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EDITORIAL

Guest Editor's Note

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The term artificial intelligence (AI) was first coined by John McCarthy in 1955 to describe the area of Thinking Machines—machines capable of solving problems often reserved for humans. Since then there has been growing interest in research in the area and over the last decade it has created astonishing technologies which have revolutionized many industries. The transformative potential of AI in delivering technological solutions to complex industrial and societal problems is beginning to be recognized and have spurred governments around the globe to formulate national policies on AI. Progress in AI has been made possible by increase in computing power, availability of large volumes of data, and, most importantly, tremendous strides in understanding the theoretical underpinnings of AI. Machine learning (ML) is an important area of AI which deals with statistical and algorithmic aspects of learning from data.

This special issue is a compendium of review articles, solicited from leading researchers, who discuss contemporary problems that are at the crux of ML. Supervised learning, an important paradigm of ML, develops models which can predict a target value given an observation. This paradigm has attracted significant amount of research and has contributed to many successful technologies. However, in many situations it may be a very expensive proposition to find labelled data, especially when the number of observations is large. In Chum et al. (2019), an overview of weak supervision, an emerging alternative to supervised learning, is described. Weak supervision is useful, more so in computer vision, in many settings where labelled data are hard to obtain. Unsupervised learning is a classical area in ML that does not require labelled observations. Probabilistic models are often tools of choice in unsupervised learning. Sastry (2019) provides a tutorial discussion on the algorithmic details of learning Restricted Boltzmann Machines (RBMs), a probabilistic model inspired by statistical mechanics, is increasingly finding use in the unsupervised learning setting. With explosion of growth in data, the need for learning models from large datasets is an important area in ML. Netrapalli (2019) and Jain (2019) provide two related, but differing, perspectives in first-order optimization methods for learning models which would apply in the big data setting. There are powerful methods and models for learning problems defined on observations described by vectors. However, more research needs to be done for learning on other kinds of data such as graphs, or sequences. Kumar et al. (2019) study centrality in multi-layer networks and Sarawagi (2019) provides an algorithm for segmenting sequences using semi-Markov models.

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