Generative Adversarial Networks (GANs)

Jose Martinez Heras

14/03/2019

Resources

Get presentation and additional resources on

https://github.com/jmartinezheras/2018-MachineLearning-Lectures-ESA

Agenda

- Deep Learning [very] short summary (from ML Lectures)
- What are Generative Adversarial Networks (GANs)?
- How GANs work? Examples
- How can we condition GANs? Examples
- Possible uses in Space Operations

Deep Learning

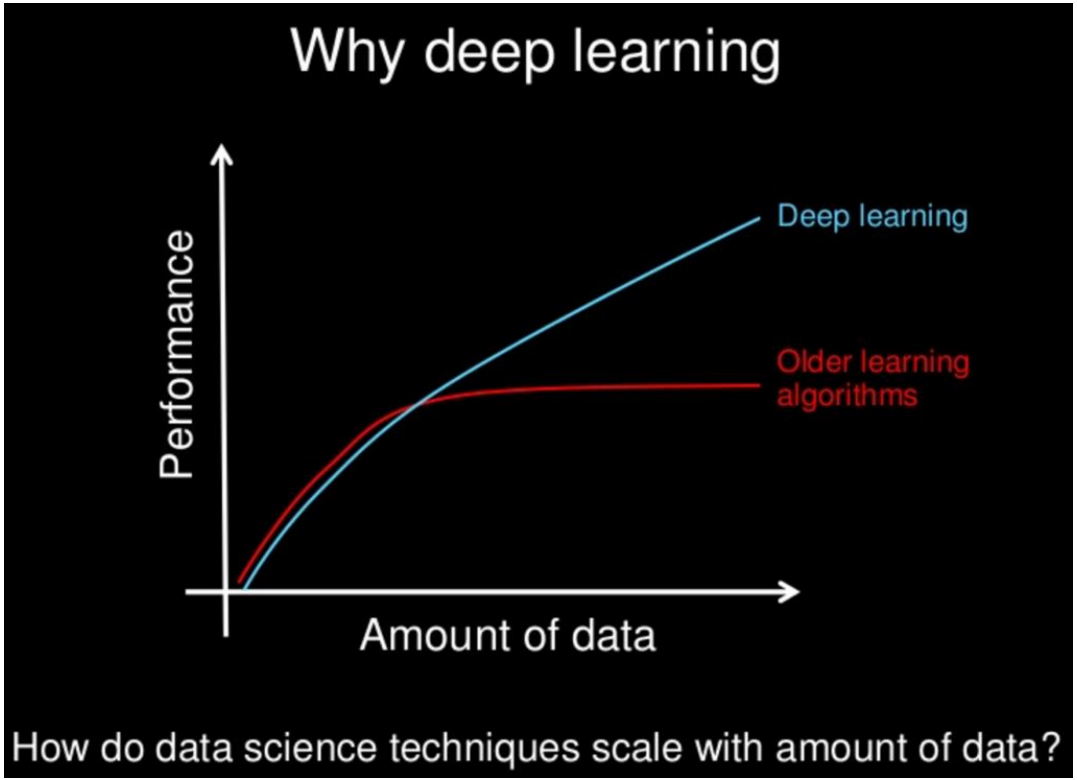


Image credit: https://www.slideshare.net/ExtractConf

Convolutional Neural Networks

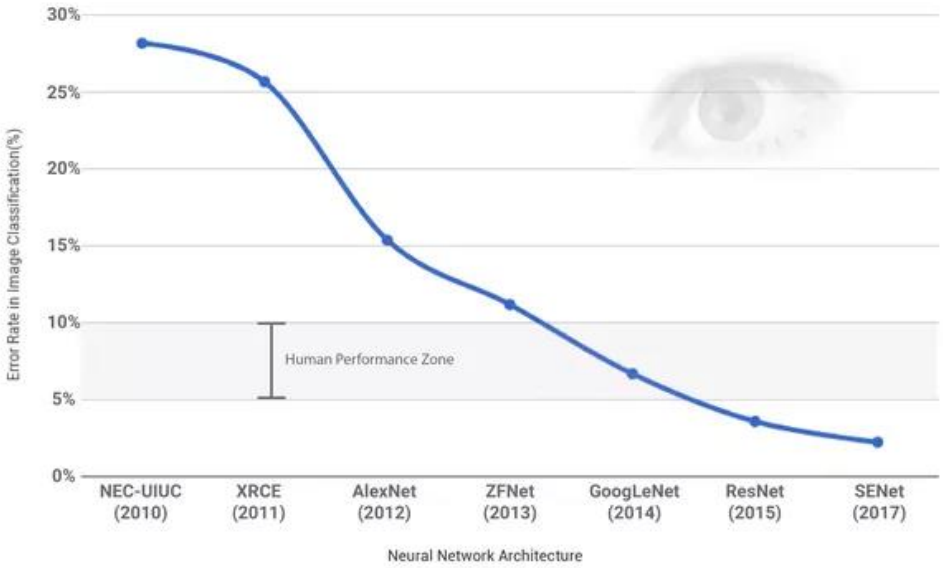


Image Classification

Convolutional Neural Networks

Mostly used for image processing: classification, localization, detection, segmentation

