Dr. Sumit J. Darak **April 25, 2018**

CONTACT INFORMATION

B605, New Academic Block,
Indraprastha Institute of Information Technology (IIIT),
Okhla Phase III, New Delhi, India - 110020.

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RESEARCH INTERESTS

Multi-standard wireless communication transceiver; Reinforcement Learning for Green Wireless Networks and Smart Grids; Efficient Transceiver Architectures for FPGA;

EDUCATIONAL BACKGROUND

Doctor of Philosophy (*PhD*)(CGPA = 4.75/5) *January, 2009 - January, 2013*
School of Computer Engineering (SCE)
Nanyang Technological University (NTU), Singapore
Date of conferment of PhD: 06/12/2013
Thesis Title : "*Design of Low Complexity Variable Digital Filters and Reconfigurable Filter Banks for Multi-Standard Wireless Communication Receivers.*"
Thesis Advisers : Assoc. Prof. A. P. Vinod (NTU, Singapore)
Assoc. Prof. E. M-K. Lai (Massey University, New Zealand)

Bachelor of Engineering (*B.E.*)(*First class with distinction*) *July, 2003 - August, 2007*
School of Electronics and Telecommunications Engineering (E & TC)
Maharashtra Institute of Technology (MIT), University of Pune, India
FYP Title : "*Implementation of Image Processing Algorithms on FPGA Using VHDL and PCI Bus.*"

EMPLOYMENT HISTORY

Indraprastha Institute of Information Technology, Delhi, India *January, 2015 - Present*

Assistant Professor at the Electronics and Communications Engineering (ECE) department of IIIT, Delhi.

Indian Institute of Technology, Bombay, India *June 2017, Dec. 2017*

Visiting Researcher at IEOR department of IIT, Bombay.

CentraleSupélec, Rennes, France *Nov. 2015 - Dec. 2015*

Visiting Professor at Signal, Communication et Electronique Embarquée (SCEE) Lab of CentraleSupélec, Rennes.

CominLabs, UEB and Supélec, Rennes, France *March, 2013 - November 2014*

Postdoctoral Research Fellow at the CominLabs Excellence Center, Université Européenne de Bretagne (UEB) and Supélec in the Signal, Communication et Electronique Embarquée (SCEE) team. Research on the Project *GREAT*: **G**reen Cognitive **R**adio for **E**nergy-**A**ware Wireless Communication **T**echnologies Evolution.

EADS Innovation Works (South Asia), Singapore *August, 2012 - January, 2013*

Internship at the embedded systems group with research focused on "Wireless Communication Applications for Airbus."
Involved in testing of optical communication trans-receiver on FPGA and FPGA implementation of Ethernet switch.

Massey University, Auckland, New Zealand *August, 2011 - December, 2011*

Visiting Research Student at the school of Engineering and Advanced Technology with research focused on "Digital Filters for Audio Processing Applications."
Involved in design and implementation of low complexity warped digital filters.

Tata Consultancy Services (TCS), Pune, India *September, 2007 - December, 2008*

Assistant System Engineer in the Embedded group with services focused on "Automotive" domain. Primarily worked on the development of firmwares for battery engine control unit (ECU) and implementation of diagnostic on CAN protocol for different vehicles.

Academic Achievements

- *Second Best Paper Award* in 36^{th} IEEE/AIAA DASC 2017, Florida, USA.
- *2017 NI Academic Research Grant.*
- *Young Scientist Paper Award* and *Conference Travel Grant* from URSI-France in *XXXI General Assembly and Scientific Symposium of the URSI*, Canada, Aug. 2017.
- *Best Demo Award* in CROWNCOM 2016, France.
- *Visiting Professor Fellowship* from CentraleSupélec, Rennes, France for one month visit.
- *DST INSPIRE Faculty Award* from Government of India for young researchers under 32 years age along with 5 year research grant.
- *Young Scientist Paper Award* and *Conference Travel Grant* from URSI-France in *XXXI General Assembly and Scientific Symposium of the URSI*, Beijing, China, Aug. 2014.
- *Organizing Committee Member* of 3^{rd} International Workshop on Next Generation Green Wireless Networks (Next-GWiN), France, 2014.
- *Session Chair* of special session on Green Communication at IEEE ATC 2013, Ho Chi Minh, Vietnam, Oct. 2013.
- Awarded Graduate Scholarship for four years to pursue graduate studies at NTU, Singapore.
- *Best Paper Award* in the IET National Conference on Signal and Image Processing Applications, Pune, India.
- *Best Effort Award* for final year project in B.E. project competition.

