Generative AI

Generative AI has been described as one of the most promising advances in AI in the past decade by the MIT Technology Review.

Generative AI opens the door to an entire world of creative possibilities with practical applications emerging across industries, from turning sketches into images for accelerated product development, to improving computer-aided design of complex objects.

For example, Glidewell Dental is training a generative adversarial network adept at constructing detailed 3D models from images. One network generates images and the second inspects those images. This results in an image that has even more anatomical detail than the original teeth they are replacing.

Glidewell Dental is training GPU powered GANs to create dental crown models

Generative AI enables computers to learn the underlying pattern associated with a provided input (image, music, or text), and then they can use that input to generate new content. Examples of Generative AI techniques include Generative Adversarial Networks (GANs), Variational Autoencoders, and Transformers.

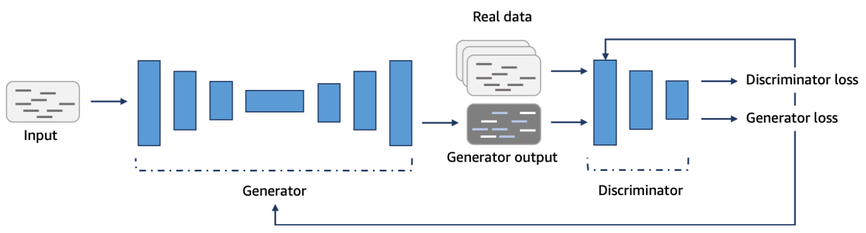
What are GANs?

GANs, a generative AI technique, pit 2 networks against each other to generate new content. The algorithm consists of two competing networks: a **generator** and a **discriminator**.

A **generator** is a convolutional neural network (CNN) that learns to create new data resembling the source data it was trained on.

The **discriminator** is another convolutional neural network (CNN) that is trained to differentiate between real and synthetic data.

The generator and the discriminator are trained in alternating cycles such that the generator learns to produce more and more realistic data while the discriminator iteratively gets better at learning to differentiate real data from the newly created data.



A schema representing a AWS DeepComposer GAN

Like the collaboration between an orchestra and its conductor

The best way we've found to explain this is to use the metaphor of an orchestra and conductor. An orchestra doesn't create amazing music the first time they get together. They have a conductor who both judges their output, and coaches them to improve. So an orchestra, trains, practices, and tries to generate polished music, and then the conductor works with them, as both judge and coach.

The conductor is both judging the quality of the output (were the right notes played with the right tempo) and at the same time providing feedback and coaching to the orchestra ("strings, more volume! Horns, softer in this part! Everyone, with feeling!"). Specifically to achieve a style that the conductor knows about. So, the more they work together the better the orchestra can perform.

The Generative AI that AWS DeepComposer teaches developers about uses a similar concept. We have two machine learning models that work together in order to learn how to generate musical compositions in distinctive styles.

As a conductor provides feedback to make an orchestra sound better, a GAN's discriminator gives the generator feedback on how to make its data more realistic

QUIZ QUESTION

Please identify which of the following statements are **TRUE** about a Generative Adverserial Network (GAN).

- [ ] The generator is learning to produce more realistic data at the same time as the discriminator is learning to differentiate real data from the newly created data.
- [x] The generator and discriminator are occurring asynchronously.
- [ ] The generator and discriminator are both using source data only.
- [x] The generator is learning to produce more realistic data and the discriminator is learning to differentiate real data from the newly created data.

SUBMIT

NEXT