Guest Editor's Introduction: Special Section on Machine Learning for End Consumers

Machine Learning for End Consumers

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Machine learning (ML) is a discipline that grew out of artificial intelligence (AI). At a minimum, an intelligent agent needs to perceive the environment around it, deliberate, and take the best course of actions to maximize some actual or estimated performance measures. ML was originally a trait of AI that concerned training intelligent agents to perform tasks that cannot be preprogrammed. ML has received much attention recently with advances in technologies that permeate many facets of our everyday lives, e.g., autonomous vehicles, lifelike chatbots, speech synthesis and recognition, intelligent web search, financial forecasting, personal healthcare, traffic navigation, and many other consumer applications. Key enablers that have propelled ML to the forefront of AI research include availability of vast volumes of data, algorithmic advancements that have enabled effective training of deep neural networks, and accessibility and affordability of powerful computing resources. Consequently, novel learning paradigms have been developed beyond the classical discriminative supervised, unsupervised, and semisupervised approaches. Notable novel learning paradigms include reinforcement learning, transfer learning, lifelong learning, generative adversarial learning, and more.

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Contemporary ML research goes well beyond training intelligent agents to perform tasks in unfamiliar environments. ML and data mining can be applied to construct predictive pattern-based models that demonstrate statistical power, as well as help us discover and understand hidden trends and patterns inherent in data. These hidden trends and patterns can be used to formulate actionable knowledge. Actionability is one of the most important measures of interestingness and analysts thrive to discover knowledge that they can act upon to their advantage. However, extracting actionable knowledge is considered one of the greatest challenges in modern studies. This special section aims to provide a comprehensive review on fundamentals as well as the current state-of-the-art in ML research and technologies. It is devoted to innovative consumer-oriented applications of ML techniques, and how these techniques become helpful in extracting actionable knowledge. Applications in this special section include healthcare and personal well-being, privacy and social issues, and imaging, all of which benefit end consumers. Therefore, this special section serves as a forum for researchers and practitioners to identify and implement ML approaches that address existing and impending real-world problems and opportunities and facilitates exchange of ideas on how these approaches are helping create actionable knowledge. These issues are addressed

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by the three articles selected for this special section from both application and implementation perspectives.

In "Juice Recipe Recommendation System Using Machine Learning in Mobile Edge Computing Environment," Juyong Lee and Jihoon Lee propose a smart recommendation system for providing user-specific recipe information based on mobile edge computing (MEC) and machine intelligence to facilitate secure user-specific health services. MEC is a new type of platform that provides computing capabilities within a wireless access network in close proximity to mobile users. While existing systems transfer users' health information to a remote cloud server for processing, the proposed system utilizes critical user information only within the local MEC server. It then transfers basic recipe information, without any user information, to the external cloud server. At the same time, their smart recipe recommendation system delegates the high computational burden to a MEC server.

Continuing the theme of preserving privacy in a personal healthcare setting is B. S. Vidyalakshmi and colleagues' article titled "Health Mentions on Twitter: A Case Study to Identify Privacy Leaks." The article provides an in-depth analysis of the health condition mentions in tweets using ML classifiers. Since health mentions can be used in different contexts, e.g., as a joke, in a news article link, or a genuine disclosure of health condition suffered by the user, it is important to understand the contexts of the tweets before analyzing them. The authors address this issue by categorizing the tweets based on context. The article describes experimentation involving several ML classifiers. The experiments show that a combined classifier is better than using the classifiers individually. A key finding is that each health mention has differing disclosure rates, affecting privacy leaks differently and peaking in disclosure rate at different time of the day. Another key finding is that personal privacy leaks and secondary privacy leaks are affected differently by each health mention.

The article titled "Optimizing Image Compression with Deep Super-Resolution Techniques" by Sébastien Hamis and colleagues introduces a low and very low bitrate image compression scheme. Their method combines a better portable graphics (BPG) codec with deep superresolution techniques, namely SRGAN (superresolution generative adversarial networks) and ESRGAN (enhanced superresolution generative adversarial networks). BPG format is well-suited for critical CE fields, such as IoT or consumer healthcare. When coupled with deep superresolution techniques, the scientific contribution to CE is far-reaching. Indeed, the authors' experimental results demonstrate the possibility of storing and transmitting images at low bitrate and resolution, while preserving the quality of the visual content. This means that there is further potential of this work to influence CE much more broadly. For example, the authors have identified an extension to adapt their method to perceptually driven models that can be applied to achieve very good results for automatic object recognition.

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

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