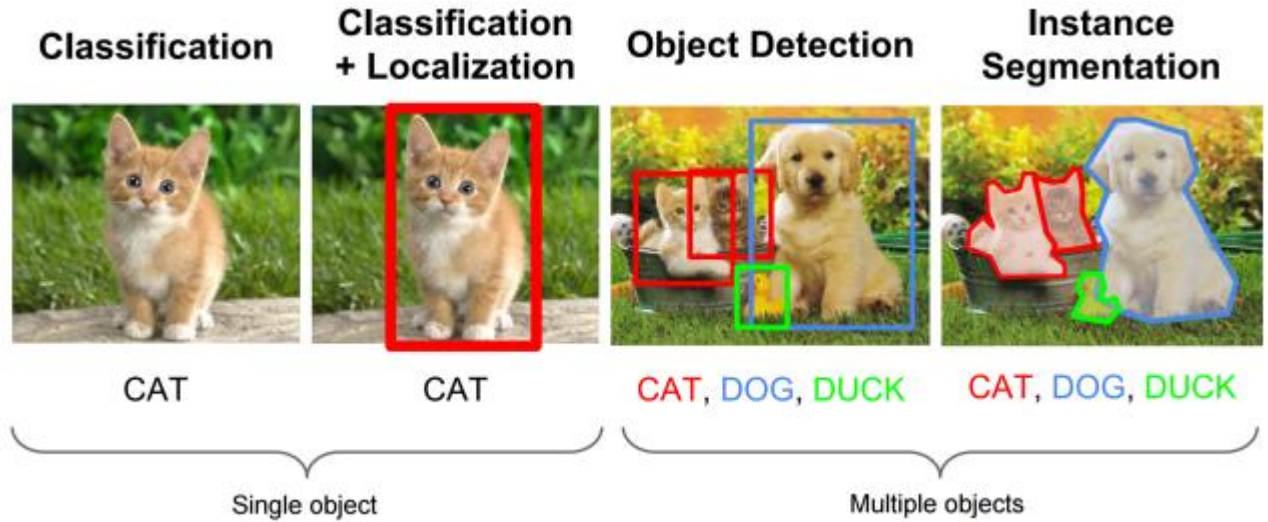


Image credit: https://leonardoaraujosantos.gitbooks.io/artificial-inteligence/content/object_localization_and_detection.html

