

# TESTING VISUAL AI GENERATORS AS A TOOL FOR TEACHING & LEARNING

Tuesday October 17, 2023

Dr. Katherine Perrott, RPP, MCIP  
Associate Director, Planning Practice & Lecturer  
Faculty of Environment, School of Planning  
[kperrott@uwaterloo.ca](mailto:kperrott@uwaterloo.ca)

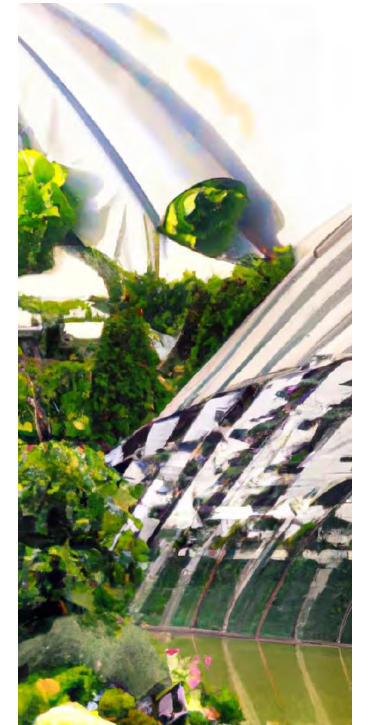


Micheal Glazyrin  
3<sup>rd</sup> year undergraduate student  
Faculty of Environment, School of Planning

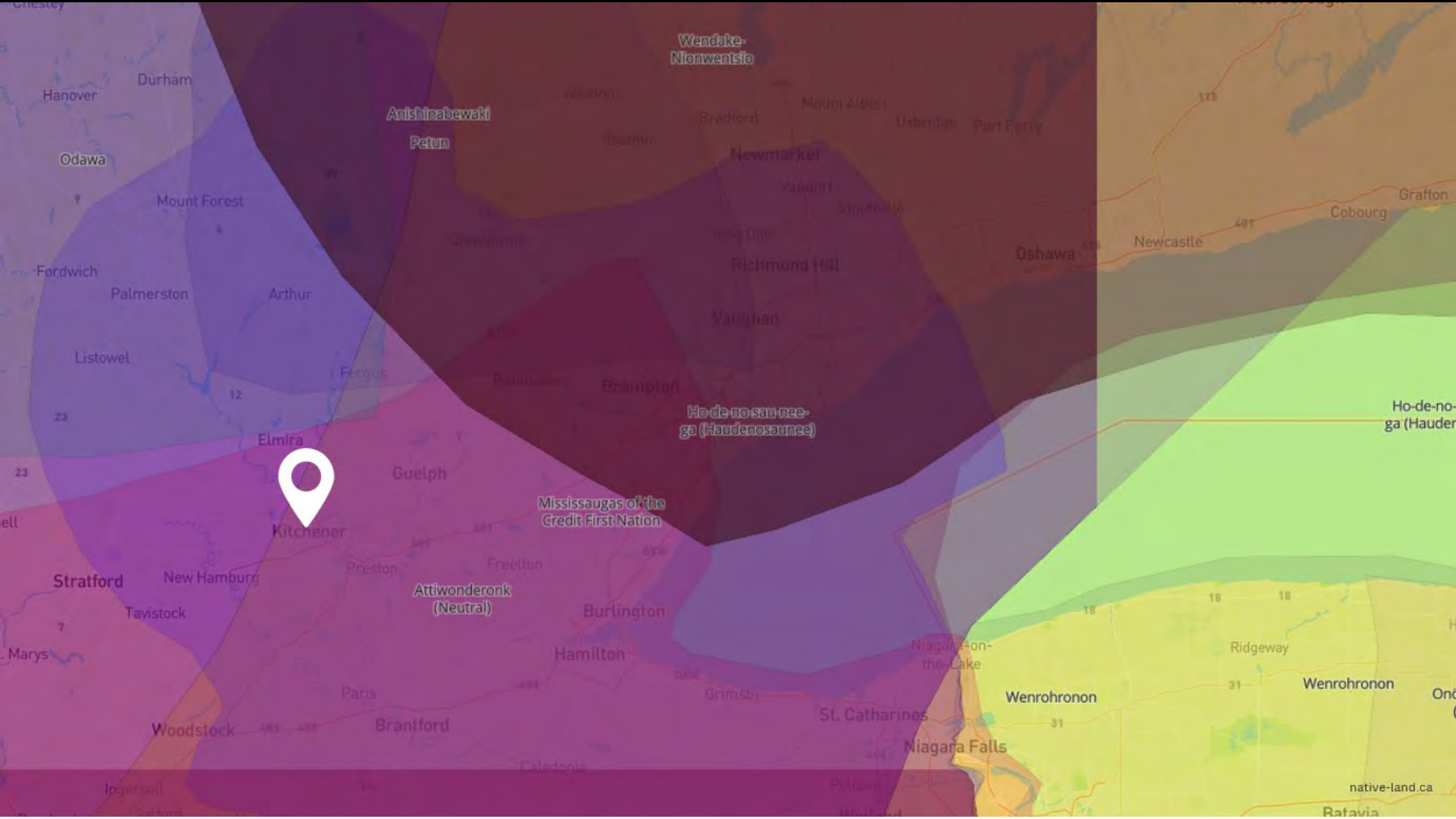


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Dall-E 2 + Dylan Schnurr; Xavier Costa; Ananya Patel



# BIG TAKE-AWAYS

- Visual AI is here!
- Students are using AI.
- Potential tool for teaching & learning.
- It isn't perfect. Let's talk about it.
- Learning objective: exercise or assignment



