

# RATNESH KUMBHKAR

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My professional interests lie in the field of physical and MAC layer algorithm development for the wireless system architecture.

## PROFESSIONAL EXPERIENCE

### WORK EXPERIENCE

**PRINCIPAL SYSTEMS DESIGN ENGINEER/** NXP Semiconductors, San Jose

**02/2018-Present**

- Design and implementation of physical layer calibration algorithms to correct the RF impairments such as IQ imbalance, filter response, etc. for the 802.11ax WiFi system.
- Design and implementation of algorithms to detect the radar signals for Dynamic Frequency Selection (DFS) for the WiFi system.
- Bring-up and tuning of the client and AP WiFi chipset developed by NXP.

**MEMBER (RESEARCH STAFF)/** Central Research Laboratory, BEL, Bangalore

**09/2009-05/2012**

- Involved in the development of routers and gateways using a generic FPGA (Altera) based platform using VHDL. Implemented various algorithms/protocols at network and data link layers for tactical router and gateway exchange.

### DOCTORAL RESEARCH

**GRADUATE ASSISTANT/** Wireless Information Network Laboratory (WINLAB), Rutgers University

**01/2013-12/2017**

#### **Dynamic spectrum access using Non Contiguous-OFDM (NC-OFDM)**

- Studied the dynamic spectrum access of fragmented spectrum using NC-OFDM and implemented the wireless system architecture design on software defined radios using GNURadio and C++ framework.
- Proposed an underlay control channel to support NC-OFDM transmissions in an ad-hoc wireless environment. Implemented the underlay control channel to find frequency and time offset of NC-OFDM transmission.
- Studied the low probability of exploitation (LPE) features of NC-OFDM transmissions. Results highlight physical layer security features of NC-OFDM transmission in a wireless environment.

#### **Coexistence study in 3.5 GHz band**

- Interference analysis for naval radar and LTE coexistence in Citizen Broadband Radio Service (CBRS) Band.
- Studied the impact of various parameters such as radar beam pattern, elevation angle and rotation speed on coexistence.
- Proposed power control algorithm and base station deployment strategies to support better coexistence.

#### **Network Coding in Heterogeneous environment**

- Studied the use of random linear network coding at the network layer when using multiple interfaces(WiFi and WiMAX) in a device.
- Conducted analysis for ad-hoc and infrastructure based networks. Performed simulations on MATLAB and experiments on the ORBIT testbed to evaluate the performance.

### INTERNSHIPS

**RESEARCH INTERN/** NEC Laboratories America Inc., Princeton, NJ

**05/2016-08/2016**

- Analyzed the fairness of the current WiFi-LTE coexistence mechanism specifically focusing on LTE-LAA (License assisted access). Studied the effect of introducing WiFi-awareness to these LTE-LAA devices. Performed simulations on NS-3.

**STUDENT INTERN/ AT&T Labs, Bedminster, NJ**

**06/2014-08/2014**

- Analyzed the effect of delay between remote radio unit (RRU) and baseband processing unit (BBU) in the overall performance of LTE for a Cloud-RAN architecture
- Published a patent titled "System and method for HARQ in cloud RAN with large front haul latency" based on the results of this study.

## SKILLS

**Programming Languages:** C, C++, Python (PyTorch, Numpy)

**Tools:** MATLAB, NS3, Octave, Git

**Software Radio Platforms:** GNURadio, NI LabView, WARP

**Languages:** Bilingual proficiency in English and Hindi, Intermediate Spanish and Bengali

## EDUCATION

**Ph.D. in Electrical Engineering**

**08/2012-12/2017**

Rutgers, The State University of New Jersey, New Brunswick

**M.Tech. in Electrical Engineering**

**07/2007-07/2009**

Indian Institute of Technology, Madras

**B.E. in Electronics and Telecommunication Engineering**

**09/2002-06/2006**

National Institute of Technology, Raipur

## COURSES

**Graduate courses** Communication theory, Wireless communication, Detection and estimation theory, Computers communication networks, Digital signal processing, Digital modulation and coding, Fiber optic communication technique, Image signal processing

**Undergraduate courses** Electromagnetic waves, Digital communication systems, Linear control theory, Data structure and algorithm

**Others** Machine learning (Coursera), Observation theory (edx)

## ACHIEVEMENTS

- Received 2018 ECE Graduate program academic achievement award for academic excellence in communications by Department of Electrical and Computer Engineering, Rutgers University.
- Part of the team from Rutgers University in partnership with IMEC of Belgium (an R&D and innovation hub in digital technologies) that won the 750K, 5th place prize at the DARPA Spectrum Collaboration Challenge
- Secured 107th Rank (top 0.2 percentile) in Graduate Aptitude Test in Engineering (GATE) 2007 in Electronics and Communication Engineering.
- Completed design of a low-cost router at Central Research Lab which was launched into production at Bharat Electronics LTD.
- Received NSF Student Travel Grant for DySPAN 2015 in Stockholm, Sweden.
- Received NSF Student Travel Grant for DySPAN 2017 in Baltimore, USA.