“Classical” Convolutional Neural Network

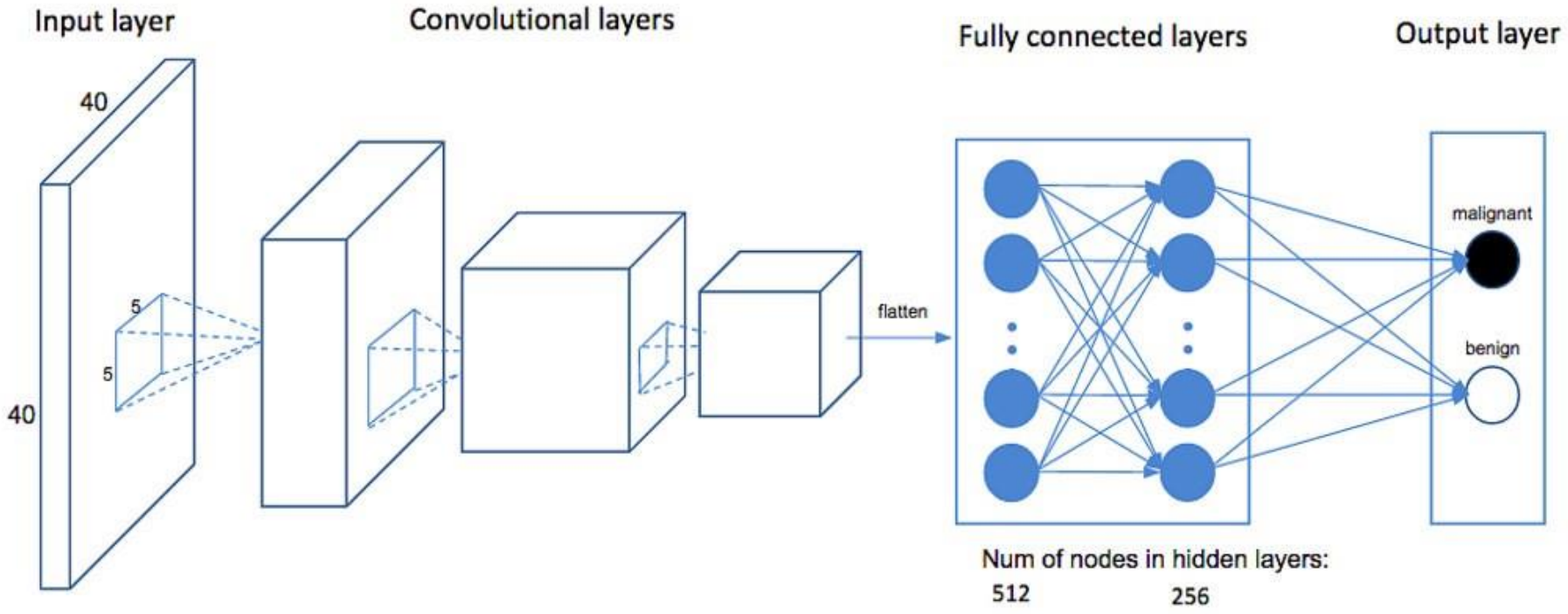
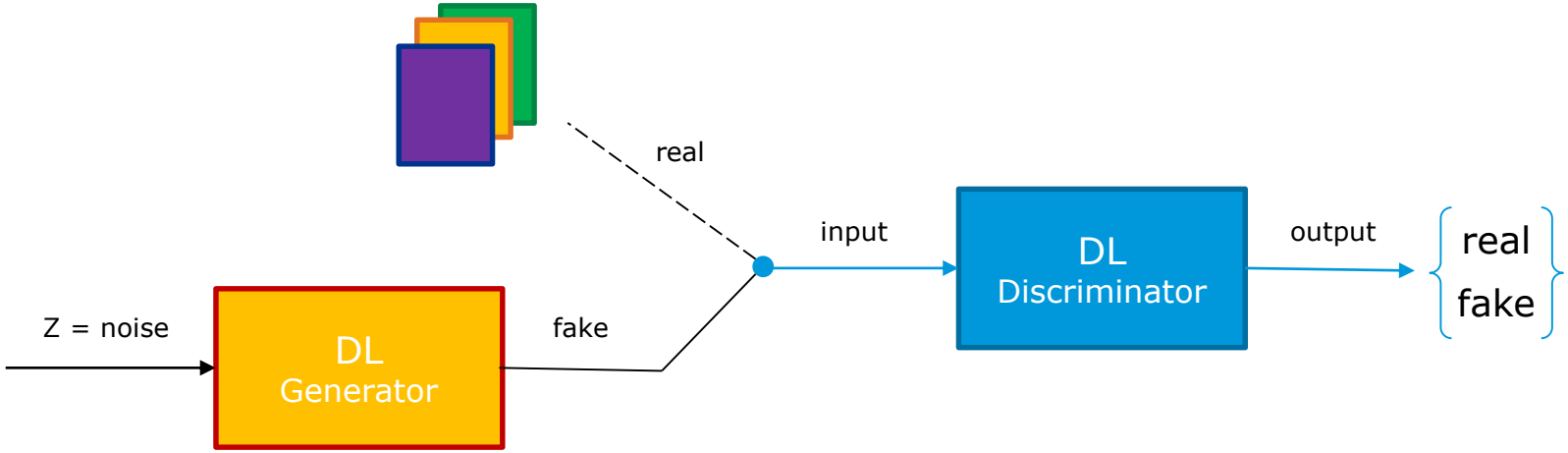


Image credit: https://blog.insightdatascience.com/automating-breast-cancer-detection-with-deep-learning-d8b49da17950

