

ABHISHEK K. GUPTA

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CURRENT AFFILIATION

Department of Electrical Engineering, Indian Institute of Technology (IIT) Kanpur

Assistant Professor

JULY 2017-PRESENT

Working as an Assistant Professor in the Department of Electrical Engineering at IIT Kanpur. My research interests include mmWave communication, VLC networks, stochastic geometry, numerical optimization, and 5G networks.

ACADEMICS

2012-2016 **Ph.D. (CommNetS), Electrical and Computer Engineering**

CPI 4.0/4.0

The University of Texas at Austin

2005-2010 **B.Tech. M.Tech. Dual Degree, Electrical Engineering**

CPI 9.6/10.0 (BT), 10.0/10.0 (MT)

Indian Institute of Technology Kanpur

PUBLICATIONS

Thesis

The University of Texas at Austin

Ph.D. Research

AUG 2012- OCT 2016

Supervisor: Prof. Jeffrey Andrews & Prof. Robert Heath

Thesis title: Association and spectrum sharing in cellular networks

MIMO HetNet modeling and Load Balancing: Analysis of a MIMO Heterogeneous network using stochastic geometry, its optimal association rule and load balancing.

mmWave spectrum access: Modeling and analysis of mmWave multi-operator systems using stochastic geometry and feasibility of spectrum license sharing. Study of possible coordination techniques among operators and their performance evaluation.

Macro-diversity in mmWave networks: Modeling of correlation among blocking events and performance evaluation of macro-diversity for a mmWave system in the presence of random blockages.

IIT Kanpur

M.Tech. Research

MAY 2009- JUNE 2010

Supervisor: Prof. Adrish Banerjee & Prof. Ajit Chaturvedi

Thesis title: Impact of antenna correlation on multiuser MIMO and correlation mode selection based user scheduling algorithms

Derivation of closed form capacity expressions for multi-user MIMO-MAC in full and no correlation scenario and analysis of the beneficial impact of antenna correlation at low SNR region. Proposed 3 scheduling schemes based on switching of correlation modes. Studied 4G standard (LTE and LTE-A).

Books

2014 **Numerical Methods using MATLAB**

Abhishek K. Gupta, Apress (Springer), NY

2010 **MATLAB By Examples**

Abhishek K. Gupta, Finch Publications, India

Book Chapter

- 2019 **The Spectrum Landscape above Radio and up to mmWave Bands**
Abhishek K. Gupta and Adrish Banerjee, Spectrum Sharing: The Next Frontier in Wireless Networks, Wiley, 2019
- 2012 **An AD-Enabled Optimization Toolbox in LabVIEW**
Abhishek K. Gupta and Shaun A Forth, Lecture Notes in Recent Advances In Algorithmic Differentiation, Also published at International Conference on Automatic Differentiation-AD2012, Fort Collins (CO)

Papers: ArXiv/Submitted/Under Review

- J1: **A Primer on Cellular Network Analysis Using Stochastic Geometry**
Jeffrey G. Andrews, Abhishek K. Gupta, Harpreet S. Dhillon, arXiv preprint arXiv:1604.03183, 2016

