

# Cognitive Radio and Adaptive Wireless Communication Systems

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Tutorial

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Today's wireless services have come a long way since the rollout of the conventional voice-centric cellular systems. The demand for wireless access in voice and high data rate multi-media applications has been increasing. New generation wireless communication systems are aimed at accommodating this demand through better resource management and improved transmission technologies. The interest in increasing the Spectrum Access and improving the Spectrum Efficiency combined with both the introduction of Software Defined Radios and the realization of the idea that machine learning can be applied to radios has created new intriguing possibilities for wireless radio researchers. In this tutorial, we will discuss the cognitive radio, software defined radio, and adaptive radio concepts from several aspects. Cognitive radio and cognitive networks are investigated from a broad aspect of wireless communication system enhancement while giving special emphasis on better spectrum utilization. The scope will include the following:

Application of SDR in advanced communication systems

Adaptive wireless communication systems

Parameter estimation for adaptation of wireless communication systems (learning environment and other factors)

Spectrum efficiency and soft spectrum usage

Multi-dimensional spectrum awareness

Applications of cognitive radio (specifically for public safety)

Femto-cells and relation to cognitive radio

Cognitive OFDM(A)

Spectrum, network, context, environment, location awareness

Blind receiver design

Interference awareness

Signal analysis, signal awareness

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