Pedram Kheirkhah Sangdeh

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SUMMARY

- I am a Ph.D. student skilled in wireless networking, signal processing, and information theory. My main focuses are performance analysis, design, and implementation of innovative protocols for 5G and beyond. I published 9 research papers in INFOCOM, IET Information Security, IEEE Transactions on Communications, etc. My achievements include a paper featured as the best student paper in CS at ICEE 2015 and prototyping two real-time solutions for blind spectrum sharing and coexistence of WiFi and LTE systems. As a fellowship award recipient at the University of Louisville, I am currently working on two projects funded by NSF, CNS-1846105 and CNS-1717840.

TECHNICAL SKILLS

- **Core skills**: Wireless Networking, Signal Processing, Machine Learning, Information Theory, Coding and Communication Theory, Physical Layer Secrecy, Vehicular Communication (DSRC-IEEE 802.11p), 5G NR, LTE, and WLANs (IEEE 802.11 a/b/g/n/ac/ax).
- **Platforms and libraries**: GNU Radio, MATLAB, POWDER-RENEW, srsLTE, TI's mmWave studio, Python, TensorFlow, PyTorch, Keras, SciPy, NumPy, CVX, CVXOPT, Matplotlib, and OrCAD.
- **Equipment**: USRP N210/X310, AWR1642 mmWave radar, 60GHz RF frontends, octoclock-g cda-2990.
- **General platforms**: HTML, OriginLab, Edraw Max, Visio, and LaTeX.

EXPERIENCE

- **Digital Wireless Communications Lab, Louisville, KY** *(Aug. 2017 - Present)*
  PhD Research Fellow,
  - ***Blind spectrum sharing***: Design and prototyping an OFDM-based system which is able to stealthily coexist with other CoTs and custom-built devices. See Demo
  - ***EE-IoT***: Design and expremination of an energy-efficient protocol enabling a WiFi access point to simultaneously serve several IoT sensors. IoT devices use a low ADC sampling rate and conserve energy.
  - ***NOMA for WLANs***: Design and implementation of a holistic framework, including channel sounding, frame structure, precoder optimization, and user scheduling, to enable NOMA in indoor WLANs.
  - ***D2D-COM***: A novel interference management technique to enhance spectral efficiency of cellular networks. The scheme enables concurrent device-to-device (D2D) and cellular 5G NR communications.
  - ***Transparent CRN***: Design and implementation of an underlay CRN scheme in which secondary users employs a set of spatial filters to re-utilize spectrum in presence of unknown primary technology.
  - ***Distributed MIMO***: Implementation of a scheme for decoding asynchronous uplink packets from independent users to distributed access points (AP with unsynchronized and distributed antennas).
  - ***TCCI***: Design and implementation of a new scheme leveraging access points' antennas for co-channel interference management without any cooperation among multiple closely deployed WLAN APs.
  - ***WiFi-LTE Coexistence***: A new design enables LTE-WiFi coexistence in the same spectrum. See Demo
  - ***ML-aided NB-IoT***: Our current project aims at bringing both massive-connectivity and low-latency communications for narrow-band IoT devises with a BS employs machine learning for NOMA.
  - ***Other Hands-On Experiences***: Operating lab-scale networks with USRPs, clocks, and switches using UHD and GNU Radio. Operating city-scale networks using POWDER-RENEW platform. Designing out-of-tree modules in GNU Radio. Shell scripting to integrate multiple off-line processing.
- **K. N. Toosi Center of Research and Technology (CreaTech)** *(Sep. 2015 - Jan. 2017)*
  Phd Researcher in Physical Layer Secrecy,
  - ***Networks with alternating CSI***: Research on fundamental secrecy limits (SDoF) of X-channels, interference channels, and relay channels with synergistic channel state information.
- **Information Systems and Security LAB (ISSL)** *(Feb. 2011 - Sep. 2014)*
  Research Assistance,
  - ***Fault-Tolerant Networking***: Design an energy-efficient and scalable algorithm for diagnosing faulty or malicious nodes, efficient routing, early-stop agreements, and message recovery.

- **Karaj Telecommunication Research Center (ITRC)** *(Jun. 2010 - Aug. 2010)*
  Intern
  - Experience with LTE, LTE-A, WCDMA, GSM, mobility management, and network performance.
  - Tuning and optimize performance for transceivers, power amplifiers, filter units, RF modules.

