Abstract

Exploring A.I. in Design Education: Enhancing Ideation with A.I. Text-to-Image Generators in Digital Design Courses

The rapid emergence of **Artificial Intelligence-powered applications** is transforming most industries, including design. This paper investigates the integration of **A.I. text-to-image generators**—programs that use A.I. to create new images—in **design education** to better understand their potential and limitations.

As a **curricular innovation** in an introductory course in **digital design**, the author introduced **Midjourney**—an A.I. image generator—to expand the **ideation process** students follow in a design project. Two cohorts of **100 undergraduate students** in **Industrial, Interior, and Apparel Design** experienced using this tool as part of their workflow in a project.

Results showed that A.I. image generators **improved students' visualization capabilities**, facilitated **unexpected creative outputs**, and **promoted equity and inclusion** within the classroom. Additionally, A.I. image generators **enhanced student collaboration** and **communication**, fostering a dynamic learning environment.

As A.I. continues to influence design practice and design education, the author argues that it is essential for **educators to remain informed**, explore with their students the **possibilities, limitations, and ethical considerations** of A.I. tools, and, ultimately, contribute to shaping the **responsible and innovative use of A.I.** in the future of design practice.
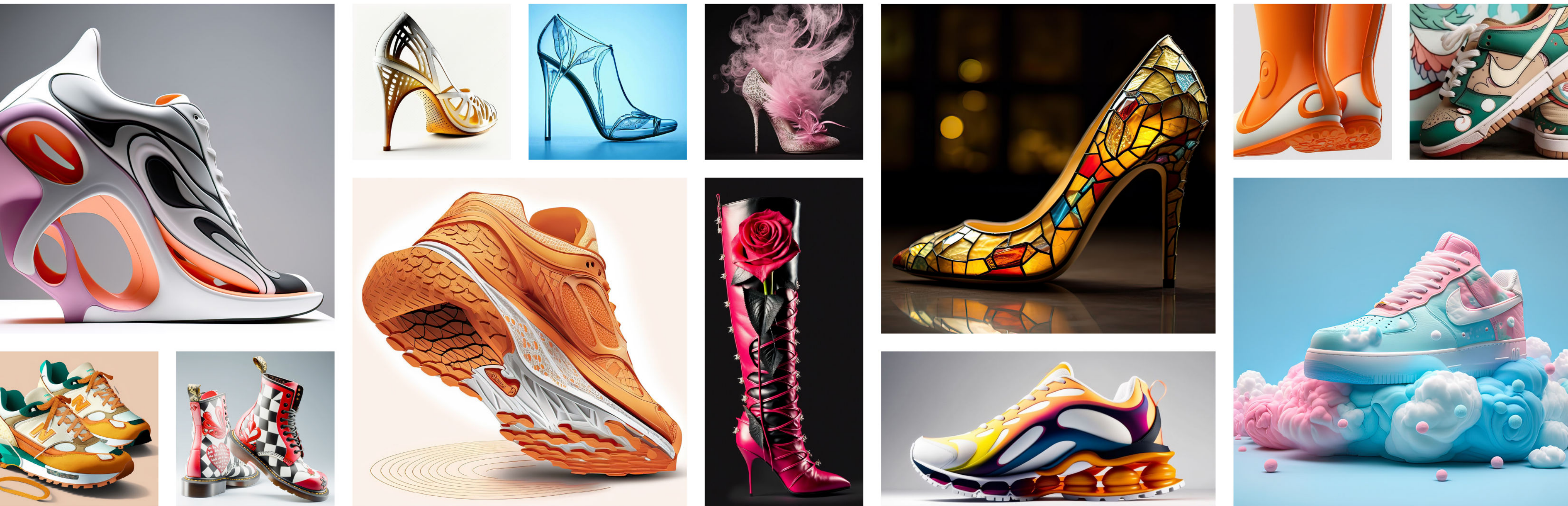
A.I. Image Generation

- A.I. text-to-image generators are software tools that **produce new images based on text descriptions** provided by users.
- These tools use deep learning models trained on vast **datasets of billions of images paired with textual descriptions**.
- This training defines a multi-dimensional **"latent space"** where each coordinate signifies attributes and features of potential images.
- Given a textual description, the model maps the **input to a specific coordinate** or sequence of coordinates within this latent space.
- Then, the model leverages its generative capabilities to create the new image, essentially **"imagining" a visual output** based on its training.
- The generator uses a **diffusion process**, starting with random noise and iteratively refining pixels until a coherent image emerges.

Fig. 1: Image generation process using the prompt *"espresso machine"* in Midjourney. This process starts with noise that is gradually refined to obtain a high-resolution image. Use the **QR code** below to see the full video.