Journal Papers: Published

- J2: **Comments on 'Coverage Analysis of Multiuser Visible Light Communication Networks'**
Abhishek K. Gupta and Jeffrey G. Andrews, IEEE Trans. Wireless Commun. , Vol. PP, No. 99, pp. 1-1, June. 2019
- J3: **Modeling Infrastructure Sharing in mmWave Networks with Shared Spectrum Licenses**
Rebal Jurdi, Abhishek. K. Gupta, J. G. Andrews and Robert W. Heath Jr, IEEE Trans. Cognitive Commun. Networking, Vol. 4, No. 2, pp. 328-343 June. 2018
- J4: **Macro diversity in Cellular Networks with Random Blockage**
Abhishek K. Gupta, Jeffrey G. Andrews and Robert W. Heath, Jr., IEEE Trans. Wireless Commun., Vol. 17, No. 2, pp. 996-1010, Feb. 2018
- J5: **Modeling and Analyzing Millimeter Wave Cellular Systems**
Jeffrey G. Andrews, Tianyang Bai, Mandar N. Kulkarni, Ahmed Alkhateeb, Abhishek K. Gupta, Robert W. Heath Jr, IEEE Trans. Commun., Vol. 65, No. 1, pp. 403-430, Jan 2017
- J6: **Gains of Restricted Secondary Licensing in Millimeter Wave Cellular Systems**
Abhishek. K. Gupta, Ahmed Alkhateeb, Jeffrey G. Andrews, and Robert W. Heath Jr, IEEE J. Sel. Areas Commun., Vol. 34, No. 11, pp. 2935-2950, Nov. 2016
- J7: **Are We Approaching the Fundamental Limits of Wireless Network Densification?**
Jeffrey G. Andrews, Xinchun Zhang, Gregory D. Durgin, Abhishek K. Gupta, IEEE Commun. Mag., Vol. 54, No. 10, pp 84-90, Oct. 2016
- J8: **On the Feasibility of Sharing Spectrum Licenses in mmWave Cellular Systems**
Abhishek K. Gupta, Jeffrey G. Andrews, Robert W. Heath, Jr., IEEE Trans. Commun., Vol. 64, No. 9, pp. 3981-3995, Sept. 2016
- J9: **SINR and Throughput Scaling in Ultradense Urban Cellular Networks**
Abhishek K. Gupta, Xinchun Zhang, Jeffrey Andrews, IEEE Wireless Commun. Lett., Vol. 4, No. 6, pp. 605-608, Dec. 2015
- J10: **Impact of Antenna Correlation on Optimum Improved Energy Detection in Cognitive Radio**
Sanket Kalamkar, Abhishek K. Gupta, Adrish Banerjee, IEICE Transactions on Communication, E98B(08), pp. 1690-1699, Aug. 2015
- J11: **Downlink Multi-Antenna Heterogeneous Cellular Network with Load Balancing**
Abhishek K. Gupta, Harpreet S. Dhillon, Sriram Vishwanath, Jeffrey G. Andrews, IEEE Trans. Commun., Vol. 62, No. 11, pp. 4052-4067, NOV. 2014

Conference Papers

- C1: **On Hybrid MoSK-CSK Modulation based Molecular Communication: Error Rate Performance Analysis using Stochastic Geometry**
Nithin V Sabu, Neeraj Varshney and Abhishek K. Gupta, in Proc. SpaSWIN, WiOpt, June 2019
- C2: **On Detection of Critical Events in a Finite Forest using Randomly Deployed Wireless Sensors,**
K. Pandey and A. K. Gupta, in Proc. SpaSWIN, WiOpt, June 2019

