



THE WEIZMANN INSTITUTE OF SCIENCE
FACULTY OF MATHEMATICS AND COMPUTER SCIENCE

Vision and Robotics Seminar

on Thursday, Jun 25, 2020
at 12:15

Zoom Link: <https://weizmann.zoom.us/j/91197729259>

Omry Sendik
Tel Aviv University

Unsupervised multi-modal Styled Content Generation

Abstract:

The emergence of deep generative models has recently enabled the automatic generation of massive amounts of graphical content, both in 2D and in 3D.

Generative Adversarial Networks (GANs) and style control mechanisms, such as Adaptive Instance Normalization (AdaIN), have proved particularly effective in this context, culminating in the state-of-the-art StyleGAN architecture.

While such models are able to learn diverse distributions, provided a sufficiently large training set, they are not well-suited for scenarios where the distribution of the training data exhibits a multi-modal behavior. In such cases, reshaping a uniform or normal distribution over the latent space into a complex multi-modal distribution in the data domain is challenging, and the generator might fail to sample the target distribution well. Furthermore, existing unsupervised generative models are not able to control the mode of the generated samples independently of the other visual attributes, despite the fact that they are typically disentangled in the training data.

In this work, we introduce UMMGAN, a novel architecture designed to better model multi-modal distributions, in an unsupervised fashion. Building upon the StyleGAN architecture, our network learns multiple modes, in a completely unsupervised manner, and combines them using a set of learned weights. We demonstrate that this approach is capable of effectively approximating a complex distribution as a superposition of multiple simple ones.

We further show that UMMGAN effectively disentangles between modes and style, thereby providing an independent degree of control over the generated content.

This is a joint work with Prof. Dani Lischinski and Prof. Daniel Cohen-Or.

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