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Google Scholar link,DBLP,Justia Patents

Dinesh Bharadia

Impact: Research & Industry

2010-2015 **Full-duplex radios** Stanford University

- Invalidated a long held assumption in wireless communications by designing and prototyping a full-duplex radio, which can simultaneously transmit and receive at the same frequency
- Two key papers have been cited over 650 times in 3 years duration
- Led to foundation of startup to build a Commercial product of this research, which received 45 Million $ in Funding
- Built a commercial product which underwent successful field trails conducted by Tier 1 network provider worldwide – Deutsche Telecom, South Korean Telecom.
- Awarded Paul Baron Young Scholar Award and MIT TR35 Award for this work.

Education

2010–2013 & 2015–2016 **M.S. & Ph.D. in Electrical Engineering**, *Stanford University*, CGPA – 4.1/4.
Thesis:"Self-Interferometry: Self-Interference Cancellation and its Applications", Advisor: Sachin Katti
My thesis built in-band full-duplex radios, i.e. they can transmit and receive at the same time in the same frequency band, thus invalidating a long-held assumption in wireless networks

2006–2010 **B.Tech. in Electrical Engineering**, *IIT Kanpur*, CGPA – 9.9/10.
Highest CGPA amongst graduating students in Electrical Engineering at IIT Kanpur

Selected Awards and Achievements

2016 Paul Baran Young Scholar Award: Marconi Society recognizes outstanding young scientists and engineers anywhere in the world who have demonstrated exceptional capabilities and potential

2016 MIT TR35 Award : World's Top 35 Innovators Under the Age of 35. Technology Review describes, "His radio could be a godsend for telecom companies and consumers."

2016 Michael Dukakis Leadership Award: It recognizes outstanding young leaders in CyberSecurity

2010 Awarded Sarah and Thomas Kailath Stanford Graduate Fellowship (SGF): the highest fellowship award given by Stanford University

2010 Awarded Best Student in Electrical Engineering at IIT Kanpur by Prime Minister of India

2006-2010 Secured Highest CGPA within Electrical Engineering students and Second highest CGPA across all disciplines at IIT Kanpur, 2010

2009 Awarded Tokyo-IIT Scholarship by University of Tokyo

2006–2009 Awarded Academic Excellence consecutively for the year 2006-07, 2007-08, 2008-09, at IIT Kanpur

2008-2009 Awarded Biswanath Jha Memorial Scholarship, IIT Kanpur

2007-2008 Awarded K. N. Saluja Scholarship, IIT Kanpur

Publications and Papers

Google Scholar link *shows that publications have a total citation count of more than 1800.*

Under Submission "Backscattering Ambient ISM Band Signals"
Pengyu Zhang, **Dinesh Bharadia**, and Sachin Katti

NSDI 2017 Accepted paper, "moVR: Enabling High-Quality Untethered Virtual Reality"
Omid Abari, **Dinesh Bharadia**, Austin Duffield, and Dina Katabi

SENSYS 2016 "HitchHike: Practical Backscatter Using Commodity WiFi"
Pengyu Zhang, **Dinesh Bharadia**, Kiran Joshi, and Sachin Katti

HOTNETS 2016 "Cutting the cord in virtual reality"
Omid Abari, **Dinesh Bharadia**, Duffield Austin, and Dina Katabi

SIGCOMM 2016 "NUMFabric: Fast and Flexible Bandwidth Allocation in Datacenters"
Kanthi Nagaraj, **Dinesh Bharadia**, Hongzi Mao, Sandeep Chinchali, Mohammad Alizadeh, Sachin Katti

SIGCOMM 2016 Demo: "Enabling Backscatter Communication among Commodity WiFi Radios"
Pengyu Zhang, **Dinesh Bharadia**, Kiran Joshi, and Sachin Katti

SIGCOMM 2015 "BackFi: High Throughput WiFi Backscatter"
Dinesh Bharadia, Kiran Joshi, Manikanta Kotaru and Sachin Katti

SIGCOMM 2015 "SpotFi: Decimeter level localization using wifi"
Manikanta Kotaru, Kiran Joshi, **Dinesh Bharadia** and Sachin Katti

NSDI 2015 "Wideo: Fine-grained device-free motion tracing using rf backscatter"
Kiran Joshi, **Dinesh Bharadia**, Manikanta Kotaru and Sachin Katti

