Guest Editor's Introduction: Special Section on Artificial Intelligence in Consumer Electronics

Artificial Intelligence in Consumer Electronics

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Artificial intelligence (AI) has become a pillar of consumer electronics. Mobile devices, virtual personal assistants, distributed and wearable sensors, smart home appliances, and automotive electronics are among the many examples of products and services that are benefiting from recent developments in AI. Novel applications, functionalities, and use cases are emerging on an almost daily basis, and providing a comprehensive review within the space of a special issue would be a daunting endeavor. Machine learning currently dominates the AI landscape and this reflects in the submissions that we received, which were mostly related to machine learning and deep learning technologies. We believe that articles selected for this special section well represent emerging applications in sectors with high potential, such as the residential energy and robotic sectors.

In a truly symbiotic relationship, consumer electronics not only benefit from AI techniques, but at the same time provide the fuel (i.e., the data) that is powering the current surge of AI. Collecting large-scale, high-quality datasets is, thus, imperative for academia alike to propel scientific progress and maintain a competitive advantage. Learning from real-life data is still very challenging, due to the ample technical variations in consumer devices and sensors, lack of standardization, sampling biases, and need to ensure users' privacy. These issues are addressed by the five articles selected for this special section both from an application and implementation standpoint.

In "Getting More From Your Datasets With Data Augmentation and Deep Learning for Consumer Devices & Services" and "Learnable Data Augmentation – A Review of Advanced Strategies for Improved Training of Deep Neural Networks," Corcoran *et al.* address the important topic of data augmentation and how it can be exploited to train more robust and effective neural networks. Indeed, it is virtually impossible to collect large-scale datasets across the spectrum of sensors employed in consumer devices (e.g., smartphone cameras). The first article provides an eye-opening introduction to data augmentation, accompanied by a few practical examples, whereas the second article covers recent advances in smart data augmentation that allow developers to learn optimal policies for a given problem.

The article titled "Learning from Smart Home Data: Methods and Challenges of Data Acquisition and Analysis in Smart Home Solutions," by Antić *et al.*, presents a comprehensive overview of the challenges associated with applying

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machine learning in the smart home domain, from data collection and standardization to designing analytics solutions, and draws a path toward the development of context-aware, adaptive smart home solutions.

The article titled "AI Powered Home Electrical Appliances as Enabler of Demand Side Flexibility," by Ciabattoni *et al.*, provides important insights on how AI can be applied to the residential energy sector, including the chance for the consumers to play a more active role in energy flexibility programs.

We close this special section with the article titled "Development of a Mimic Robot: Learning from Demonstration Incorporating Object Detection and Multi-Action Recognition to Manipulate a Coffee Maker as an Example," by Hwang *et al.*: bypassing the need for low-level coding, learning from demonstration has the potential to make robotics accessible to unskilled users and, hence, opens new opportunities for low volume automation and the maker economy.

We would like to thank all the contributing authors for their excellent submissions, as well as the reviewers for their help and efforts.

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