



Contribution ID: 48

Type: **not specified**

Expressive Structured Representations in Deep Generative Models

Friday, 23 August 2019 16:40 (25 minutes)

Deep generative models, such as variational autoencoders and generative adversarial networks, are among the most exciting recent developments in machine learning. Variational autoencoders, in particular, have seen a tremendous rise in popularity due to their principled variational framework and powerful neural approximations to previously infeasible inference tasks, including marginal and posterior inference with arbitrary distributions. Their applications comprise a broad range of topics in computer science, such as image and video synthesis, temporal forecasting, and feature learning.

In this talk, we first revisit the basic principles of variational autoencoders with a focus on the underlying implicit modeling assumptions. Using these insights, we identify their representational limitations and reinterpret them from the viewpoint of probabilistic graphical models. Finally, we discuss a structure learning approach that overcomes these limitations through an explicit and dynamic encoding of latent dependencies, leading to an efficient and more expressive variant of traditional variational learning. The benefits of this approach will be illustrated with applications in computer vision and computer graphics.

Short Bio

Andreas Lehrmann works at the intersection of machine learning, quantitative finance, and computer vision. His research focuses on the development of expressive neural architectures for structured data and approximate methods for the associated inference tasks. He is also interested in deep generative models exploiting contextual information in non-stationary time-series. Fields of application in finance and vision include volatility and hedging of derivatives, natural language processing, conditional video synthesis, and scene understanding. Before assuming his current role as a machine learning research team lead with Borealis AI, Andreas was a postdoctoral research scientist at Facebook Reality Labs and Disney Research (United States). Prior to that, he was a Microsoft Research Ph.D. scholar at ETH Zurich (Switzerland) and the Max-Planck-Institute for Intelligent Systems (Germany).

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Session Classification: Data Science and Quantum Computing Workshop