uppsala, Sweden.

His visiting positions include stints at the S. N. Bose National Centre for Basic Sciences, Kolkata, Raman Research Institute, Bangalore, Universities of Rochester, New York and Cincinnati, Ohio, U.S.A. and the High Energy Research Organization (KEK), Tsukuba, Japan.

His research interests are: Quantum Entanglement, Classical and Quantum Field Theory and Fluid Dynamics.

S. Senthamarai Kannan

S. Senthamarai Kannan received his B.Sc. degree from HKRH College, Uthama Palayam (1985-88), M.Sc. degree from the Madurai Kamaraj University (1988-90) and Ph.D. from the Chennai Mathematical Institute, (1992-98). He has been a Post-doctoral Fellow at the International Centre for Theoretical Physics (1999-2000).

His research interests are: Representation Theory and Algebraic Geometry.

K.V. Subrahmanyam

K.V. Subrahmanyam received his B.Tech. (Computer Science) degree from the Indian Institute of Technology, Bombay (1986) and M.S. from Vanderbilt University, U.S.A. in 1987. He received his Ph.D. degree from the University of Bombay in December, 1995.

His research interests are: Circuit Complexity, Algebraic methods in Complexity theory.

Clare D' Cruz

Clare D' Cruz received her M.Sc. (Mathematics) from the Indian Institute of Technology, Bombay (1991) and her Ph.D. (Mathematics) from the Indian Institute of Technology, Bombay (1996).

She has been a Post-Doctoral Fellow at the Tata Institute of Fundamental Research, Mumbai (1996-98) and a Visiting Scholar at the Northeastern University, Boston, U.S.A. (1997-98).

Her research interest is: Commutative algebra.

Govind S. Krishnaswami

Govind S. Krishnaswami received his B.Sc (Physics), B. A. (Mathematics) from University of Rochester,U.S.A. (1999), M.A. (Physics), from University of Rochester, U.S.A. (2001) and Ph.D. (Physics) from University of Rochester, U.S.A. (2004).

He has been a Marie Curie Fellow, Spinoza Institute & Institute for Theoretical Physics, Utrecht University, The Netherlands (2004-07).

His research interests are: Quantum Field Theory, Hydrodynamics and Mathematical Physics

K. Narayan

K. Narayan received his B.Tech. (Engineering Physics) from the Indian Institute of Technology Bombay, Mumbai (1997), M.S. (Physics) from the Cornell University, U.S.A. (1999) and Ph.D. (Physics) from the Cornell University, U.S.A. (2002).

He has been a Research Assistant at the Cornell University, U.S.A. (1998-2001), a Research Assistant at the Cornell University, U.S.A. (2001-02), a Postdoctoral Research Fellow at the Duke University, U.S.A. (2002-04) and a Postdoctoral Research (Visiting) Fellow at the Tata Institute of Fundamental Research, Mumbai (2004-07).

His research interests are: String theory and cosmology, Stringy geometry and D-brane gauge theories.

Samir Datta

Samir Datta received his B. Tech. degree from the Indian Institute of Technology, Kanpur (1995), M.S. degree from Rutgers University (1997) and Ph.D. degree from Rutgers University (2004).

He has been a Network Architect at Tellium Inc. (2000-03) and a Post Doctoral Fellow at WINLAB, Rutgers University (2004-05).

His research interests are: Complexity Theory, Wireless and High Speed Networking.

R. Srinivasan

R. Srinivasan received his Ph.D. degree in Mathematics from the Indian Statistical Institute and the Institute of Mathematical Sciences (1998).

He has been a Visiting Fellow at the Harish-Chandra Research Institute, Allahabad (1998-2000), a Post Doctoral Fellow at the Indian Statistical Institute (2000-01), a Post Doctoral Fellow at Universite d'Orleans, France (2001-02), a Visiting Scientist at the Indian Statistical Institute (2002-03), a Visiting Fellow at ICTP, Trieste, Italy (2003) and a JSPS Post Doctoral Fellow at University of Tokyo, Japan (2003-2005).

His research interests are: Operator Algebras and Operator Theory.

M. Sundari

M. Sundari received her M.Sc. (Mathematics) from the University of Hyderabad, Hyderabad (1988), M.Phil. (Mathematics) from the University of Hyderabad, Hyderabad (1990) and Ph.D. (Mathematics) from the Indian Statistical Institute, Bangalore (1996).

She has been a Visiting Mathematician at the International Center for Theoretical Physics, Trieste, Italy (1996), a Research Associate at the University of New South Wales, Sydney, Australia (1996-97), an Assistant Professor in the Eat College, Jeddah, Saudi Arabia (2000-01), a Faculty member at the ICFAI Institute of Science and Technology, Hyderabad (2003-04) and an Assistant Professor at the Indian Institute of Technology Roorkee, Roorkee (2004-06).

Her research interests are: Representation theory of Lie groups, Uncertainty Principles in Harmonic Analysis, Wiener-Tauberian theorems.

S.P. Suresh

S.P. Suresh received his M.C.A. degree from R.E.C. Trichy (1996), received his M.Sc. (by Research) from Anna University (1999) and received his Ph.D. degree from the Institute of Mathematical Sciences (2003).

His research interests are: Logic in Computer Science, Reasoning about Security protocols and Classical Indian Epistemology.

Suresh Nayak

Suresh Nayak received his B.Tech. (Computer Science) degree from the Indian Institute of Technology, Bombay (1991), M.S. and Ph.D. (Mathematics) degree from the Purdue University, (1997,98).

He has been a Visiting Fellow at the Harish-Chandra Research Institute, Allahabad (1999-2001).

His research interests are: Algebraic Geometry and Commutative Algebra.

Upendra Kulkarni

Upendra Kulkarni received his B.Tech (Computer Science) from the Indian Institute of Technology Bombay, Mumbai (1992) and Ph.D. (Mathematics) from Brandeis University, U.S.A. (1998).

He has been a Visiting Assistant Professor at the University of Massachusetts Amherst (1998-2000), an Assistant Professor at the Truman State University (2000-05), An Associate Professor at the Truman State University (2005), a Visiting Scientist at the Indian Statistical Institute, Bangalore (2005-06) and a Visiting Fellow at the Tata Institute of Fundamental Research, Bangalore (2006-07).

His research interests are: Representations of algebraic groups over the integers and in characteristic p, Algebraic aspects of Lie representation theory including Lie algebras, quantum groups and related combinatorics and in solving elementary challenging problems.

M.K. Vemuri

M.K. Vemuri received his M.S. (Mathematics) from Syracuse University, U.S.A. (1989) and Ph.D. from the University of Chicago, U.S.A. (1997).

He has been a Visiting Assistant Professor at Colgate University, U.S.A. (1997-99), an Instructor at Polytechnic University, U.S.A. (1999-2000) and a Teaching Research Associate at Syracuse University, U.S.A. (2000-2002).

His research interest is: Analysis

K.G. Arun

K.G. Arun received his B.Sc. (Physics) from Calicut University, Calicut (1998), M.Sc. (Physics) from Cochin University of Science and Technology (2001) and Ph.D. (Physics) from Raman Research Institute, Bangalore.

He has been a Postdoctoral Research Associate, Washington University in St Louis and VESF Fellow, LAL Orsay & IAP, Paris (2009-2010).

His research interests are: Gravitational Wave Astrophysics, Modelling compact binaries, High energy Astrophysics and Cosmology, Tests of General Relativity and Alternative theories of gravity.

Partha Mukhopadhyay

Partha Mukhopadhyay received his B.E. Electronics & Telecommunication Engineering from Jadavpur University, Kolkata (2000), M.Tech. (Computer Science) from the Indian Statistical Institute, Kolkata (2002) and Ph.D. from the Institute of Mathematical Sciences, Chennai (2009).

He has been a Software Engineer at Motorola India Electronics Ltd., Bangalore (2002-2003), a Research Associate at the Indian Statistical Insitute, Kolkata (2003-2004) and a Postdoctoral Fellow at Technion, Israel (2009-2010).

His research interests are: Complexity Theory and Additive Combinatorics.

Prajakta Nimbhorkar

Prajakta Nimbhorkar received her B.E. (Computer Science and Engineering) from Government College of Engineering, Aurangabad (2003), M.Tech. (Information Technology) from Indian Institute of Technology, Bombay (2005) and Ph.D. The Institute of Mathematical Sciences, Chennai (2010).

Her research interests are: Complexity and Algorithms.

Purusottam Rath

Purusottam Rath received his Ph.D. (Mathematics) from Harish Chandra Research Institute, Allahabad (2006).

He has been a Visiting Fellow at the Institute of Mathematical Sciences, Chennai (2006-2007) and a Coleman Research Fellow at Queen's University, Canada (2007-2008).

His research interests are: Combinatorial Number Theory, Diophantine Approximation and Transcendental nature of special values of L-functions.

Sasanka Roy

Sasanka Roy received his B.Sc. (Mathematics) from A.B.N. College,West Bengal, M.C.A. from North Bengal University, West Bengal (2001) and Ph.D. from Indian Statistical Institute, Kolkata (2007).

He has been a Scientist at the Tata Research Development and Design Centre, Pune (2006-09) and a Centenary Postdoctoral Fellow at the Indian Institute of Science, Bangalore (2009-10).

His research interests are Computational Geometry and Algorithms.

Shrihari Sridharan

Shrihari Sridharan received his B.Sc. (Mathematics) from Barathidasan University, Trichy (1998), M.Sc. (Mathematics) from Anna University, Chennai (2000) and Ph.D. (Mathematics) from the University of Manchester, Manchester (2004).

He has been a Post-doctoral Fellow at the Institute of Mathematical Sciences, Chennai (2004-2006), a Post-doctoral Fellow at the Indian Institute of Science, Bangalore (2006-2007) and a Senior Lecturer at the Department of Mathematics, Indian Institute of Technology, Guwahati (2007-2008).

His research interests are: Complex Dynamics and Ergodic Theory.

Sourav Chakraborty

Sourav Chakraborty received his B.Sc. from Chennai Mathematical Institute (2003) M.S. from University of Chicago (2005) and Ph.D. from University of Chicago (2008).

He has been a Post-doctoral researcher at Technion, Israel (2008-2009) and Post-doctoral researcher at CWI, Amsterdam (2009-10).