- C3: **Modeling and Analysis of Wildfire Detection using Wireless Sensor Network with Poisson Deployment**
K. Pandey and A. K. Gupta, in Proc. IEEE ANTS, Indore, Dec. 2018
- C4: **On Socially Optimal Traffic Flow in the Presence of Random Users**
A. Chopra, D. Singh, A. S. Bedi, A. K. Gupta and K. Rajawat, in Proc. IEEE ANTS, Indore, Dec. 2018
- C5: **On Association and Bandwidth Allocation for Hybrid RF/VLC Systems**
A. K. Gupta, A. Banerjee, K. Pathak, and S. Srivastava, in Proc. IEEE ANTS, Indore, Dec. 2018
- C6: **On the spatial performance of users in indoor VLC networks with multiple reflections**
A. K. Gupta, and A. Banerjee, in Proc. SPCOM, Bangalore, July 2018
- C7: **Impact of correlation between link blockages on macro-diversity gains in mmWave networks**
A. K. Gupta, J. G. Andrews and R. W. Heath Jr, in Proc. IEEE ICC Workshop, May 2018
- C8: **A Model for infrastructure sharing in mmWave cellular networks**
R. Jurdi, A. K. Gupta, J. G. Andrews and R. W. Heath Jr, in Proc. IEEE ICC, May 2018
- C9: **Restricted Secondary Licensing for mmWave Cellular: How Much Gain Can be Obtained?**
Abhishek K. Gupta, Ahmed Alkhateeb, Jeffrey G. Andrews, and Robert W. Heath Jr, in Proc. IEEE GLOBECOM, Washington DC, Dec. 2016
- C10: **Rate Analysis and Feasibility of Dynamic TDD in 5G Cellular Systems**
Abhishek K. Gupta, Mandar N. Kulkarni, Eugene Visotsky, Frederick W. Vook, Amitava Ghosh, Jeffrey G. Andrews, Robert W. Heath Jr., in Proc. IEEE ICC, Malaysia, May 2016
- C11: **Can Operators Simply Share Millimeter Wave Spectrum Licenses?**
Abhishek K. Gupta, Jeffrey G. Andrews, Robert W. Heath, Jr., in Proc. ITA, San Diego, Feb. 2016
- C12: **Potential Throughput in 3D Ultradense Cellular Networks**
Abhishek K. Gupta, Xinchun Zhang, Jeffrey Andrews, in Proc. ASILOMAR, Nov. 2015
- C13: **Distributed Self Localization of Sensors with Poisson Deployment using Extended Kalman Filter**
Abhishek K. Gupta, Somsubhra Barik, Harris Vikalo, in Proc. IEEE WCNC, New Orleans, March 2015
- C14: **Downlink Coverage Probability in MIMO HetNets with Flexible Cell Selection**
Abhishek K. Gupta, Harpreet S. Dhillon, Sriram Vishwanath, Jeffrey G. Andrews, in Proc. IEEE GLOBECOM, Austin, Dec. 2014
- C15: **SNR Wall for Generalized Energy Detection Under Noise Uncertainty in Cognitive Radio**
Sanket Kalamkar, Adrish Banerjee, Abhishek K. Gupta, in Proc. APCC, 2013
- C16: **Development of ANN River Flow Model using Particle Swarm Optimization**
Ravikumar Ganti and Abhishek K. Gupta, in Proc. National Conference on Hydraulics and Water Resources-2011, Surat (India) and in Journal of Indian Society for Hydraulics (ISH), Dec. 2011
- C17: **Avoidance of Threat Zone by UAV for Automated Navigation**
Arpit Gupta, Abhishek K. Gupta, Cosmin Bocaniala, Venkat VS Sastry, in Proc. IEEE INDICON, Kanpur, India, Dec. 2008
- C18: **LVAD package: Implementation of Forward Mode Automatic Differentiation in LabVIEW using Operator Overloading**
Abhishek K. Gupta and Amrit Agrahari, in Proc. National Instrument VI Mantra 2008

EXPERIENCE

Professional Experience

Samsung Research America, Richardson, TX

Sr. Standards Engineer

OCT 2016-JULY 2017

Working on 5G standardization. Work involved active participation in 3GPP standards meetings, performance evaluation of new technologies and innovation efforts.

Applied Micro, Pune

Design Engineer II

AUG 2010-APRIL 2012

Worked on multiple design blocks including SATA 2.0, USB 3.0 and Queue manager interface on SOC level. Work involved design, bug fixes and verification of these blocks using Verilog/System Verilog/OVM.

Professional Internships

Nokia Networks, Arlington Heights, IL

Research Intern

Studied feasibility of dynamic TDD in millimeter wave cellular networks.

MAY-AUGUST 2015

Futurewei (Huawei R & D), Bridgewater, NJ

Research Intern

Work involved simulation environment development and performance analysis of active antenna system with stochastic and ray tracing model and DIDO system.

MAY-AUGUST 2013, MAY-AUGUST 2014

Academic Internships

Cranfield University, UK

Guide: Dr. Shaun A Forth

MAY 2008-JUNE 2008

Development of MAD package for Efficient Reverse mode Automatic Differentiation: Developed the MAD package for reevaluation of global tape in reverse mode AD. Succeeded to increase the performance by more than 5 times in the sense of computation time. The package has been sold to TOMLAB Optimization.