SIGCOMM 2014 "FastForward: fast and constructive full duplex relays"
Dinesh Bharadia and Sachin Katti

SIGCOMM 2014 Demo: "Robust full duplex radio link"
Dinesh Bharadia, Kiran Joshi and Sachin Katti

NSDI 2014 "Full duplex MIMO radios"
Dinesh Bharadia and Sachin Katti

HOTNETS 2013 "Full duplex backscatter"
Dinesh Bharadia, Kiran Joshi and Sachin Katti

SIGCOMM 2013 "Full duplex radios"
Dinesh Bharadia, Emily McMilin and Sachin Katti

BMC Bioinformatics 2013 "QualComp: a new lossy compressor for quality scores based on rate distortion theory"
Idoia Ochoa, Himanshu Asnani, **Dinesh Bharadia**, Mainak Chowdhury, Tsachy Weissman and Golan Yona

NAS 2013 "Deterministic matrices matching the compressed sensing phase transitions of Gaussian random matrices"
Hatef Monajemi, Sina Jafarpour, Matan Gavish, David Donoho, Sivaram Ambikasaran, Sergio Bacallado, **Dinesh Bharadia**, Yuxin Chen, Young Choi, Mainak Chowdhury, and others

Archive 2012 "Lossy Compression of Quality Values via Rate Distortion Theory"
Himanshu Asnani, **Dinesh Bharadia**, Mainak Chowdhury, Idoia Ochoa, Itai Sharon, Tsachy Weissman

Mobicom 2011 "Practical, real-time, full duplex wireless"
Jain Mayank, Choi Jung Il, Kim Taemin, **Dinesh Bharadia**, Seth Siddharth, Srinivasan Kannan, Levis Philip, Sachin Katti and Sinha Prasun

IEEE TCOM 2011 "Relay and power allocation schemes for OFDM-based cognitive radio systems"
Dinesh Bharadia, Gaurav Bansal, Praveen Kaligineedi and Vijay K Bhargava

Patents

Grant 2015 "Systems and methods for multi-rate digital self-interference cancellation"
Dinesh Bharadia, Jung-Il Choi, Mayank Jain, Rajendra Tushar Moorti. US Patent#9276682

Grant 2015 "Apparatus and method for interference cancellation in communication systems"
Vaneet Aggarwal, **Dinesh Bharadia**, Rittwik Jana, Christopher W. Rice, Nemmara K. Shankaranarayanan. US Patent#9203655

Filed 2015 "SYSTEMS AND METHODS FOR FREQUENCY-ISOLATED SELF-INTERFERENCE CANCELLATION"
Dinesh Bharadia, Jeffrey Mehlman, Wilhelm Steffen Hahn. Publication#20150333847

Filed 2015 "SYSTEMS AND METHODS FOR NEAR BAND INTERFERENCE CANCELLATION"
Dinesh Bharadia, Jung-Il Choi, Mayank Jain, Jeffrey Mehlman, Steven Hong. Publication#20150280893

Grant 2015 "Systems and methods for hybrid self-interference cancellation"
Dinesh Bharadia, Jung-Il Choi, Mayank Jain, Jeffrey Mehlman. US Patent #9077421

Filed 2015 "System and method for MAC design of a full-duplex centralized cellular network "
Vaneet Aggarwal, **Dinesh Bharadia**, Rittwik Jana, Christopher W. Rice, Nemmara K. Shankaranarayanan US Patent #9007999

Grant 2015 "Apparatus and method for interference cancellation in communication systems"
Vaneet Aggarwal, **Dinesh Bharadia**, Rittwik Jana, Christopher W. Rice, Nemmara K. Shankaranarayanan US Patent #9001920

Filed 2014 "SELF-INTERFERENCE CANCELLATION"
Dinesh Bharadia, Sachin Katti, Emily McMilin Publication #20140348018

Filed 2013 "SYSTEMS AND METHODS FOR CANCELLING INTERFERENCE USING MULTIPLE ATTENUATION DELAYS"
Dinesh Bharadia, STEVEN HONG, Jeff Mehlman, Sachin Katti Publication #20130301488

Filed 2011 "ADAPTIVE TECHNIQUES FOR FULL DUPLEX COMMUNICATIONS"
Dinesh Bharadia, Jung Il Choi, Mayank Jain, Sachin Katti, Tae Min Kim, Philip Levis Publication #20120201153

