Sprite Generation

CS 534 - Fall 2018 - Term Project

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https://uwmadison-cs534-term-project-f2018-cdh.github.io/

Problem

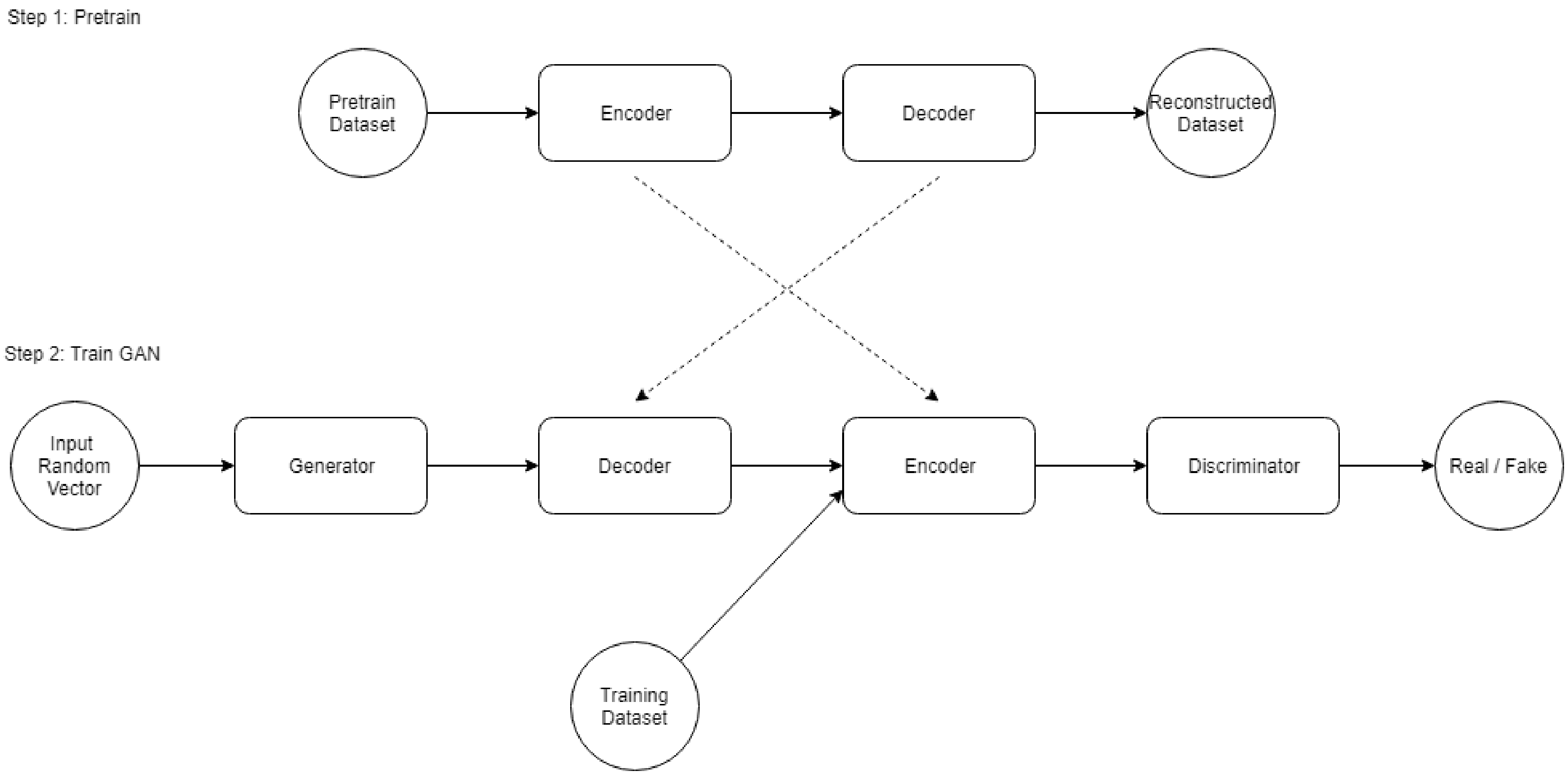
- Content generation for video games is time consuming
- Current approaches
  - Hand-craft everything
  - Develop composite sprites from discrete pieces (head, hair, shirt, etc.) [1]
  - Turn to machine learning [2]

- Is this computational photography?
  - No, but approach should be a generalizable principle.

