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Each "Reader's Choice" column focuses on a different publication of the IEEE Signal Processing Society. In this issue of *IEEE Signal Processing Magazine*, we highlight articles in *IEEE Transactions on Cognitive Communications and Networking* (*T-CCN*).

T-CCN is committed to the timely publishing of high-quality manuscripts that advance the state of the art of cognitive communications and networking research. The focus of the transactions will be on "cognitive" behaviors in all aspects of communications and network control, from the physical layer (PHY) functions (including hardware) through to the applications (including architecture); and in all kinds of communication networks and systems regardless of type of traffic, transmission media, operating environment, or capabilities of communicating devices. Topics of interest include machine learning and artificial intelligence for communications and networking; distributed learning, reasoning, and optimization for communications and networking; architecture, protocols, cross layer, and cognition cycle design for intelligent communications and networking; information/communications theory and network science for intelligent communications and networking; ontologies, languages, and knowledge representation for intelligent communications and networking; security and privacy issues in intelligent communications and networking; cognitive radio and dynamic spectrum access; cognitive technologies supporting software-defined radios, systems, and networks; and emerging services and applications enabled by intelligent communications and networks.

This issue's "Reader's Choice" column lists the 10 *T-CCN* articles most downloaded from January 2018 to June 2020. Your suggestions and comments are welcome and should be sent to Associate Editor H. Vicky Zhao (vzhao@tsinghua.edu.cn).

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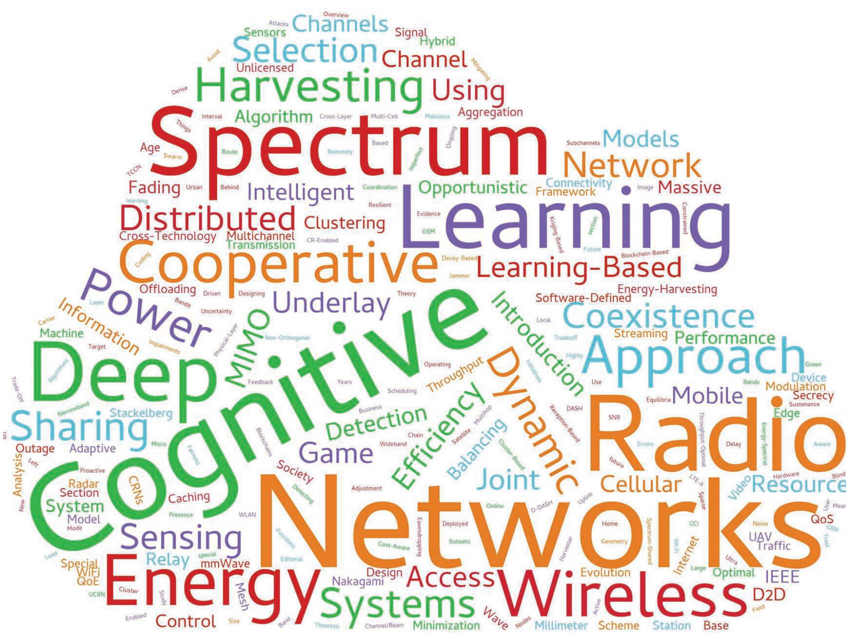
An Introduction to Deep Learning for the Physical Layer

O'Shea, T.; Hoydis, J.

This article presents several novel applications of deep learning (DL) for the PHY. A communication system is interpreted as an autoencoder, and the communication system design is modeled as an end-to-end reconstruction task that jointly optimizes transmitter and receiver components in a single process. The idea is then extended to an adversarial network of multiple transmitter–receiver pairs competing for capacity, and the concept of radio transformer networks is introduced to integrate expert knowledge in the DL



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model. The use of convolutional neural networks on complex-valued in-phase and in-quadrature samples for modulation classification is proposed.

2017

A Very Brief Introduction to Machine Learning With Applications to Communication Systems

Simeone, O.

This tutorial article provides a very brief introduction to key concepts in machine learning and the literature on machine learning for communication systems. It highlights conditions under which the use of machine learning is justified in engineering problems. Then, for both supervised and unsupervised learning, exemplifying applications to communication networks is discussed by distinguishing among tasks carried out at the edge and cloud segments of the network at different layers of the protocol stack, with an emphasis on the PHY.

2018

Deep Reinforcement Learning for Dynamic Multichannel Access in Wireless Networks

Wang, S.; Liu, H.; Gomes, P.H.; Krishnamachari, B.