“Classical” usage of Deep Learning

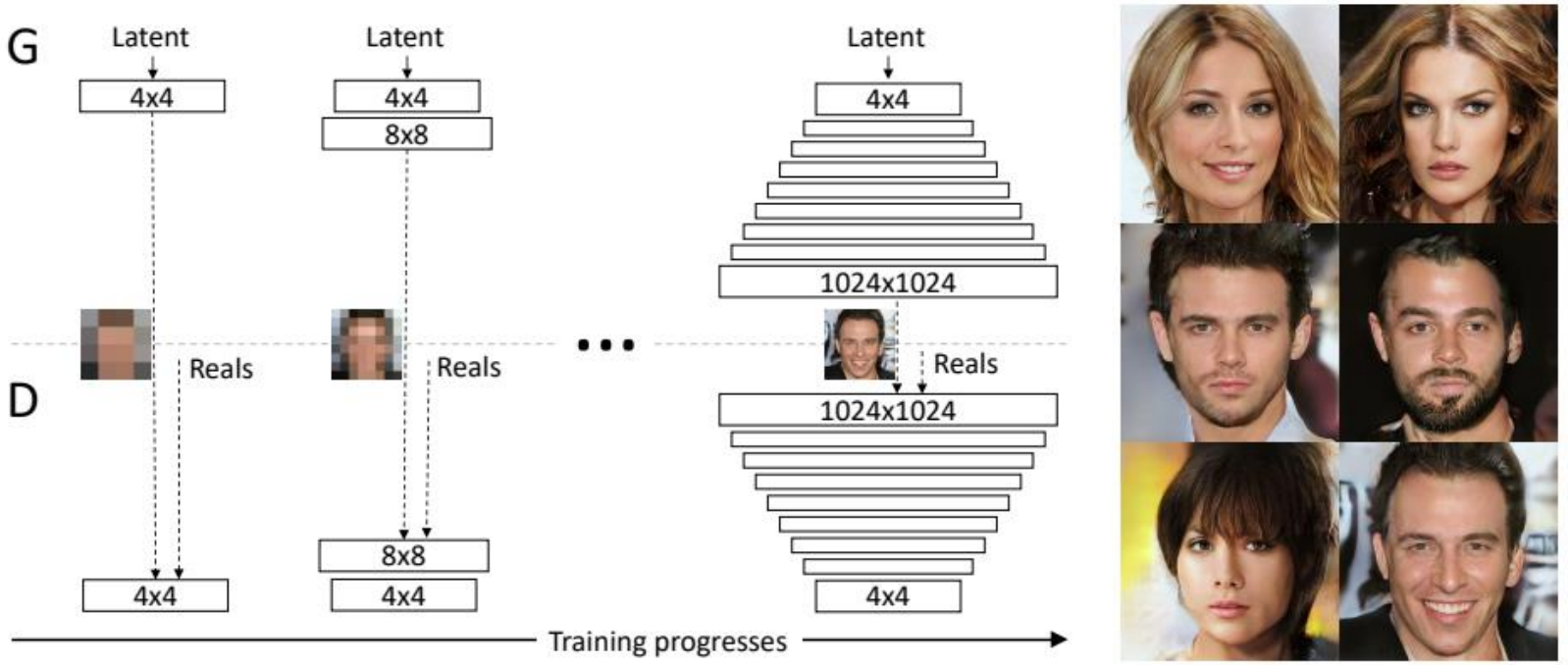
Generative Adversarial Networks



Deep Convolutional GANs (DCGANs)

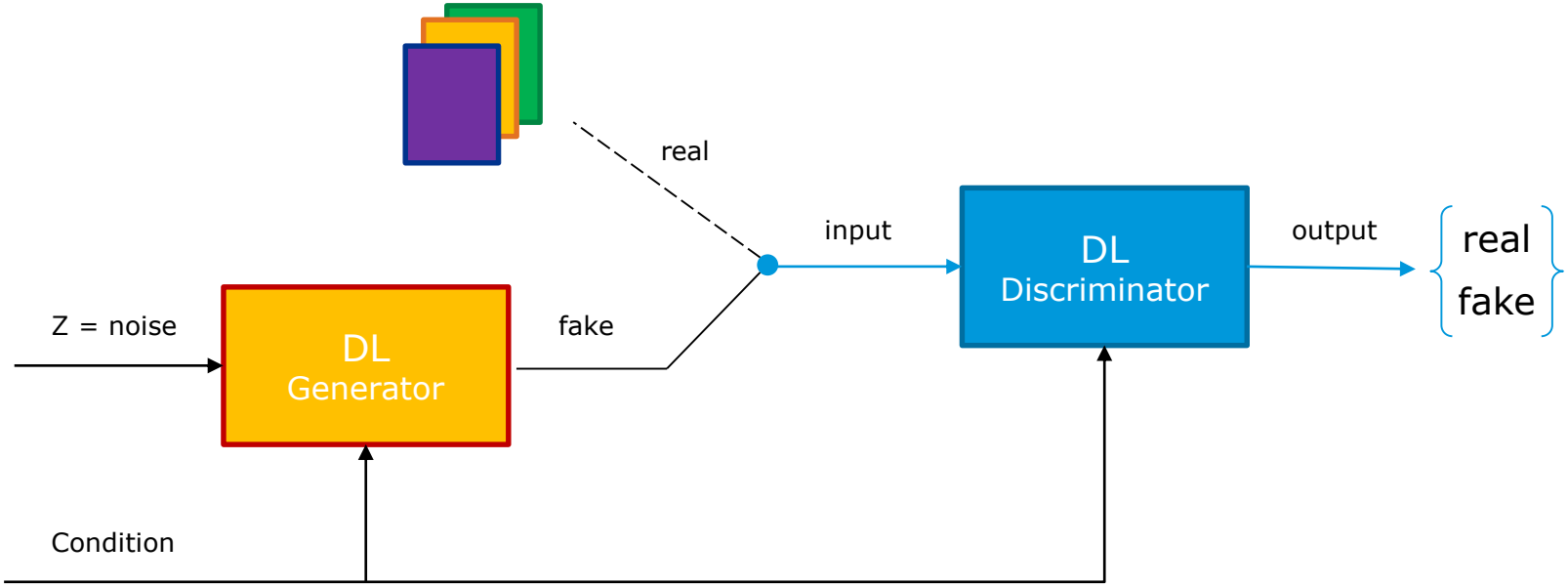
Radford, Alec, Luke Metz, and Soumith Chintala. "Unsupervised representation learning with deep convolutional generative adversarial networks." *arXiv:1511.06434v2* (2016). https://arxiv.org/abs/1511.06434

