

RAMA MURTHY GARIMELLA

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Research Interests:

Artificial / Biological Neural Networks, Wireless Sensor Networks, Adhoc Wireless Networks, Performance Evaluation, Signal Processing

Courses Taught:

Performance Evaluation of Computer Networks, Computer Networks, Computer Systems, Electronic Circuits, Digital Signal Processing, Soft Computing, Linear Control Systems, Information Theory and Coding, Signals and Systems, Error Correcting Codes, Topics in Wireless Communication, Wireless Sensor Networks & Others....**Detailed List is attached**

EDUCATION:

86-89	Ph.D	Computer Engineering, Purdue University, West Lafayette, U.S.A. (GPA: 5.83/6.0).
85-86	M.S	Electrical Engineering, Louisiana State University, Baton Rouge U.S.A. (GPA: 4.0/4.0)
80-84	B.Tech	Electronics & Communications Engineering, S.V. University, Tirupati, India
75-79	S.S.C, Inter	School for Gifted Children, Govt. of AP

*** Selected for M.Tech in ECE Department of IIT, Kharagpur & IIT, Kanpur.

Ph.D Thesis: Transient and Equilibrium Analysis of CDMA Slotted ALOHA Networks: Finite Memory and Matrix Geometric Recursions

EMPLOYMENT INFORMATION

July 2016	Visiting Researcher, Simon Fraser University, Canada
December 2014 to May 2015	Visiting Professor, Tampere University of Technology, Tampere, Finland
June 2014	Visiting Researcher, Wroclaw University of Technology, Poland
May 2006---July 2006	Visiting Scholar, University of Illinois at Urbana

April 2005—June 2005	Research Associate, Purdue University
June 2004—July 2004	Research Associate, IISc, Bangalore
July 2001 - Present	Associate Professor, IIIT-HYDERABAD
Feb 2000 - June 2001	Manager, Hellosoft
Jul 94 - Jan 2000	Defended the Theory of Cybernetics & Consultant
Jul 91 - July 94	Consultant
Feb 90- July 91	Member of Technical Staff, Bellcore, USA
Jan 87 – Dec 89	Research Assistant, EE Department, Purdue University, USA
Aug 86 – Dec 86	Teaching Assistant, Department of Mathematics, Purdue University, USA
Jan 85 – May 86	Teaching Assistant, EE Department Louisiana State University, USA

HONORS AND AWARDS

- *Rashtriya Gaurav Award (2009) from IIFS, New Delhi
- *Second Rank, B. Tech, S.V. University, Tirupati, India, 1984.
- *Second Prize, All India Technical Essay Contest, 1982.
- *Certificate of Merit for an All India Contest on ‘ Decision Making,’ 1983
- *Thrid Prize, 14th All India Design Competition for Engineering students, 1983.
- *National Merit, State Merit and A.P. Residential Scholarships (77-83,79-83,76-79)**
- Listed in MARQUIS Who’s Who in the World (in Science and Engineering)
- Outstanding Researcher Award (2015), Venus International Foundation, Chennai
- Bharat Excellence Award (2016), Friendship Forum of India, New Delhi

Professional Memberships:

- Eta Kappa Nu, Phi Kappa Phi (Honor Societies in USA)
- IEEE Computer Society, Computer Society of India
- Senior Member, Association for Computing Machinery (ACM)
- Fellow, IETE (Institution of Electronics and Telecommunication Engineers)

LEADERSHIP ACTIVITIES

- *Secretary, EE Association, S.V.U. College of Engineering, Tirupati (82-83).
- *President, Rotaract Club, S.V.U. College of Engineering, Tirupati (82 –83).
- *Vice-President, Rotaract Club, S.V.U. College of Engineering, Tirupati (81 –82).
- *Office Bearer, India Student’s Association, Purdue University (1988)
- *Academic Counsellor, Alumni Association, IIIT—Hyderabad (2003)

REFERENCES

Available upon request

PUBLICATIONS

Total Publications (Journal + Conference) = 243

Journal Publications, Book Chapters = 64.....**Highlighted**

Research Monographs:

- G. Rama Murthy, “MULTI—DIMENSIONAL NEURAL NETWORKS: UNIFIED THEORY” New Age International (P) Limited, Publishers. Published in November 2007. **Second edition requested for publication by Springer**
- G. Rama Murthy, “Natural Computation: Discrete Optimization,” Manuscript Under Preparation and being considered by Springer
- G. Rama Murthy, “Transient Analysis of Structured Markov Chains : Applications” Book proposal under consideration by New Age International Publishers

(A) NEURAL NETWORKS (in the order of Importance) :

- (A1) **Multi-Dimensional Neural Networks: Unified Theory:**

[1] G. Rama Murthy, “ Multi / Infinite Dimensional Neural Networks, Multi / Infinite Dimensional Logic Theory ; Published in 1995 IEEE International Symposium on Circuits and Systems, Seattle. International Journal of Neural Systems, Vol.15, No.3, pp.223-235, 2005...Generalization of Boolean Logic Theory

[2] G. Rama Murthy, “Optimal Control, Codeword, Logic Function Tensors: Multi-Dimensional Neural Networks, “International Journal of Systemics, Cybernetics and Informatics, October 2006, pp. 9-17

[3] G. Rama Murthy, “ Tensor State Space Representation: Multi-Dimensional Systems,” International Journal of Systemics, Cybernetics and Informatics, January 2007, pp. 16-23

[4] G. Rama Murthy, “ Multi / Infinite Dimensional Coding Theory: Multi /Infinite Dimensional Neural Networks : Constrained Static Optimization, “ **Proceedings of IEEE Information Theory Workshop, October 2002.**

[5] G. Rama Murthy, “Biological Neural Networks: 3-D/Multi-Dimensional Neural Network Models, Multi-Dimensional Logic Theory, “Proceedings of International Conference on Theoretical Neurobiology, February 24th to 26, 2003. Organized by National Brain Research Centre (NBRC), Manesar, Haryana