# **CURB CUTS FOR PARTICIPATION**

**A Universal Design for Learning Approach**



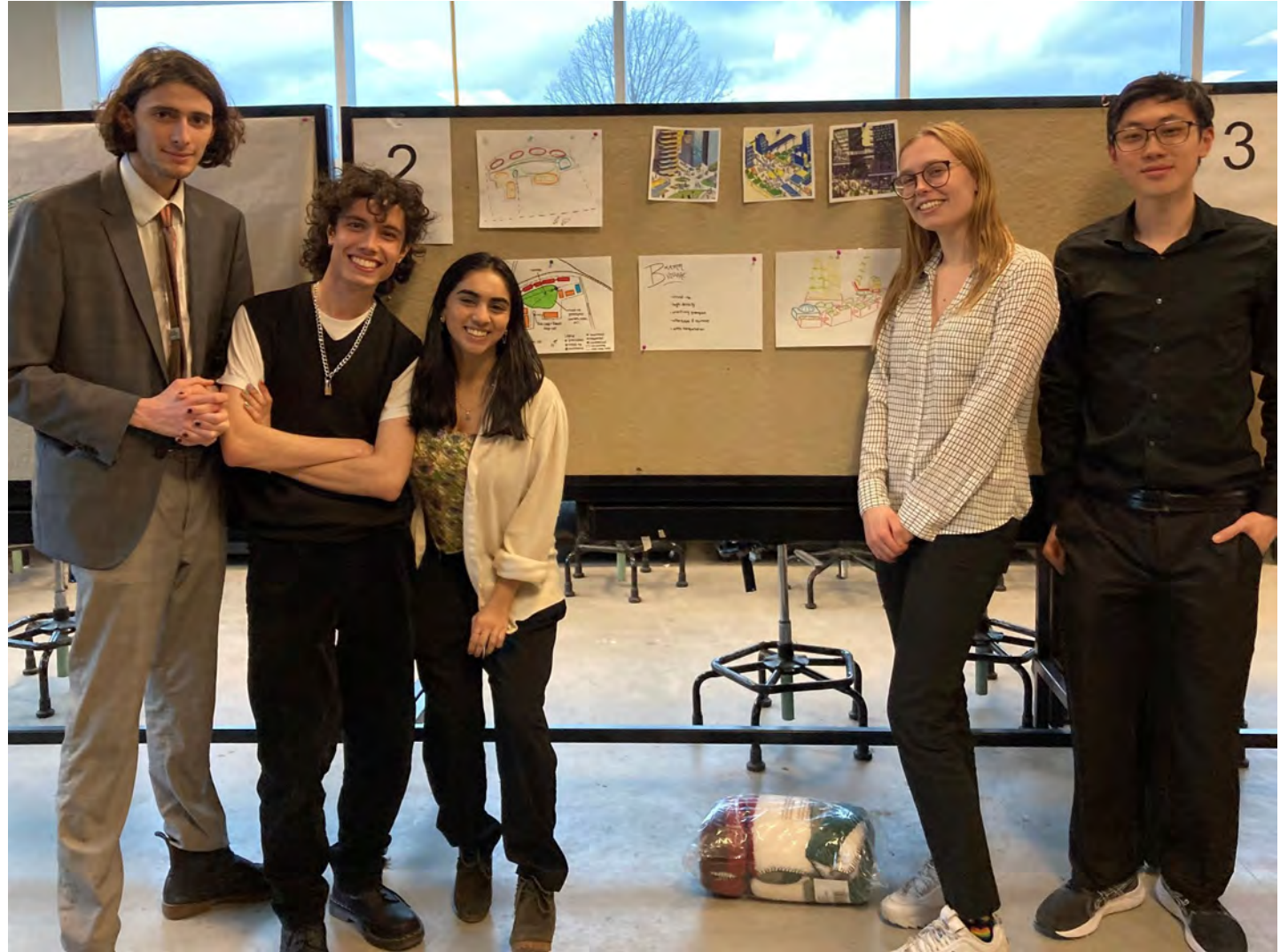
**FLEXIBLE STRATEGIES**

**MULTIPLES MEANS  
OF EXPRESSION**



# VISUAL AI IS

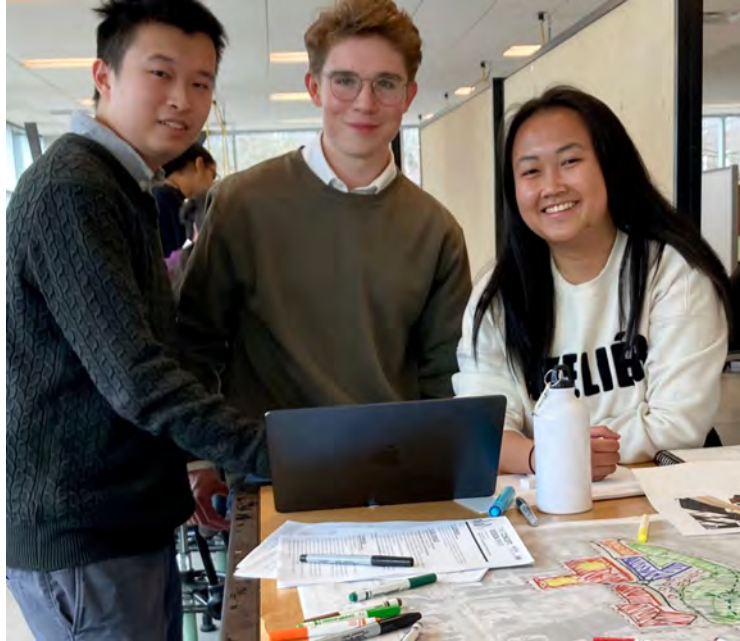
- a low-cost, low-stress, quick, and fun way to **turn ideas into sharable images**



# VISUAL BRAINSTORMING



“This is what I have in mind!”



What if [big idea]?!



How do others visualize a sustainable future?



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# VISUAL AI COMPLEMENTS SKILLS, NOT REPLACES



My students continue to learn a range of by-hand and digital design skills!  
Real-world, existing precedents and case studies are still important!



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# PLAN 211, WINTER 2023

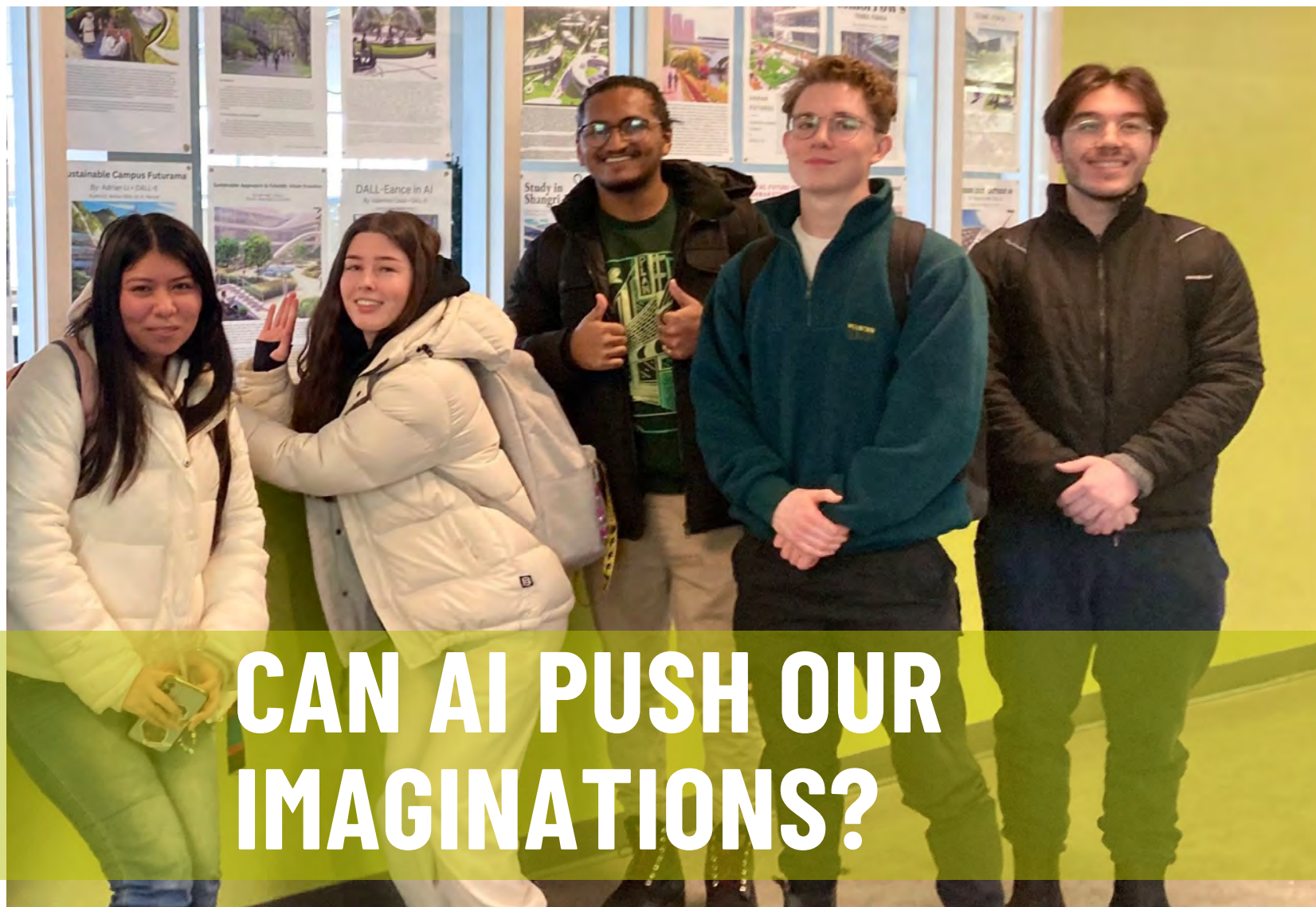
## VISUALIZING A HOPEFUL CLIMATE FUTURE FOR THE UNIVERSITY OF WATERLOO

### IMAGINE...

IT'S THE YEAR 2050 AND THE UNIVERSITY HAS MET ITS GOALS FOR NET ZERO EMISSIONS. WHAT DOES THIS FUTURE CAMPUS LOOK LIKE? IN WINTER 2023, PLAN 211 HAS AN EXCITING PARTNERSHIP WITH THE SUSTAINABILITY OFFICE TO PRODUCE URBAN DESIGN VISUALIZATIONS THAT CAN REFLECT, INFORM, AND INSPIRE GOALS FOR A HOPEFUL CLIMATE FUTURE FOR THE UNIVERSITY CAMPUS.