His research interests are: Complexity and Algorithms

Awards

- C.S. Seshadri has been elected to the National Academy of Sciences, U.S.A. in April 2010.
- Govind S. Krishnaswami has been awarded the Ramanujan National Research Fellowship in October 2010.

Research Activities

Mathematics

Geometric reductively of reductive groups over a field of characteristic $p>0$ was established by using a quotient space approach.

In operator algebras, certain classes of endomorphism semigroups on the algebra B(H) of bounded operators on a separable Hilbert space H were studied. Interest was on the so called E0-semigroups, in particular on "Generalized CCR ows" and "Toeplitz CAR ows" introduced by R. Srinivasan and Masaki Izumi. One of the aims was to develop a stochastic calculus in this setting. Study of E0-semigroups on Type II1 factors was initiated. A notion of index for special class of E0-semigroups on these factors was dened, with implications for "Cliord flows" (namely that their cocycle conjugacies can be classied by their ranks.

A new way of looking at Hilbert modules as spaces of operators between Hilbert spaces was found, while studying E0 semigroups on II1 factors. An analogue of the Stinespring dilation theorem was established.

Investigation of the transcendental nature of special values of L-functions (arising from arithmetic as well as analytic contexts) was continued. The nature of zeros of modular forms (or even quasi-modular forms) was understood better, in the spirit of the classical work of Rankin, Swinnerton-Dyer and Kohnen (whose work showed that a zero of the Eisenstein series Ek which is not a CM-point or i, is necessarily transcendental).

Some results on the theoretical as well as computational aspects of stochastic games were found.

Work continued on stochastic processes and martingale problems, efficacy of multiple choice tests.

It was shown that differential operators act naturally on certain residual complexes (more generally on Cousin complexes). Concrete understanding of residues and duality in algebraic geometry was pursued.

A systematic mathematical study of the combinatorial aspects of the work of the great musicologist Saranga Deva (circa 1225 AD) was undertaken a couple of years ago. It deals with the mathematics of swara patterns as well as tala patterns related to unique representation of an integer in terms of factorials and a sequence of numbers analogous to Fibonacci Numbers respectively.

The work of 14th century mathematicians Narayana Pandita on Combinatorics was studied and a paper entitled "Narayana Pandita's Enumeration of Combinations and associated representation of numbers as sums of binomial coecients" was completed.

Time dependent Scrodinger equation was considered. With the initial data on the noncompact Riemannian symmetric spaces it was shown that the solution is identically zero when one applies a decay condition called the Beurlings condition on the initial data. At present attempts are being made to establish another uncertainty principle called L^p - L^q Morgans theorem for the Riemannian symmetric spaces of the non-compact type and conclude a similar result as above for the Schrodinger equation under this condition.

Computer Science

Multi-pushdown systems were studied and a new proof was established for the decidability of reachability and parity games for MPDSs under the bounded-phase restriction. Regularity of the set of winning configurations and pre* was also established.

The study of timed message sequence charts was continued. The conformance, problem, that is, to verify that all timed behaviours exhibited by the system conform to the timing constraints imposed by the specication was studied. In general, this corresponds to checking inclusion for timed languages, which is an undecidable problem even for timed regular languages. It has been shown that regular collections of time-constrained MSCs can be translated into a special class of event-clock automata that can be determinized and complemented, thus permitting an algorithmic solution to the conformance problem.

A deterministic polynomial time algorithm that takes as input the multiplication table of some finite group G and constructs a directed O(logjGj) degree Cayley expander for the group G has been proposed. The O(logjGj) degree Cayley graph

output by the algorithm has a rapid mixing property that guarantees constant spectral expansion. The main tool used is Erdos-Renyi sequences for finite groups. Refining this approach, new deterministic polynomial-time algorithm that computes an O(logjGj) degree undirected Cayley expander for the group G has also be constructed, giving a conceptually different and elementary combinatorial proof of Wigderson and Xiao's derandomization of the Alon-Roichman classical randomized construction of an O(logjGj) size expanding generator set for G.

Win-lose bimatrix games were studied with a view to obtaining efficient algorithms for solving such games. It was shown that a Nash equilibrium can be found in Nondeterministic Logspace for K3;3-free games, a subclass of K5-free games and win-lose games whose triconnected components are planar, K5 or V8.

New classes of stochastic games with the orderfield property have been proposed. Further, algorithms for solving some classes and mixtures of stochastic games - in particular, an algorithm (using LCP formulation) for solving a subclass of switching control polystochastic games have been described.

Algorithmic problems arising from Computational Geometry, Databases, and Sensor Networks were studied.

The problem of testing whether two Boolean functions are isomorphic under permutation of its variables was studied and a tight bound on the query complexity of the property testing version of this problem was obtained. Other property testing problems both in the classical and quantum case have also been studied.

The connection of property testing to locally decodable codes was studied. A strengthening of locally decodable codes called reconstructible codes was considered and various bounds on the query complexity and rate were obtained.

Physics

Research in theoretical physics at CMI, during the year 2010-2011, was performed in the following broad areas: (1) classical general relativity, (2) string theory, (3) quantum field theory, (4) fluid dynamics, (5) mathematical physics, (6) miscellaneous

Inspiralling compact binary systems are the most promising sources of gravitational waves (GWs) that can be detected by earth-based or space-based experiments. Accurate modelling of the source using General Relativity immensely helps the detection and parameter extraction of these signals. These binaries are usually modelled under the simplifying assumption that they move in circular orbits,

which is a reasonable assumption since the emission of gravitational waves will circularize the orbit of the binary even if has a non-zero eccentricity initially.

The linear momentum flux from inspiralling compact binaries moving in circular orbits up to 2.5 post-Newtonian (PN) order beyond the leading quadrupolar approximation have been calculated. This will be helpful in understanding many astrophysical phenomena involving stellar mass or supermassive black holes.

There is lot of interest to go beyond the usual circular orbit approximation as there may be astrophysical mechanisms which might counter the circularization by GWs. Work is in progress on computing gravitational waveforms from elliptical orbit binary system at the 2.5PN order and there are many nonlinear contributions which have to be consistently accounted for.

Gravitational wave observations can test General Relativity to high precision and in completely dierent regimes of strong field gravity. One of the important predictions of General Relativity is the existence of only two states of GW polarizations. A proposal has been made for a systematic parametrization of gravitational waveforms using which GW observations can bound the two vector modes of polarization which can in principle exist in a generic metric theory of gravity. This parametrizations would be handy to test the presence of non-tensorial modes of polarizations since we expect the first detection of GWs within the next 5-6 years.

Baryons in multicolor (large-N) 1+1 dimensional quantum chromodynamics have been studied using Rajeev's gauge-invariant reformulation as a nonlinear classical theory of bilocal meson fields on a Grassmannian phase space. It reproduces 't Hooft's meson spectrum via small oscillations near the vacuum, while baryons are topological solitons. It was shown that the lightest baryon has zero mass/color in the chiral limit and its form factor was found exactly. It moves at the speed of light through a family of massless states. Excitations of the baryon were modelled by linearizing the equations of motion. The baryon spectrum should be determined by an eigenvalue problem for a hermitian singular integral operator, which was obtained approximately. Excited baryons are like bound states of the lightest one with a meson. Using a simple ansatz, a crude estimate was obtained for the mass and form factor of the rst excited baryon.

In the large-N limit of 1+1 dimensional QCD, the spectrum of mesons is understood either by summing planar Feynman diagrams or by considering small oscillations about the vacuum. If we leave the infinitesmal neighborhood of the vacuum, the curved phase space and non-linear equations of motion would modify

the picture of mesons as free particles: the dynamics of mesons beyond the linearized approximation is under investigation.

A non-linear dispersive non-dissipative partial dierential equation for one dimensional fluid flow is under investigation. It shares some features with the KdV equation. It has been shown that it admits solitary waves, plane waves and an analogue of periodic cnoidal waves. However, it does not arise from a local Lagrangian variational principle of the sort that works for the KdV equation. In the process, a criterion has been found to test whether such an equation arises from a Lagrangian local in a given set of variables.

Recently, there has been considerable interest in AdS/CMT, i.e. applying string theory ideas and tools to strongly coupled condensed matter systems, using in particular holographic (AdS/CFT) methods. In particular, Lifshitz xed points exhibiting certain scaling symmetries arise in various condensed matter systems. Holographic (gravity) duals of these have been constructed about three years back using certain reduced eective models of gravity with specic matter content. Previous attempts by several groups to embed these in string theory had been unsuccessful. In recent work, the first concrete string constructions of some of these Lifshitz spacetimes have been found, based on some previous work (in a different context) of one of the authors. The simplest (and most striking) of these can be thought of as appropriate dimensional reduction of certain lightlike deformations of the usual AdS/CFT example in string theory (IIB string theory on AdS5 x S5 dual to N=4 4-dim super Yang-Mills theory) and various arguments have been given as evidence. This work has been generalized by various groups since then. Further exploration on this has been carried out, in particular studying correlation functions in greater detail in certain specic cases within this class of solutions, both with and without any dimensional reduction. Also discussed is a certain nongeometric construction of Lifshitz-like solutions.

Investigations of string spectra near some null cosmological singularities have been continued building on recent previous work: it was argued there that free string propagation is well-defined across certain classes of null cosmological singularities in Rosen variables, and that oscillator states become light near the singularity. In present work, this has been developed further, studying various physical observables for a time-dependent harmonic oscillator toy model (thought of as a single momentum mode of the string) and then the free string, reconciling the Rosen description with that in the conventional (Brinkman) variables. In particular this analysis shows that various observables are still divergent in the Rosen frame despite the nonsingular

time-dependence of the near-singularity wavefunctional. This suggests that the free string limit is ill-defined in any frame, string interactions becoming important, perhaps consistent with string oscillator states becoming light in the vicinity of the singularity.

The quantum counterpart of precession and nutation has been under investigation. Also being studied are time delays in tunnelling phenomena.

Publications

Journal Articles

Mathematics

J1. S.S. Kannan and S.K. Pattanayak: Normality, Projective normality and EGZ theorem, Integers 11 (2011), A28, 4 pp.

