Hidden Worlds

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Abstract

Hidden Worlds is a series of artworks created by Machine Learning exploring gender through the lens of computer vision. The works are first created by a DCGAN, then responded to by J. Rosenbaum before being reinterpreted into a generative narrative using image classifiers and tied together using Augmented Reality. This collaborative series of works is part of Rosenbaum's ongoing work with machines using 3D Modeling, machine learning and Augmented Reality.

Introduction

Hidden Worlds uses Artificial Intelligence and Augmented Reality to examine gender through the lens of computer vision. These works use a computer trained on Greek and Roman statuary to generate its own which I interpret in my own way. I use another AI to write descriptive content for each work and generated music to create a multi-media interactive installation.

Can computers see gender? Without being trained in traditional binary notions of gender what can they produce? And how do we interpret the results? J. Rosenbaum presents Hidden Worlds, a series of Artificial Intelligence Computer Generated artworks using mobile Augmented Reality technologies to see gender through the lens of computer vision. A Neural Network that has been trained in thousands of images of Greek and Roman statuary attempts to create its own. Rosenbaum then takes the output and seeks to find the truth inside the computer generated work and reveal that to the viewer. Another Neural Network looks at the works and attempts to write poetry based on what it sees. This has been incorporated into a soundscape inside the app. Viewers will see the computer generated images and watch them come to life inside the app as the work is transformed and reinterpreted by human eyes and hands. The language will be alien, computer driven showing a collaborative effort between human and machine. This experimental work invites questions about computers creating art, about how machines see humans and gender and idealized beauty.

Project Development

This series works with a small dataset, ~4000 images of Greek and Roman statuary. The nature of curation and critique is a constant recurring theme, the artist curates a dataset of thousands of images for the machine to work with. The discriminator critiques the results of the generator, I curate and critique the results that passed the discriminator.

Once the dataset was complete, I started the weeks of training of the neural network. I would load the samples as they emerged from in the latent space of training and watch as it learned. Sifting through these images for ones that inspired me was another exercise in curation. and I watched as the concept evolved in my head. Being a small dataset, the results were still abstract, but open to interpretation. The generated works were abstract as expected but with recognizably human shapes. As the dataset was extremely idealized it was a delight to see exaggerated bodies and delightful curves emerge, works beyond what I had expected to find. I delighted in the textures and the shapes that I saw emerging.

I selected my favorites and made drawings of what I saw in the works, the figures emerging within the abstract forms. from those drawings I made 3D models and from those models I made augmented reality interactions. While close you see something abstracted but as you move back it resolves into something more tangible and real. As with pointillism and cubism you can appreciate the details close, it's only until you step back and take in the entire work that the forms start to resolve into something more than the sum of their parts. It also reflects the training process of the works, the slow coming in to being of certain forms. Some final artworks stood well with just the drawings saved as animations, and some felt best with 3D models attached.

The images and the different 3D models were submitted to the narrative writer which created passages of generated text. I did some minor grammatical edits on the texts, and had a text to speech synthesizer speak the words. It felt important to have digital voices as the narrators of these works and I feel particularly pleased with how the gender of

the subject flips around seemingly at random. the gender of the people in these works feels fluid and I am obscurely proud the machine saw and automatically produced these gender fluid results.

From here I brought them all together in unity, the spoken word, music based on the generated words and the interactions, captions and options to turn off the sound were added and submitted to the different app stores.

This series is a true collaboration for me between my computer and my self. The art is generated by machine with the information I provided it, I then worked back into its results and submitted them back to the machine to see its interpretation of my interpretation. Back and forth we would go, creating work, creating art based on that work, a mini collective of two.

Technological Development

I constructed Hidden Worlds by chaining together different machine Learning projects and training them in my own specific datasets to get the results I was after. this is an initial experimental round in the development of a greater project around viewing gender through the lens of computer vision. The concept behind this was to take the idealized figures of Greek and Roman statuary and see how a DCGAN blends them together. I have selected these works from the latent samples during the creation process, I wanted something more abstract, open to interpretation. from there, I created 3D models as an interpretation of the GAN's output.

The DCGAN (Radford et al. 2015) I used was by Taehoon Kim on the TensorFlow framework with some customizations by me and my own dataset. This is an easy GAN to get started with and I enjoyed working with it.

From there I worked with Ryan Kiros' Skip Thoughts (Kiros et al. 2015) and Neural Storyteller to create captions for the works. using MSCOCO Image recognition and captioning (Lin, Tsung-Yi et al. 2014), neural storyteller creates a small story. For me, the main success was in the abstract thoughts it generated and the way that gender was a completely fluid concept. this writing is inherently non-binary in its construction and is ideally suited to my work.

The voices were made using Apple's own voice synthesis and the music tracks were made in LangoRhythm[1]—a midi piano music writer that assigns note values to letters and durations to vowels and the way they occur to create interesting musical compositions. Each musical track is based on the generated captions.

These works have been woven together in Unity to create an Augmented Reality Experience[2].

Conceptual Statement

Conceptually this work explores the nature of gender and how computers construct and see gender. Working with a DCGAN to create the works, then working back into them myself before submitting them to a classifier and writer shows me machine perceptions of gender when it comes to trans and gender non-conforming bodies. This series is also an exercise in working collaboratively with my machine, gaining inspiration from the machine output to create a new work then working with the machine definitions.

The app[3] is the glue behind this work, it holds all of these disparate concepts together and entwines them, showing the collaborative process between human and machine in interactive sculptures and sketches.

While these works literally transform when viewed they are about the internal dialogue of transness and of hearing yourself correctly or incorrectly gendered. That disconnect that is felt when a pronoun that doesn't fit is used and the comfort of the correct pronoun. These works seek to create this discomfort in people who have never had cause to question the gender they were assigned at birth and hopefully challenge assumptions around assigned pronouns and pronoun assumptions.

These works use multiple systems, none of which were designed for the express purpose I put them towards. They are tied together in a cohesive exhibition and application interlacing the narrative with the human created artworks and the machine generated artworks. Using a neural network designed for faces to generate bodily works, using a classifier that isn't trained on gender and a romance dataset shows that even without specifically fine tuning the datasets and the classification training I can produce something that makes us question gender. This all ties into my research exploring computer perceptions of gender. In this case it is clear that these works do not elicit a binary reaction from the classifier and the pronouns from the narrative writer switch, seemingly at random.

My work is intrinsically about gender. I explore how computers view and create gender and how we respond to gender that is outside the binary. I am non-binary and my work reflects living in a binary world as a non-binary person. Machine Learning is a fascinating way to explore this subject as it is inherently binary in nature, but knowing only what it has been taught or shown it can be as biased as humanity or completely unbiased, creating amazing gender mashups and diverse gender explorations.

References

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[1] http://kickthejetengine.com/langorhythm/
[2] See https://youtu.be/ZhK0Uurb5Vw for a video showcase.

[3] To download the app and see images from the project
https://www.jrosenbaum.com.au/projects/hidden-worlds/