[6] **G. Rama Murthy, Sangram Singh and N. Ahuja,” Multi-Dimensional Neural Network Paradigm: Convergence Theorems, “Proceedings of International Conference on Systemics, Cybernetics and Informatics (ICSCI-2007), January 2007. Accepted for Publication in Journal of Systems, Science and Engineering, System Society of India, Vikram Sarabhai Space Centre, Thiruvananthapuram, India**

- **(A2) Spherical Seperability: Artificial Neural Networks:**

[7] G. Rama Murthy, Y.Ganesh and Rhishi Pratap Singh,”Optimal Spherical Seperability: Artificial Neural Networks, **Proceedings of International Work Conference on Artificial Neural Networks, June 2017, Lecture Notes in Computer Science, Springer**

[8] Y.Ganesh, Rhishi Pratap Singh and G. Rama Murthy,” Pattern Classification using Quadratic Neuron: An Experimental Study,” THE EIGHT INTERNATIONAL CONFERENCE ON COMPUTING, COMMUNICATION AND NETWORKING TECHNOLOGIES (ICCCNT), July 2017, Organized by IIT-Delhi

- **(A3) Associative Memories:**

[9] G. Rama Murthy, M. Dileep and R. Anil,” Convolutional Associative Memory,” **International Conference on Neural Information Processing [ICONIP 2015], November 2015, Turkey.....DEEP LEARNING APPROACHSubmitted to SOFT COMPUTING Journal (SPRINGER)**

[10] G. Rama Murthy and Moncef Gabbouj,”On the Design of Hopfield Neural Networks: Synthesis of Hopfield Type Associative Memories,” **Proceedings of IEEE International Joint Conference on Neural Networks (IJCNN 2015)**, July 2015 , Appears on IEEE Explore

[11] **G. Rama Murthy and L. Behera, “Adaptive Associative Memory , “Published in GESTS International Transactions on Communications and**

Signal Processing, April 2006. Also in Proceedings of National Conference on Soft Computing, Bhubaneswar, 24th-26th March 2006,

- **(A4) Complex Valued Neural Networks (Associative Memories):**

[12] G. Rama Murthy and D. Praveen.”Complex-Valued Neural Associative Memory on the Complex Hypercube, “ **Proceedings of 2004 IEEE Conference on Cybernetics and Intelligent Systems (CIS 2004)**

[13] G. Rama Murthy,”Infinite Population, Complex Valued State Neural Network on the Complex Hypercube,” **Proceedings of International Conference on Cognitive Science (ICCS 2004)**, December 16-18, 2004

[14] G.Rama Murthy and N. Ahuja ”Novel Complex Valued Neural Networks, “Proceedings of 2006 International Conference on Computer Design (CDES'06): June26-29, 2006, Las Vegas, USA

[15] G. Rama Murthy, “Some Novel Real/Complex-Valued Neural Network Models” Advances in Soft Computing, Springer Series, Computational Intelligence, Theory and Applications, **Proceedings of 9th Fuzzy Days (International Conference on Computational Intelligence), Dortmund, Germany, September 18-20, 2006.**
.....Travel Grant provided by DST and INSA

[16] G. Jagadeesh, D. Praveen and G. Rama Murthy, “Heteroassociative Memories on the Complex Hypercube, “ **Proceedings of 20th IJCAI workshop on “Complex Valued Neural Networks” 6-12th January, 2007**

[17] G. Rama Murthy and D. Praveen,”A Novel Associative Memory on the Complex Hypercubic Lattice, “ Proceedings of **16th European Symposium on Artificial Neural Networks**

[18] V. Sree Hari Rao and G. Rama Murthy,”Global Dynamics of a Class of Complex Valued Neural Networks, “ **Special issue on Complex Valued Neural Networks of International Journal of Neural Systems, April 2008**

[19] G. Rama Murthy and Moncef Gabbouj,”Existence and Synthesis of Complex Hopfield Type Associative Memories,” Proceedings of **International Work Conference on Artificial Neural Networks, June 2015, Lecture Notes in Computer Science, Springer**

- **(A5) Recurrent Neural Networks:**

[20] G. Rama Murthy, Berkay Kicanoglu and Moncef Gabbouj,”On the Dynamics of a Recurrent Hopfield Network” **Proceedings of IEEE International Joint**

Conference on Neural Networks (IJCNN 2015), July 2015 , Appears on IEEE Explore

[21] G. Rama Murthy and Moncef Gabbouj, “Linear Congruential Sequences : Feedback and Recurrent Neural Networks,” Third International Conference on Emerging Research in Computing, Information and Communication and Applications (ERCICA 2015)

[22] G. Rama Murthy and Anil Rayala,” Dynamics of Quaternionic Hopfield Type Neural Networks, “Proceedings of **International Work Conference on Artificial Neural Networks, June 2017, Lecture Notes in Computer Science, Springer**

[23] G. Rama Murthy, R. Anil and M.Dileep,” Dynamics of Structured Complex Recurrent Hopfield Networks,” **Proceedings of International Joint Conference on Neural Networks (IJCNN 2016)**, Vancouver, Canada, July 2016

[24] Siva Raju, G. Rama Murthy, Ayush Jha and Anil Rayala,”Dynamics of Ordinary and Recurrent Hopfield Networks: Novel Themes, “ Proceedings of IEEE IACC-2017, January 2017

- **(A6) Convolutional Neural Networks: Signal Processing**

[25] G. Rama Murthy,”Optimal Robust Filter Model of Synapse : Associated Neural Networks , “ **INVITED PAPER**, Proceedings of International Conference on Soft Computing and Intelligent Systems, December 27-29, 2007

[26] G. Rama Murthy,”Finite Impulse Response (FIR) Filter Model of Synapse: Associated Neural Networks,” Proceedings of 4th International Conference on Natural Computation (ICNC’08) (sponsored by IEEE), October 2008

[27] G. Rama Murthy and Bhanu Prasad, “ Linear Filter Model of Synapse operating on Noisy Inputs: Associated Neural Networks, “ Proceedings of 2007 International Conference on Artificial Intelligence and Pattern Recognition (AIPR-07), 9-12th July 2007

[28] G. Rama Murthy, Gaurav Vijayvarguja, M.Thiyagarajan and P. Krishna Reddy, “Optimal Binary Filters: Neural Networks, “ Proceedings of IASTED International Conference. Proceedings of First Indian International Conference on Artificial Intelligence, Hyderabad, India, December 2003.