J2. S.S. Kannan and S.K.Pattanayak: Projective normality of Weyl group quotients, Proc. Indian Acad. Sci. Math. Sci. 121 (2011), 1, 19-26.

J3. Purusottam Rath, S. Gun and M. Ram Murty: Transcendental nature of special values of L-functions, Canadian Journal of Mathematics, 63 (2011), 136-152.

J4. Purusottam Rath, S. Gun and M. Ram Murty: On a conjecture of Chowla and Milnor, to appear in the Canadian Journalof Mathematics.

J5. Purusottam Rath, S. Gun and M. Ram Murty: Algebraic Independence of Values of Modular Forms, to appear in the International Journal of Number Theory.

J6. Purusottam Rath, S. Gun and M. Ram Murty: Transcendental values of certain Eichler integrals, to appear in the Bulletin of London Mathematical Society.

J7. Rajeeva L. Karandikar: On multiple choice tests and negative marking Current Science, 99, (2010), 1042-1046.

J8. Rajeeva L. Karandikar and A.G. Bhatt: Uniqueness of solution to the Kolmogorov's forward equation: Applications to White Noise Theory of Filtering Communications on Stochastic Analysis, 4 (2010), 115-128.

J9. C.S. Seshadri: Remarks on Parabolic Structures, Contemporary Mathematics, 522 (2010), 171-182.

J10. C.S. Seshadri and P. Sastry: Geometric Reductivity - A quotient space approach, Journal of the Ramanujan Math. Soc., to appear.

J11. Shiva Shankar: The dual of a flat module in TOP, Linear Algebra and its Applications, 433 (2010), 1077-1081.

J12. Shiva Shankar, D. Napp-Avelli and M.van der Put: Periodic behaviors, SIAM jl Control & Optimization, 48 (2010), 4652-4663.

J13. Shiva Shankar: A question of models, to appear in Mathematics Student.

J14. R. Sridharan: Combinatorial Methods in Indian Music: Pratyayas in Sangita Ratnakara of Saranga Deva, Studies in the History of Indian Mathematics - By C.S. Seshadri - (2010), 55-110, Hindustan Book Agnecy.

J15. R. Sridharan: An Encomium of Hemann Weyl, The Mathematics Student, 79, (2010), 1-11.

J16. R. Sridharan, Raja Sridharan and M.D. Srinivas: Narayana Pandita's Enumeration of combinations and associated representation of numbers as binomial coecients, to appear in the Indian History of Science.

J17. R. Sridharan: Division of periods of elliptic functions by 5 and an outer automorphism of S6, to appear in Mathematics Student, in 2011.

J18. R. Sridharan: Rational Quadrilaterals from Brahmagupta to Kummer "Mathematics Unlimited - Essays in Mathematics", (Edited by R. Sujatha, H.N. Ramaswamy, C.S. Yogananda), 403-417, CRC Press.

J19. R. Sridharan, Raja Sridharan and M.D. Srinivas: Dierences in style, but not in substance, "Mathematics Unlimited" - Essays in Mathematics, (Edited by R. Sujatha, H.N. Ramaswamy and C.S. Yogananda), 431-449, CRC Press.

J20. R. Srinivasan and Mazaki Izumi: Toeplitz CAR flows and type I factorizations, Kyoto Journal of Mathematics, 50 (2010), 1, 1-32.

J21. M. Sundari and Angela Pasquale: Uncertainty principles for the Schrodinger equation on Riemannian symmetric spaces of non-compact type, Annales de linstitut Fourier, 61 (2011).

Computer Science

J22. Nagarajan Krishnamurthy, T. Parthasarathy and G. Ravindran: "On Solving Subclasses of Multi-Player Stochastic Games via Linear Complementarity Problem Formulations: A Survey and Some New Results", Journal of Optimization and

Engineering (a Special Issue on Applications of Variational Inequalities and Complementarity Problems), Springer. 2011.

J23. Partha Mukhopadhyay, Shachar Lovett and Amir Shpilka: Pseudorandom generators for CC0[p] and the structure of the Fourier spectrum of low-degree polynomials over finite fields, to appear in Computational Complexity.

J24. Sasanka Roy, Mustaq Ahmed, Anil Maheshwari and Subhas C. Nandy: On number of shortest descent paths on convex polyhedron, to appear in the Journal of Discrete Algorithms (http://dx.doi.org/10.1016/j.jda.2010.12.002).

J25. Sourav Chakraborty: On the Sensitivity of Cyclically-Invariant Functions, to appear in Discrete Mathematics and Theoretical Computer Science.

J26. Sourav Chakraborty, Jop Brit, David Garca-Soriano and Arie Matsliah: Monotonicity Testing and Shortest-Path Routing on the cube, to appear in Combinatorica.

J27. Sourav Chakraborty, Eldar Fischer, Arie Matsliah and Raphael Yuster: Hardness and Algorithms for Rainbow Connectivity, Journal of Combinatorial Optimization (JOCO).

Physics

J28. K.G. Arun and P Ajith: Gravitational Wave Astronomy, to appear in Resonance magazine.

J29. H.S. Mani, P. Pathak and V. Singh: Energy and Angular momentum storage in a rotating magnet, American Journal of Physics 79, 873 (2011).

J30. Govind S. Krishnaswami: On lightest baryon and its excitations in large-N 1 + 1 dimensional QCD J. Phys. A: Math. Theor. 43 (2010), 395-401, arXiv:1005.4942 [hep-th].

J31. K. Narayan and Koushik Balasubramanian: Lifshitz spacetimes from AdS null and cosmological solutions, J. High Energy Phys. 1008:014, (2010), arXiv:1005.3291 [hepth].

J32. K. Narayan: Null cosmological singularities and free strings: II, J. High Energy Phys. 1101:145, (2011), arXiv:1012.0113 [hep-th].

J33. K. Narayan: Lifshitz-like systems and AdS null deformations, Phys. Rev. D84, 086001, (2011), arXiv:1103.1279 [hep-th].

Conference Papers

Mathematics

C1. Purusottam Rath: Some musings on rational approximation and transcendental numbers. Mathematics Newsletter, Ramanujan Math. Soc., Special Issue Commemorating ICM 2010, 19 (2010), 1, 183-194.

C2. Purusottam Rath and S.D. Adhikari: Simplices with monochromatic vertices: reflections on some problems in Euclidean Ramsey Theory, to appear in the conference proceedings held at Chennai in honour of Prof. T.C. Vasudevan.

Computer Science

C3. Samir Datta and Nagarajan Krishnamurthy: Some Tractable Win-Lose Games, Proceedings of the 8th Annual Conference on Theory and Applications of Models of Computation (TAMC 2011), Tokyo, Japan. LNCS 6648, Springer Berlin/ Heidelberg. pp. 365-376, 2011. (Also archived: CoRR abs/1010.5951, http://arxiv.org/abs/1010.5951v2 [cs.GT]).

C4. Nagarajan Krishnamurthy, T. Parthasarathy and G. Ravindran: New Classes of Two Player and Multi-Player Stochastic Games with the Ordereld Property, The Second Brazilian Workshop of the Game Theory Society, in honor of John Nash, on the occasion of the 60th anniversary of Nash equilibrium, University of So Paulo, Brazil (2010).

C5. Nagarajan Krishnamurthy, T. Parthasarathy and G. Ravindran: On Solving Classes of (Two Person) Stochastic Games via Linear Complementarity Problem Formulations", The Second Brazilian Workshop of the Game Theory Society, in honor of John Nash, on the occasion of the 60th anniversary of Nash equilibrium, University of So Paulo, Brazil (2010).

C6. S. Akshay, Paul Gastin, Madhavan Mukund and K. Narayan Kumar: Model checking time-constrained scenario-based specications, Proceedings of FSTTCS 2010, LIPICs, 8, 204-215

C7. Joy Chakraborty, Deepak D'Souza and K. Narayan Kumar: Analysing Message Sequence Graph Specications, Proceedings of ISoLA (1) 2010, Springer LNCS, 6415, 549.563.

C8. Prajakta Nimbhorkar, Michal Koucky and Pavel Pudlak: Pseudorandom generators for group products, STOC 2011

C9. John Augustine, Qi Han, Philip Loden, Sachin Lodha and Sasanka Roy: Energy-Efficient Shortest Path Algorithms for Convergecast in Sensor Networks, Proc. of the Computing: the Australasian Theory Symposium, CATS 2011.

C10. Sangameshwar Patil, Sasanka Roy, John Augustine, Amanda Redlich, Anand Deshpande, Mangesh Gharote, Sachin Lodha, Ankit Mehrotra, and Harrick Vin: Minimizing Application Testing in Database Migration, Proc. of the International Conference on Management of Data, COMAD 2010, 191-201.

C11. Sourav Chakraborty, Jop Briet, David Garca-Soriano and Arie Matsliah: Monotonicity Testing and Shortest-Path Routing on the cube, 14th International Workshop on Randomization and Computation (RANDOM 2010).

C12. Sourav Chakraborty, Eldar Fischer, Arie Matsliah and Ronald de Wolf: Quantum Query Complexity for Testing Distribution, 30th International Conference on Foundations of Software Technology and Theoretical Computer Science (FSTTCS 2010).

C13. Sourav Chakraborty,Nikhil Devanur and Chinmay Karande: Market Clearance Pricing in a Metric, WINE 2010.

C14. Sourav Chakraborty, David Garca-Soriano and Arie Matsliah: Tight Bounds for Testing Function Isomorphism, ACM-SIAM Symposium on Discrete Algorithms (SODA 2011).

C15. Sourav Chakraborty, Eldar Fischer and Arie Matsliah: Query Complexity Lower Bounds for Reconstruction of Codes, Innovations in Computer Science (ICS 2011).

C16. Sourav Chakraborty, David Garca-Soriano and Arie Matsliah: Cycle Detection, Order Finding and Discrete Log with Jumps, Innovations in Computer Science (ICS 2011).

Preprints and Reports

Mathematics

P1. Purusottam Rath, S. Gun and M. Ram Murty: Note on special values of L-functions.

P2. Purusottam Rath: Real numbers with non-optimal complexity.

P3. C.S. Seshadri and V. Balaji: Moduli of parohoric G-tensors on a compact Riemann surface.