Methodology

- **200 undergraduate design students** were introduced to **Midjourney** as an ideation tool in a project in which they had to **create and illustrate a new shoe**. Their work was collected and analyzed for this study.
- The **process** students followed is described below:

1. Students participated in a **Midjourney workshop**, where they were introduced to A.I. image generators and prompt design.
2. Students **brainstormed** ideas and were encouraged to explore various shoe concepts, combining different sources of inspiration.
3. Students created **prompts** for Midjourney, using descriptive words that captured their shoe concept.
4. Students created several **hand-drawn sketches** inspired by their Midjourney-generated images.
5. Students used their sketches as a base to create **digital illustrations** of their shoe concepts using Adobe Illustrator and Adobe Photoshop.
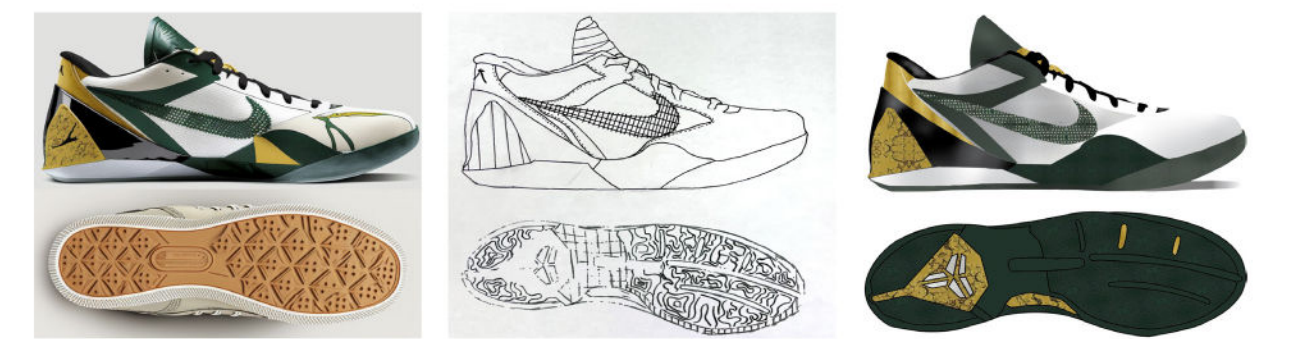

Fig. 2: Synthesis of the process followed by students: (1) inspiration images generated in Midjourney; (2) sketches based on inspiration images; (3) digital illustrations created in Illustrator and Photoshop.

Fig. 3: Examples of shoe concepts generated in Midjourney by the students.

Findings: Challenges and Opportunities of A.I. in Design Education

Challenge 1: Proficiency and learning curve

Introducing Midjourney posed challenges for novice designers. Proficiency demanded clarity in input prompts, requiring students to articulate ideas effectively. To address this, a basic prompt structure and examples were provided, encouraging refinement based on design intentions. Consequently, besides exploring new tools, students honed their verbal articulation of visual concepts, vital in modern interdisciplinary design.

Challenge 2: Technology dependence

In the context of design education, A.I. tools like Midjourney can both inspire and limit student creativity. While intended as inspiration, students often replicated with little change A.I.-generated designs, restricting their creativity. Interestingly, when Midjourney struggled creating sole images, students exhibited enhanced creativity. It's vital to use A.I. tools critically, ensuring that it augments, not hinders, creativity and design learning.

Challenge 3: Ethical implications and considerations

Incorporating Midjourney into the curriculum required opening discussions with the students on the ethical considerations of A.I. tools, covering implicit biases, intellectual property concerns, and potential misuse. Students were informed about biases in datasets leading to perpetuated stereotypes and the complexities of copyright issues. This was aimed at promoting responsible A.I. usage and fostering ethical design practices.

Reducing the time and effort needed to visualize ideas

Incorporating A.I. image generators like Midjourney into the curriculum expedited students' visualization of ideas. They generated multiple sketches rapidly, refining designs faster than with traditional methods. Midjourney helped in exploring materials, colors, and textures swiftly, reducing pressure for perfect sketches and easing repetitive tasks. This led to more innovative, diverse, and creative design solutions.

Creating unexpected variations from textual prompts

Midjourney's image generation process introduces a level of randomness into each generated image. This level of randomness allowed students explore unexpected design ideas represented in color, texture, material, and shape variations. This expanded students' creativity, encouraging open-mindedness and critical assessment of these unexpected results that were often interesting and inspiring.

Exploring complex and abstract ideas

Midjourney helped students visualize complex ideas traditionally hard to depict. Examples included a boot symbolizing love and attachment, shoes inspired by music genres, and designs reflecting historic eras. The tool also facilitated the infusion of cultural patterns into designs, promoting identity exploration. Midjourney fostered out-of-the-box thinking by driving innovative solutions by combining abstract and tangible concepts.

Overcoming creative blocks

Midjourney aided students facing creative blocks, offering fresh and unexpected design directions. For instance, one student, unsure about their shoe concept, used Midjourney to ideate a superhero-inspired design. The tool allows abstract concept experimentation in tangible forms, especially helping those students that struggled with idea visualization. Midjourney enhanced creativity, promoting students' growth as designers.

Promoting a more equitable learning experience

Midjourney's integration into the course leveled the educational playing field, providing an advanced visualization tool accessible to all students, regardless of prior design experience. It facilitated design process engagement for those with limited art education or software access, and served experienced students as a tool for ideation. Consequently, the use of Midjourney in the class promoted a more equitable learning experience.

About the author

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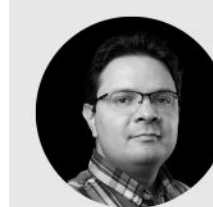
F. Andres Tellez, Ph.D. is a designer, researcher, and educator currently serving as an Assistant Professor at Appalachian State University (North Carolina). Dr. Tellez has experience teaching at the graduate and undergraduate levels focused on human-centered design, design research, design thinking, and design foundations. His research explores the intersection of design and education and is increasingly oriented on addressing complex issues from a design approach.