[29] G. Rama Murthy,” Distributed Signal Processing: Neural Networks,” **IEEE Workshop on Computational Intelligence: Theories, Applications and Future Directions, July 14, 2013, IIT-Kanpur** (Sponsored by IEEE Computational Intelligence Society

- **(A7) Neural Networks: Optimal Control:**

[30] G. Rama Murthy, A. Zolnierok and L. Koszalka, "Optimal Control of Time Varying Linear Systems: Neural Networks," 2014 International Symposium on Computational and Business Intelligence (ISCBI 2014), December 6-7, 2014, New Delhi, India

[31] G. Rama Murthy, "A Novel Optimal Regulator: Neural Network based Computational Intelligence," Proceedings of Second Indian International Conference on Artificial Intelligence, Pune, India, December 2005.

- **(A8) Others:**

[32] **G. Rama Murthy, "Control, Communication and Computing Units : Converged Architectures," Accepted for publication in the digital library of International Journal on Futuristic Computer Applications (IJFCA), 2010.**

[33] G. Rama Murthy, "A Novel Class of Generative Neural Networks," "Proceedings of 4th International Conference on Natural Computation (ICNC'08) (sponsored by IEEE), October 2008

[34] G. Rama Murthy, "Hybrid Neural Networks," Proceedings of International Conference on Power System Analysis, Control and Optimization (PSACO-2008), 13th-15th March 2008

[35] G. Rama Murthy, D. Praveen, G. Jagadeesh, "Novel Method for Error Back-Propagation in Complex Valued Multi Layer Perceptron," "Proceedings of National Conference on Soft Computing, Bhubaneswar, 24th-26th March 2006,

[36] Md. Aquil Mirza and G. Rama Murthy, "Decoupling of Neural Networks from Markov Models in IPv6", The Second National Conference on Mathematical Techniques: Emerging Paradigms for Electronics and IT Industries (MATEIT), New Delhi, India. September 26-28th, 2008

- **(A9) Theoretical Computer Science: Neural Networks: NP-Hard Problems:**

[1] G. Rama Murthy, "Towards Resolution of $P = NP$ Conjecture," Proceedings of 14th and 15th Polish-British Workshop (Organized by Wroclaw University of Technology, Poland), 2016, **INVITED TALK sponsored by Department of Science and Technology, Government of India**

[2] G. Rama Murthy and B. Nischal, "Hopfield-Amari Neural Network : Minimization of Quadratic forms," The 6th International Conference on Soft Computing and Intelligent Systems, Kobe Convention Center (Kobe Portopia Hotel) November 20-24, 2012, Kobe, Japan.

[3] G. Rama Murthy,"Optimization of Quadratic Forms: NP Hard Problems : Neural Networks, " 2013 International Symposium on Computational and Business Intelligence (ISCBI 2013), August 24-26, 2013, New Delhi, India

(B) PERFORMANCE EVALUATION OF COMPUTER AND COMMUNICATION SYSTEMS:

- **(B1) Equilibrium and Transient Analysis of Skip Free & Other Markov Chains (Matrix Geometric and Finite Memory Recursions) :**

[1] G. Rama Murthy, M. Kim and E. J. Coyle, " Equilibrium analysis of skip-free Markov chains: Non-linear Matrix Equations, " **Communications in Statistics –Stochastic Models**, pp.547-571, Vol.4, 1991.

[2] G. Rama Murthy and E.J Coyle, " Finite Memory Recursive Solutions in Stochastic Models: Equilibrium and Transient Analysis," **Technical Rept. no.29, Purdue University, May 1989.**

[3] G. Rama Murthy,"Matrix Geometric Recursions for the Equilibrium Analysis of Markov Chains: Matrix Power Series Equations," In part appeared in the **Proceedings of International Congress of Mathematicians, 2010**

[4] G. Rama Murthy," Non-Linear Matrix Equations : Equilibrium Analysis of Markov Chains, " **Accepted for Global Journal of Mathematical Analysis, June 2008**

[5] G. Rama Murthy, "Transient Performance Evaluation of Toeplitz Type Markov Chains, " Poster paper presented at **International Symposium on Information Theory (ISIT-2004), Chicago.**

[6] G. Rama Murthy and Alexander Romyantsev," On an exact solution of the rate matrix of Quasi-Birth-Death process with small number of phases" **Proceedings of 31st European Conference on Modelling and Simulation (ECMS 2017), Budapest, Hungary .**

[7] G. Rama Murthy, "Transient and Equilibrium Analysis of Markov Chains: Forward and Backward Finite memory Recursions: Canonical Forms," **Proceedings of the Princeton Annual Conference on Information Sciences and Systems, pp.574-579, Vol.2, March 1990.**

[8] G. Rama Murthy, " Transient Analysis of Generalized Skip-Free Markov Chains, " In part Published in the **1990 Conference on Information Sciences and Systems, Princeton University.**

[9] G. Rama Murthy and E.J Coyle, "Finite Memory recursive Solutions for the Equilibrium and Transient Analysis of G/M/1 Type Markov Process," **Proceedings of IEEE International Symposium on Information Theory, January 1990.**

[10] G.Rama Murthy and E.J Coyle, "Finite Memory recursions for the transient and equilibrium analysis of M/G/1-type Markov Processes," **Proceedings of the Second International Conference on Industrial and Applied Mathematics, July 1991.**

- **(B2) Adaptive Routing in Computer and Communication Systems:**

[11] G. Rama Murthy, Hemant Gogineni and Bharat Bhargava, "Modeling Adaptive Routing in Wireless and Other Networks using Coupled Queues," **Proceedings of IEEE Workshop on Next Generation Wireless Networks, December 2005, Goa.**

[12] M.S. Arunachalam, Manas Pandey and G. Rama Murthy, "Transient Analysis of finite state space, state dependent M/M/1 queues and their application to adaptive routing in Communication Networks," **Proceedings of IEEE Information Theory Workshop, Bangalore, India, October 2002.**

[13] Arunachalam M. Srinivas, Manas Pandey and G. Rama Murthy," **Transient Analysis of Finite State Space, State dependent M/M/1 queues and their applications to Adaptive Routing in Communication Networks," International Journal of Systemics, Cybernetics and Informatics, July 2009,pp. 36-38.**

[14] G.Rama Murthy , " Mobile Multi-access Spread Slotted ALOHA networks: Overload Control ,Adaptive Routing," *Proceedings of the Bellecore/Ameritech computer and Network Security Conference* , pp. 469-479,September 1990.