Development of Gradient Enhanced PSO: Developed a new hybrid algorithm of optimization titled GEPSO on the concepts of particle swarm optimization and gradient methods with automatic differentiation (now known as GRASP). Tested the algorithm over 7 benchmark functions.

IMMT (CSIR), Odisha

Guide: Prof B K Mishra

DECEMBER 2007

Generation of Spiral Surface for Extraction Simulation of Particles: Developed and implemented an algorithm for generation of a uniform 3D spiral mesh for providing surface to a particle extraction simulation based on DEM method.

Teaching Experience

EE, IITK

Instructor

Taught following Course: Modeling and Representation of Random Signals (EE621), Analysis of Modern Wireless Networks (EE6980).

JULY 2017- CURRENT

ECE, UT Austin

Teaching Assistant

Worked as Teaching Assistant under Prof. J. Andrews for Wireless Communications graduate course in Spring 2015, Prof. S. Sanghavi for Probability, Statistics, and Random Processes course in Fall 2012 and Prof. R. Flake for Introduction to Automatic Control course in Spring 2013 in ECE, UT-Austin.

JAN 2015-MAY 2015, AUGUST 2012-MAY 2013

Hewlett Packard Education Services

Instructor, MATLAB

MAY 2009-JUNE 2012

Worked as an instructor for MATLAB at HPES. The work involved designing the course, the complete organization of the course, teaching and managing resources. Conducted the following technical sessions on MATLAB:

- June 2012, Introduction to Numerical Analysis using MATLAB Noida (India), 6 days
- July 2011, Tools in MATLAB: Signal Proc. & Communications BBDNITM, Lucknow
- June 2011, Engineering in MATLAB: Tools and Simulink JSS Noida, 11 days course
- June 2010 & May 2009, Control Systems in MATLAB BIT Meerut, 7days
- July 2010, Control and Power systems in MATLAB SRIT Jabalpur, 11 days

Invited Speaker, Talks and courses in MATLAB

Given following invited talks and short courses in MATLAB at various prestigious engineering colleges in India:

- March 2011, Engineering in MATLAB 3 days Course at HBTI Kanpur
- April 2010, Talk: Introduction to MATLAB and Its Application in Electrical at Integral University, Lucknow
- April 2010, Talk: Introduction to MATLAB for Mechanical Students, at HBTI Kanpur
- March 2010, Talk: MATLAB for Mechanical Engineers, at Institute of Engineering and Technology, Lucknow

EE IIT Kanpur

Teaching Assistant

Worked as Teaching Assistant for one year under Prof. A. Banerjee in EE, IIT Kanpur for Cryptography course and Summer Workshops.

JULY 2009-MAY 2010

Instructor

Advanced Courses in MATLAB

MAY 2009 AND NOV 2009

Organized and taught two advanced courses in MATLAB at IIT Kanpur. The work involved full teaching responsibility, homework assignments and complete organization of course.

AWARDS AND ACHIEVMENTS

Exemplary Reviewer, IEEE Wireless Communication Letters

2016

Selected as exemplary reviewer for providing timely and high quality reviews.

GEFS Leadership Award

2009-2010

Awarded the prestigious GE Foundation Leadership Award by General Electric (GE) Foundation and Institute of International Education (I.I.E.) for academic year 2009-2010 for excellence in academics and future potential. Attended Energy to Innovate workshop in Bangalore

Academic Excellence Award

2005-06, 2006-07, 2007-08, 2008-09

Awarded Academic Excellence Award consecutively four years by IIT Kanpur for securing high SPI (semester performance index).

Dharam Hinduja Scholarship

2003-2010

Selected for Dharam Hinduja Scholarship on the basis of interview and position in merit in high-school (2003).

NLSTSE

2004, 2005

1st in Kanpur at National Level Science Talent Search Examination 2004 and 2005 Conducted by Unified Council, Chennai in two consecutive year 2004 and 2005