Publications: Journals

13. R. Kumar, **S. J. Darak**, A. Yadav A. Sharma and R. Tripathi "Channel Selection for Secondary Users in Decentralized Network of Unknown Size," accepted in *IEEE Communications Letters*, July 2017.
12. H. Joshi, **S. J. Darak**, and Y. LOUET "Spectrum Blind Recovery and Application in Non-Uniform Sampling Based Automatic Modulation Classifier," accepted in *Circuits, Systems, and Signal Processing*, Oct. 2017.
11. **S. J. Darak**, Christophe Moy and Jacques Palicot,"Distributed Decision Making Policy for Frequency Band Selection Boosting RF Energy Harvesting Rate in Wireless Sensor Nodes," in *Wireless Networks (Springer)*, May 2017.
10. **S. J. Darak**, Honggang Zhang, Jacques Palicot and Christophe Moy,"Decision Making Policy for RF Energy Harvesting Enabled Cognitive Radios in Decentralized Wireless Networks," in *Digital Signal Processing (Elsevier)*, vol. 60, pp. 33-45, Jan. 2017.
9. R. Kumar, **S. J. Darak**, A. Sharma and R. Tripathi "Two-Stage Decision Making Policy for Opportunistic Spectrum Access and Validation on USRP Testbed," accepted in *Wireless Networks*, Nov. 2016.
8. **S. J. Darak**, Christophe Moy and Jacques Palicot "Proof-of-Concept System for Opportunistic Spectrum Access in Multi-user Decentralized Networks," accepted in *EAI Transactions on Cognitive Communications*, Sept. 2016.
7. A. Aggarwal, A. Singhal and **S. J. Darak**, "Clean and Green India: Is Solar Energy the Answer?," accepted in *IEEE Potential*, Sept. 2016.
6. **S. J. Darak**, Sumedh Dhabu, Christophe Moy, Honggang Zhang, Jacques Palicot and A. P. Vinod, "Low Complexity and Efficient Dynamic Spectrum Learning and Tunable Bandwidth Access for Heterogeneous Decentralized Cognitive Radio Networks," in *Digital Signal Processing (Elsevier)*, vol. 37, pp. 13-23, Feb. 2015.
5. **S. J. Darak**, Jacques Palicot, Honggang Zhang, Vinod A. Prasad and Christophe Moy , "ReconïňAgurable Filter Bank With Complete Control over Subband Bandwidths for Multi-standard Wireless Communication Receivers," in *IEEE Transactions on Very Large Scale Integration (VLSI) Systems*, vol. 23, no. 9, pp. 1772-1782, Sept. 2015.

4. **S. J. Darak**, A. P. Vinod, E. M-K. Lai, Honggang Zhang and Jacques Palicot, "Linear Phase VDF Design with Unabridged Bandwidth Control over the Nyquist Band," *IEEE Transactions on Circuits and Systems - II (TCAS-II)*, vol. 61, no. 6, pp. 428-432, April 2014.
3. **S. J. Darak**, A. P. Vinod, K. G. Smitha and E. M-K. Lai, "Low Complexity Reconfigurable Fast Filter Bank for Multi-Standard Wireless Receivers," *IEEE Transactions on Very Large Scale Integration (VLSI) Systems*, vol. 22, no. 5, pp. 1202-1206, July 2013.
2. **S. J. Darak**, A. P. Vinod, and E. M-K. Lai, "Efficient Implementation of Reconfigurable Warped Digital Filters with Variable Lowpass, Highpass, Bandpass and Bandstop Responses," *IEEE Transactions on Very Large Scale Integration (VLSI) Systems*, vol. 21, no. 6, pp. 1165-1169, June 2012.
1. **S. J. Darak**, A. P. Vinod, and E. M-K. Lai, "A Low Complexity Reconfigurable Non-uniform Filter Bank for Channelization in Multi-standard Wireless Communication Receivers," *Journal of Signal Processing Systems (Springer)*, vol. 68, no. 1, pp.95-111, July 2012.