[15] G. Rama Murthy, Ch. Rahul, Priyanshu Raj and N.M.Chandrachud, " A Performance Model for Evaluation of Process Scheduling Scheme," **Proceedings Of International Conference on Systemics, Cybernetics and Informatics, January 2005.**

- **(B3) Multi-access Networks (CDMA Slotted ALOHA Networks -Finite Memory Recursions:**

[16] G.Rama Murthy and E.J Coyle, "Matrix Quadratic Equations and Quasi-Birth-and-Death Models of Multiple Access Networks," **Proceedings of the 26th Allerton Conference on Communication, Control and Computing ,University of**

Illinois at Urbana Champaign, Sept.1988. Also appeared in Proceedings of 1989 CORS/TIMS/ORSA Joint National Meeting, Vancouver, Canada

[17] G. Rama Murthy and E. J.Coyle, "Finite Memory Recursive Solutions (FMRS) for the Equilibrium and Transient Analysis of G/M/1-type Markov Processes with Application to Spread Spectrum Multiple Access Networks," **Proceedings of the 1989 Conference on Information Science and Systems, " Johns Hopkins University, Baltimore MD, March 1989.**

[18] G. Rama Murthy,"Transient and Equilibrium Analysis of Spread Spectrum Slotted ALOHA networks: Finite Memory Recursions, Proceedings of the **27th Allerton Conference on Communication , Control and Computing, University of Illinois at Urban Champaign ,** Sept,1989. Also in part published in the proceedings of the Bellcore / Ameritech Computer and Network Security Conference, pp.469-479, September 1990.

[19] G. Rama Murthy and V.Ramaswami , "Modeling and performance Analysis of a Line Concentrator," Bellcore Internal Technical Memorandum.

(C) WIRELESS NETWORKS (Wireless Sensor Networks, Cognitive Radio Networks etc):

- **(C1) Best Paper Awards:**

[1] Chandan Pradhan and Garimella Rama Murthy. "Full-Duplex Transceiver for Future Cellular Network: A Smart Antenna Approach.", Proceedings of IEEE International Conference on Advanced Networks and Telecommunications Systems (ANTS 2015), ISI Kolkata, December 2015

[2] **N. Bharat Varma, M.Pratyush, G. Rama Murthy and M.B. Srinivas, "Power_aware protocol for routing in Sensor Networks using Data Highways , "GESTS International Transactions on Computer Science and Engineering, Vol.25, #1, December 2005, Pages. 196-208, ISSN 1738-6438 (Judged as the BEST PAPER in GESTS Transactions). In part appeared in Proceedings of IEEE TENCON, Bangkok, 2004**

[3] Vasanth Iyer, G. Rama Murthy, M.B. Srinivas , "Simulation based optimization for Managing Lifecycle of Sensor Networks" ICSCI, **Best paper award in the category,** Hyderabad Jan 3rd 2007

- **(C2) Software Defined Networking:**

[4] Rhishi Pratap Singh and Garimella Rama Murthy, "Economic Node Allocation in Software Defined Wireless Networks with forecasted Traffic and Distance Constraints", Accepted for **8th ICCCNT, July 2017, IIT-Delhi**

- **(C3) Device to Device Communication:**

[5] Gadiraju Divija Swetha and G. Rama Murthy, "D2D Communication as an Underlay to Next Generation Cellular Systems with Resource Management and Interference Avoidance," International Conference on Wireless Communications, Signal Processing and Networking (WiSPNET), 2017, 22-24 March 2017.

- **(C4) Full Duplex Wireless Communication:**

[6] Chandan Pradhan and Garimella Rama Murthy. "Full-Duplex Communication for Future Wireless Networks: Dynamic Resource Block Allocation Approach.", **Physical Communication, 19, Elsevier Proceedings, pp. 61-69, 2016**

[6.2] Chandan Pradhan, Garimella Rama Murthy, "Analysis Of Full-Duplex Downlink using Diversity Gain," Accepted for **Springer Journal on Wireless Personal Communication (JUNE 2017).....TO APPEAR ONLINE**

[7] Chandan Pradhan, Kunal Sankhe, Sumit Kumar and G. Rama Murthy, "Full-Duplex eNodeB and UE Design for 5G Networks ", in **Wireless Telecommunication Symposium 2015, New York City, USA.**

- **(C5) Cyber Physical Systems:**

[8] G. Rama Murthy, "Concurrent Cyber Physical Systems: Tensor State Space Representation" Proceedings of 11th IEEE International Conference on Control & Automation, **ICCA 2014, Taichung, Taiwan, June 18-20..Travel Grant by DEITY**

- **(C6) Cellular Radio Networks:**

[9] Gadiraju Divija Swetha, Jitender Grovor and G. Rama Murthy, "Efficient Method for Dynamic Channel Allocation with special regard to Small Cells using Integer Programming", **Journal of Information and Optimization Sciences (JIOS) - Special Issue On: Smart Computing And Optimization**

[10] Kunal Sankhe and Garimella Rama Murthy, "Distributed Spatial Modulation - OFDM in Uplink Relay-assisted Cellular Network", Proceedings of **18th International Symposium on Wireless Personal Multimedia Communication 2015 (WPMC - 2015).**

[11] Kunal Sankhe, Sachin Chaudhari and Garimella Rama Murthy, "Distributed Spatial Modulation with Dynamic Frequency Allocation", Physical Communication 23, Elsevier Proceedings, pp. 65-75, 2017

[12] Chandan Pradhan, Kunal Sankhe, Sumit Kumar and G. Rama Murthy, "Revamp of eNodeB for 5G Networks: Detracting Spectrum Scarcity ", in The 12th Annual IEEE Consumer Communications & Networking Conference 2014, Las Vegas, Nevada, USA.