P4. R. Sridharan: A mathematical model of Planetary motions by Eudoxus.

P5. R. Srinivasan, Panchugopal Bikram, Kunal Mukherjee and V.S. Sunder: Hilbert von Neumann Modules, Preprint, Submitted to a special volume of `Communications in Stochastic Analysis'.

P6. Yashonidhi Pandey: The multiplicative Horn Problem for the case of the special orthogonal, spin and the symplectic group.

P7. Yashonidhi Pandey: The construction of the moduli of vector bundles on curve together with a quadratic form that degenerates at a prescribed set of points with prescribed orders of degeneracies.

Computer Science

P8. Partha Mukhopadhyay, V. Arvind and Prajakta Nimbhorkar: Erdos-Renyi Sequences and Deterministic construction of Expanding Cayley Graphs, Technical Report: ECCC TR11-081.

P9. Sourav Chakraborty and Oded Lachish: Improved Competitive Ratio for the Matroid Secretary Problem.

P10. Sourav Chakraborty, Jop Brit, David Garca-Soriano and Arie Matsliah: Testing by Implicit Learning with Fewer Queries.

Book

Computer Science

B1. M. Mukund: Automata on Distributed Alphabets, to appear in in D. D'Souza and P. Shankar (eds.): Modern Applications of Automata Theory, IISc Research Monographs Series, Vol 2, World Scientic, Singapore (2011).

B2. M. Mukund: Finite-state Automata on Infinite Inputs to appear in in D. D'Souza and P. Shankar (eds.): Modern Applications of Automata Theory, IISc Research Monographs Series, Vol 2, World Scientic, Singapore (2011)

B3. Nagarajan Krishnamurthy and T. Parthasarathy: Multistage (Stochastic) Games, Wiley Encyclopedia of Operations Research and Management Science (EORMS), (Editors: James J. Cochran, Louis A. Cox, Pinar Keskinocak, Jerey P. Kharoufeh, and J. Cole Smith), John Wiley & Sons, Inc. 2011 (Published Online: DOI: 10.1002/9780470400531.eorms0551).

The National Undergraduate Programme

In 1998, CMI initiated an National Undergraduate Programme in the Mathematical Sciences in collaboration with Madhya Pradesh Bhoj Open University with a 3 year course in Mathematics and Computer Science, leading to a B.Sc. Honours degree. In 2001, this programme was extended to the postgraduate level with separate 2 year courses leading to M.Sc. degrees in Mathematics and Computer Science. The scope of the undergraduate programme was expanded in 2003 to incorporate a 3 year course leading to a B.Sc. Honours degree in Physics. CMI commenced a two year course leading to M.Sc. degree in Applications of Mathematics in 2010.

The undergraduate and postgraduate teaching programmes at CMI are both run in cooperation with the Institute of Mathematical Sciences (IMSc), Chennai. These programmes tap the teaching talent available at the elite research institutes of the country, which are normally outside the university system. Students are thus exposed to lectures by active researchers who bring a very dierent perspective to the teaching.

B.Sc. (Hons.) Mathematics

In 2010, the thirteenth batch of students was admitted to the undergraduate programme. 17 students have joined the programme. The second year B.Sc. class has 13 students, while the third year B.Sc. class has 13 students. Out of the 13 students of the 2007 batch who took their degrees at the convocation in August, 2010, several have been placed in very prestigious institutions.

Name	Placement
Arpan Dutta	M.Sc. Student, CMI
Navoneel Raichaudhuri	M.Sc. Student, CMI
Satwik Mukherjee	M.Sc. Student, ISI, Kolkata
Pratish Rohit Gandhi	Societe Generale, Hong Kong

Nitin Saurabh	Ph.D. Student, IMSc, Chennai
Rahul Kumar Abhishek Hemantkumar Dang	M.Sc. Student, CMI
Aditya Chandrasekhar Karnataki	Ph.D. Student, Boston University, USA
Hrishikesh Rajesh Terdalkar	M.Sc. Student, CMI
Pranabendu Misra	Ph.D. Student, CMI
Rajesh Hemant Chitnis	Ph.D. Student, Univ. of Maryland, USA
Ashwin Deopurkar	Ph.D. Student, Columbia University, USA
Atul Shekhar	Ph.D. Student, Berlin Math School, Germany

B.Sc. (Hons.) Physics

This programme was started in 2003 with the assistance of the Physics Faculty of the IMSc., Chennai, and the active participation of physicists across the country.

In 2010, 9 students have joined the programme. The second year B.Sc. class has 8 students, while the third year B.Sc. class has 6 students.

During the course of the academic year, Physics students perform some basic experiments in class at CMI. In addition, students have an intensive laboratory programme at the Homi Bhabha Centre for Science Education (HBCSE), Mumbai, during the summer vacation after the rst year. A similar arrangement has been worked out with the Indira Gandhi Centre for Atomic Research (IGCAR), Kalpakkam for students at the end of the second year. Regular laboratory classes are conducted with the help of IIT Madras for students in the third year.

Out of the 6 students of the 2007 batch who took their degrees at the convocation in August, 2010, several have been placed in very prestigious institutions.

Name	Placement
Renjan Rajan John	Ph.D. Student, IMSc, Chennai
Prathyush Manchala	Ph.D. Student, TIFR, Mumbai
Sourabh Nampalliwar	M.Sc. Student, Univ. of Texas, USA
Gunjan Sharan Gola	Ph.D. Student, IMSc, Chennai
Harikrishnan Ramani	Ph.D. Student, Univ. at Stonybrook, USA
Arijit Bose	Ph.D. Student, Syracuse Univ, USA

M.Sc. Mathematics

Three students who joined the programme in 2008 have completed the programme successfully.

Name	Placement
Arun Maiti	
Priyanka Rajan	
Rohith Varma	Ph.D Math, CMI

In 2010, Six students have joined the programme.

M.Sc. Computer Science

Five students who joined the programme in 2008 have completed the programme successfully.

Name	Placement
Abdullah Abdul Khadir	MPRI, Paris, France
Amit Dhar	MPRI, Paris, France
Shrinivas Kannan	Global Analytics, Chennai
Supartha Podder	MPRI, Paris, France
Ravishankara Shastry	TCS Innovation Labs, Bangalore

In 2010, eight students have joined the programme.

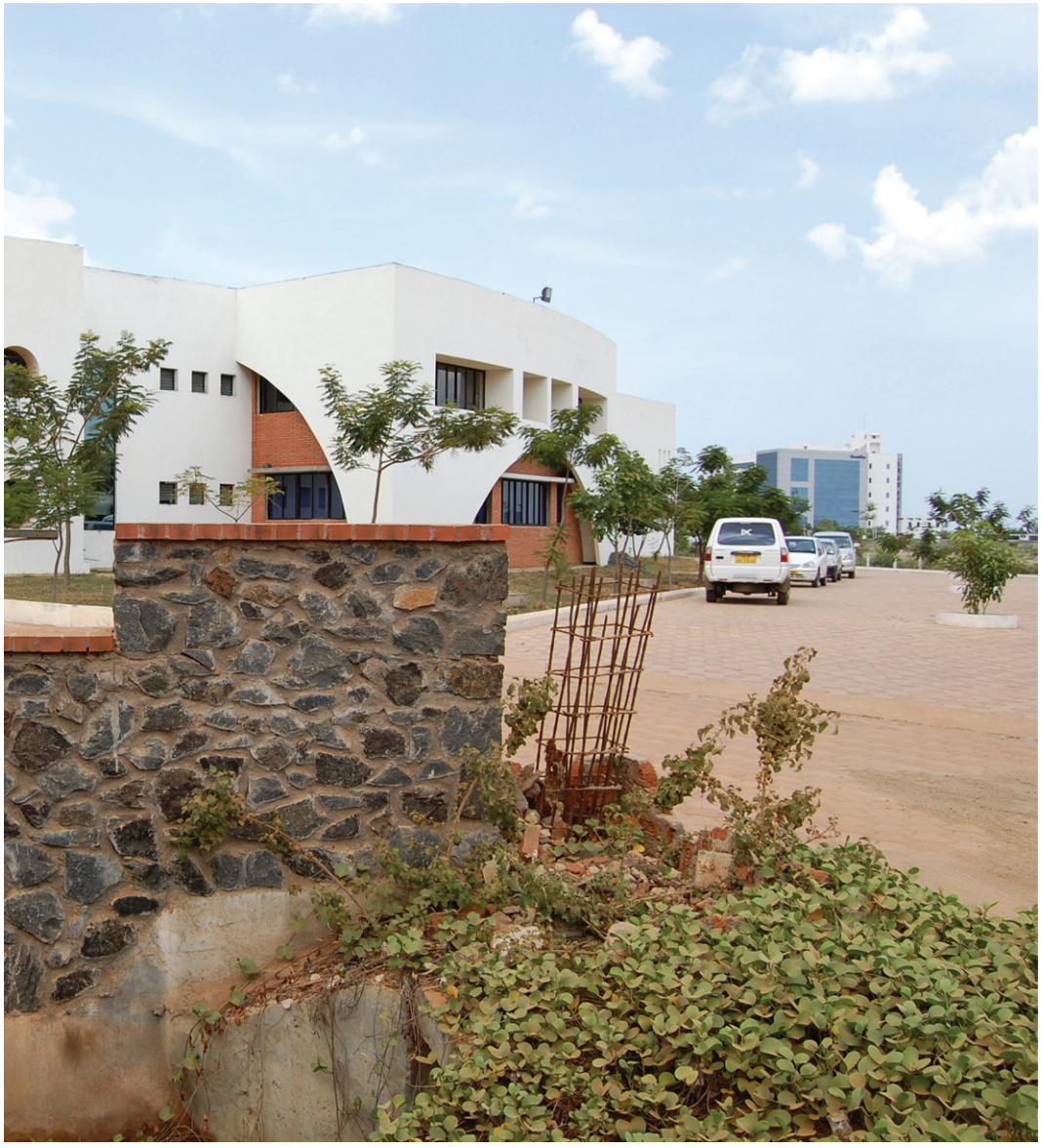
M.Sc. Applications of Mathematics

In 2010, Two students have joined the programme.