Progressive GANs for higher quality images

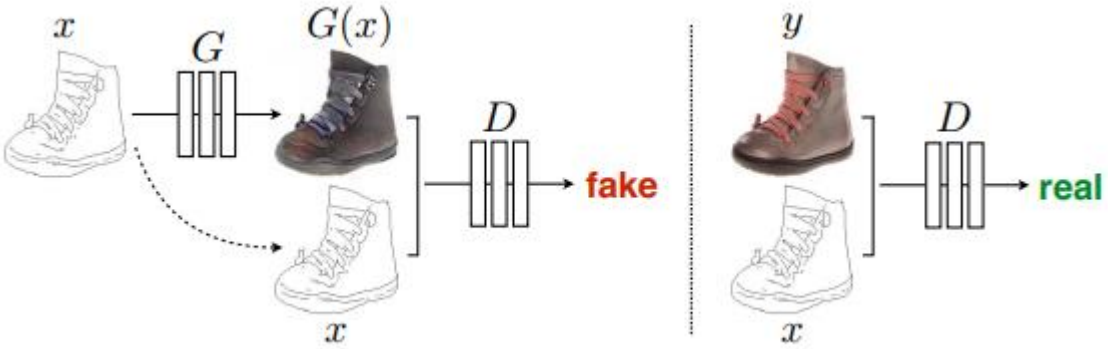


Karras, Tero, Timo Aila, Samuli Laine, and Jaakko Lehtinen. "Progressive growing of gans for improved quality, stability, and variation." *arXiv:1710.10196v3* (2018). https://arxiv.org/abs/1710.10196

Conditional Adversarial Networks

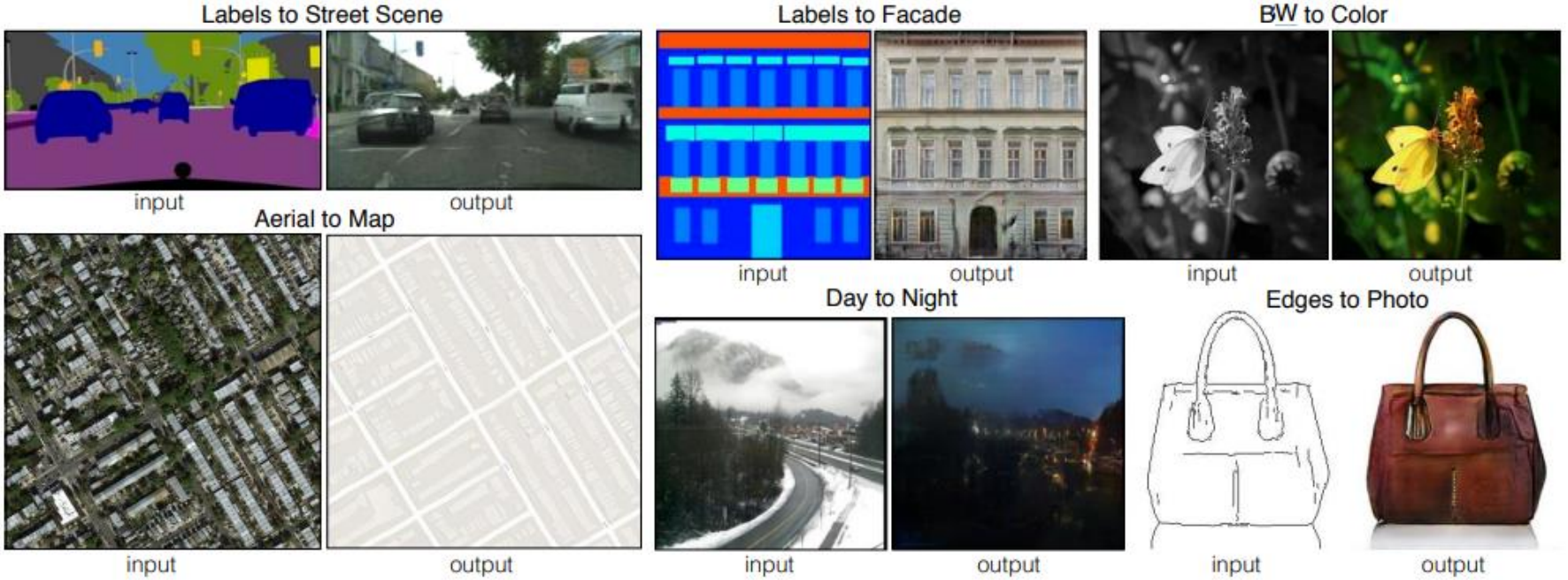


Conditional Adversarial Networks



Zhu, Jun-Yan, Taesung Park, Phillip Isola, and Alexei A. Efros. "Unpaired image-to-image translation using cycle-consistent adversarial networks." In *Proceedings of the IEEE International Conference on Computer Vision*, pp. 2223-2232. 2017. https://arxiv.org/abs/1611.07004