PLAN 211 IS THE FOUNDATIONAL STUDIO COURSE IN THE URBAN DESIGN SPECIALIZATION. TO ENROLL, STUDENTS MUST BE ADMITTED TO THE SPECIALIZATION THROUGH THE PORTFOLIO REVIEW PROCESS. PORTFOLIOS ARE DUE MON. NOV. 21. CONTACT [KPERROTT@UWATERLOO.CA](mailto:kperrott@uwaterloo.ca) FOR MORE INFO.



# CAN AI PUSH OUR IMAGINATIONS?

# U of Topia - 2050

Kavishka Gomes + DALL-E

PLAN 211, Winter 2023, Dr. K. Perrott



Through my several AI generations, my focus was to create an image of a university that was centred around the themes of utopia, sustainability, walkability, and lots of green space. My initial generation consisted of the commands "green, university, sustainable, naturalistic, geese, vegetation, architecture, minimalistic, urban, solar energy, green roof, courtyard, and public square". This combination of commands resulted in a very basic image of something that could be seen in our world today. However, I felt the initial image I generated was a good foundation, therefore, I started experimenting by adding different commands on top of the commands from the initial generation to create an image that looked more futuristic. These commands included "cyber-punk, utopian city, concrete jungle, futuristic, eco-friendly architecture, and green walls." After a lot of back-and-forth experimentation with commands, my final image consists of the commands "concrete jungle, high resolution, tall buildings, naturalism, realism, crowds of students walking around, active transportation, futuristic, high density, smart city, utopian city, eco-friendly architecture, sustainable, university, skyscrapers, wooden architecture, 3D Render, 4k, ambient lighting, bridges, and green walls." I added commands such as "4k, 3D Render, high resolution, and ambient lighting" to ensure that my final image had adequate lighting and looked realistic and presentable as if I were using the image for a future development proposal.

One strength of AI is how well it formed images that were very focused on green space and big futuristic architectural concepts that will most likely be used more prominently within the next few decades. A limitation, personally, was that the people in my generations weren't as clear as I would've liked them to be, as well as that other small details that did not pixelate well. However, as a big picture, the AI generations look decently clear. Overall, I think that AI is the future in any field, especially in the field of urban design because I believe that AI generated images help spark new, innovative, and ground-breaking design ideas. I also think it should become an industry standard to use some form of AI in the field of Urban Design as it is a great tool to help create and express images that you visualize in your head.

# tomorrow's

TERRA FIRMA

By: Mariella Leccese + DALL-E

PLAN 211, Winter 2023, Dr. K. Perrott



**Describe your image objective and AI generation process.** My objective for this image was to create a visualization of a sustainable built environment that prioritizes the natural environment and targets solutions that neutralize operational carbon. The AI generation command inputted into DALL-E was "3D rendering of contemporary buildings with solar panels and roof-top gardens + people riding electric bicycles and walking on paths." While little edits had to be made to generate this image, an edit command I made was "add a colourful paved pathway." Colour is extremely important to me in the urban design context because I think it brings life and culture into a functional-based design. The AI generation process perfectly captured the eco-friendly nature that I had in mind for a sustainable future university as greenery is a dominant characteristic in this image. However, throughout the process, DALL-E lost track of minor details as the command became lengthier. For example, it did not fully represent people riding electric bicycles as intended.

**Take a stance on the question: Is AI the future of Urban Design, why or why not?** I believe AI will have a presence in urban design in the future, but I do not think it will be the future. AI has many technological capabilities such as being able to convert simple text into visualizations to benefit brainstorming and problem-solving processes by respectively generating designs for inspiration and solutions. On the other hand, urban designers tend to have pre-conceived ideas for a given space, and through experience, AI could not fully capture what I had envisioned. Additionally, AI would have to be able to evolve frequently and quickly to new terms, phrases, and concepts used by urban designers and adjacent fields which can become challenging. Essentially, AI would enable open-minded thinking; however, its limitations may only make it an intrinsic step in the design process.

# THE FUTURE OF UNIVERSITY CAMPUSES IS IT GREEN?

By: Dylan Schnurr + DALL-E  
Plan 211, Winter 2023, Dr. K. Perrott



**My goal was to generate an image that emphasizes outdoor education spaces.** I firmly believe that outdoor educational spaces create positive learning environments and create spaces where creativity and collaboration flourish. As educational institutions are often known for their innovative and cutting-edge architecture, it was essential to create buildings with a lot of visibility of these outdoor spaces to give those inside the same benefits that they would have being outside. The initial command into DALL-E was a "futuristic utopia university campus with a lot of trees, ecologically friendly, sustainable, outdoor seating, lots of people walking around, buses, green transit, year 2100," which provided the majority of the rendered image. A few sample edits were made, primarily in the interiors of the courtyards and surroundings of the buildings, with the prompts "add outdoor seating" and "add outdoor classrooms" to truly capture the image of a campus with an emphasis on outdoor education. Similarly, I used the commands "add large courtyard" and "increase walkways" to create more spaces in the backright of the campus. DALL-E understood the prompts of emphasizing greenspace and outdoor seating areas but did not understand how to link pathways together and struggled to add trails underneath some of the seating areas, taking realism out of the rendering. When I prompted DALL-E to add transit options, like bus networks, it failed to smoothly and realistically integrate the network onto the existing pathways.

**I believe that AI has a future in Urban Design, but only with the assistance of the design process.** I firmly believe that Urban Design is an intimate process where one needs to have complete knowledge and understanding of the local context, including the history of the area and its people, along with the surrounding character of the buildings and neighbourhood around it, to entirely create a design that will remain timeless within that particular area. AI cannot fully capture the true character and vibe of space quite as one-on-one interactions or town halls can. Humans can effectively put thought and effort into minute details every step along the way. In contrast, computer algorithms cannot do an area justice to the same level of detail and care for the local context.

**That said, however, AI provided me with structures that I had never even imagined, with each initial drawing featuring different layouts and building shapes along with different overall features.** AI is a great starting point, allowing designers to visualize ideas for a particular area quickly, and then from those ideas, more personal, thought-out designs can be implemented. With technology constantly advancing, AI software will ultimately become more realistic and detailed, providing designers with a plethora of new ideas and styles, all with the quick push of a button.

# Visually brainstorming sustainability with DALL-E 2



**CLIENT:** University of Waterloo Sustainability Office  
**COURSE:** University of Waterloo, School of Planning: PLAN 211 Design Studio Foundations. Instructor: Dr. K. Perrott,  
**Student work shown by** Ealy Fong+DALLE2 & Ealy Fong

# Final visualizations using SketchUp, TwinMotion, Photoshop, Illustrator & InDesign

## ILLUMINATING SUSTAINABILITY AND INNOVATION AT THE HEART OF HUMAN SCALED DESIGN

DAVIS CENTRE QUAD, UNIVERSITY OF WATERLOO

Ealy Fong  
 PLAN 211, Dr. Katherine Perrott



### Sense of Place and Seasonality

Focusing on the human scale and creating a sense of place, the site design encourages interaction with the urban realm at all times of day and seasons. Opportunities to stay, enjoy, and engage with the public space are woven through the design.

The DC pavilion design integrates placemaking with advanced technologies in the urban realm. Technological innovations are an increasing tool for designing safe, creative, and accessible public spaces on campus for all to delight in. The pavilion opens new possibilities as a connecting corridor between main campus buildings, life between buildings comprises the spectrum of social activity.

Outdoor and indoor insulated study spaces encourage students to engage with nature, benefiting individual well-being and providing opportunities for community building. Distinguished by record permeable pavers for separation of space, the enclosed seating area surrounding the Learning Centre encourages people to spark conversations with one another. Surrounding noise sources are hushed by surrounding trees, creating a "talkscape" for listening and speaking (Gehl & Rogers, 2010).