Convocation

The 8th Annual Convocation of CMI was held on 30 July 2010. Degrees were awarded to 29 successful candidates at various levels. Of these, 19 were at the Undergraduate level, 8 were at the Postgraduate level and 2 were at Ph.D. level. Dr. Srikumar Banerjee, Chairman, Atomic Energy Commission & Secretary, Department of Atomic Energy, Government of India gave away the degree certificates. Prof. Kalyan B. Sinha, Distinguished Associate, Indian Institute of Science & Dean, Faculty Affairs, Jawaharlal Nehru Centre for Advanced Scientic Research, Bangalore, delivered the convocation address.

The CMI Medal of Excellence (instituted by Prof. K.R. Nagarajan) was awarded to Dang Abhishek Hemantkumar in Mathematics and Computer Science and Harikrishnan Ramani in Physics for their outstanding performance at the undergraduate level.



Activities of the Undergraduate Students

Informatics Olympiad

CMI faculty coordinate the training and selection of students to represent India at the International Olympiad in Informatics through the Indian Association for Research in Computer Science (IARCS).

Prizes won

Gaurav Digambar Patil won a Silver medal in the International Mathematics Olympiad, at Kazakhstan in July 2010. Ronno Das obtained a honourable mention in the same contest. Siddharth Krishna won a Bronze medal at the International Olympiad in Informatics held inWaterloo, Canada in August 2010.

Internships

CMI offers visiting students' programme to orient motivated students pursue further studies in Mathematics and Computer Science. The programme is held in the CMI campus in the months of May, June and July.

Interaction with graduate students from Ecole Normale Superieure

Chennai Mathematical Institute has an agreement with the Ecole Normale Superieure in Paris, France, one of the leading institutions in the world for teaching and research in Mathematics. This agreement provides for regular exchange visits by academic members of CMI and ENS, Paris. This includes, in particular, exchanges of visits by undergraduate students between the two institutions.

Every year, the top three students passing out from the B.Sc. Mathematics programme spend 8 weeks at the ENS, where they work on research projects with

the ENS faculty. In May-June 2010, Abhishek Dang, Ashwin Deopurkar and Aditya C. Karnataki visited the ENS.

Sylvain Arguillere from the ENS visited CMI during January-February 2011, Oriane Blondel from the ENS visited CMI during February-May 2011 and Nicolas Laillet from the ENS visited CMI during March-May 2011. They taught, examined and evaluated the course Calculus II (second semester of B.Sc. I).

Interaction with graduate students from Ecole Polytechnique

Chennai Mathematical Institute has an agreement with the Ecole Polytechnique in Paris, France, one of the leading institutions in the world for teaching and research in Physics.

Every year, the top three students passing out from the B.Sc. Mathematics programme spend 8 weeks at the ENS, where they work on research projects with the ENS faculty. In May-July 2010, Harikrishnan Ramani and Arijit Bose visited the ENS.

Undergraduate / Graduate Courses

Course	Instructor
Algebra I	Suresh Nayak
Calculus I	T Parthsarathy
English	Shreekumar Varma
Intro to Programming (Haskell)	K Narayan Kumar
Algebra III	P Vanchinathan
Real Analysis	R Srinivasan
Caculus III	Murali Vemuri
Design & Analysis of Algorithms	Sasanka Roy
Theory of Computation	K V Subrahmanyam
Algebra IV	Clare D'Cruz
Introduction to Logic	S P Suresh
Classical Mechanics I	V V Sreedhar
Electromagnetism I	H K Sahu
Mathematical Physics I	H S Mani
Laboratory	M V Rao
Intro to Programming (Python)	Madhavan Mukund
Classical Mechanics II	R Jagannathan
Electromagnetism III	K Narayan
Quantum Mechanics II	R Parthasarathy
Statistical Mechanics II	S Sivakumar
Laboratory	M V Rao
Condensed Matter Physics	Radha Banhatti

Course	Instructor
Nuclear and Particle Physics	G Rajasekaran
Algebra	V Balaji
Analysis	Sundari Maddala
Advanced Calculus	Purusottam Rath
Linear Algebra	P Vanchinathan
Sheaves and Cohomology	Pramathnath Sastry
Measure and Integration	B V Rao
Algebraic Topology	Shiva Shankar
Analysis	Upendra Kulkarni
Probability and Statistics	R Karandikar
Concurrent Programming	S P Suresh
Databases	Madhavan Mukund
Discrete Mathematics	Samir Datta
Automata Theory & Verication	K Narayan Kumar
Complexity Theory	K V Subrahmanyam
Datamining	Madhavan Mukund
Logspace Computation	Samir Datta
Advanced Programming	Madhavan Mukund
Algebra II	Clare D'Cruz
Calculus II	ENS/ R Srinivasan
Discrete Mathematics	Sourav Chakraborty/ Partha Mukhopadhyay
Probability Theory	P Vanchinathan
Complex Analysis	Murali K Vemuri
Dierential Equations	B V Rao
Topology	Upendra Kulkarni
Programming Language Concepts	Madhavan Mukund/ S P Suresh
Economics	Malathi Velamuri
Classical Mechanics II	K Narayan
Mathematical Physics II	H S Mani

Course	Instructor
Quantum Mechanics I	Govind Krishnaswami
Statistical Mechanics I	N D Haridass
Laboratory	M V Rao
Classical Mechanics III	Rakesh Nigam
General Relativity	K G Arun
Mathematical Physics III	R Jagannathan
Quantum Mechanics III	R Parthasarathy
Quantum Field Theory	G Rajasekaran
Design & Analysis of Algorithms	K V Subrahmanyam
Compilers	S P Suresh
Theory of Computation	Samir Datta
Algebra II	Suresh Nayak
Differential Geometry	Shiva Shankar
Functional Analysis	S Kesavan
Measure Theoretic Probability	R V Ramamoorthy
Game Theory	T Parthasarathy
Hyperbolic Geometry	Shrihari Shridharan
Lie Algebra/ Algebriac Groups	Senthamarai Kannan
Sheaves & Cohomology II	Pramathanath Sastry
Analytic Combinatorics	Partha Mukhopadhyay
Computational Geometry	Sasanka Roy
Probabilistic Method	Sourav Chakraborty
Topics in Automata Theory	K Narayan Kumar
Finite Model Theory	S P Suresh/ K Narayan Kumar
Program Analysis	Madhavan Mukund
Topics in Commutative Algebra	R Sridharan
Seminar in Algebraic Geometry	S Ramanan

Courses, Special Lectures

- C.S. Seshadri gave a talk on "Methods of construction of the Picard Scheme" (April 2010).
- Priyanka Rajan gave a talk on "Compact surfaces, knots and isolated complex hypersurface singularities" (June 2010).
- Purusottam Rath gave a series of lectures on Algebraic number theory in June-July 2011.
- A. Baskar gave a talk on "Mixing blind signatures freely with encryption" (August 2010).
- V. Balaji gave a talk on "Fundamental Groups and Tannakian Categories" (September 2010).
- Pramathanath Sastry gave two talks on "Reductive Groups are Geometrically Reductive" (September 2010).
- P. Vanchinathan gave two talks on "Beauville Surfaces and Triangle Groups" (October 2010).
- S. Ramanan gave a talk on "Topics in Algebraic Geometry" (October 2010).
- G. Rajasekaran gave a talk on "The elusive neutrinos and their importance" (August 2010) and "Chandrasekhar and the Stars" (November 2010).
- R. Parthasarathy gave a talk on "Is Einstein's Gravity Attractive?" (November 2010).
- Sir Anthony Leggett (Nobel Prize Physics 2003), University of Illinois at Urbana-Champaign, U.S.A., gave a talk on "Prospects for topological quantum computing" (January 2011).

- David Gross (Physics Nobel 2004), Kavli Institute of Theoretical Physics, Sanata Barbara, U.S.A. Gave a talk on "Physics and Mathematics at the Frontier" (January 2011).
- Michel Brion, Institut Fourier, Grenoble, France, gave a course of lectures entitled"Chevalley structure theorem on algebraic groups, and beyond" (January 2011).
- Alladi Sitaram, Raja Ramanna Fellow, Indian Institute of Science, Bangalore, gave R.K. Rubugunday Distinguished Lecture on "A glimpse into non-Euclidean harmonic analysis" (February 2011).
- R. Balasubramanian, Director, Institute of Mathematical Sciences, Chennai, gave K. Lakshmanan Memorial Distinguished Lecture on "Partition functions" (February 2011).
- Alladi Sitaram, Raja Ramanna Fellow, Indian Institute of Science, Bangalore, gave a set of five lectures on "Introduction to Fourier series and Fourier transforms". (February 2011).
- Maurice Herlihy, Brown University, gave a three lecture mini-course on "Applying Combinatorial Topology to Distributed Computing" (February 2011).
- Sujatha Ramdorai, TIFR, Mumbai, gave a talk on "Overview of the theory of elliptic curves" (March 2011).
- N.D. Hari Dass gave a talk on "Do you need to understand General Theory of Relativity to understand gravitation?" (March 2011).

Workshops/ Conferences/ Schools

I ICM satellite conference on Mathematical Logic and Set Theory - August 2010

In the successful tradition of logic satellite meetings at recent ICMs, CMI organised a satellite conference on mathematical logic and set theory in India to provide a specialized venue for logicians and set theorists connected with ICM 2010 in Hyderabad. The conference was cohosted by the Institute of Mathematical Sciences and the Chennai Mathematical Institute on behalf of the Association for Logic in India. The scope of the meeting included all of mathematical logic, including its areas of application (theoretical computer science, algebraic logic and others).

- Theodore A. Slaman,University of California, U.S.A. - Structures Recursive in a Random Real.
- Dilip Raghavan, University of Toronto, Canada - Conal types of ultralters.
- Andre Nies, University of Auckland, New Zealand - Borel Structures.
- Justin T. Moore, Cornell University, U.S.A. - Forcing Axioms and the Continuum Hypothesis.
- Andrew Brooke-Taylor, University of Bristol - Zero-one laws for Fraisse limits over infinite languages.
- Gunnar Wilken, Okinawa Institute of Science and Technology, Japan - Tracking Chains of 2-Elementarity.
- Denis I. Saveliev, Moscow State University, Russia - Groupoids of ultrafilters.
- Anand Pillay, University of Leeds, U.K. - Measures in model theory.
- Joan Bagaria, ICREA & Universitat de Barcelona, Spain - Structural Reflection and the Hierarchy of C(n) cardinals.