Publications: Book Chapter

2. J. Gulati, B. Prakash and **S. J. Darak**, "An Efficient Timing and Clock Tree Aware Placement Flow with Multibit Flip-Flops for Power Reduction," in *VLSI Design and Test*, Brajesh Kumar Kaushik, Sudeb Dasgupta and Virendra Singh, Ed. Springer Singapore, Feb. 2018.
1. **S. J. Darak**, Amor Nafkha, Christophe Moy and Jacques Palicot, "Is Bayesian Multi-armed Bandit Algorithm Superior?: Proof-of-Concept for Opportunistic Spectrum Access in Decentralized Networks," in *Cognitive Radio Oriented Wireless Networks*, D. Noguet, K. Moessner and J. Palicot, Ed. Springer International Publishing, June 2016, pp. 104-115.

Publications: Demo

1. **S. J. Darak**, Navikkumar Modi, Amor Nafkha and Christophe Moy, "Spectrum Utilization and Reconfiguration Cost Comparison of Various Decision Making Policies for Opportunistic Spectrum Access Using Real Radio Signals," in 11^{th} *International Conference on Cognitive Radio Oriented Wireless Networks (CROWNCOM)*, Grenoble, France, May 2016. (**Best Demo Award**)

Publications: International Conferences, Workshops

37. R. Kumar, A. Yadav, **S. J. Darak** and M. Hanawal, "Trekking Based Distributed Algorithm for Opportunistic Spectrum Access in Infrastructure-less Network," in *16th International Symposium on Modeling and Optimization in Mobile, Ad Hoc and Wireless Networks (WiOpt 2018)*, China, May 2018. (**WiOpt'18 Student Grant**)
36. S. Sawant, M. Hanawal, **S. J. Darak** and R. Kumar, "Distributed Learning Algorithms for Coordination in a Cognitive Network in Presence of Jammers," in *16th International Symposium on Modeling and Optimization in Mobile, Ad Hoc and Wireless Networks (WiOpt 2018)*, China, May 2018.
35. Gyan Deep, **S. J. Darak** and P. Garg, "Spectral Parameter Approximation Based Tunable Digital Filters on Zynq SoC," in *IEEE International Symposium on Circuits and Systems (ISCAS)*, Italy, May 2018.
34. H. Joshi, R. Kumar, A. Yadav and **S. J. Darak**, "Distributed Algorithm for Dynamic Spectrum Access in Infrastructure-less Cognitive Radio Network," in *IEEE Wireless Communications and Networking Conference (WCNC)*, Spain, April 2018. (**2017 National Instruments (NI) Academic Research Grant**)
33. **S. J. Darak**, "Parallel Aggregated MAB Framework for Source Selection in Multi-Antenna RF Harvesting Circuit," in *IEEE Wireless Communications and Networking Conference (WCNC)*, Spain, April 2018.
32. P. Jain, V. Batra and **S. J. Darak**, "Improved Hierarchical Decision Making Policy for Reliable and Green Electricity Grid," in *10th International Conference on communication Systems & Networks (COMSNETS 2018)*, India, Jan. 2018.
31. N. Agrawal, **S. J. Darak** and F. Bader, "Reconfigurable Filtered OFDM Waveform for Next Generation Air-to-Ground Communications," in *IEEE/AIAA 36th Digital Avionics Systems Conference (DASC)*, Florida, USA, Sept. 2017. (**Second Best Paper Award**)