### The Design Process

The central idea of placemaking and accessibility evolved to incorporate elements of technology and futuristic design to reflect the innovation hub at the University of Waterloo in the vision for the campus in 2050.



### Equity and Inclusion within the Urban Realm

Inclusivity in the public realm means that spaces are fully accessible — in both the physical and social sense — with acceptance of different lived experiences, ages, income levels, religions, genders, and cultures. Incorporating design principles from the University of Manitoba's Indigenous Planning and Design Principles, the site design incorporates the principle of fostering a sense of belonging and community (University of Manitoba, 2018).

Placemaking invites people to use and be part of the public space; it encourages people to flow through spaces, make conversations, and build relationships. The design of shared spaces reconciles and integrates the needs and demands of the human dimension (Carmona et al., 2012).

### Technological Innovation Illuminates Campus

Lighting on campus is fundamental in defining space and the feelings experienced within it. Insufficient lighting and low visibility evokes fear when travelling through connector corridors between buildings. The interactive screens display pathway illuminates the space in vibrant colours to encourage evening uses. Sufficient lighting provides a sense of security and prevention against crime (Gehl & Rogers, 2010). The heated learning centre invites those on campus to engage while taking shelter from weather conditions.

**The University of Waterloo's Sustainability Strategies**

To mitigate urban intensification and growth, the University Urges Grounds Operations to deliver sustainable landscape management practices interwoven with community building and enhanced aesthetics on campus (University of Waterloo, 2017).

Biophilic and future sustainability design reimagines urban life by understanding the urban realm and ecosystem belonging to a larger place of nature (Saville, 2016, p. 29). Sustainable urban design works to integrate and weave existing natural features into the urban form. The relationship between urban design and nature is fundamental for the preservation of nature and a sense of belonging (Friedman, 2020).

The quad design aims to provide stormwater management practices through the passive, yet interactive design of sculptural water features to encourage engagement with the urban realm.

Pathways are paved around existing vegetation to sustain the existing biodiversity. To preserve the organic contours in the topography, the design emphasises the natural form in the gentle curves of pathway movement.

**LEGEND**

- BIOPHILIC CIRCULATION
- TECHNOLOGICAL CIRCULATION
- EXISTING SITE

SCALE: 1:800

# Visually brainstorming sustainability with DALL-E 2



# Final visualizations using SketchUp, TwinMotion, Photoshop, Illustrator & InDesign

## VELOCITY PARK A Visionary Bike Parking Solution



East Campus, University of Waterloo  
Khalil Heron  
April 2023  
Plan 211  
Dr. Katherine Perrott



CLIENT: University of Waterloo Sustainability Office  
 COURSE: University of Waterloo, School of Planning: PLAN 211 Design Studio Foundations. Instructor: Dr. K. Perrott,  
 Student work shown by Khalil Heron & DALLE2 +Khalil Heron



# Visually brainstorming sustainability with DALL-E 2

# Final visualizations using SketchUp, Lumion, Photoshop, Illustrator & InDesign



## SLC STUDENT SQUARE

A North Common Open Space Development

Micheal Glazyrin  
 PLAN 211, Dr. Katherine Perrott  
 University of Waterloo



Bubble Diagram



### The Big Idea

"Context integration with the use of open space enhancement and urban afforestation"

### Background

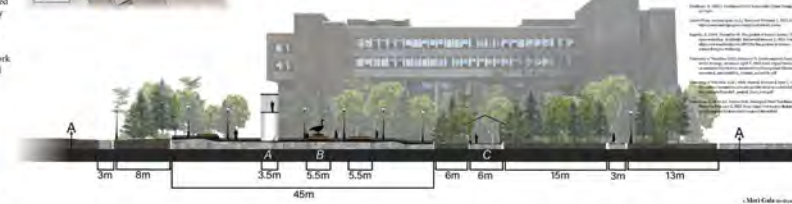
The North Common Open Space was once a vibrant place for students to congregate outdoors prior to the SLC expansion. Nowadays, the space is made up of mismatched footpaths, some patches of grass, and mud. It is clear the recent constructions have not only negatively affected students experiencing the outdoorspace but also the biodiversity of this area. This proposal addresses these issues by introducing open space enhancement and productive greenpaces.

### The Process

This development has gone through many iterations throughout the design process. The addition of assets like lamp posts and benches in underutilized spaces was brought in early during the drafting stage. Optimization and changes in land use occurred with the open space and greenpace frequently shrinking and expanding. One of the largest issues that were brought up included the effect that the vegetation would have on surrounding buildings. Concerns included the way that branches could damage the glass windows of the SLC/MC bridge. To address such concerns, buffers were implemented with the canopy being removed and instead replaced by smaller forms of vegetation. The second concern brought up by my colleagues was the feeling of rapidness with the original design. To address this concern, appropriate materiality needed to be chosen and additional furnishings added. Currently, there are a total of 3 large round tables that occupy the internal space and additional table space hugging the perimeter of the open space. The materials that I chose to primarily work with include engineered wood and exposed aggregate. The feeling of intimacy was my goal and I hoped to accomplish it by enclosing the open space with a thick tree line.

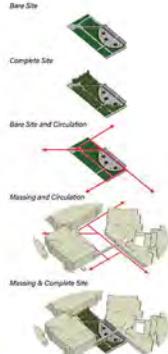


Precedents



### Addressing Broader Goals and Literature

- Offsetting emissions through natural means is one of the outlined actions the campus will take according to the Shift Neutral document. This has been considered in the site plan by allocating much of its greenpace for mature trees. The installation of native tree species such as White Spruce and Eastern White Cedar are just a few species under consideration. (Still Neutral)
- Energy is an outlined operational sector that is addressed in the Campus's Environmental Sustainability Strategy. Specifically, the goal is to minimize long-term energy use to mitigate emissions. This goal is reflected in my site proposal by ensuring that all light fixtures are fitted with energy-efficient LED light bulbs. (Environmental Sustainability Strategy)
- Investment in high-quality buildings and open spaces is one of the goals of the Campus Master Plan and the Environmental Sustainability Strategy. The pursuit of supporting efficient developments with a long lifespan is crucial in reducing the impacts of embodied carbon. This goal is represented in the proposed development through the use of high-quality resources and ecological practices. Constructing pedestrian walkways out of brick and tile ensures that repairs are not taxing and infrequent. The installation of mature species in the available greenpace strengthens the soil from erosion. (Environmental Sustainability Strategy, 2023)
- Sustainable development involves the consideration of the impact of construction and its long-term consequences. As a point of critique, the recent SLC expansion failed to consider the surrounding greenpace that was removed in its construction. The open space enhancements that this new development proposes is directly addressing such shortcomings. This proposal does this by converting the underutilized open space into a resilient microecosystem. (Friedman, 2021, pg. 15-20)
- Stormwater management is addressed in the site's design. Despite the presence of a large swath of impermeable surface, this proposal has strategically placed bio swells. The goal of these naturalized areas is to absorb surrounding stormwater. Currently, the soil quality is quite poor and is unable to absorb excess moisture. The careful installation of plant species ensures that the greenpace is functional. (Friedman, 2021, pg. 15-26)



CLIENT: University of Waterloo Sustainability Office  
 COURSE: University of Waterloo, School of Planning: PLAN 211 Design Studio Foundations. Instructor: Dr. K. Perrott,  
 Student work shown by Micheal Glazyrin & DALLE2 +Micheal Glazyrin



Kitchener-Waterloo · Photos

## These University of Waterloo students reimagined a more sustainable campus using AI

AI system called DALL-E can design images based on written prompts



Aastha Shetty · CBC News · Posted: Feb 18, 2023 6:00 AM EST | Last Updated: February 18



University of Waterloo students Myah Sachedina (top) and Khalil Heron used artificial intelligence to help create an image of a more sustainable life on campus. Sachedina's creation is on the top left and Heron's image is on the bottom right. (Photos submitted by Katherine Perrott, Myah Sachedina and Khalil Heron)

4 comments

## SCHOOL OF PLANNING

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School of Planning » News » 2023 » February »

## Using AI (DALL-E 2) to Visualize the Future in PLAN 211

FRIDAY, FEBRUARY 3, 2023



This year, the PLAN 211: Design Studio Foundations course, taught by [Dr. Katherine Perrott](#), has partnered with the [Sustainability Office](#) to produce urban design visualizations that explore the possibilities of what the future of the University of Waterloo campus could look like when meeting the University's sustainability goals. The students' first project was to create a general idea of a sustainable campus by submitting prompts into the new cutting-edge technology: DALL-E 2.

