

Kunal Sankhe

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Education

- **Northeastern University** Boston, USA
PhD in Electrical Engineering (CGPA: 3.89/4.0) Sep 2016-Present
– **Advisor:** Prof. Kaushik Roy Chowdhury
- **International Institute of Information Technology** Hyderabad, India
MS by Research, Electronics & Communication Engineering (CGPA: 9.8/10) Aug 2013-Jul 2016
– **Advisor:** Prof. Garimella Rama Murthy
- **University of Mumbai** Mumbai, India
BE, Electronics & Telecommunication Engineering (70.34%) Jul 2007-May 2011

Work Experience

- **Northeastern University** Boston, USA
Research Assistant Sep 2016 - Present
- **Intel Labs** Hillsboro, USA
Research Intern Aug 2018 - Dec 2018
- **Signal Processing and Communication Research Center, IIIT-H** Hyderabad, India
Research Assistant Aug 2013 - Jul 2016
- **Tata Consultancy Services** Mumbai, India
Assistant System Engineer 2011 - 2013

Publications

- K. Sankhe, F. Restuccia, S. DOro, T. Jian, Z. Wang, A. Al-Shawabka, J. Dy, T. Melodia, S. Ioannidis, and K. R. Chowdhury, "Impairment Shift Keying: Covert Signaling by Deep Learning of Controlled Radio Imperfections", **IEEE MILCOM'19**, Virginia, USA, accepted.
- N. Soltani, K. Sankhe, D. Jaisinghani, S. Ioannidis, and K. R. Chowdhury, "SpectrumAwareness at the Edge: Modulation Classification using Smartphones", **IEEE DySpan'19**, New Jersey, USA, accepted.
- R. Balakrishnan, K. Sankhe, V. Somayazulu, R. Vannithamby, J. Sydir, "Deep Reinforcement Learning based Traffic- and Channel-aware OFDMA Resource Allocation", **IEEE GLOBECOM'19**, Hawaii, USA, accepted.
- K. Sankhe, M. Belgiovine, F. Zhou, S. Riyaz, S. Ioannidis, and K. R. Chowdhury, "ORACLE: Optimized Radio Classification through Convolutional neural Networks", **IEEE INFOCOM'19**, Paris, France, May 2019.
- S. Riyaz, K. Sankhe, S. Ioannidis, and K. R. Chowdhury, "Deep Learning Convolutional Neural Networks for Radio Identification", **IEEE Communications Magazine**, vol.56, no. 9 Sept. 2018.
- A. S. Cacciapuoti, K. Sankhe, M. Caleffi, and K. R. Chowdhury, "Beyond 5G: THz-based Medium Access Protocol for Mobile Heterogeneous Networks", **IEEE Communications Magazine**, vol. 56, no. 6, Jun. 2018.

- K. Sankhe, U. Muncuk, M. Y. Naderi, and K. R. Chowdhury, “Talking When No One is Listening: Piggybacking City-scale IoT Control Signals Over LTE”, **IEEE INFOCOM’18**, Hawaii, USA, Apr. 2018.
- F. Zhou, M. Y. Naderi, K. Sankhe, and K. R. Chowdhury, “Making the Right Connections: Multi-AP Association and Flow Control in 60GHz Band”, **IEEE INFOCOM’18**, Hawaii, USA, Apr. 2018..
- K. Sankhe, S. Chaudhari, and G. Ramamurthy, “Distributed Spatial Modulation with Dynamic Frequency Allocation”, **Physical Communication (Elsevier)**, vol. 23, pp. 65-75, Jun. 2017.
- K. Sankhe, C. Pradhan, S. Kumar, and G. Ramamurthy, “Machine Learning Based Cooperative Relay Selection in Virtual MIMO”, **IEEE WTS’15**, New York, USA, Apr. 2015.
- K. Sankhe, C. Pradhan, S. Kumar, and G. Ramamurthy, “Cost Effective Restoration of Wireless Connectivity in Disaster Hit Areas using OpenBTS”, **IEEE INDICON 2014**.

Projects

- **Deep reinforcement learning based OFDMA resource allocation:** Developed a deep RL based framework that allocates time and frequency resources in OFDMA wireless systems to optimize different objective functions using per-user channel quality and traffic information as inputs.
- **Radio Identification using Convolution Neural Network:** Implemented a convolutional neural network (CNN) that detects a unique radio from a large pool of bit-similar devices (same hardware, protocol, physical address, MAC ID) using only IQ samples at the physical layer. A CNN is implemented in Keras running on top of TensorFlow, achieving 99% classification accuracy for a 16-node USRP X310 SDR testbed and an external database of > 100 COTS WiFi devices. Also, demonstrated a principled method of intentionally introducing controlled imperfections on the transmitter side through software directives to increase differentiability for the CNN classifier for time-varying wireless channels
- **Software-defined Wireless Charging using Distributed Beamforming:** Developed a prototype of wireless charging system, which uses distributed energy beamforming algorithm implemented in software defined radios. It allows multiple uncoordinated energy transmitters (USRPs B210) to self adjust their transmission so that the net energy transfer to the target receiver is constructive.
- **Performance measurement of multi-cell/AP networks in Wi-Fi and LTE:** Simulated Wi-Fi and LTE network in Network Simulator (NS-3). Analyzed and studied the network performances in terms of user mobility and density of users.
- **Development of a Testbed for GSM Base Transceiver Station:** Implemented GSM Base Transceiver Station using USRP N210, GNU Radio 3.7 and OpenBTS. After configuring OpenBTS, Asterisk and sqlite3 on a host PC, real time voice and data (SMS) connectivity was tested using standard GSM handsets.

Workshops and Participations

- Attended Joint Telematics Group (JTG) Summer School 2015 on Signal Processing, Communications and Networks.
- Attended Microsoft Research India Summer School 2014 on Wireless Networking.
- Microsoft Hackathon Code.fun.do: Awarded certificate of achievement in Finalist Forum (three month contest). Developed a Windows Phone 8 application Internet Radio which provides summarized audio news at user specified time.
- Top contributor in Devthon, Hyderabad, India (theme: Safety)

Skills

Hardware: Universal Software Radio Peripheral (USRP) N210 and B210, Raspberry Pi, Arduino.

Programming and Scripting Languages: Python, C/C++, C#,

Development Tools: MATLAB, GNU Radio, Keras, TensorFlow

Advanced Courses

PhD (NEU): Wireless Communication, Mobile and Wireless Networking, Fundamentals of Computer Engineering

MS (IIIT-H): Advanced Computer Networks, Artificial Neural Network, Speech Signal Processing, Information Theory and Coding