



Perception, Reasoning, and Imagination: Enhance Visual Intelligence by Pixel-level Analysis



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Abstract

To interact with the environment, our human can effortlessly perceive the visual world through understanding the semantics, estimating the 3D geometry, and then utilize our reasoning capabilities to forecast, plan and act. Besides perception and reasoning, we can also reconstruct and synthesize the visual world with our imagination ability. My research aims to build machines that can have similar capabilities. In this talk, I will discuss my recent efforts on building intelligent systems that can perceive, reason and imagine the visual world by pixel-level analysis. The core idea is to integrate mathematical models in our physical world with deep learning approaches.

I will firstly introduce a series of works on advancing the semantic understanding, e.g., semantic segmentation and instance segmentation, where we focus on improving its accuracy, efficiency, and scalability. Besides semantic understanding, geometry is also an essential component to aid intelligent systems to freely interact with the environment. In this regard, I will present our work on integrating geometric consistency of depth and surface normal for high-quality 3D geometry estimation. Beyond semantic understanding and geometry estimation which all focus on visual perception, the next is to equip the intelligent system with more advanced capabilities, like forecasting and imagination. In this respect, I will show our preliminary results on image synthesis and 3D visual forecasting. Applications in medical image analysis will also be covered in this talk.

Biography

Dr. Xiaojuan Qi is a postdoctoral researcher in the Department of Engineering Science, University of Oxford. She obtained her Ph.D. degree in Computer Science from the Chinese University of Hong Kong in 2018. She graduated from Shanghai Jiao Tong University in 2014 with a B.Eng. degree in Electronic Science and Technology. From September 2016 to November 2016, she was a visiting student in the Machine Learning Group, University of Toronto. She has carried out an internship at Intel Intelligent Systems Lab from May 2017 to November 2017.