Pictured from left to right: Valentina Casas, Paige Thompson, Kavishka Games, Tim Ross & Michael Barone.

DALL-E 2 is an artificial intelligence (AI) system that can design an entire image based on written prompts and was created by the same developer as ChatGPT: Open AI. It can recreate photos and art in a range of artistic styles, or design something never seen before. DALL-E-2 opens many possibilities for creation and discovery. Being new, there is still much to discover about the platform and its potential. For design instructor Dr. Perrott, "it is important to show students how AI can be an appropriate tool for idea generation and exploration as long as students clearly acknowledge AI use as part of the broader creative process." Her goal is to facilitate opportunities for students to critically engage with, and evaluate, new technologies like DALL-E-2.

In this project, students were asked to start with an initial command for DALL-E 2 that captured components of a sustainable campus. They then continued to add commands and edits until the displayed image aligned with their vision. Students created posters with their images and a brief discussion about the strengths and limitations of the platform. The students took a stance on the question: "Is AI the future of Urban Design?" Students identified the limits of an algorithm for replicating the contextual knowledge, critical perspective, attention to diversity, and nuanced iteration of a human designer, but they recognized the power of AI to quickly turn ideas into images. These technologies are becoming increasingly powerful and accessible and as one student, Myah Sachedina, concluded: it's not a question of if AI will be the future of urban design, but rather: "What will the future of urban design look like with AI?"

The final product is a studio gallery wall showcasing unique visualizations of what a sustainable future

# UW-TMU Student Conference





# PLAN 210 FALL 2023



# DEMO: DALL-E - Image generation

DALL-E History Collections

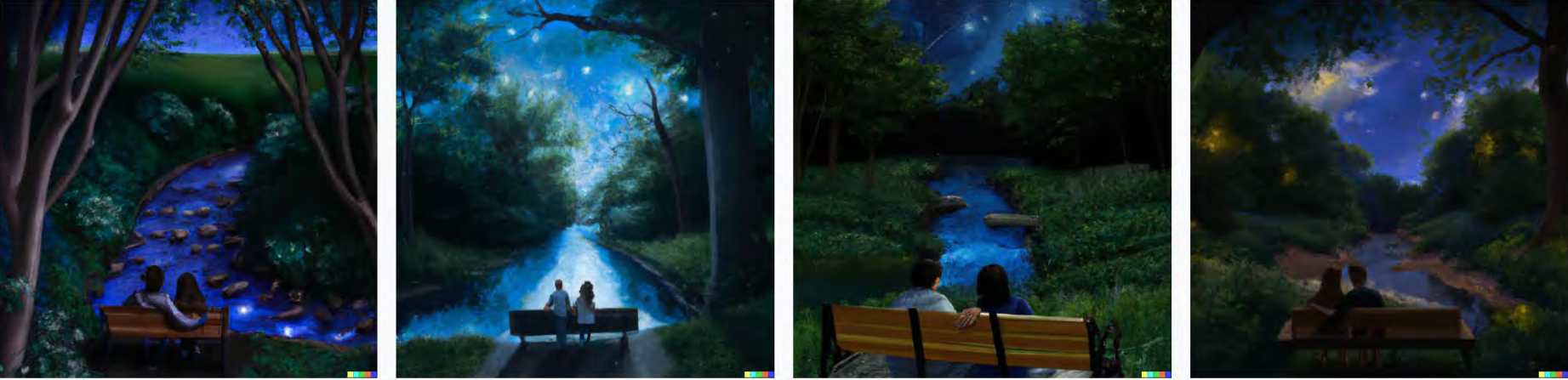
Edit the detailed description

Surprise me Upload →

realistic painting rendering a starry night overlooking a creek in a dense park forest with a couple hold hands on a bench facing towards the creek

Generate

Recent Clear



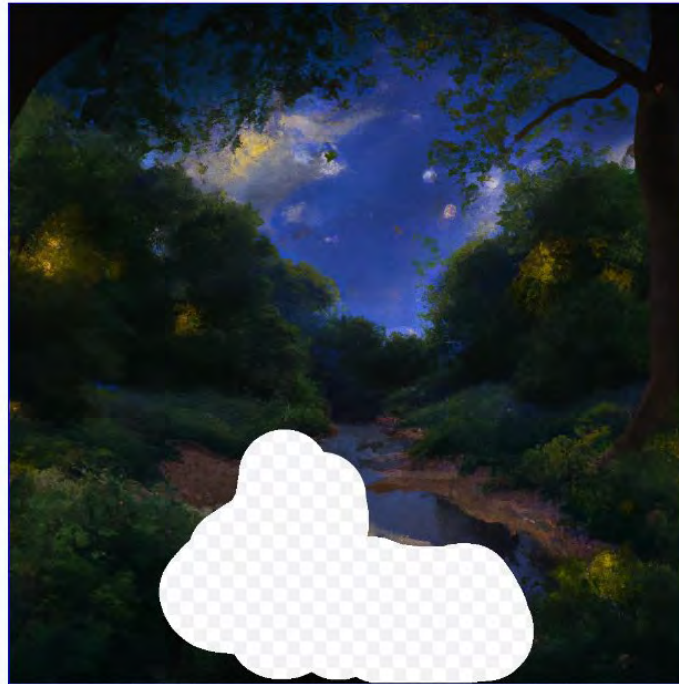
The interface shows the DALL-E web application. At the top, there are navigation links for 'DALL-E', 'History', and 'Collections'. Below this is a text input field containing the prompt: 'realistic painting rendering a starry night overlooking a creek in a dense park forest with a couple hold hands on a bench facing towards the creek'. To the right of the input are buttons for 'Surprise me', 'Upload', and a right arrow. A 'Generate' button is positioned to the right of the input field. Below the input field, four generated images are displayed in a row. Each image shows a couple sitting on a wooden bench by a creek at night, with a starry sky and dense forest. The images vary slightly in perspective and lighting. To the right of the main image area is a 'Recent' gallery with a 'Clear' button and a grid of smaller image thumbnails.

# DEMO: DALL-E - editing capabilities - "inpainting"

< Edit image

Edit romantic couple sitting on a wooden bench facing backwards

Generation frame: 1024 x 1024



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# DEMO: DALL-E - editing capabilities - "inpainting" - Bias

Edit romantic queer couple sitting on a wooden bench facing backwards

Generation frame: 1024 x 1024



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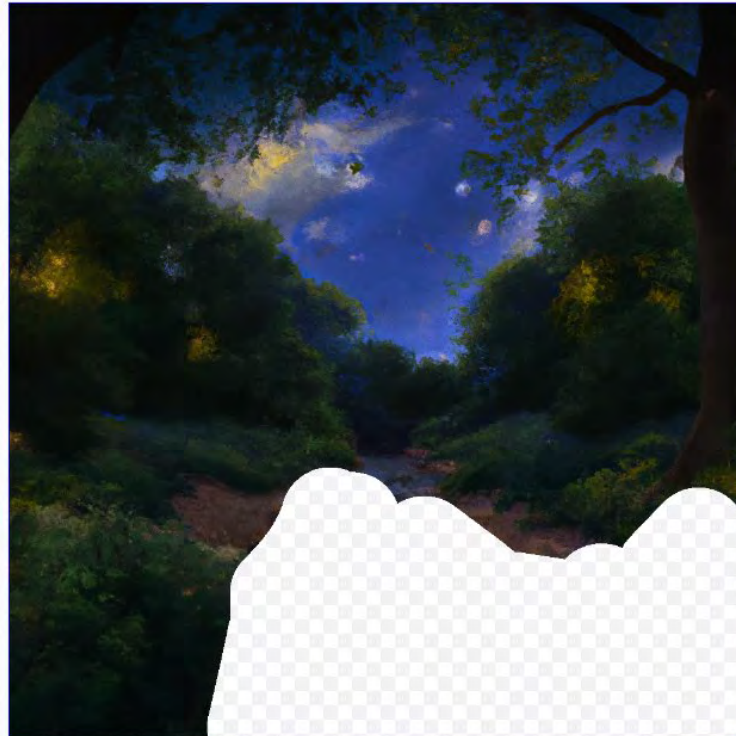
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# DEMO: DALL-E - editing capabilities - "inpainting"