- Janak Ramakrishnan, Universit Claude Bernard, France - Definable linear orders definably embed into lexicographic orders in o-minimal structures.
- Cedric Milliet, Universit Claude Bernard, France - Groups with few types.
- Menachem Magidor,Hebrew University of Jerusalem, Israel - Square like principles and Forcing axioms.
- Rob Goldblatt, Victoria University of Wellington, New Zealand - Elementary Classes Generating Varieties of Complex Algebras.
- S.M. Srivastava, Indian Statistical Institute, Kolkata - Stochastic Kripke models
- Kobi Peterzil, University of Haifa, Israel - O-minimal ingredients in solutions to arithmetic conjectures in Algebraic Geometry.
- Wolfgang Thomas, Rheinisch-Westflische Technische Hochschule Aachen, Germany - Refining determinacy results for innite games.

II Automata, Concurrency and Timed Systems, ACTS III - January 2011

ACTS III is a follow-up to the ACTS workshops held in CMI in January 2009 and February 2010 The main theme of the workshop is the use of logic and automata for modelling and verifying distributed, open and timed systems.

- Benedikt Bollig, LSV, ENS Cachan - An automaton over data words that captures EMSO logic.
- Tayssir Touili, LIAFA, Paris 7 - On Model Checking Multi-threaded recursive programs.
- Benoit Razet, TIFR, Mumbai - Tracing the decision procedure for regular expressions equality.
- Nathalie Bertrand, INRIA - A game approach to determinize timed automata.
- Stefan Haar, INRIA/LSV, ENS Cachan - A Concurrency-Preserving Translation from Time Petri Nets to Networks of Timed Automata.
- Hugo Gimbert, LaBRI, Bordeaux - Stochastic Games with Partial Observation: Decidable and Undecidable Problems.

- Manfred Kufleitner, Stuttgart - On languages of dot-depth one over infinite words.
- Loic Helouet, IRISA - Diagnosis with Dynamic MSC Languages.
- Paritosh Pandya, TIFR, Mumbai - Unambiguity in Timed Regular Languages: Automata, Logics and Expressiveness.
- K. Vasanta Lakshmi, IISc., Bangalore - Verification of Requirement Specications Using Counter Automata.
- Yaron Velner, Tel Aviv - Church Synthesis Problem for Noisy Input.
- Ramchandra Phawade, IMSc., Chennai - A Kleene functor for a subclass of net systems.
- Soumya Paul, IMSc., Chennai - Neighbourhood structures in games.
- B. Srivathsan, LaBRI, Bordeaux - A lazy reachability algorithm for timed automata.
- Supratik Chakraborty, IIT, Mumbai - Ranking function based disambiguation techniques for Buchi automata.
- Stefan Schwoon, LSV, ENS Cachan - Towards an efficient contextual unfolder.
- S.P. Suresh, CMI, Chennai - A DEXPTIME-complete Dolev-Yao theory with distributive encryption.
- Hrishikesh Karmarkar, IIT, Mumbai - Determinization of omega - automata unified.
- Sylvain Salvati, LaBRI, Bordeaux - Towards an algebraic classification of recognizable sets of lambda-terms.
- S. Akshay, NUS, Singapore - Approximate methods for probabilistic inference in Dynamic Bayesian Networks.
- Deepak D'Souza, IISc. Bangalore - Conflict Tolerant Specications for Hybrid Systems.
- M Praveen, IMSc., Chennai - Small Vertex Cover makes Petri Net Coverability and Boundedness Easier.

III Seminar on Creating Communication

The CMI Seminar '10 on Creating Communication was aimed at recognising and understanding the processes that lead to communication through different media. The purpose of the Seminar was to bring together expert practitioners from different art and communication areas, who shared their experiences and discoveries in their chosen elds. Seminar '10 focused on Communication in the fields of historical literature, mass media, public speaking and theatre. The speakers also interacted with the students.

- History In the Writing - V. Sriram, Historian, Columnist, Author
- Press Freedom & Media Ethics - K.P. Sunil, Vice President (News), Jaya TV
- The Art of Articulation - M. Keshav, Management Guru
- From The Page to The Stage - P.C. Ramakrishna, Theatre Personality, Voice Artiste

Conferences, Visits and External Lectures

Rajeeva L. Karandikar

- Attended International Congress of Mathematicians at Hyderabad in August 2010.
- Visited Indian Institute of Science in October 2010 and gave lecture on "MCMCMarkov Chain Monte Carlo"
- Visited Indian Statistical Institute, Delhi, during December 2010 and gave lectures on "Introduction to Option pricing."
- Gave invited lecture at IIT Bombay on January 2011 titled "Markov Chains with periodic transition probabilities".
- Gave a lecture at Astrostatistics School, Kavalur Observatory organised by Indian Institute of Astrophysics on "Probability theory and statistical Inference".

C.S. Seshadri

- Participated in the Conference on "The Interplay of Algebra and Geometry" held in honour of Corrado De Concini at Cortona, Italy, in June 2010 and gave an invited talk on "Moduli and Monodromy".

Shiva Shankar

- Delivered the P.L. Bhatnagar Memorial Award Lecture (`` Fourier series, arithmetic and control theory") at the 76th Annual Conference of the Indian Mathematical Society, Surat, in December 2010.
- Gave Special lecture of the IEEE Signal Processing and Control Systems Societies on 'Modelling periodic signals in dynamical systems" in Bangalore in 2011

Madhavan Mukund

- Visited LSV, ENS de Cachan, France and IRISA, Rennes, France in April-May 2010
- Attended ICALP 2010 at Bordeaux, France, in July 2010.
- Attended 9th Update Meeting on Advanced Formal Methods, at DA-IICT, Gandhinagar, in July 2010 and presented a talk on "Verification of weak memory models".
- Gave a talk on "Who's afraid of concurrent programming?" in ACM, Chennai Professional Chapter at IMSc., in November 2010.
- Attended 76th annual conference of the Indian Mathematical Society at NIT, Surat, in December 2010 and presented an invited talk on "The Interplay between Automata Theory and Mathematical Logic".
- Attended RMIT Symposium on Mathematics and Information Technology at NIT, Surat, in December 2010 and presented an invited talk on "Formal Verification".
- Co-organizer of Workshop on Automata, Concurrency and Timed Systems III, at the Chennai Mathematical Institute, in January 2011.
- Co-organizer of Mysore Park Workshop on "The Chemistry of Concurrent and Distributed Programming", at Mysore, during February 2011.

K. Narayan Kumar

- Visited LSV, ENS de Cachan in May-June 2010 funded by the ARCUS project of Ile-de-France.
- Attended 9th Update Meeting on Advanced Formal Methods at Ahmedabad and gave a talk on "Analysis of Multi-stack Systems", in July 2010.
- Attended 21st International Conference on Concurrency Theory, Paris, France, in August 2010.
- Attended 30th Foundations of Software Technology and Theoretical Computer Science (FSTTCS 2010), at IMSc, Chennai, in December 2010.
- Attended Workshop on Automata, Concurrency and Timed Systems III, CMI, Chennai, in February 2011.

S. Senthamarai Kannan

- Visited University of Melbourne during May-November 2010.

R. Sridharan

- Gave an invited lecture on "Pingala to Saranga Deva" in Bhaskaracharya Pratishtan in 2010.
- Gave a lecture on "Indian Combinatorics" at IISER, Pune in 2010.
- Gave Inaugural address of a conference on "Recent Developments in Mathematics and its applications" organized by the Department of Mathematics of SRM - University in January 2011.

H.S. Mani

- Participated in the Olympiad programme at Homi Bhabha Centre for Science Education, gave lectures and prepared problems for the Olympiad students (several visits during the course of the year 2011).
- Gave a series of lectures on Mechanics (special theory of relativity) to teachers at the University of Mumbai, Mumbai, in January 2011.

Clare D'Cruz

- Gave a talk on "Solving polynomial equations and applications to engineering" in March 2011 at Periyar Maniammai University, Thanjavur.
- Gave a talk on" Counting integral points in a polytope and integrally closed ideals" in March 2011 at Periyar Maniammai University, Thanjavur.

Govind S. Krishnaswami

- Attended the 26th meeting of the North British Mathematical Physics Seminar, at University of York, U.K., in June 2010.
- Gave LMS-EPSRC Short Course on "Classical and Quantum Integrable Models" in July 2010, University of Kent, Cantebury, U.K.
- Visited Durham University, during Easter and Summer terms 2010.
- Attended Chandrayana, Conference in honour of S. Chandrasekhar, at IMSc., Chennai in January 2011.

- Attended QFT 2011, Conference on Quantum Field Theory, at IISER Pune, in February 2011 and gave a talk on "Some aspects of hadrondynamics in 1 + 1 dimensions".

K. Narayan

- Gave a talk on "Lifshitz spacetimes from AdS null and cosmological solutions" at IMSc., Chennai in June 2010.
- Gave a talk on "Lifshitz spacetimes from AdS null and cosmological solutions" in the String theory seminar, at TIFR, Mumbai, in July 2011.
- Attended International Workshop on String and M-theory at Ascona, Switzerland and gave a talk on "Lifshitz spacetimes from AdS null and cosmological solutions", in July 2010.
- Attended Primordial Features and Non-gaussianities International Conference, at HRI, Allahabad, in December 2010 and gave a talk on "Cosmological singularities in string theory".
- Attended ISM2011, International string theory workshop, in Puri, in January 2011.
- Attended ICTS Applied String theory and Holography Discussion Meeting around the Chandrasekhar Lectures given by Prof. Dam Son, at TIFR, Mumbai, in March 2011 and gave a talk on "Lifshitz-like systems and AdS null deformations".

R. Srinivasan

- Visited Prof. Rajarama Bhat at Indian Statistical Institute, Bangalore, for one month in June 2010.
- Attended a workshop on Free Probability held during July-August 2010, at IMSc., Chennai.
- Attended a conference on Operator algebras held at IMSc., Chennai, in August 2010.
- Attended the International Conference on Quantum Probability and Related Topics held at Jawaharlal Nehru Centre for Advanced Scientic Research, Bangalore during August 2010 and gave a talk.

