Cognitive Radio and Wireless Communications – Theory, Practice and Security

Overview

Cognitive radio (CR) based systems and networks are a revolutionary new concept in wireless communications. Such systems are built on the novel software defined radio (SDR) architecture and have powerful signal processing capabilities to sense spectrum underutilization or spectral holes. The cognitive abilities in the embedded processors emulate the human brain by continuously analyzing the radio scene through an aggregation of external radio stimuli provided by the end devices. These networks can thus dynamically allocate spectrum to multiple users thereby easing network congestion. Coupled together with cutting edge wireless technologies such as OFDM, they can meet the growing wireless broadband demands of billions of users worldwide by efficiently utilizing spectrum resources in wireless networks, which are scarce and expensive.

CR is a paradigm shift in wireless communications and requires a complete redesign of each layer. In this course we will comprehensively cover several different aspects of CR systems and networks starting from a basic introduction to modern wireless networks and OFDM based Physical Layer (PHY) design. The subsequent module will provide an elaborate introduction to the CR concept and SDR transceivers. Following sessions will further specialize in several CR aspects such as Spectrum Sensing, OFDM Based CR, Optimization, Game Theory, and Dynamic Spectrum Allocation amongst others and will include a treatment of results in cutting edge research on CR. Further, another key issue in cognitive radio networks is that of cybersecurity, where the operation of such nodes may be compromised by internal adversaries also termed “Byzantines”. Thus, secure transmission and processing strategies play an important role in cognitive radio networks. This course will also focus on several topics towards ensuring reliability in CR.

Modules	**Cognitive Radio & Wireless Communications : September 1 – September 10** **Number of participants for the course will be limited to Seventy Five.**
You Should Attend If…	▪ You are a **Ph.D. student** or **faculty member** from an engineering college/ private university/ academic institution doing research on cognitive radio systems and other aspects of cognitive radio such as spectrum sensing, game theory, estimation and detection. ▪ You are a **B.Tech** or **M.Tech** student interested in learning about applications of cognitive radios and impact of cognitive radios on future communications. ▪ You are an **electronics engineer** or **scientist** interested in designing cognitive radios and performing research in cognitive radio.
Fees	The participation fees for taking the course is as follows: **Participants from abroad : US $500** **Undergraduate B.Tech/B.E. Students from Engineering Colleges: Rs 7,500** **Postgraduate M.Tech/M.E./Ph.D. Students from Engineering Colleges: Rs 7,500** **Faculty of Engineering Colleges/ Universities: Rs 8,500** **Industry Professionals/Personnel from R & D Organisations: Rs 8,500** The above fee include all instructional materials, course notes, Conference kit containing stationery items, Course participation certificate, 24 hr free internet facility. The participants will be provided with accommodation on payment basis.

The Faculty

Prof. Pramod K. Varshney received the B.S. degree in electrical engineering and computer science (with highest honors), and the M.S. and Ph.D. degrees in electrical engineering from the University of Illinois at Urbana-Champaign in 1972, 1974, and 1976 respectively. Since 1976 he has been with Syracuse University, Syracuse, NY where he is currently a Distinguished Professor of Electrical Engineering and Computer Science and the Director of CASE: Center for Advanced Systems and Engineering. His current research interests are in distributed sensor networks and data fusion, detection and estimation theory, wireless communications, physical layer security, image processing, and radar. He has published extensively. He was elected to the grade of Fellow of the IEEE in 1997 for his contributions in the area of distributed detection and data fusion. In 2000, he received the Third Millennium Medal from the IEEE and Chancellor's Citation for exceptional academic achievement at Syracuse University. He is the recipient of the IEEE 2012 Judith A. Resnik Award. He received an honorary doctor of Engineering degree from Drexel University in 2014. He is on the editorial boards of Journal on Advances in Information Fusion and IEEE SP Magazine. He was the President of International Society of Information Fusion during 2001.

Prof. Aditya K. Jagannatham received his Bachelors degree from the Indian Institute of Technology, Bombay and M.S. and Ph.D. degrees from the University of California, San Diego, U.S.A.. From April '07 to May '09 he was employed as a senior wireless systems engineer at Qualcomm Inc., San Diego, California. His research interests are in the area of wireless communications, wireless 3G/4G cellular standards, and CDMA/OFDM/MIMO wireless technologies. In 2009 he received the Upendra Patel Achievement Award for his efforts towards developing HSDPA/HSUPA/HSPA+ WCDMA technologies at Qualcomm. He is currently an Associate Professor in the Electrical Engineering department at IIT Kanpur. He has been awarded the P.K. Kelkar Young Faculty Research Fellowship (June 2012 to May 2015 and June 2015 to May 2018) for excellence in research. His popular video lectures for the NPTEL (National Prgramme on Technology Enhanced Learning) course on Advanced 3G and 4G Wireless Mobile Communications can found at the following YouTube link (NPTEL 3G/4G).

Course Co-ordinator

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