< Edit image

Edit House being flooded and swept away by the creek

Generation frame: 1024 x 1024



# DEMO: DALL-E - editing capabilities - "inpainting" a photo

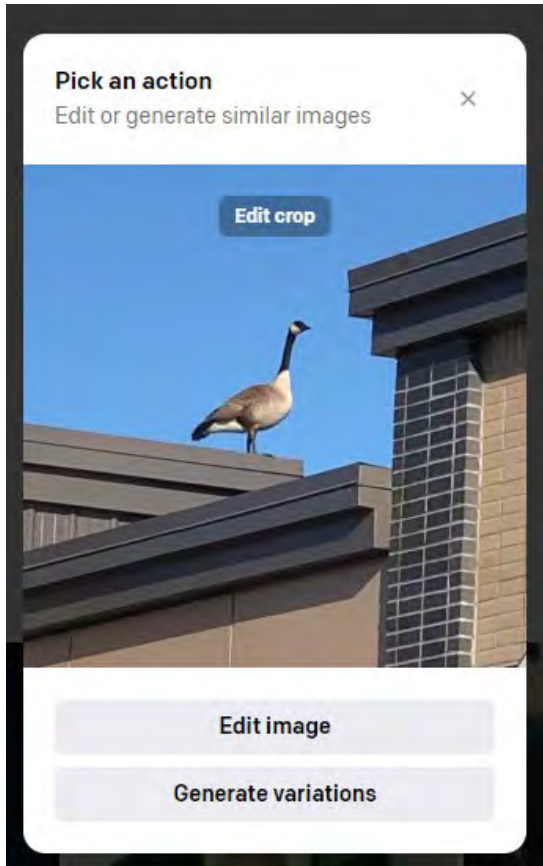
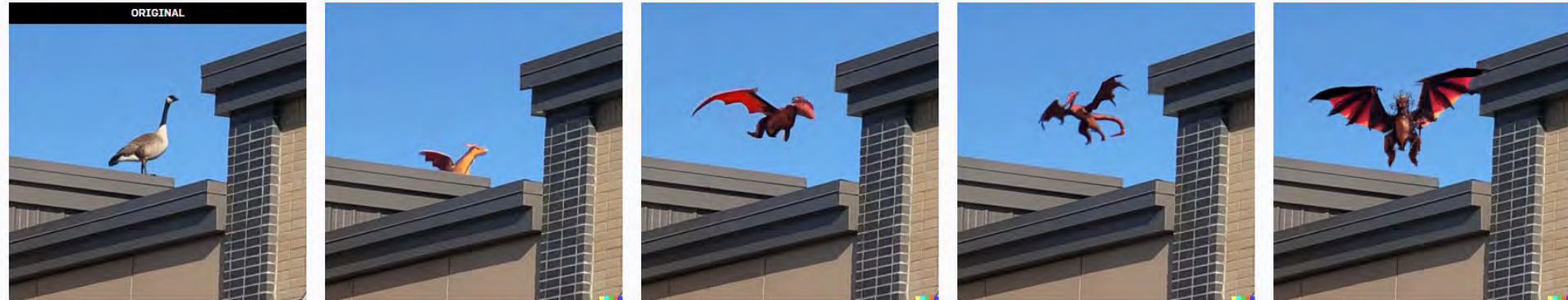
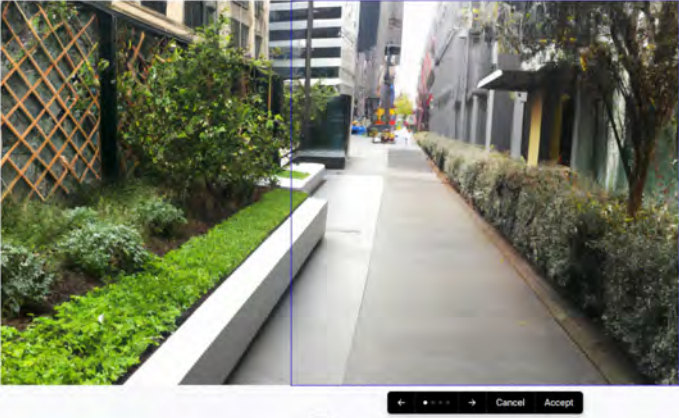
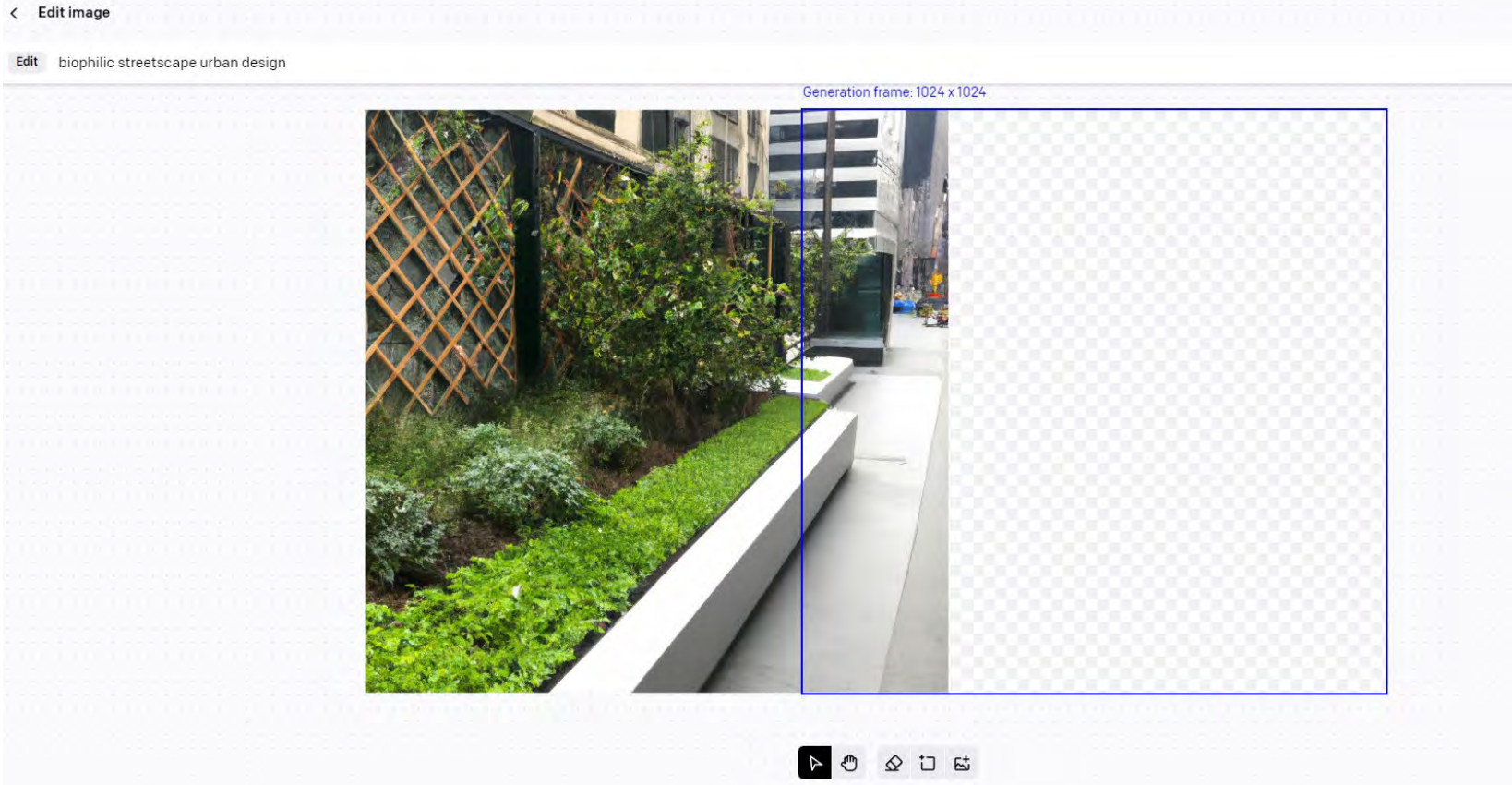