[13] Kunal Sankhe, Chandan Pradhan, Sumit Kumar and G. Rama Murthy, "Cost Effective Restoration of Wireless Connectivity in Disaster Hit Areas using OpenBTS ", Proceedings of **IEEE INDICON 2014**, India.

[14] K Viswanadh and G.Rama Murthy, "Interference Mitigation in HetNets using Power Control and Beam Forming", Proceedings of ICEIC 2015.

[15] Priyanka Sharma and G. Rama Murthy," Energy Efficiency in Cellular Networks," National Seminar on Recent Advances in Wireless Networks and Communications (NWNC-2014), January 2014

[16] Kunal Sankhe, Chandan Pradhan, Sumit Kumar and G. Rama Murthy, "Machine Learning Based Cooperative Relay Selection in Virtual MIMO", in **Wireless Telecommunication Symposium 2015**, New York City, USA.

- **(C7) Cognitive Radio Networks (Cellular Networks, Wireless Sensor Networks): (Spectrum Sensing, Doubly Cognitive Architecture etc)**
- **Book Chapters (Survey Articles):**

[17] Deepti Singhal, Chandan Pradhan, Kunal Sankhe and G. Rama Murthy, **Book Chapter: "Cognitive Radio Networks: Issues and Solutions" in Handbook of Research on Self-Organized Mobile Communication Technologies, IGI Global.**

[18] Sumit Kumar, Deepti Singhal, Garimella Rammurthy," Cognitive Radio based mobile and static Wireless Sensor networks. (Accepted), Chapter 17 in Book Title:"Intelligent Wireless sensor networks" Publisher: Taylor & Francis LLC, CRC Press, 2012.)

- **Spectrum Sensing:**

[19] G. Rama Murthy and Rhishi Pratap Singh,"Time Optimal Spectrum Sensing," Accepted for SmartTech 2017. Also appears in **Journal of Information and Optimization Sciences (JIOS) - Special Issue On: Smart Computing And Optimization, 2017**

[20] Sumit Kumar and G. Rama Murthy, "Efficient Spectrum Sensing/Monitoring Methods and Testbed Development for Cognitive Radio based WSN", **2014 Wireless Innovation Forum Conference on Communications Technologies and Software Defined Radio (SDR-WInnComm 2014)**

[21] Jagannadha Swamy, A. Srinivas, T. Sandhya and G. Rama Murthy, "Spectrum Sensing: Approximations for Eigenvalue Ratio based Detection," Proceedings of IEEE ICCCI 2012,

- **Cross Layer Protocols:**

[22] G. Rama Murthy and Deepthi Singhal, "Energy Efficient Cognitive Cross Layer MAC protocol," Proceedings of International Conference on Advances in Computing, Communication and Informatics (ICACCI 2015)

[23] Deepthi Singhal and G. Rama Murthy, "Cognitive Cross Layer Multipath Probabilistic Routing for Cognitive Networks," **Springer Wireless Networks Journal, 21(4): 11811192, May 2015**

- **Cognitive Base Station Design:**

[24] Chandan Pradhan, Kunal Sankhe, Sumit Kumar and G. Rama Murthy, "Cognitive Base Station Design for Efficient Spectrum Utilization in Cellular Network", Eleventh International Conference on Wireless and Optical Communications Networks WOCN 2014, India.

[25] K Viswanadh and G. Rama Murthy, "A Cognitive Femto Cell Access Point in HetNets to Mitigate Interference", Proceedings of ICICT 2014

- **Routing Algorithms:**

[26] Sujeeth Nanda, Padmalaya Nayak and G. Rama Murthy, "Quality of Service Routing Algorithm for Cognitive Wireless Sensor Network," **Bonfringe International Journal of Networking Technologies & Applications, Vol. 2, March 2013**

[27] S. Quadri, G. Rama Murthy, "Energy Efficient Threshold Sensitive Hierarchical Routing Algorithm for Cognitive Wireless Sensor Networks," **International Journal of Information and Electronics Engineering, Vol.2, No.2, March 2012**

[28] Shahansha Quadri and G. Rama Murthy, "ETSHRA : Energy Efficient Threshold Sensitive Hierarchical Routing Algorithm for Cognitive Wireless Sensor Network," Proceedings of 2011 International Conference on Network Communication and Computer (ICNCC 2011), New Delhi, March 19-20.

[29] G.Lakshmi Phani, K.Venkat Sayeesh, K.Vinod Kumar and G. Rama Murthy," Energy Efficient Combined Routing, Fusion, Localization Algorithm in Cognitive Wireless Sensor Networks," Proceedings of Seventh International Conference on Wireless and Optical Communication Networks, (WOCN-2010), September 2010, Colombo

- **Doubly Cognitive Architecture:**

[30] **Sumit Kumar, Deepti Singhal and G. Rama Murthy,"Doubly Cognitive Architecture based Cognitive Wireless Sensor Networks," International Journal of Wireless Networks and Broadband Technologies (IJWNBT), Volume 1, Issue 2 (April—June 2011), IGI Global Publications**

[31] Deepti Singhal, Saurabh Barjatiya and G. Rama Murthy,"A Novel Network Architecture for Cognitive Wireless Sensor Network," Proceedings of IEEE International Conference on Signal Processing, Communication, Computing and Networking Technologies (ICSCCN 2011)

[32] K.Vinod Kumar, G. Lakshmi Phani, K. Venkat Sayeesh, Aparna Chaganty, G. Rama Murthy," Two Layered Hierarchical Model for Cognitive Wireless Sensor Networks, " **Proceedings of International Conference on Advances in Computing and Communications (ACC-2011), July 22-24, 2011, Lecture Notes in Computer Science (LNCS), Springer Series on Communications in Computer and Information Sciences,**

- **Miscellaneous: (Authentication etc):**

[33] Chandan Pradhan and Garimella Rama Murthy. "Analysis of Path Loss mitigation through Dynamic Spectrum Access: Software Defined Radio.", **Proceedings of International Conference on Microwave, Optical and Communication Engineering (ICMOCE-2015), IIT Bhubaneswar.**

[34] Vasanth Iyer, G. Rama Murthy et.al,"Cognitive Models in Co-existing operation of Wireless Sensor Networks," Proceedings of 1st Workshop on New applications and performance of Cognitive Radio and resource aware communication networks, IEEE IPCCC 2010 (**28th International Performance Computing and Communications Conference**), **December 9th-11th 2010, Albuquerque, New Mexico, USA**

[35] Sonal Jain, Muzzammil Hussain, Ramamurthy Garimella, "*Primary User Authentication in Cognitive Radio Network using Authentication Tag", *Second IEEE International Conference on Recent Advances and Innovations in Engineering 2016, Jaipur.