Sundari Maddala

- Attended ICWM in August 2010 at HCU, Hyderabad.

K.G. Arun

- Lectured in the IndIGO (Indian initiative in gravitational wave observations) school on Gravitational Wave Astronomy during December 2010 held at University of Delhi, New Delhi.
- Attended the Indian Association for General Relativity and Gravitation (IAGRG) meeting at HRI, Allahabad, in January 2011 gave an invited talk on "Gravitational waves from coalescing compact binaries: Source modelling and astrophysics".
- Attended the "The Indian Roadmap for Gravitational-Wave Astronomy: IndIGO - ACIGA meeting on LIGO-Australia" meeting held in Jamia-Milia Islamia, New Delhi in February 2011 and gave a technical talk on "Testing General Relativity using gravitational wave observations".

Partha Mukhopadhyay

- Attended Mysore Park workshop on Algorithms and Complexity at Infosys, Mysore, in October 2010.

Prajakta Nimbhorkar

- Attended Mysore Park workshop on Algorithms and Complexity at Infosys, Mysore, in October 2010.

Purusottam Rath

- Gave a talk in the ICM satellite conference on "Modular forms" at Mahabalipuram, in August 2010.
- Gave a series of lectures on transcendence and diophantine approximation in IMSc., Chennai, in relation to the Special year in Number theory in 2011.
- Co-organiser of the on-going Special year in Number theory at IMSc., Chennai, in 2011.

Sasanka Roy

- Attended the 30th International Conference on Foundations of Software Technology and Theoretical Computer Science (FSTTCS 2010),at IMSc., Chennai, in December 2010.
- Attended WALCOM 2011.
- Visited BITS, Pilani, in August 2010.
- Attended School on Geometric Computing, at IIT, Delhi, in October 2010.
- Attended Workshop on Geometric Computing, at IIT, Delhi, in November 2010
- Visited ISI, Kolkata, in November 2010.
- Delivered a talk on "Voronoi Diagram" at Research Promotion Workshop on Introduction to Graph and Geometric Algorithms, at PSG College of Technology, Anna University, Coimbatore, in January 2011.

Sourav Chakraborty

- Visited Technion, Israel, during November 2010.
- Attended the 30th International Conference on Foundations of Software Technology and Theoretical Computer Science (FSTTCS 2010),at IMSc., Chennai, in December 2010.
- Attended IMPECS School on Parameterized and Exact Computation, in December 2010, at IMSc Chennai.
- Visited University of Chicago, U.S.A., in January 2011 and gave a talk on "Testing Function Isomorphism".
- Visited TIFR, Mumbai, in January 2011 and gave a talk on "Testing Function Isomorphism".
- Visited MSR, Bangalore, in February 2011.
- Attended ACM-SIAM Symposium on Discrete Algorithms (SODA 2011), San Francisco.
- Attended Innovations in Computer Science (ICS 2011), Beijing.

- Visited Karnatak University, Dharwad and attended a Workshop on Graph Theory and graph algorithms.

Yashonidhi Pandey

- Attended an annual instructional school on schemes and cohomology in Kerala school of Mathematics in August 2010 and gave a talk on "Schemes and Cohomology".
- Attended CAAG in December 2010 in Bangalore.

Nagarajan Krishnamurthy

- Attended the Second Brazilian Workshop of the Game Theory Society, in honor of John Nash, on the occasion of the 60th anniversary of Nash equilibrium at University of So Paulo, Brazil, in July August 2010.
- Attended ICM satellite conference on set theory and mathematical logic in Chennai, in August 2010.
- Attended 30th Foundations of Software Technology and Theoretical Computer Science (FSTTCS 2010), at IMSc., Chennai, in December 2010.
- Visited ISI, Bangalore, in March 2011.

Prateek Karandikar

- Attended ICMSELST (ICM satellite event on logic and set theory), at CMI, in August 2010.
- Attended Mysore Park workshop on algorithms and complexity, at Infosys, Mysore, in October 2010.
- Attended the 30th International Conference on Foundations of Software Technology and Theoretical Computer Science (FSTTCS 2010),at IMSc., Chennai, in December 2010.
- Attended Mysore Park workshop on the chemistry of concurrent and distributed programming, at Infosys, Mysore, in February 2011.
- Attended Google Asia-Pacic Geo Community Summit, Singapore, during March-April 2011.

Other Professional Activities

Rajeeva L. Karandikar

- Convenor for the CSIR UGC NET examination in Mathematical science. Was a member of INSA sectional committee on Mathematical Sciences.

Shiva Shankar

- Associate editor, Multidimensional Systems and Signal Processing, (Springer).

Madhavan Mukund

- Member, Editorial Board, LIPIcsLeibniz International Proceedings in Informatics.
- Member, Editorial Board, Formal Methods Letters.
- Member, Editorial Board, Transactions on Petri Nets and Other Models of Concurrency (ToPNoC).
- Member, Program Committee, International Computer Science Symposium in Russia (CSR-2010), Kazan, Russia, June 2010.
- Member, Program Committee, 31st International Conference on Application and Theory of Petri Nets and Other Models of Concurrency (Petri Nets 2010), Braga, Portugal, June 2010.
- Member, Program Committee, 3rd Workshop on Interaction and Concurrency Experience (ICE'10), Amsterdam, The Netherlands, June 2010.
- Member, Program Committee, 35th International Symposium on Mathematical Foundations of Computer Science (MFCS 2010), Brno, Czech Republic, August 2010.

- Member, Program Committee, 8th IEEE International Conference on Software Engineering and Formal Methods (SEFM 2010), Pisa, Italy, September 2010.
- Member ACM India Council, Association of Computing Machinery (ACM).
- Member of the Council, European Association for Theoretical Computer Science (EATCS).
- Secretary, Indian Association for Research in Computing Science (IARCS).
- National Coordinator, Indian Computing Olympiad.
- Member, Scientific Board, Mysore Park Workshop Series.
- Team Leader of the Indian team, International Olympiad in Informatics, Waterloo, Canada, August 2010.
- Member, Website Committee, ICM 2010.
- Column editor, "News from India", Bulletin of the European Association for Theoretical Computer Science (EATCS).
- Convenor, Academic Council and Member, Board of Studies in Computer Science, Chennai Mathematical Institute
- Member, Board of Studies in Mathematical Sciences, Homi Bhabha National Institute
- Member, Board of Studies in Computer Science, PSG College of Technology, Coimbatore

K. Narayan Kumar

- Member, Scientific Committee, Workshop on Automata, Concurrency and Timed Systems III, Chennai, January 2010.
- Member, Program Committee, 21st International Conference on Concurrency Theory, Paris, France, July 2010.
- Coach, Indian Computing Olympiad.
- Deputy Leader of the Indian team, International Olympiad in Informatics, Waterloo, Canada, August 2010.

Govind S. Krishnaswami

- Refereed papers for Journal of Physics A (Mathematical and Theoretical).

Sasanka Roy

- Program committee Member of National Conference on Theoretical Computer Science and Applications (NCTCA 2010), BS Abdur Rahman University, Chennai

Prateek Karandikar

- Assistant coach at the International Olympiad in Informatics Training Camp, Bangalore, June 2010

Visitors

- V. Lakshmibai, Northeastern University, U.S.A. Gave a talk on “An introduction to Standard Monomial Theory - II” (April 2010).
- V. Uma,IIT Madras. Gave two talks on “Equivariant K-theory of compactications of algebraic groups” (April 2010).
- Prabuddha Chakraborty,University of Augsburg, Germany. Gave a talk on “Interacting electrons in a random potential in two dimensions: Beyond the scaling theory of localization” (April 2010).
- Bobby Ezhuthachan,HRI, Allahabad. Gave a talk on “Higher derivative membrane action” (May 2010).
- Anshuman Maharana, Cambridge, UK. Gave a talk on “Informal discussion on large volume compactications” (June 2010).
- Anandam Banerjee. Gave two talks on “Tensor Structure on Smooth Motives” (June 2010).
- Rajesh Kulkarni, Michigan State University, East Lansing, U.S.A. Gave a talk on “Maximal Orders on Surfaces” (June 2010).
- S. Lakshmivarahan, School of Computer Science, University of Oklahoma, U.S.A. Gave a talk on “Data Assimilation” (July 2010).
- Purna Bangere, University of Kansas, U.S.A. Gave a talk on “On geometry and topology of surfaces of general type” (July 2010).
- Manoj Kummini, University of Kansas, U.S.A. Gave a talk on “Hilbert Functions of Cohomology Modules” (July 2010).
- Krishna Chaitanya, University of Kansas, U.S.A. Gave a talk on “Geometry and Syzygies of Line Bundles on an Algebraic Surface” (July 2010).

- Raghavan Parthasarathy, ERM, Chicago, USA. Gave a talk on "Oil Spill in the Gulf of Mexico" (August 2010).
- Koushik Balasubramanian, MIT, U.S.A. Gave a talk on "Mott Insulators from the holographic perspective" (August 2010).
- Sukhendu Mehrotra, University of Wisconsin, U.S.A. Gave two talks on "An Introduction to Derived Categories in Geometry" (July & (August 2010).
- Andreas Brandstaedt,Universitat Rostock. Gave a talk on "On independent vertex sets and variants of matching" (August 2010).
- Arul Shankar,Princeton University, U.S.A. Gave a talk on "The boundedness of the average rank of elliptic curves" (August 2010).
- Leticia Brambila Paz, CIMAT, Mexico. Gave a talk on "Coherent systems" (August 2010).
- B. Srivathsan, LaBRI, Bordeaux, France. Gave a talk on "Efficient Emptiness Check for Timed Buechi Automata" (August 2010).
- S.G. Rajeev, University of Rochester, U.S.A. Gave a talk on "Relativistic Spinning Particles" (August 2010).
- Sir Michael Berry, Bristol University, U.K. Gave a talk on "Making light of mathematics" and "Hamilton's diabolical singularity" (August 2010).
- Arun Ram, University of Melbourne, Australia. Gave a talk on "Towards elliptic Chevalley groups and flag varieties" (September 2010).
- Sandip Trivedi, TIFR, Mumbai. Gave a talk on "Accelerating Universes and the Emerging Landscape in String Theory" and "Holography of charged dilaton black holes" (September 2010).
- Sudarshan Anant, IISER, Pune. Gave a talk on "Relating the forces of Nature" (September 2010).
- Sakthivel, Sri Muthukumaran Institute of Technology, Chennai. Gave a talk on "Nonarchimedean summability" (September 2010).
- Himadri Samanta. Gave a talk on "Non-equilibrium Statistical Physics with fictitious time" and "Casimir Effect: a force from nothing" (September 2010).