30. S. Garg, N. Agrawal, **S. J. Darak** and P. Sikka, "Spectral Coexistence of Candidate Waveforms and DME in Air-to-Ground Communications: Analysis via Hardware Software Co-Design on Zynq SoC," in *IEEE/AIAA 36th Digital Avionics Systems Conference (DASC)*, Florida, USA, Sept. 2017. (**IIIT-Delhi Best MTech Thesis Award 2017 (ECE)**)
29. N. Modi, P. Mary, C. Moy and **S. J. Darak**, "Proof-of-Concept: Spectrum and Energy Efficient Multi-User CR Network via Vacancy and Quality based Channel Selection," in *XXXII General Assembly and Scientific Symposium of the URSI*, pp. 1–4, Montreal, Canada, Aug. 2017.
28. H. Joshi and **S. J. Darak**, "Sub-Nyquist Sampling and Machine Learning based Online Automatic Modulation Classifier for Multi-carrier Waveform," in *XXXII General Assembly and Scientific Symposium of the URSI*, pp. 1–4, Montreal, Canada, Aug. 2017.
27. A. Unnam and **S. J. Darak**, "Bayesian Multi-Armed Bandit Framework for Multi-Band Auction Based Dynamic Spectrum Access in Multi-User Decentralized Networks," in *XXXII General Assembly and Scientific Symposium of the URSI*, pp. 1–4, Montreal, Canada, Aug. 2017. (**Young Scientist Paper Award and Conference Travel Grant**)
26. S. Kumar, V. A. Bohara and **S. J. Darak**, "Automatic Modulation Classification by Exploiting Cyclostationary Features in Wavelet Domain, " in 23^{rd} *National Conference on Communications (NCC)*, India, Mar. 2017.
25. S. Sharma, **S. J. Darak** and A. Srivastava, "Energy Saving in Heterogeneous Cellular Network via Transfer Reinforcement Learning Based Policy, " in 9^{th} *International Conference on COMmunication Systems & NETworkS (COMSNETS)*, India, Jan. 2017.
24. P. Kumar, **S. J. Darak** and Y. Yeleswarapu, "Performance Evaluation of Cumulant Feature Based Automatic Modulation Classifier on USRP Testbed, " in 9^{th} *International Conference on COMmunication Systems & NETworkS (COMSNETS)*, India, Jan. 2017.
23. R. Kumar, **S. J. Darak**, A. Sharma and R. Tripathi, "Two-Stage Decision Making Policy Using Bayesian Multi-armed Bandit Algorithm for Opportunistic Spectrum Access, " in *International conference on Big Data and Advanced Wireless technologies (BDAW)*, Bulgaria, Nov. 2016.
22. H. Joshi, **S. J. Darak** and Y. LOUET, "Testbed and Experimental Analysis of Automatic Modulation Classifier for Non-uniformly Sampled Signal, " in 10^{th} *IEEE International Conference on Advanced Networks and Telecommuncations Systems (ANTS)*, India, Nov. 2016.
21. S. Sharma, **S. J. Darak**, A. Srivastava and H. Zhang, "A Transfer Learning Framework for Energy Efficient Wi-Fi Networks and Performance Analysis Using Real Data," in 10^{th} *IEEE International Conference on Advanced Networks and Telecommuncations Systems (ANTS)*, India, Nov. 2016.
20. H. Joshi, **S. J. Darak** and Y. LOUET, "Blind and Adaptive Reconstruction Approach for Non-Uniformly Sampled Wideband Signal," in 5^{th} *IEEE International Conference on Advances in Computing, Communications and Informatics (ICACCI)*, India, Sept. 2016.
19. S. Kumar, V. A. Bohara and **S. J. Darak**, "Blind Symbol Rate Estimation by Exploiting Cyclostationary Features in Wavelet Domain," in 5^{th} *IEEE International Conference on Advances in Computing, Communications and Informatics (ICACCI)*, India, Sept. 2016.
18. **S. J. Darak**, Christophe Moy and Jacques Palicot, "Smart Decision Making Policy for Faster Harvesting From Ambient RF Sources in Wireless Sensor Nodes," in 13^{th} *IEEE International Symposium on Wireless Communication Systems (ISWCS)*, Poland, Sept. 2016.
17. S. Garg and **S. J. Darak**, "FPGA Implementation of High Speed Reconfigurable Filter Bank for Multi-standard Wireless Communication Receivers," in 20^{th} *IEEE VLSI Design and Test Symposium (VDAT-2016)*, India, May 2016.
16. P. Sharma, J. Gulati, K. Bharath, R. Anusha, P. Walia and **S. J. Darak**, "Quantification of figures of merit of 7T and 8T SRAM cell in sub-threshold region and their comparison with the conventional 6T SRAM cell," in 20^{th} *IEEE VLSI Design and Test Symposium (VDAT-2016)*, India, May 2016.
15. **S. J. Darak**, Christophe Moy and Jacques Palicot, "Bayesian Multi-Armed Bandit Based Decision Making Policy for RF Energy Harvesting Enabled Wireless Sensor Nodes," in *URSI-France Workshop on Energy and Radio Science*, Rennes, France, March 2016.