Book Chapter

2015-2016 Wrote a book chapter on "Full Duplex Radios" in **Towards 5G** book published by Wiley
Dinesh Bharadia, Sachin Katti

Research Work Experience

2016-present **Postdoctoral Associate** CSAIL, Massachusetts Institute of Technology
- Extending the work on self-interference cancellation to mmWave communication to enable untethered connectivity and to indoor radar (WiTrack) to enable wireless imaging applications (such as on-road wireless imaging for driver-less cars in bad weather (non-line of sight) scenarios and helping blind people navigate indoors using wireless imaging).
- Building transport algorithms for data-center networks to achieve network operator utility function
- Designed & implemented the first mmWave mirror that enables wireless virtual reality headset with multi-Gbps untethered connectivity
- Designed & implemented a transport control algorithm for data-center networks that achieves flexible and fast bandwidth allocation to maximize the network operator utility (NUM). It performs $(2.3\times)$ faster than prior work

2015-2016 **Research Assistant**, Stanford University
- Built fundamental techniques upon self-interference cancellation to enable backscatter communication and RF imaging applications
- Designed & built a low-power $(10\mu W)$ Internet of Things connectivity solution by backscattering ambient signals (similar to WiFi).
- Designed & built a fine grained device-free human motion tracking systems,

2010-2013 **Graduate Fellowship**, Stanford University
- Awarded prestigious Sarah and Thomas Kailath Stanford Graduate Fellowship to pursue MS-PhD in the field of Electrical Engineering
- Led full-duplex wireless research where we solved a difficult problem, which was considered to be impossible in wireless communication
- Designed & built the first full-duplex radio solving an open problem and this paper was cited more than 650 times in just 3 years

Industry Work Experience

2013-2015 **Principal Scientist**, Kumu Networks

- Leave of absence from Ph.D. program to commercialize the research prototype of full duplex radios.
- Co-founded a startup Kumu Networks which raised $45 million to build the commercial product
- Led the design and implementation of both algorithms and architecture for the cancellation technology which enables full-duplex radios
- Successfully completed field trials of a commercial full-duplex radio product with Deutsche Telekom, South Korean telecom and other major Tier 1 network providers

Teaching & Mentoring Experience

2015	Teaching Assistant for EE107 Embedded Systems: Designed the course, assignments and exams and graded them, and advised students on their projects and taught 3 lectures. The course got a 5/5 rating by students (EE 107)
2012	Course Assistant for EE40N Computer Networks: designed assignments and exams and graded them, and advised students on their assignments and projects
2015	Guest Lecture at MIT for 6.888 Wireless Communication Systems on "Full-duplex radios"
2016	Guest Lecture at MIT for 6.888 Advanced Topics in Networking on "Wireless data-center design"
Manikanta Kotaru (Stanford)	I mentored Manikanta when he joined our research group in the Fall of 2013 as a PhD student at Stanford. Our work resulted in SpotFi, indoor localization system published in SIGCOMM
Joseph Samuel (Stanford)	I mentored Joseph over the summer of 2015 when he interned in our group as an undergraduate from the Indian Institute of Technology Madras. He is now a PhD student at Stanford
Kanthi Nagraj (Stanford)	I mentored Kanthi in the Summer of 2015 as a PhD student at Stanford. Our work resulted in NumFabric, an fast and flexible bandwidth allocation system for data-centers.
Hongzi Mao (MIT)	I mentored Hongzi over the Spring of 2016 as a PhD student at MIT. His work recently was published in HotNets
Austin Duffield (MIT)	I am currently mentoring Austin to build a tag localization system. He is a Master's student in Dina's group
Kiran Joshi (Stanford)	I collaborated with Kiran in the summer of 2014 as a Senior PhD student, where we brought together our expertise to build Wireless RF camera

Professional Service

2016	I was TPC of IEEE Wireless Communication and Networking Conference, helped gather reviewers and prepare a final recommendation for 6 papers
2012-Now	Reviewed over $100+$ papers on full-duplex wireless topic

Selected News and Media Coverage for Individual Projects

Full-duplex radio	Wall Street Journal, CNBC, MIT Tech. Review, TechCrunch, Fierce Wireless
Wireless Virtual Reality	MIT news , WIRED , Firstpost , TechCrunch, circuit breaker , University Herald , Digital Trends
Indoor Localization	MIT Tech. Review
IoT Connectivity	Stanford News , IEDF , Indian web 2 , Internet of Business , Converge Digest

References

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