- Dishant M. Pancholi, ICTP, Italy. Gave a talk on "Symplectic cobordisms and Lutz twists" (October 2010).
- Amritanshu Prasad, Institute of Mathematical Sciences, Chennai. Gave a talk on "Degenerations and Orbits in Finite Abelian Groups" (October 2010).
- Frank Neumann, University of Leicester, U.K. Gave a talk on "Cohomology of Moduli Stacks of Vector Bundles on Curves and Frobenius morphisms" (October 2010).
- Arati Khedekar, Institute of Mathematical Sciences, Chennai. Gave talk on "Extensions of locally compact groups" (October 2010).
- Jayendra N Bandyopadhyay, Centre for Quantum Technologies, National University of Singapore. Gave a talk on "Entanglement: A signature of Quantum Chaos" (October 2010).
- Suresh Govindarajan, IIT Madras. Gave a talk on "Mathieu Moonshine from counting dyonic states in string theory" (October 2010).
- Jayendra N Bandyopadhyay, Centre for Quantum Technologies, National University of Singapore. Gave a talk on "Quantum chaotic system as a model of decohering environment" (October 2010).
- Sambuddha Roy,IBM, Delhi. Gave a talk on "Primal Dual algorithms for Resource Allocation Problems" (October 2010).
- Masahiro Kaminaga, Institute of Mathematical Sciences, Chennai. Gave a talk on "The spectrum of Schrodinger operators with Poisson type random potential (joint work with Kazunori Ando, Akira Iwatsuka and Fumihiko Nakano)" (November 2010).
- Heribert Vollmer, University of Hanover, Germany. Gave a talk on "Complexity of Satisfiability Problems" (November 2010).
- Colas Bardavid, Institute of Mathematical Sciences, Chennai. Gave two talks on "Leaves and trajectories for schemes" (November 2010).
- Jeanne Scott, Institute of Mathematical Sciences, Chennai. Gave a talk on "Doing the twist by dimers" (November 2010).
- G. Raghavan, Indira Gandhi Centre for Atomic Research, Kalpakkam. Gave a talk on "Quantication of quantum entanglement" (November 2010).

- M. Sivakumar, University of Hyderabad. Gave a talk on Emergent Geometry from Matrix Models" (November 2010).
- Jeanne Scott, Institute of Mathematical Sciences, Chennai. Gave a talk on "Doing the twist by dimers II" (December 2010).
- Raazesh Sainudiin, University of Canterbury, Christchurch, New Zealand. Gave a talk on "Experiments with the site frequency spectrum" (December 2010).
- B.P. Purnaprajna, University of Kansas, U.S.A. Gave a talk on "Why varieties of general type?" (December 2010).
- Prasanna Balasubramanian, McMaster University, Hamilton,Canada. Gave a talk on "Cold atoms in optical cavities: Bloch Oscillations & Band-Structure Loops" (January 2011).
- Jean Barge, Ecole Polytechnique, France. Gave a talk on "Around Maslov index" (January 2011).
- Arnab Bhattacharya, MIT, U.S.A. Gave a talk on "A Unified Framework for Testing Linear-Invariant Properties" (January 2011).
- Arnab Bhattacharya, MIT, U.S.A. Gave a talk on "Transitive-Closure Spanners" (January 2011).
- Aldo Conca, University of Genova. Gave a talk on "Bounds for Betti numbers" (January 2011).
- Pallab Basu, U. Kentucky, U.S.A. Gave a talk on "Low temperature properties of holographic superconductors" (January 2011).
- V.P. Nair, City University, New York, U.S.A. Gave a talk on "Feynman's Last Problem 30 years Later: Liquid Helium and QCD" and "Fluids with color: Lagrangians, solitons and color coherence" (January 2011).
- Steve Tomsovic, Washington State University, U.S.A. Gave a talk on "Quantum Chaos: Origins and Developments" (February 2011).
- Abhishek Agarwal, American Physics Society, New York, U.S.A. Gave a talk on "From Quarks to Strings via Magnets: Recent progress in Gauge and String Theories" and "Recent Progress in Gauge-String Duality in $D = 2 + 1$" (February 2011).

- Sastry G Pantula, Director, Division of Mathematical Sciences, NSF and Professor, Department of Statistics, North Carolina State University. Gave a talk on "NSF Funding models and opportunities" (February 2011).
- Andrew DeBenedictis, Simon Fraser University, and The Pacific Institute for the Mathematical Sciences, Vancouver, Canada. Gave a talk on "Introduction to Loop Quantum Gravity and Loop Quantum Black Holes" (February 2011).
- Nikolai Vavilov, St. Petersburg University, Russia. Gave a talk on "Calculations in Exceptional Groups over Rings" (February 2011).
- C.S. Rajan, TIFR, Mumbai. Gave a talk on "Varieties not homeomorphic to their conjugates" (March 2011).
- Prakash Chandrasekaran, CEA LIST DILS, France. Gave a talk on "Model based design, Integration Models, UML" (March 2011).
- Kannan Soundararajan, Stanford University, U.S.A. Gave a talk on "Quantum unique ergodicity and number theory" (March 2011).
- M.S. Narasimhan, TIFR, Bangalore. Gave a talk on "Algebraic geometry and Analysis" (March 2011).
- K. Yogendran, IISER, Mohali. Gave a talk on "Holographic Superfluids" (March 2011).
- V. Lakshmibai, Northeastern University, U.S.A. Gave a talk on "Grobner bases & degenerations" (March 2011).

N.K. Rajendiran & Co.,
Chartered Accountants

FORM NO. 10-B
(See Rule 17 – B)

AUDITOR'S REPORT

Audit report u/s 12A (b) of the Income Tax Act 1961, in case of charitable or religious Trust or institutions

We have examined the Balance sheet of **CHENNAI MATHEMATICAL INSTITUTE**, Plot No. H1, SIPCOT IT Park, Siruseri 603 103 as at 31st March 2011 and also the Income & Expenditure Account for the year ended on that date which are in agreement with the books of accounts maintained by the said Institution.

We have obtained all the information and explanations, which to the best of our knowledge and belief were necessary for the purpose of our audit. In our opinion, proper books of account, have been kept by the Head Office and the Branches of the above named institution visited by us so far as appears from our examination of the books, and proper returns adequate for the purposes of Audit have been received from Branches not visited by us.

In our opinion and to the best of our information and according to the information given to us the said accounts give a true and fair view.

i) in case of Balance Sheet, of State of affairs of the above named Institution as at 31st March 2011, and

ii) In case of Income & Expenditure Account, Excess of Income over Expenditure for the year end on that date.

Prescribed particulars are annexed hereto.

FOR N.K.RAJENDIRAN & CO.
Chartered Accountants.

Place : Chennai
Date : 13.09.2011

N.K.RAJENDIRAN
(PROPRIETOR)

No. 135 (Old No.147), Flat No. 3B, IIIrd Floor, Nelson Manickam Road, Aminjikarai, Chennai - 600 029.
Tel : 2374 1212, Fax : 2374 0303 E-mail : auditornkr@yahoo.com

CHENNAI MATHEMATICAL INSTITUTE
PLOT NO. H1, SIPCOT IT PARK, SIRUSERI, 603 103.

BALANCE SHEET AS AT 31ST MARCH 2011

SOURCES OF FUNDS	SCH	31.03.2011 Rs.	31.03.2010 Rs.
General Fund	A	20361086	5383789
Capital Fund	B	59905510	59905510
Endowment Fund	C	102520931	61108334
TOTAL		182787527	126397633
APPLICATION OF FUNDS			
Fixed Assets	D	126584306	93247386
Investments	E		
Endowment Fund Deposits		39039543	28027027.61
Other Deposits		30324542	16779589
Current Assets, Advances & Deposits			
Current Assets	F	375235	275235
Advances and Deposits	G	3961800	1464259
Total		4337035	1739494
Less: Current Liabilities	H	17497899	13395863
Net Current Assets		(13160864)	(11656369)
TOTAL		182787527	126397633
Notes forming part of Accounts	I		
Significant Accounting Policies	J		

Dr. A.C. Muthiah
Founder Trustee

Shri R. Thyagarajan
Trustee

Prof. C.S. Seshadri
Trustee/Director-Emeritus

As per our report of even date annexed
For M/s. N.K. Rajendiran & Co.,
Chartered Accountants

N.K. Rajendiran
Proprietor

Place : Chennai
Date : 13/09/2011

CHENNAI MATHEMATICAL INSTITUTE
PLOT NO. H1, SIPCOT IT PARK, SIRUSERI, 603 103.

INCOME & EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH 2011

INCOME	SCH	31.03.2011 Rs.	31.03.2010 Rs.
Voluntary Contributions	K	81000000	56046623
Professional & Technical Fees	L	5000000	5000000
Fee Receipts	M	1951595	1030033
Interest on Deposits	N	2894392	2035829
Fellowship Contributions & Other Receipts	O	521436	222722
TOTAL		**91367423**	**64335207**
EXPENDITURE			
Research & Establishment	P	51389457	45073681
Operational Expenses	Q	14543999	16518551
Administrative & General Expenses	R	4198726	2545148
Depreciation	E	6257944	6328251
TOTAL		**76390126**	**70465631**
Excess of Income Over Expenditure transferred to Balance Sheet		14977297	(6130424)

Dr. A.C. Muthiah
Founder Trustee

Shri R. Thyagarajan
Trustee

Prof. C.S. Seshadri
Trustee/Director-Emeritus

As per our report of even date annexed
For M/s. N.K. Rajendiran & Co.,
Chartered Accountants

N.K. Rajendiran
Proprietor

Place: Chennai
Date : 13/09/2011