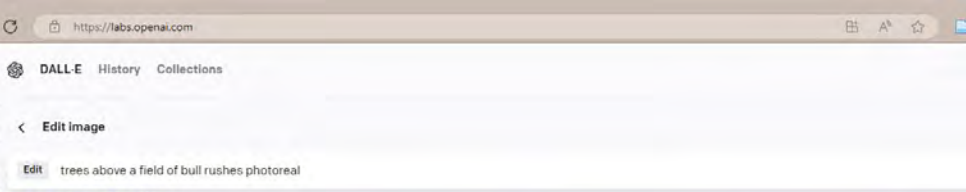
photo realistic rendering of a red fire breathing dragon with big wings Generate



# DEMO: DALL-E - editing capabilities - "outpainting"



# DEMO: DALL-E - editing capabilities - "outpainting"



**TAKE-AWAY QUESTIONS**  
Trading core planning values for fast growth?

*Will these changes deliver speed, high-quality developments, or affordability?*

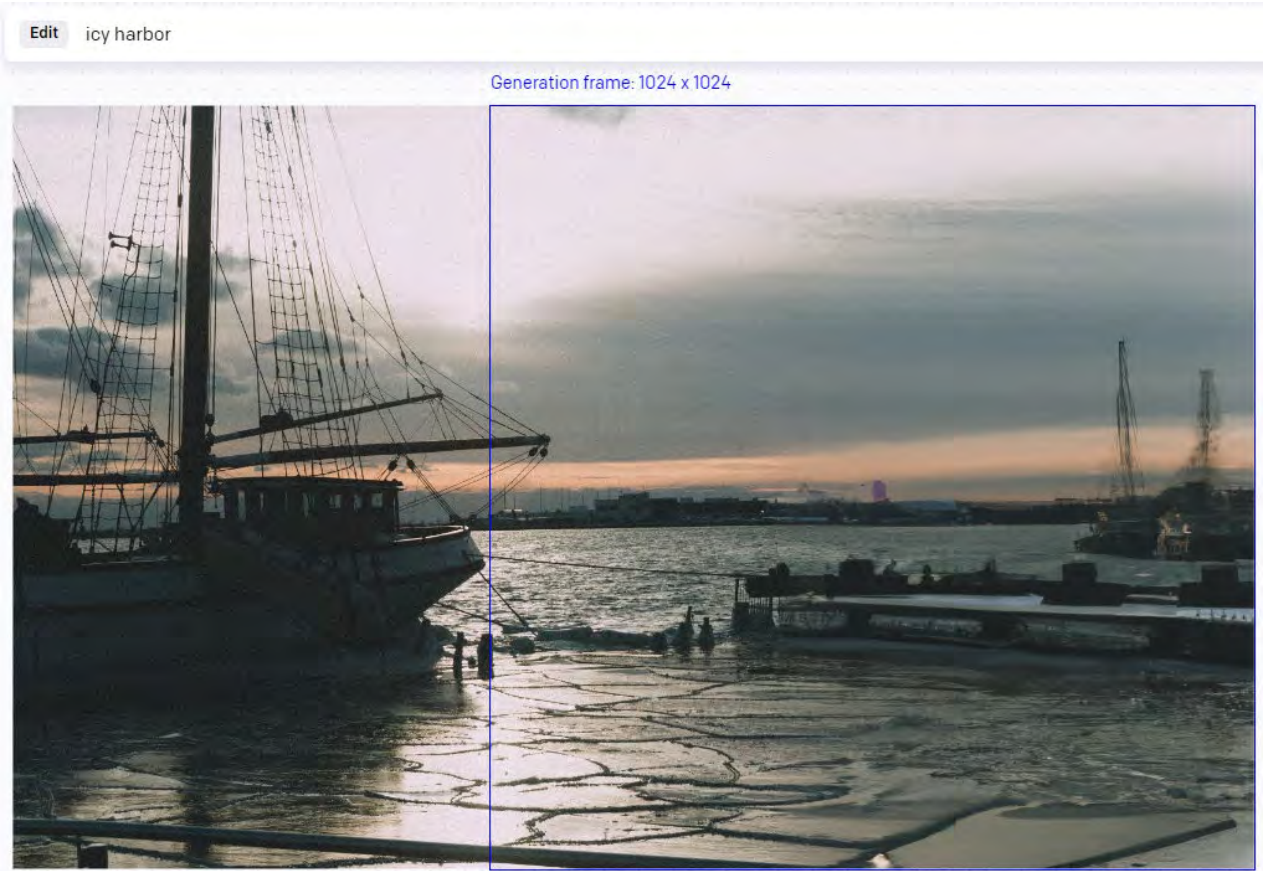
How else would *you* define contemporary planning problems & solutions?

**TOWNS & SINGLES**  
COMING SOON REG

Katherine Perrott, Ph.D., RPP, MCIP  
Associate Director, Planning Practice & Lecturer  
Faculty of Environment, School of Planning  
University of Waterloo, Ontario  
kperrott@uwaterloo.ca

Jill L. Grant, Ph.D. FCIIP  
Professor Emerita  
Faculty of Architecture & Planning, School of  
Planning Dalhousie University, Halifax, Nova  
Scotia

