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Keynote

Why Learn Something you Already Know?

Jaakko Lehtinen
Aalto University & NVIDIA

Abstract

While computer graphics has many faces, a central one is the fact that it enables creation of photorealistic pictures by simulating light propagation, motion, shape, appearance, and so on. In this talk, I'll argue that this ability puts graphics research in a unique position to make fundamental contributions to machine learning and AI, while solving its own longstanding problems.

The majority of modern high-performing machine learning models are not particularly interpretable; you cannot, say, interrogate an image-generating Generative Adversarial Network (GAN) to truly tease apart shape, appearance, lighting, and motion, or directly instruct an image classifier to pay attention to shape instead of texture. Yet, reasoning in such terms is the bread and butter of graphics algorithms! I argue that tightly combining the power of modern machine learning models with sophisticated graphics simulators will enable us to push the learning beyond pixels, into the physically meaningful, interpretable constituents of the world that are all tied together by the fact they come together under well-understood physical processes to form pictures. Of course, such "simulator-based inference" or "analysis by synthesis" is seeing an increasing interest in the research community, but I'll try to convince you that what we're seeing at the moment is just a small sample of things to come.

Short Biography

Jaakko Lehtinen is a tenured associate professor at Aalto University, and a research scientist at NVIDIA Research. Prior to that, he spent a few years as a postdoc with Frédo Durand at MIT. He works on computer graphics and computer vision, in particular realistic image synthesis, appearance acquisition, and procedural animation.

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Keynote

Neural Scene Representation and Rendering

Ali Eslami
Google DeepMind

Abstract

In this talk I will introduce the Generative Query Network (GQN), a framework within which machines learn to represent scenes using only their own sensors, and to render those scenes from any new viewpoint. The GQN takes as input images of a scene taken from different viewpoints, constructs an internal representation, and uses this representation to predict the appearance of that scene from previously unobserved viewpoints. The GQN demonstrates representation learning and rendering without human labels or domain knowledge, paving the way toward machines that autonomously learn to understand and imagine the world around them.

Short Biography

S. M. Ali Eslami is a staff research scientist at DeepMind. His research is focused on getting computers to learn generative models of images that not only produce good samples but also good explanations for their observations. Prior to this, he was a post-doctoral researcher at Microsoft Research in Cambridge. He did his PhD in the School of Informatics at the University of Edinburgh, during which he was also a visiting researcher in the Visual Geometry Group at the University of Oxford.