14. **S. J. Darak**, Honggang Zhang, Jacques Palicot and Christophe Moy, "Compute-Efficient Decision-Making Policy for D2D Communications and RF Energy Harvesting in Cognitive Radio Networks: Go Bayesian!," in 23^{rd} *European Signal Processing Conference (EUSIPCO)*, pp. 1–5, Nice, France, Aug. 2015.

13. **S. J. Darak**, Christophe Moy, Honggang Zhang and Jacques Palicot, "Dynamic Spectrum Access with Tunable Bandwidth for Multi-standard Cognitive Radio Receivers," in 38^{th} *International Conference on Telecommunications and Signal Processing*, pp. 1–5, Berlin, Germany, July 2015.

12. **S. J. Darak**, Honggang Zhang, Jacques Palicot and Christophe Moy, "Efficient Decentralized Dynamic Spectrum Learning and Access Scheme for Multi-standard Multi-user Cognitive Radio Networks," in 11^{th} *International Symposium on Wireless Communication Systems (IEEE ISWCS'2014)*, pp. 271–175, Barcelona, Spain, Aug. 2014.

11. Sumedh Dhabu, **S. J. Darak**, A. P. Vinod and Jacques Palicot, "Design of Low Complexity Variable Digital Filter with Large Cutoff Frequency Range based on Second Order Frequency Transformation and Interpolation," in *XXXI General Assembly and Scientific Symposium of the URSI*, pp. 1–4, Beijing, China, Aug. 2014. (**Young Scientist Paper Award**)

10. **S. J. Darak**, Xiguang Wu, Jacques Palicot and Honggang Zhang, "Linear Phase Filter Bank Design with Unabridged Control over Bandwidth and Center Frequency of Subbands," in *XXXI General Assembly and Scientific Symposium of the URSI*, pp. 1–4, Beijing, China, Aug. 2014.

9. Xiguang Wu, **S. J. Darak**, Pierre Leray, Jacques Palicot and Honggang Zhang, "Reconfiguration Management on FPGA Platform for Cognitive Radio," in *XXXI General Assembly and Scientific Symposium of the URSI*, pp. 1–4, Beijing, China, Aug. 2014. (**Travel Grant URSI-France**)

8. **S. J. Darak**, Honggang Zhang, Jacques Palicot and A. P. Vinod, "Efficient Spectrum Sensing for Green Cognitive Radio Using Low Complexity Reconfigurable Fast Filter Bank," *IEEE International Conference on Advanced Technologies for Communications*, pp. 318-322, Ho Chi Minh City, Vietnam, Oct. 2013. (**Invited Paper for Special Session on Green Communications**)

7. **S. J. Darak**, A. P. Vinod and E. M-K. Lai, "An Area and Power Efficient Two-Stage Parallel Spectrum Sensing Scheme for Cognitive Radios," *IEEE International Symposium on Communications and Information Technologies (ISCIT)*, pp. 263-267, Gold Coast, Australia, Oct. 2012.