PUBLICATIONS

1. **P. K. Sangdeh**, H. Pirayesh, A. Quadri, and H. Zeng, "A Practical Spectrum Sharing Scheme for Cognitive Radio Networks: Design and Experiments," *submitted to IEEE/ACM Transaction on Networking*.
2. **P. K. Sangdeh**, H. Pirayesh, Q. Yan, K. Zeng, W. Lou, and H. Zeng, "A Downlink NOMA Scheme for Wireless LANs," *Accepted at IEEE Transactions on Communication*.
3. **P. K. Sangdeh**, H. Pirayesh, H. Zeng and H. Li, "A Practical Underlay Spectrum Sharing Scheme for Cognitive Radio Networks," IEEE INFOCOM 2019, Paris, France, 2019, pp. 2521-2529.
4. H. Pirayesh, **P. K. Sangdeh**, and H. Zeng, "EE-IoT: An Energy-Efficient IoT Communication Scheme for WLANs," IEEE INFOCOM 2019, Paris, France, 2019, pp. 361-369.
5. **P.K. Sangdeh** and H. Zeng, "Overview of Multiplexing Techniques in Wireless Networks," In *Multiplexing*, S. Mohammady, London, UK: IntechOpen, 2019, pp. 1-15.
6. B. Barari, **P. K. Sangdeh** and B. Akhbari, "Secure degrees of freedom of two-user X-channel with synergistic alternating channel state information," in *IET Information Security*, vol. 13, no. 1, pp. 54-60, 2019.
7. B. Barari, **P. K. Sangdeh** and B. Akhbari, "Secure Degrees of Freedom of two-user two-hop X-channel," In *proceeding of the 27th ICEE*, 2017, pp. 1911-1916.
8. **P. K. Sangdeh**, M. Mirmohseni and F. Poursabzi, "Applying the Byzantine Agreement in Wireless Sensor Networks based on clustering," In *proceeding of the 23rd ICEE*, 2015, pp. 619-624.
9. **P. K. Sangdeh**, M. Mirmohseni and M. A. Akhaee, "Blind interference alignment for three-user multi-hop SISO interference channel," *6th International Congress on Ultra Modern Telecommunications and Control Systems and Workshops*, St. Petersburg, 2014, pp. 462-467.
10. **P. K. Sangdeh**, M. Mirmohseni and M. A. Akhaee, "Interference alignment for two-user two-hop interference X-channel with delayed and No CSIT," In *6th International Congress on Ultra Modern Telecommunications and Control Systems and Workshops*, St. Petersburg, 2014, pp. 473-479.

PROFESSIONAL ACTIVITIES

- **Technical Program Committee**
  - International Conference on Computers, Data Management and Technology Applications, Egypt, 2017.
  - Global Summit on Computer and Information Technology, Tunisia, Jul. 2016.
  - IEEE International Circuits and Systems Symposium, Malaysia, Sept. 2015.
  - International Conference on Signal Processing and Data Mining, Turkey, Jul. 2015.
- **Reviewer**
  - ***Journals***: IEEE Trans. Circuits Syst., IEEE Syst. J., IEEE Commun. Lett., KSII Trans. Internet Inf. Syst.
  - ***Conferences***: IEEE GLOBECOM, IEEE WCNC, IEEE ICC
- **Teaching**
  - MATLAB Programming (Fall 2019)
  - Probability and Statistics (Fall 2013)

HONORS & AWARDS

- Best student paper award for "Applying the Byzantine Agreement in Wireless Sensor Networks based on clustering" in ICEE 2015.
- Fellow of J. B. Speed School of Engineering at the University of Louisville.
- Ranked 67th among more than 270,000 participants in the nationwide entrance examination of Iranian universities, July 2006.

EDUCATION

Ph.D. in Electrical and Computer Engineering	*University of Louisville*	2017 - Present
MS in Electrical and Computer Engineering	*University of Tehran*	2011 - 2014
BS in in Electrical and Computer Engineering	*University of Science and Technology*	2006 - 2011

REFERENCES

- Dr. Huacheng Zeng, ECE Assistant Professor, huacheng.zeng@louisville.edu
- Dr. Mahtab Mirmohseni, ECE Assistant Professor, mirmohseni@sharif.edu
- Dr. Hongxiang Li, ECE Associate Professor, h.li@louisville.edu