

Fall 10-26-2022

Iterating the Design Process Using AI Diffusion Models

Josh Vermillion

University of Nevada, Las Vegas

Follow this and additional works at: https://digitalscholarship.unlv.edu/cfa_collaborate



Part of the [Architectural Technology Commons](#), [Environmental Design Commons](#), [Fine Arts Commons](#), [Interdisciplinary Arts and Media Commons](#), and the [Other Architecture Commons](#)

Recommended Citation

Vermillion, Josh, "Iterating the Design Process Using AI Diffusion Models" (2022). *Creative Collaborations*. 9.

https://digitalscholarship.unlv.edu/cfa_collaborate/9

This Poster is protected by copyright and/or related rights. It has been brought to you by Digital Scholarship@UNLV with permission from the rights-holder(s). You are free to use this Poster in any way that is permitted by the copyright and related rights legislation that applies to your use. For other uses you need to obtain permission from the rights-holder(s) directly, unless additional rights are indicated by a Creative Commons license in the record and/or on the work itself.

This Poster has been accepted for inclusion in Creative Collaborations by an authorized administrator of Digital Scholarship@UNLV. For more information, please contact digitalscholarship@unlv.edu.

CREATIVE COLLABORATIONS // INTERDISCIPLINARY WORK INCORPORATING THE ARTS
HOW ART, DESIGN, MEDIA & PERFORMING ARTS DISCIPLINES ENHANCE THE CREATION OF KNOWLEDGE

ITERATING THE DESIGN PROCESS USING AI DIFFUSION MODELS

► **JOSHUA VERMILLION** // ARCHITECTURE, DESIGN, COMPUTER SCIENCE

► PROJECT DESCRIPTION

Introduction:

These studies span research and creative work to interrogate the generative capacity of text-to-image diffusion models that leverage artificial intelligence to produce architectural concepts, ideas, and imagery. These systems can generate an enormous amount of imagery in a very short amount of time based entirely from the written word, and we are still just beginning to understand how these digital tools might augment and/or disrupt, both, the design process, and design pedagogy within the discipline of architecture.

Background:

Text-to-image diffusion models have been around for a while; however, it's only been recently (the last 6-8 months) that these systems have seemed to burst into the art and design communities as useful tools for generating graphics. Diffusion models learn from a massive data set of images with corresponding labels and metadata that explains the content of each image. Each picture is iteratively deconstructed into gaussian noise (static), and then, this process is reversed, teaching the model how to turn random static into an image of an object, a setting, a character—anything you can type (literally). These AI models occupy a quickly evolving technology space with tremendous implications for how we design, as well as how we visualize—and verbalize—our ideas.

Methods:

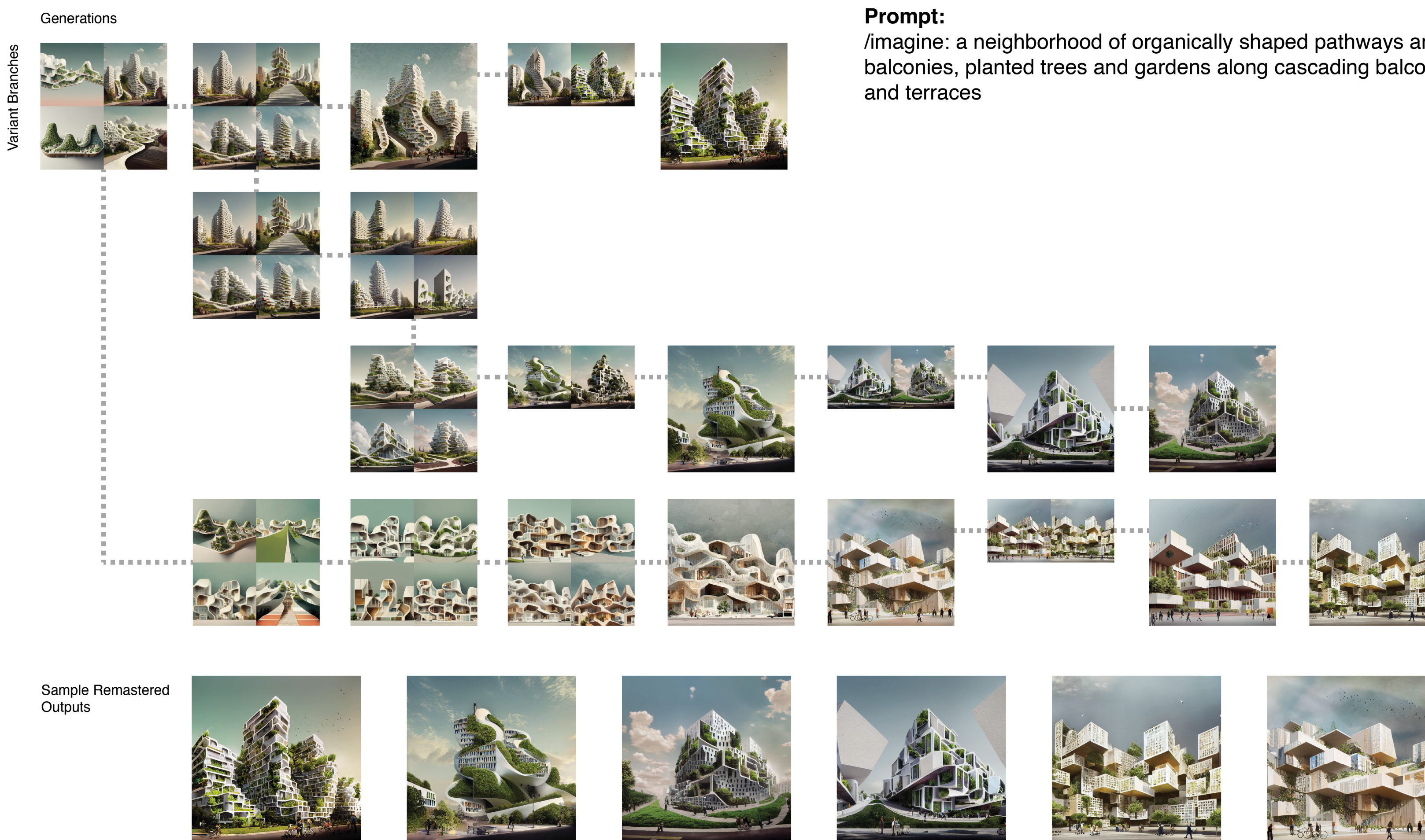
Several AI diffusion model platforms are being tried and tested to iterate various conceptual design ideas, including Dall-E, MidJourney, and Stable Diffusion. The poster graphics show how this process works (in MidJourney, in this case), starting with a text “prompt.” This prompt is the description one gives to the model in order to generate imagery. It typically consists of describing the subject of the image (a building, for example, along with corresponding description of the building). Qualitative words are needed to describe context, setting, atmospherics, moods, artistic styles or movements to emulate, etc. Four resulting images are created, at which time, the user can re-run the prompt, create larger versions of the resulting images, and/or can ask the model to produce variants of each image. As the user creates more variants, the design space begins to branch with various images, each uniquely interpreting the original prompt.

While designers and illustrators are very capable of generating their own graphics to design and communicate ideas, diffusion models offer two different value propositions. The first is speed. Each of these images only take 30-90 seconds to create. The second is the randomness and non-determinant factors from the machine training. The algorithm can produce many different ways to see and interpret that idea, resulting in “happy accidents” and other results that “tickle” the designer’s imagination, leading to further exploration and iteration in this early stage of design and ideation.

Pedagogically, this author has always had a hard time getting his students to write creatively and expressively about architecture, and especially, the conceptual design process. This autumn, the year-four undergraduate design studios in our architecture program (led by Professors Strain and Vermillion) will use AI diffusion models and prompt writing to engage in a more expressive and iterative writing workshop, aimed at developing the students’ writing and language skills in describing the experiential qualities of form, space, and order for their design work. Hopefully these exercises make it fun for students to think and write critically and with detail about their design ideas.

Future Trajectories:

The author is already in discussions with intermedia-focused labs at several universities, and these conversations focus on developing a workflow for stitching the results of several of my studies into immersive virtual environments that can be experienced with VR goggles.



Example design space in MidJourney of a specific architectural prompt description.

► ABOUT THE AUTHOR

Joshua Vermillion is an Associate Professor at UNLV’s School of Architecture. In addition to co-editing two books, Joshua has spoken, published, and presented peer-reviewed research worldwide about the topics of computational design, digital fabrication, embedding situated technologies and robotics into the built environment, as well as how “digital craft” augments research, pedagogy, and practice. As an educator, Joshua’s students have won design awards and competitions, and as a designer, his collaborative work has been featured in diverse media outlets including a variety of exhibitions, magazines, books, and blogs. Josh enjoys spending his free time hiking with his wife and kids as well as obsessively sending DMs to the MidJourney bot in Discord.

► ACCESS AND DOWNLOAD THIS PROJECT POSTER WITH LINKS TO FURTHER INFORMATION