Solution

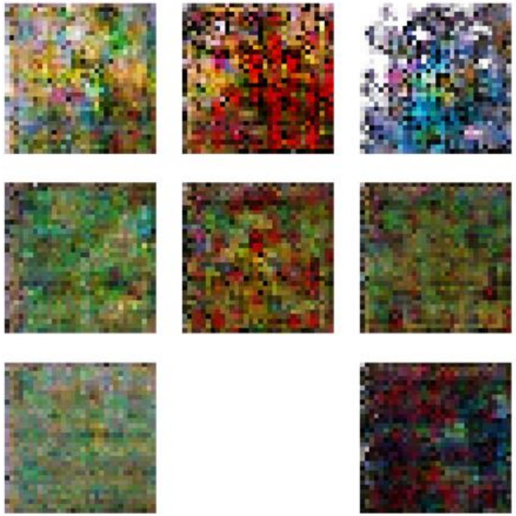
- Inspired by Horsley & Perez-Liebana’s 2017 paper
    - *Building an Automatic Sprite Generator with Deep Convolutional Generative Adversarial Networks*
- Learn visual metaphors used in pixel art [3]
    - Pretrain an autoencoder to learn the art style, then flip encoder and decoder
    - 32 x 32 x 4 images
- Use a DCGAN to learn the feature autoencoder feature space
- Technologies
    - Keras
    - Google Colab

DCGAN + Autoencoder



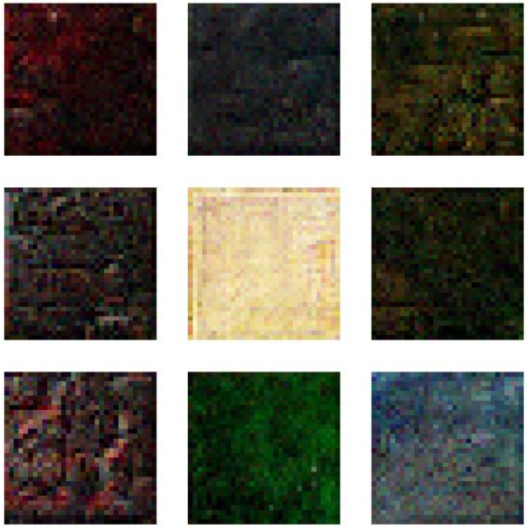
Results : Environment

Autoencoder



- Autoencoder could not learn environment sprites
- Comparison with ample time can learn some reasonable looking sprites

Comparison



Results: Items

Autoencoder

- Comparison network does not do well until it starts duplicating from dataset
- Comparison has difficulty learning new coloring

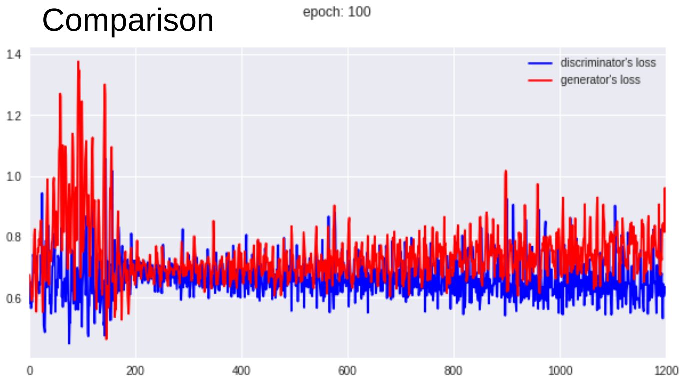
- Autoencoder learns new coloring and novel structuring
- Autoencoder has difficulty with quality structuring of sprite

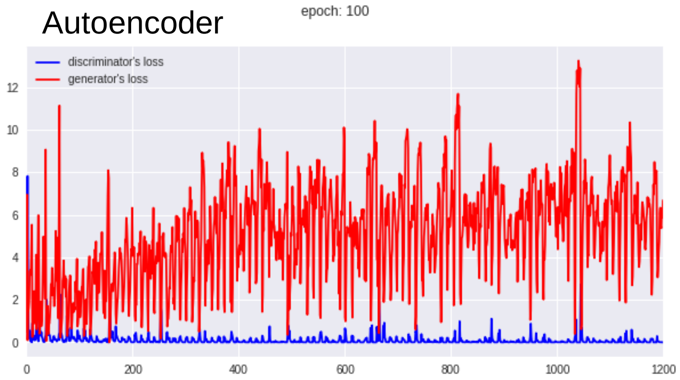
- Both have random pixel noise outside of the structure

Comparison

Challenges and Limitations

- Mode collapse, learning only few exemplars
- Dataset high variance without enough sprites in each category
- Autoencoder not learning color with small datasets
- Multi-layer autoencoder not learning dataset variance
- Time to train (Google Collab helped)
- GAN not learning correct color
- Discriminator goes to zero quickly





Takeaway

- Autoencoder augmented GAN learns faster but has stability problems
- Autoencoder can learn feature space, GAN need only learn this new space
  - Seems to result in novel combinations
- Using only the decoder boosts generators performance early.
  - Still not stable but an improvement
- Develop GAN for grayscale sprites with a seperate recoloring network?





References

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2. Horsley L., Perez-Liebana D. (2017) *Building an Automatic Sprite Generator with Deep Convolutional Generative Adversarial Networks*. IEEE Conference on Computational Intelligence and Games, p.134-141. Online Access: https://ieeexplore.ieee.org/document/8080426/?part=1
3. Reed S. E., Zhang Y., Zhang Y., Lee H. (2015) *Deep Visual Analogy-Making*. Advances in Neural Information Processing Systems 28. P.1252-1260. Online Access: http://papers.nips.cc/paper/5845-deep-visual-analogy-making.pdf

Dataset Sources

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