Special Issue: Advances in Architectures and Theories for Computer Vision

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Computer Vision has been revolutionized by deep learning, and it is not surprising that the overwhelming majority of our selected papers make extensive use of neural networks. This special issue focuses on advances in architectures and theories for computer vision. Often the contribution is a new architecture that is better suited to a particular vision task (e.g. Law and Deng 2019, Veit and Belongie 2019, Esteves et al. 2019) or the definition of a new visual task that can be tackled with this powerful tool (Harwath et al. 2019, Pumarola et al. 2019). The flow of ideas between Computer Vision and Deep Learning continues to be bidirectional, and one of the selected papers defines a new learning procedure that may prove to be useful beyond computer vision (Wu and He 2019). Over the last decade, the field of visual recognition has made the most use of machine learning methods, while geometry and reconstruction have mostly been less data-driven. In recent years we are witnessing a resurgence of learning based methods in geometry and reconstruction and three of our selected papers apply deep learning for pose estimation and modeling of 3D geometry (Sundermeyer et al. 2019, Zhou et al. 2019, Li et al. 2019). While the field of computer vision is dominated by empirical observations in recent years, three of our selected papers are more conceptual. They either rigorously examine the complexity of a classic algorithm (Chin et al. 2019) or present novel formulations of classic problems when applied to new sensors (Ma et al. 2019, Gehrig et al. 2019).

The idea for a special issue about architectures and theories for computer vision came from the ECCV conference held in 2018. Out of the 59 papers presented at the conference, 12 were selected for this special issue after being vetted against journal standards and going through the rigorous peer review process. Three of the papers were selected by the ECCV 2018 Best Paper Committee: Thomas Brox, Andrew Fitzgibbon, Alexei Efros, David Jacobs and Xiaoou Tang. The remaining nine papers were selected by the program chairs of the conference. Selected papers underwent an additional round of rigorous reviewing and revisions. Taken together, the picture that emerges from these 12 selected journal papers is that of a community that continues to adapt to new tools, but also contributes to the development of the tools in a way that is informed by the specific challenges of computer vision.

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