[36] Deepti Singhal, Manish Sharma and G. Rama Murthy, "Energy Efficient Localization of Primary Users for Avoiding Interference in Cognitive Networks," IEEE International Conference on Computer Communication & Informatics (ICCCI 2012), 10-12th January 2012

- **(C8) Wireless Sensor Networks: (Journal Papers, Rated Conference Papers, others)**
- **Book Chapter:**

[37] Sujeeth Nanda, Sumit Kumar, Garimella Rammurthy, "Mobile Wireless Sensor Networks: A Cognitive Approach, Book Title, "Wireless sensor networks: Theory and Applications" (Publisher: Taylor & Francis LLC, CRC Press, 2012).

- **Energy Aware Protocols: Leveling and Sectoring Algorithm etc**

[38] Priyanka Sharma, G. Rama Murthy and Naveen Chilamkurti, "Mathematical Modelling of Energy Wastage in Absence of Levelling & Sectoring in Wireless Sensor Networks" Journal of Communication Networks and Distributed Systems, Inderscience Publishers, 2016

[39] C. Aparna, G. Rama Murthy and C. Naveen, "A Novel Levelled and Sected Hybrid Protocol for Wireless Sensor Networks," SENSOR LETTERS, 2013.

[40] U. Nagaraju, B.V.S.S. Subrahmanyam and G. Rama Murthy, "An Energy Efficient Technique to prolong network lifetime of Ad-hoc Sensor Networks (ETPNL), " IETE Special Issue on Next Generation Networks, July-August 2008

[41] Md. Aquil Mirza, Abdul Faheem Mohed., Rama Murthy Garimella, "Energy Efficient Sectoring Based Routing in Wireless Sensor Networks for Delay Constrained Applications: A Mixed Approach", IEEE International Region 10 Conference (TENCON), Hyderabad, India. November 18-21st, 2008.

[42] U. Nagaraju, B. Subrahmanyam, G. Rama Murthy, "Energy Efficient Routing Technique for Ad-Hoc Sensor Networks, " Proceedings of IEEE Sensors Applications Symposium (SAS-2008), 12-14 February 2008, Atlanta, Georgia

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[2] G. Rama Murthy and G. Jagadeesh, “Verhulst type Deterministic/Stochastic Non-Linear Dynamical Systems in Discrete Time, “ **Proceedings of Second International Conference on Non-Linear Systems: Modeling, Simulation and Applications, December 19-22, 2006**

• **(G2) Stochastic Processes:**

[3] G. Rama Murthy,”Stochastic Chains: Matrix Power Series Equations: Algebraic Geometry: Quantity Theory,” Proceedings of International Congress of Mathematicians (ICM), 2010

[4] G.Rama Murthy,”**Theory of Chances: Novel Stochastic Chains: Linear Algebraic Approach,**” **Journal of Applied and Computational Mathematics,** November 2014. Also appeared in part in **INTERNATIONAL CONGRESS OF MATHEMATICIANS, 2010**

[5] G. Rama Murthy,”**Weakly Short Memory, Wide Sense Stationary Stochastic Processes,**” **International Journal of Algorithms, Computing and Mathematics,** *Volume 4, Number 4, November 2011* © *Eashwar Publications* ISSN : 0974-3367, Pages 41-53

[6] G. Rama Murthy, "Weakly Short Memory Stochastic Processes: Signal Processing Perspectives," Proceedings of International Conference on Frontiers of Interface between Statistics and Sciences," December 20, 2009 to January 02, 2010,

[7] G. Rama Murthy," Graphs: Associated Markov Chains," **IEEE International Conference on Applied Mathematics and Theoretical Computer Science, January 2013**

- **(G3) Linear Algebra:**

[8] **Rahul Gupta and G. Rama Murthy, "INNOVATIVE STRUCTURED MATRICES," Advances in Linear Algebra & Matrix Theory, Vol. 3 No. 3, Pages 17-21, September 2013.**

[9] **G. Rama Murthy, "Novel Structured Matrices" International Journal of Algorithms, Computing and Mathematics, Volume 2, Number 4, November 2009 ©Eashwar Publications ISSN : 0974-3367, (Also IIT Technical Report, 2009)**

[10] G. Rama Murthy," Structured Multi—Matrix Variate, Matrix Polynomial Equations: Solution Techniques," **IEEE International Conference on Applied Mathematics and Theoretical Computer Science, January 2013**

- **(G4) Number Theory:**

[11] G. Rama Murthy, " Theory of Irrational and Transcendental Curves in the Real and Complex Domain: Bujjitals: **Towards a Proof of Fermat's Last Number Theorem**" Presented at the 900th meeting of the American Mathematical Society, Chicago.