Conditional Adversarial Networks



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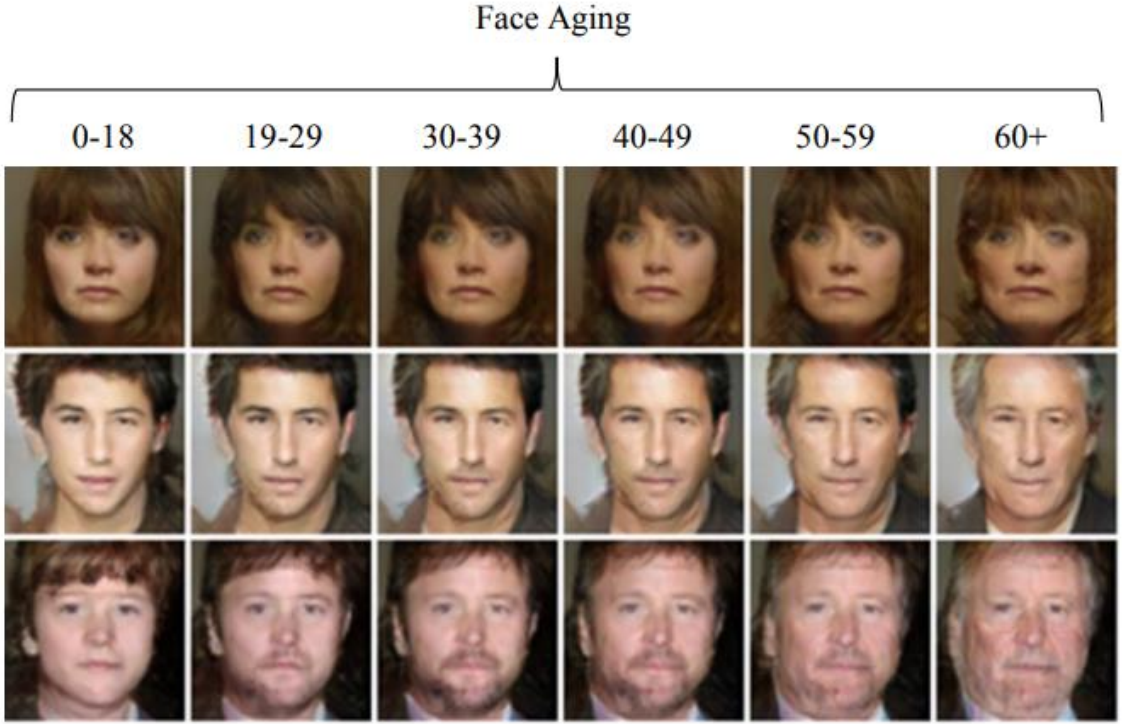
Face Aging with Conditional Adversarial Networks



Antipov, Grigory, Moez Baccouche and Jean-Luc Dugelay. "Face aging with conditional generative adversarial networks." *2017 IEEE International Conference on Image Processing (ICIP)* (2017): 2089-2093. https://arxiv.org/abs/1702.01983

Text to Images

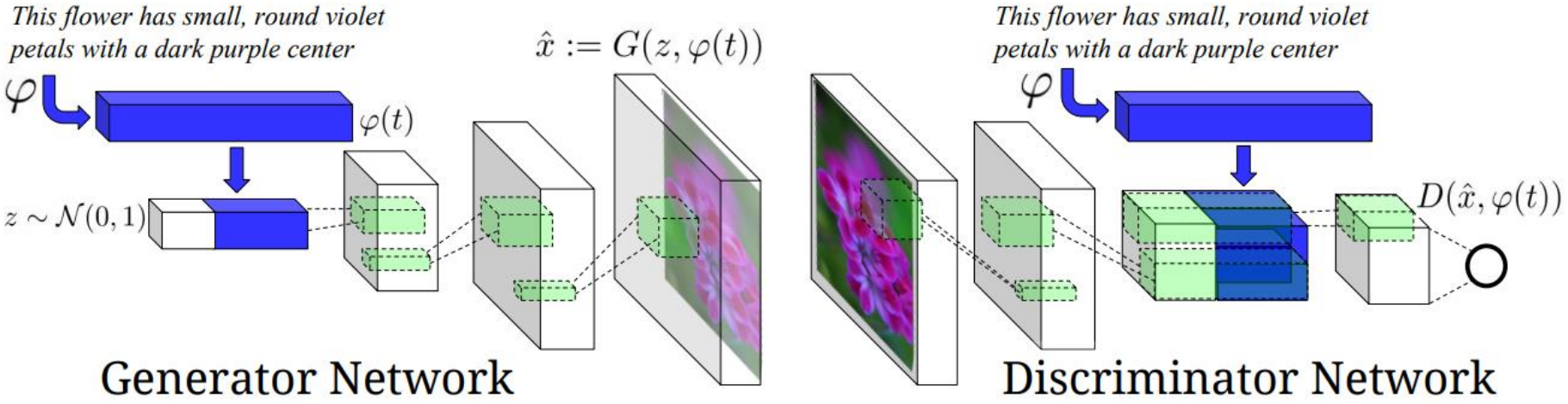
this small bird has a pink breast and crown, and black primaries and secondaries.

this magnificent fellow is almost all black with a red crest, and white cheek patch.

this white and yellow flower have thin white petals and a round yellow stamen

Reed, Scott, Zeynep Akata, Xinchen Yan, Lajanugen Logeswaran, Bernt Schiele, and Honglak Lee. "Generative adversarial text to image synthesis." *arXiv preprint arXiv:1605.05396* (2016). https://arxiv.org/abs/1605.05396