This work considers a dynamic multichannel access problem, aiming to find a policy that maximizes the expected long-term number of successful transmissions. The problem is formulated as a partially observable Markov decision process with unknown system dynamics. A deep Q-network is implemented to efficiently find the near-optimal channel access policy from historical observations without the knowledge of system dynamics. An adaptive deep Q-network approach is also proposed to adapt its learning in time-varying scenarios.

2018

Online Learning for Offloading and Autoscaling in Energy Harvesting Mobile Edge Computing

Xu, J.; Chen, L.; Ren, S.

An efficient reinforcement learning-based resource management algorithm is proposed to address the challenge of incorporating renewable energy into mobile edge computing. It learns on the fly the optimal policy of dynamic workload offloading and edge-server provisioning to minimize the long-term system cost, including service delay and operational cost. The proposed algorithm uses a decomposition of the offline value iteration and online reinforcement learning to improve the learning rate and the run-time performance, and it is proven to converge.

2017

Deep Learning Models for Wireless Signal Classification With Distributed Low-Cost Spectrum Sensors

Rajendran, S.; Meert, W.; Giustiniano, D.; Lenders, V.; Pollin, S.

This article studies the modulation-classification problem for distributed wireless spectrum-sensing networks and proposes a long short-term memory-based automatic modulation-classification model. The proposed model can learn good representations of variable-length time-domain sequences. To decrease the implementation cost, it studies the feasibility of classification using averaged-magnitude spectrum data and online classification on the low-cost spectrum sensors. Quantized versions of the proposed models are also analyzed for sensor deployment.

2018

Kriging-Based Interference Power Constraint: Integrated Design of the Radio Environment Map and Transmission Power

Sato, K.; Fujii, T.

This article proposes a probabilistic interference-constraint method with a radio environment map (REM) for spatial spectrum sharing. The REM stores the spatial distribution of the average received signal power, and Kriging interpolation optimizes the accuracy of the measurement-based REM. The proposed method predicts the estimation error distribution using the Kriging variance and then estimates the maximum allowable interference power at the primary user. A suitable transmission power for the interference sources is then designed by combining the allowable interference power with the interference channel distribution.

2017

Hybrid Spectrum Sharing in mmWave Cellular Networks

Rebato, M.; Boccardi, F.; Mezzavilla, M.; Rangan, S.; Zorzi, M.

A new hybrid spectrum-access scheme for millimeter-wave (mm Wave) networks is proposed, where data packets are scheduled through two mm Wave carriers

(continued on page 191)

cyberphysical systems, signal and image processing, computer vision, media security, and communications. He is a Fellow of IEEE.

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SP

READER'S CHOICE *(continued from page 6)*

with different characteristics. The proposed scheme combines a lower mm Wave band with exclusive access and a higher mm Wave band where spectrum is pooled between multiple operators. It is shown that, compared to traditional fully licensed or fully pooled spectrum-access schemes, this approach offers increased throughput and spectral efficiency as well as higher fairness.

2017

Radar-Communications Convergence: Coexistence, Cooperation, and Co-Design

Chiriyath, A.R.; Paul, B.; Bliss, D.W.

This article studies the problem of radar communications coexistence and describes the challenges in achieving radar-communications radio-frequency (RF) convergence. The RF convergence problem is formulated as a joint information problem, and the estimation rate is introduced as a novel parameterization of radar performance. The meaning and interpretation of the estimation rate are discussed. Then, results for several joint radar-communications information bounds and their accompanying weighted spectral-efficiency measures are presented.

2017

D-DASH: A Deep Q-Learning Framework for DASH Video Streaming

Gadaleta, M.; Chiariotti, F.; Rossi, M.; Zanella, A.

This article presents D-DASH, a framework that combines DL and reinforcement learning techniques to optimize the quality of experience of the dynamic adaptive streaming over HTTP (DASH) standard. Different learning architectures are proposed and assessed, combining feedforward and recurrent deep neural networks with advanced strategies. D-DASH designs are thoroughly evaluated against prominent algorithms from the state of the art using performance indicators such as image quality across video segments and freezing/rebuffering events.

2017

An Overview of Dynamic Spectrum Sharing: Ongoing Initiatives, Challenges, and a Roadmap for Future Research

Bhattarai, S.; Park, J.-M.J.; Gao, B.; Bian, K.; Lehr, W.

This article considers the global paradigm shift to more flexible, dynamic, market-based ways to manage and share radio spectrum resources. It provides a comprehensive review of important trends, regulatory reform initiatives, and research challenges that are a part of the ongoing systematic efforts toward dynamic shared spectrum. It focuses on current efforts to implement database-driven approaches to manage sharing among multiple classes of users with heterogeneous access rights and radio network technologies and discusses open research challenges.

2016

SP