[12] A.Sangameshwar and G.Rama Murthy, " Novel Arithmetic Functions ," IIT Technical Report, IIT/TR/2004/18

[13] **G. Rama Murthy, "Innovative Arithmetical Functions: Infinite Products," International Journal of Algorithms, Computing and Mathematics, ISSN : 0974-3367, Vol.1, No.1., August 2008, Eashwar Publications (---Version 2", IIT Technical Report, 2006)**

[14] G. Rama Murthy," Arithmetical Functions : Infinite Products," **IEEE International Conference on Applied Mathematics and Theoretical Computer Science, January 2013**

- **(G5) Analysis:**

[15] **G. Rama Murthy, "Bounded Infinite Sequences / Functions : Orders of Infinity "," International Journal of Algorithms, Computing and Mathematics,**

• **(G6) Cosmology and String Theory:**

[16] **G. Rama Murthy, "On the amount of space associated with condensed mass/energy: Universal Physical Law ,"** *International Journal of Systemics, Cybernetics and Informatics (IJSCI)*, Pages 28-30, April 2006

[17] G. Rama Murthy, "Relativistic Statistical Mechanics ,"Paper presented at the International Conference on Relativity, Amravati University. Abstract appeared in the proceedings. Also registered as IIIT—Technical Report

[18] **G. Rama Murthy, "Towards experimental verification of distributed, spinning/vibrating string energy systems at cosmic level,"** *International Journal of Systemics, Cybernetics and Informatics (IJSCI)*, Pages 9-15, January 2006

[19] **G. Rama Murthy, "Transient Evolution of Universe,"** *International Journal of Systemics, Cybernetics and Informatics (IJSCI)*, April 2007, pages 11-13

[20] **G. Rama Murthy,"Gravitational Waves : Repulsive Force: Dark Energy Problem (A New Look at Gravitation),"** *International Journal of Systemics, Cybernetics and Informatics (IJSCI)*, Pages 16-18, January 2008

(H) MISCELLANEOUS

[1] Bhanu Kalyan, Raghu Kishore and G.Rama Murthy, "Low Cost Distributed Anonymous File Server for the Internet, " Proceedings of International Conference on Information Technology, CIT, Hyderabad, 2004

[2] G. Rama Murthy and Sajid Ali Khan, "Generic Framework for cluster computing, " Proceedings of International Conference on Systemics, Cybernetics and Informatics (ICSCI), 2006

[3] Priyanka Sharma and G. Rama Murthy," Big Data in Education," Xerox Research Open Symposium (XRCI) (Poster Paper), March 2014

[4] **G. Rama Murthy and N.C. Eswar Reddy,"Micro-processor based Combinational Lock,"** *Instruments and Electronics Developments*, June 1984

FUNDED RESEARCH PROJECTS:

[1] Design, Development and Analysis of Routing and Fusion algorithms for Wireless Sensor Networks", funded by the Department of Science and

Technology (DST), Government of INDIA...**Started in APRIL 2006;**
Amount : 11.3 lakhs; Duration : TWO YEARS

[2] Design and Deployment of Test Bed for Emulation of Adhoc Wireless Networks” funded by the Ministry of Information and Communication Technology (MCIT), Government of India; **Started in December 2006; Amount: 21.9 lakhs; Duration : TWO YEARS**

[3] Mobile and Static Cognitive Wireless Sensor Networks,” Funded by the Ministry of Information and Communication Technology, Government of India , **Started in May 2010, Amount 73.2 Lakhs, Duration : 2.5 YEARS**

[4] Design and Implementation of Cellular Cognitive Radio Networks: Funded by the Department of Electronics and Information Technology, Government of India, **Started in September 2013, Amount 63.12 lakhs, Duration : 2 years**

PROJECTS UNDER CONSIDERATION & PREPARATION

[1] Design and Analysis of Cyber Physical Systems: Applications, Submitted to Department of Science and Technology (DST), Government of India, in December 2016, Amount: 21 lakhs

[2] Mobile Arogya—Ambulance based Telemedicine service for Rural Healthcare and Real Time Patient Support System in India, Submitted to Department of Science and Technology (DST), Government of India, in March 2017, Amount: 38 lakhs

[3] Design and Analysis of Localization, Fusion Algorithms in Wireless Sensor Networks : Deployment of Test Bed” To be submitted

[4] Design of Routing, Fusion, Localization Algorithms in Underwater Acoustic Sensor Networks,” To be submitted

PATENT DETAILS:

Here are the domestic patents filed on Wireless Sensor Networks and Global Cognitive Radio.

- (A) “A System for Implementation of Doubly Cognitive Wireless Sensor Networks,” Application Number: 3779/CHE/2011. Filed with Patent Office, Government of India
- (B) “Instantaneous Accident Detection and Notification System,” Application Number: 3780/CHE/2011. Filed with Patent Office, Government of India.....**READY FOR CLEARANCE**

- (C) “Global / Universal Cognitive Radio based Communication Systems,” Filed with the patent office.

INVENTIONS: PATENT APPLICATIONS:

- (1) G. Rama Murthy, “ Combined Localization, Fusion, Routing in Wireless Sensor Networks (WSNs), Indian Patent Application Submitted to AP Patent Cell
- (2) G. Rama Murthy, “Fire Control System, “**Submitted to the U.S. Patent and Trademark Office.**
- (3) G. Rama Murthy “Efficient Water, Related Resource Utilization / Control System: Disaster relief technologies “ Submitted to the **U.S. Patent and Trademark Office.**
- (4) G. Rama Murthy, “Intelligence Testing Solids, “ Submitted to the **U.S. Patent and Trademark Office.**
- (5) G. Rama Murthy, “Pollution Control System, “Submitted to the **U.S. Patent and Trademark Office.**
- (6) G. Rama Murthy, “Wave Radiation Therapy Equipment, “submitted to the **U.S. Patent and Trademark Office.**
- (7) G. Rama Murthy, “Principles, Mechanisms of Instrument Innovation: Illustrations --- (a) Playing Card Holder, (b) Musical / Artificial Chair, (c) Fly Zipper etc “ Submitted to the U.S. Patent and Trademark Office.