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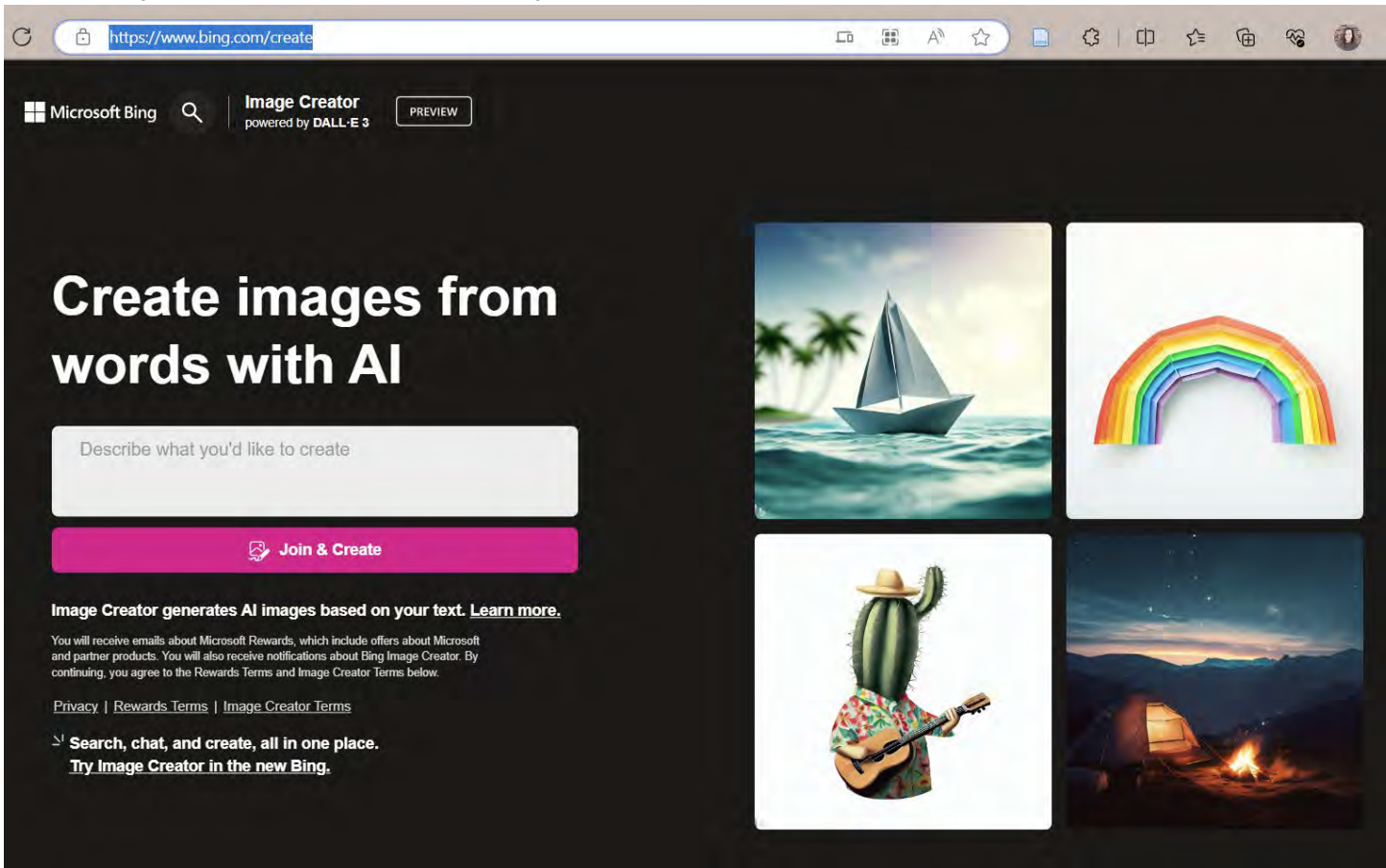




# INTERACTIVE: Get into Microsoft Bing Image Creator

<https://www.bing.com/create>

Login to your personal Microsoft account, or quickly create one if you don't have one yet.



# **INTERACTIVE: Generate an image with the same prompt**

**Prompt: A happy Canada Goose sitting in a blue lecture hall during a presentation**

**Show each other.  
What did you get?**

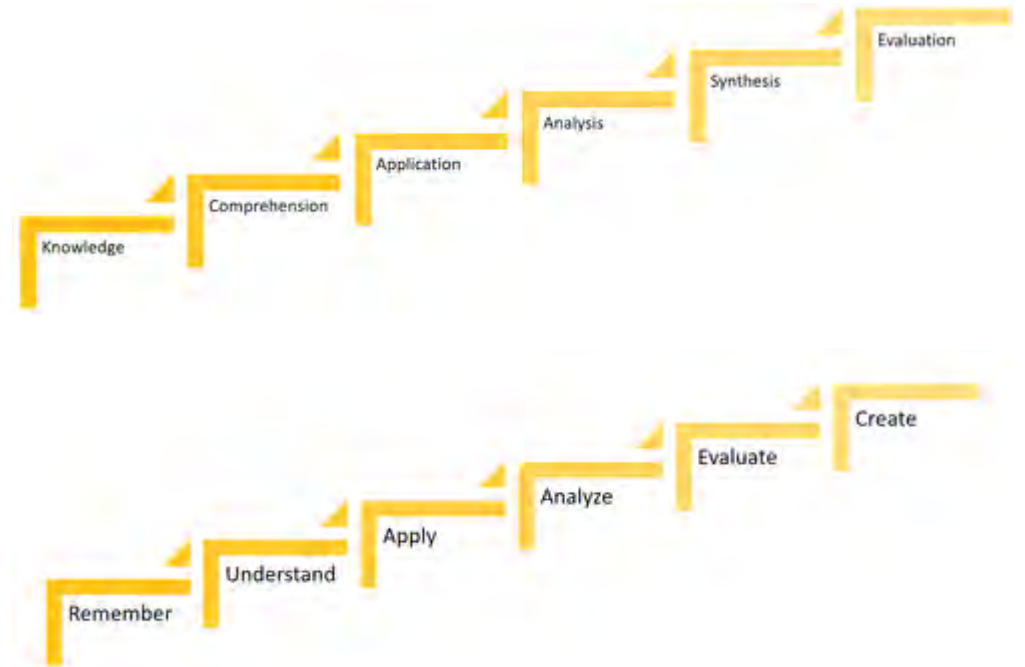
# How to write a good AI prompt

- Stick to a single clear idea
- Be specific about the clear idea
- Style it

Clear Ideas	Specificity	Style it
<ul style="list-style-type: none"><li>- University campus</li><li>- Subway</li><li>- Clown</li><li>- Goose</li></ul>	<ul style="list-style-type: none"><li>- Crowded</li><li>- Red</li><li>- Laughing</li><li>- Gigantic</li></ul>	<ul style="list-style-type: none"><li>- Oil painting</li><li>- Photorealistic</li><li>- Scary</li><li>- Colourful</li></ul>

# INTERACTIVE: Create an assignment using visual AI

- **Course**
- **Grade weight**
- **Stand-alone or part of a bigger assignment, or an in-class activity**
- **Learning Objectives**
- **Generative AI + \_\_\_\_\_**
  - **Comparison to exemplar or principle**
  - **Reflection component**
  - **Brainstorming (demonstrate iteration)**
  - **Labeling/notations**
  - **Critique**
- **Assessment**



CTE, UW, Bloom's

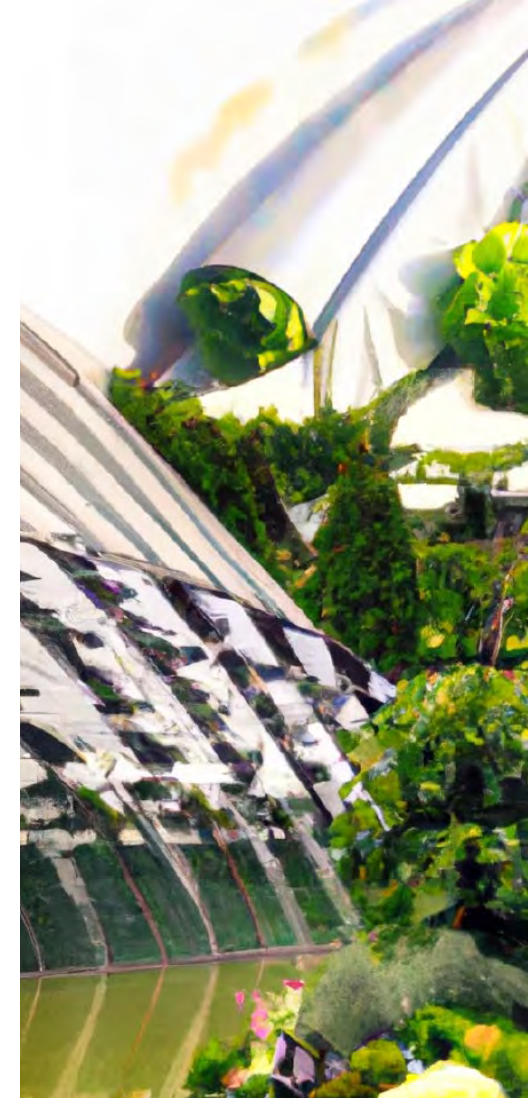


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# FINAL REFLECTIONS

- AI Offers both potential and limitations.
- Contextualization, reflection & debate is necessary.
- Limited by what's on the internet – radical imagination demands more.



Dall-E 2 Mariella Leccesse; Ananya Patel



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## **FACULTY OF ENVIRONMENT**

How might you use Visual AI generators in your courses?  
What potential opportunities and limitations do you think visual AI holds?

Thank you! Connect: [kperrott@uwaterloo.ca](mailto:kperrott@uwaterloo.ca) and on LinkedIn.