6. **S. J. Darak**, A. P. Vinod and E. M-K. Lai, "Design of Variable Linear Phase FIR Filters Based on Second Order Frequency Transformations and Coefficient Decimation," *IEEE International Symposium on Circuits and Systems (ISCAS)*, pp. 3182-3185, Seoul, South Korea, May 2012.

5. **S. J. Darak**, A. P. Vinod and E. M-K. Lai, "Design of Variable Linear Phase FIR Filters Based on Second Order Frequency Transformations and Coefficient Decimation," 18^{th} *Electronics New Zealand Conference (ENZCON)*, Palmerston North, New Zealand, Nov. 2011.

4. **S. J. Darak**, A. P. Vinod and E. M-K. Lai, "A Low Complexity Spectrum Sensing Scheme for Estimating Frequency Band Edges in Multi-Standard Military Communication Receivers," *International Conference on Communication, Science and Information Engineering (CCSIE)*, London, ISBN: 978-0-9556254, July 2011, in print.

3. **S. J. Darak**, A. P. Vinod and E. M-K. Lai, "A New Variable Digital Filter Design Based on Fractional Delay," *IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, pp. 1629-1632, Prague, Czech Republic, May 2011.

2. **S. J. Darak**, R. Mahesh, A. P. Vinod and E. M-K. Lai, "A Reconfigurable Filter Bank for Uniform and Non-uniform Channelization in Multi-Standard Wireless Communication Receivers," 17^{th} *IEEE International Conference on Telecommunications (ICT)*, pp. 951-956, Doha, Qatar, May 2010.

1. H. M. Rode, A. S. Chiddarwar and **S. J. Darak**, "Suitability of FPGA for Computationally Intensive Image Processing Algorithms," 17^{th} *IET seminar digest*, 2009. (**Best Paper Award**)

Talks

9. Invited talk at JIIT Noida (April 2017)
8. Invited speaker for FDPs at NIT Patna (Dec. 2016) and AIACTR, Delhi (Mar. 2017)
7. Career in Research, National Institute of Technology, Delhi, India, Sept. 2015.
6. Design of Linear Phase Reconfigurable Filter Banks For Multi-Standard Wireless Communication Radios, Telecom Commission, Supélec, Paris, France, Oct. 2013.
5. Design of Low Complexity Linear Phase Reconfigurable Filter Banks, Supélec, Rennes, France, May 2013.
4. A Wireless Body Sensor Network Based Ubiquitous Health and Safety Monitoring System for Marine Industry Workers, Workplace Safety and Health Institute, Singapore, Nov. 2012.
3. Design of Low Complexity Variable Digital Filters and Reconfigurable Filter Banks for Multi-Standard Wireless Communication Receivers, EADS Innovation Works, Singapore, Nov. 2012.
2. Efficient Implementation of Reconfigurable Warped Digital Filters With Variable Lowpass, Highpass, Bandpass And Bandstop Responses, Graduate Students Workshop organized by IEEE CAS society, Singapore, Sep. 2012.
1. Low Complexity Linear Phase Variable Digital Filters and Filter Banks For Wireless Communication Receivers, School of Engineering and Advanced Technology, Massey University, New Zealand, Oct. 2011.

Teaching

- Embedded Logic Design (Second year BTech)
- Digital Circuits (First year BTech)
- Digital Hardware Design (Senior BTech, MTech and PhD students)
- Green ICT (Senior BTech, MTech and PhD students)
- Algorithms to Architecture (Senior BTech, MTech and PhD students)

Teaching

- Digital Circuits (First year BTech)
- Embedded Logic Design (Second year BTech)
- Digital Hardware Design (Senior BTech, MTech and PhD students)
- Green ICT (Senior BTech, MTech and PhD students)
- Algorithms to Architecture (Senior BTech, MTech and PhD students)

Institute Service

- Mentor for credit based online courses
- Mentor for online exam assessment portal
- Member of community work committee, library committee and lab committee
- Organized NGO fair at IIIT-Delhi in which more than 20 NGO participated
- Organized various workshops on FPGAs and SDRs

References

Available on Request