Al-empowered lighting style/atmosphere transfer

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Gartner Hype Cycle for emerging technologies









Deep learning is a sub-field of machine learning dealing with algorithms inspired by the structure and function of the brain called **artificial neural networks**



"learn" to perform tasks by considering examples









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...make it finally possible to train these neural networks.







But what about AI, ML and Deep Learning and lighting design?

The discussion has just started and now we are only scratching the surface of using AI in lighting design.



AI in lighting:

- Sensor-based personalised lighting systems
- Intelligent lighting system controls

We asked ourselves:

How deep learning can actually help the lighting designer's practice?





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Then... you get a rapid design process, by allowing easy light conception and visualization of scenes.



Neural Style Transfer (NST) is an deep learning image processing technique that enables the adoption and depiction of (strong) image characteristics of one or more images, termed *style images*, to be transferred upon another image, termed *content image*.



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artistic style transfer Vs photorealistic style transfer

lighting style images or atmosphere images (not paintings!)



The constraint is that the stylized output photos should remain photorealistic.



Content (Reference) Image



Use of a pre-trained network termed VGG-16 [1]

[1] Simonyan, K. and Zisserman, A. (2015). Very deep convolutional networks for largescale image recognition. *In International Conference on Learning Representations*.

Lighting Style Image





Output Image





Lighting Style Image











Ongoing work [2]:

- PhotoWCT: Generate a stylized image with visible distortions by applying a whitening and coloring transform to the deep features extracted from the content and style images (based on VGG-19 model)
- **Photorealistic Smoothing:** Suppress the distortion in the stylized image by applying an image smoothing filter.

[2] Li, Y., Liu, M. Y., Li, X., Yang, M. H., & Kautz, J. (2018). A closed-form solution to photorealistic image stylization. In *Proceedings of the European Conference on Computer Vision (ECCV)*.



Content image



Lighting style image



Output image



Content image



Lighting style image



Output image







Thank you – Any questions?

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