Text to Images

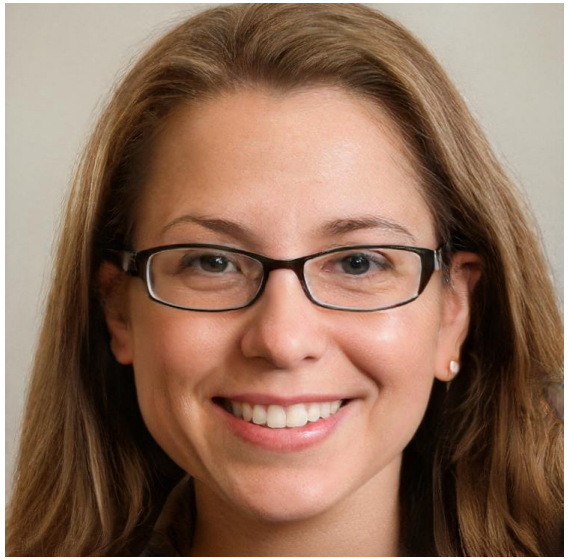


Reed, Scott, Zeynep Akata, Xinchen Yan, Lajanugen Logeswaran, Bernt Schiele, and Honglak Lee. "Generative adversarial text to image synthesis." *arXiv preprint arXiv:1605.05396* (2016). https://arxiv.org/abs/1605.05396

Style-Based GANs

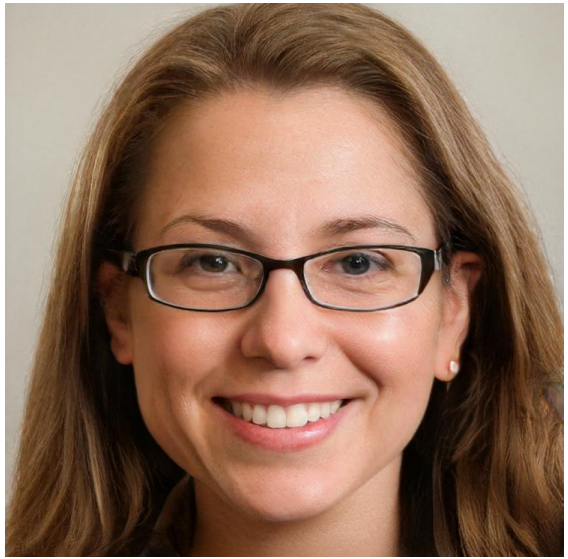
Karras, Tero, Samuli Laine, and Timo Aila. "A style-based generator architecture for generative adversarial networks." *arXiv preprint arXiv:1812.04948* (2018). https://arxiv.org/abs/1812.04948

This person does not exist



https://thispersondoesnotexist.com

This person does not exist



★★★★★

"Loved the 20MINNO about Generative Adversarial Networks"