INVITED TALKS:

- (1) Transient Analysis of Computer Networks at **BELL LABORATORIES, USA** ...July 1991
- (2) Performance Evaluation of Computer/ Communication Systems at **Indian Space Research Organization (ISRO), Sriharikota.....July 2003.**
- (3) Design of Future Information Processing Machines, INDO-FRENCH workshop on Brain Assymetries, Sri Rama Chandra Medical College, Chennai, 2005
- (4) **Key note speaker** at the National Conference on Artificial Neural Networks, Organized by Sree Nidhi Institute of Science and Technology (SNIST), Ghatkesar, Hyderabad.....November 2005

(5) **Key note speaker** at the National Conference on Wireless and Mobile Communications (NCWMC), Vardhaman College of Engineering, Shamshabad, 10-11 March 2006

(6) Delivered guest lecture at the **Institute of Mathematical Sciences, Taramani, Chennai**

(7) Delivered guest lecture at the **Tata Institute of Fundamental Research, (TIFR) Mumbai**

(8) Delivered **Key Note Lecture** at the Christu Jyothi Jubilee PG College, Guntur

(9) Delivered **Invited Lecture** at the International Conference on Soft Computing and Intelligent Systems, December 27-29, 2007

(10) Delivered an INVITED TALK at the First International Workshop on “Future Internet Model and Services,” Daejeon, South Korea, December 16-17,2010

(11) **Key note speaker**, Second International Conference on Computer Communication and Informatics (ICCCI 2012), 10-12, January 2012, Coimbatore

(12) Delivered THREE INVITED TALKS at the Wrocklaw University of Technology, POLAND. Also delivered invited talk at the 14th POLISH-BRITISH Workshop, Poland

(13) Delivered INVITED talk at SIMON FRASER UNIVERSITY, Vancouver, JULY 2016

(14) **Keynote Speaker** at the 2nd IEEE International Conference on Next Generation Computing Technologies (NGCT-2016), Centre for Information Technology, University of Petroleum and Energy Studies, Dehradun, 14th and 16th October, 2016

(15) **Keynote Speaker** at International Conference on Systemics, Cybernetics and Informatics, 2017, Hyderabad, India

Editorship of Journals:

(1) Associate Editor, “International Journal of Wireless Networks and Broadcasting Technologies” (IJWNBT)” published quarterly by IGI-global

(2) Editorial Committee Member, International Journal on Multimedia and Ubiquitous Engineering

- (3) Editorial Committee Member, International Journal of Advanced Networking and Applications (IJANA)
- (4) Editor, International Network for Scientific Information (INSINET) PUBLICATIONS
- (5) Editor, International Journal of Algorithms, Computing and Mathematics
- (6) Guest Editor, International Journal of Neural Systems, Special issue on Complex Valued Neural Networks, International Journal of Neural Systems

PROJECTS: (Since 1984 to 2001)

- (1) ECIL, Hyderabad: Developed a Cross Assembler utilizing the Assembly Language Programming.
- (2) ISRO, Sri Hari Kota: Executed programs written in FORTRAN, COBOL etc.
- (3) LSU, Baton Rouge: Developed Image Segmentation Software and applied it to real world data.
- (4) HRC, Las Vegas: Developed Software for non-parametric statistical procedures.

Consultancy:

- (1) AT&T: Transient and Equilibrium Analysis of ISDN Networks: Overload and Congestion Control,
- (2) Qualcomm: Design of Public Key Cryptography Algorithms
- (3) Bose Musicals: Design and Implementation of Musical Chairs
- (4) Ameritech: Design of a tester for switching systems as well as VLSI modules.
- (5) Siemens: Performance model of a line concentrator based on call arrival rate, Performance model of a leaky bucket in SS7 networks.

3G Wireless Works:

- (1) Prepared a report on the comparison of 3GPP protocols H.323 and H.324
- (2) Design of Public / Private Key cryptography algorithms based on Nonlinear Dynamical systems.
- (3) Design of Chip Sequence generator for two dimensional signals (Images).

Program Committee Memberships, Reviewer:

- (1) Member, Technical Program Committee, Sensor Network Information Processing Track for IEEE ISSNIP 2013 (the Eighth IEEE International Conference on Intelligent Sensors, Sensor Networks and Information Processing, 2-5 April 2013, Melbourne, Australia).
- (2) Member, Advisory Committee, Second International Conference on Computing, ICC 2011, 28th-29th December 2011
- (3) Program Committee Member, Sensors, Circuits & Instrumentation Systems (SCI), International Multi-Conference on Systems, Signals & Devices, March 22-25, 2011, Sousse, Tunisia
- (4) Member, Advisory Committee, DEVICE-2010, November 2010
- (5) Member, Technical Advisory Committee, International Conference on Methods and Models in Computer Science (ICM2CS-2010), December 13-14, 2010.
- (6) Member, Task Force on Complex Valued Neural Networks, IEEE CIS Neural Networks Technical Committee
- (7) Member -Technical Board, International Workshop on Future Directions of Artificial Neural Networks-- FDANN10
- (8) Member, Advisory committee, International Conference on Computing (ICC-2010), New Delhi, December 2010
- (9) Member, Technical Program Committee, IEEE International Conference on Wireless & Mobile Computing, Networking and Communications [WiMob'2010]
- (10) Member, Technical Program Committee, ISSNIP 09, 5th International Conference on Intelligent Sensors, Sensor Networks and Information Processing, 7-10 December 2009, Melbourne, Australia
- (11) Member, Technical Program Committee, ISWPC (International Symposium on Wireless and Pervasive Computing, 11-13 February 2009, Melbourne, Australia
- (12) Member, Technical Program Committee, TENCON 2008
- (13) Program Committee Member, National Conference on Research & Development in Hardware and Systems (CSI-RDHS 2008)

- (14) Technical Committee member of International Conference on Systemics, Cybernetics and Informatics (ICSCI-2004, ICSCI-2005, ICSCI 2006).
- (15) Program Committee member of a IEEE workshop on Next Generation Wireless Networks, High Performance Computing (HIPC), 2005. Also Program Committee Member of a workshop at HIPC---2006.
- (16) Program committee member of 41st Annual Convention of Computer Society of India (CSI-2006) **and SEVERAL OTHERS**
- (17) Reviewed papers for Elsevier Journals, IEEE Transactions on Mobile Computing, IEEE Transactions on Neural Networks, IEEE Transactions on Wireless Communications and other IEEE Journals, ICSCI conferences and Journals
- (18) Reviewer of Department of Science and Technology (DST) and Others.
- (19) Served as reviewer of projects submitted by students to DOEACC society.
- (20) Served as evaluator of Ph.D thesis from Jawaharlal Nehru University (JNU), Delhi, University of Hyderabad, Hyderabad, IIT—Kanpur, University of Mysore, Nagarjuna University, Jawaharlal Nehru Technological University etc.