Sarah Smith

Not only pictures

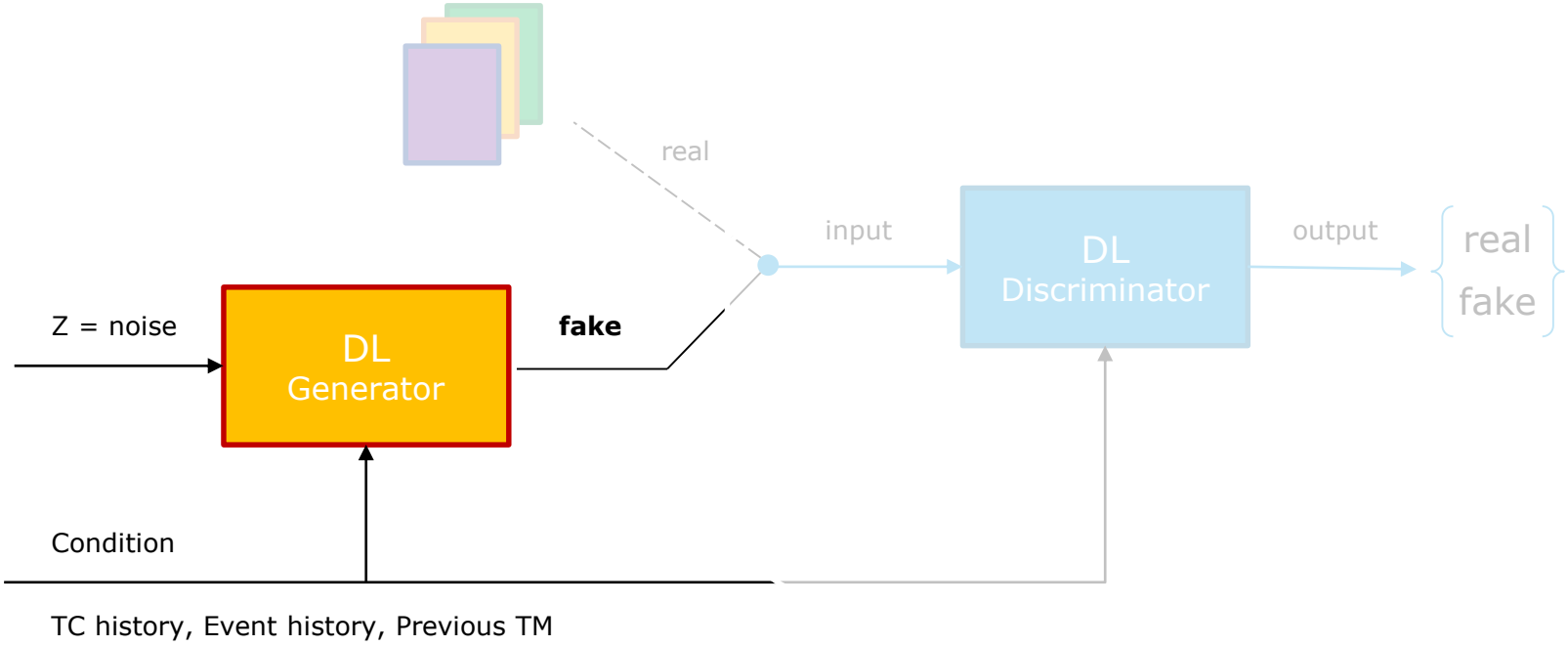
(a) MidiNet model 1

(b) MidiNet model 2

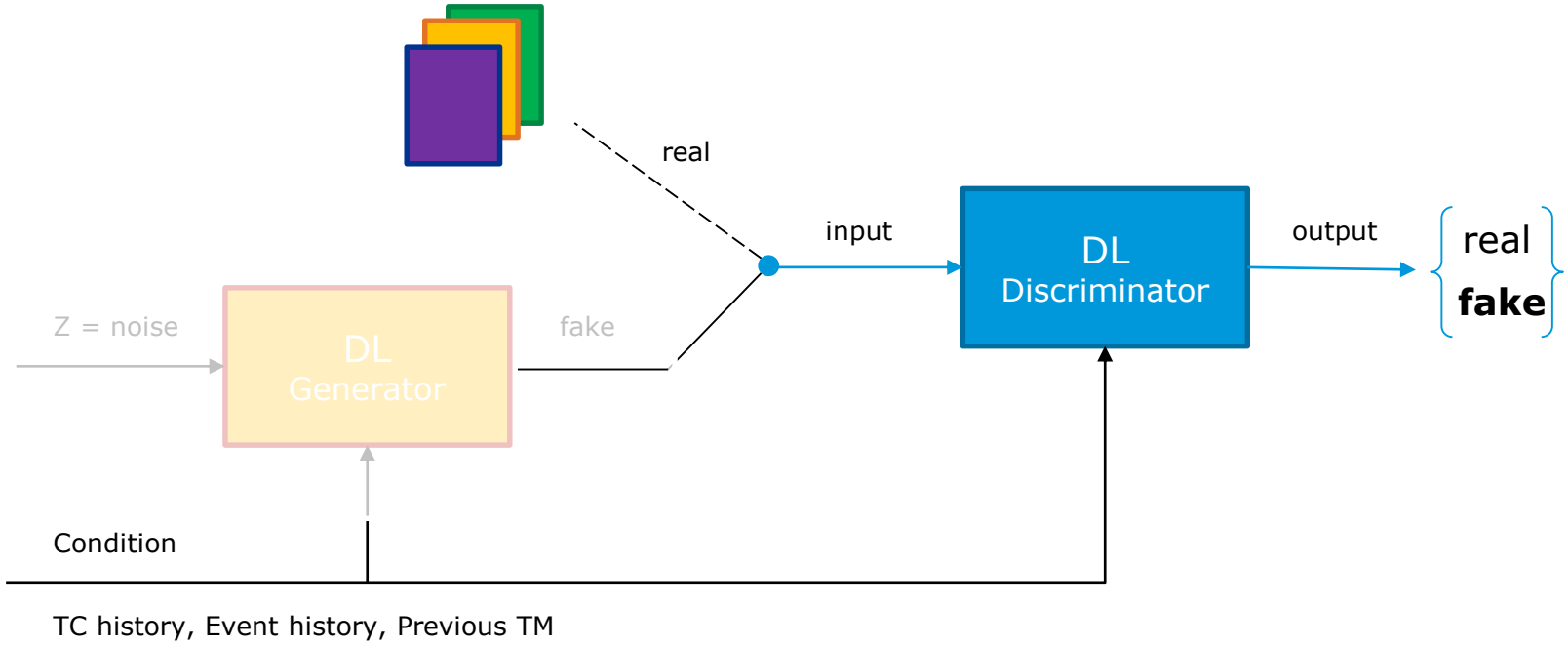
(c) MidiNet model 3

Yang, Li-Chia, Szu-Yu Chou, and Yi-Hsuan Yang. "MidiNet: A convolutional generative adversarial network for symbolic-domain music generation." *arXiv preprint arXiv:1703.10847*(2017). https://arxiv.org/abs/1703.10847

In Space Operations: Simulations



In Space Operations: Anomaly Detection



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