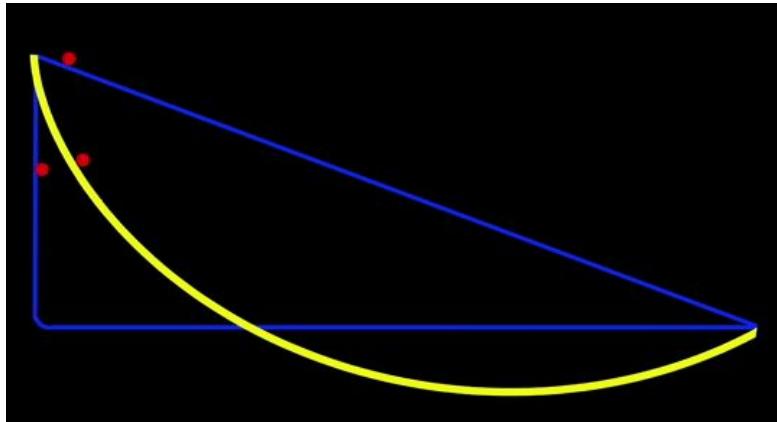


Engineering Patterns within AI Engines

Created by: Anna, Brooke, Destiny, Jessica & Stone

Slide 1: Prompting AI on Creating Geometry with Mathematica

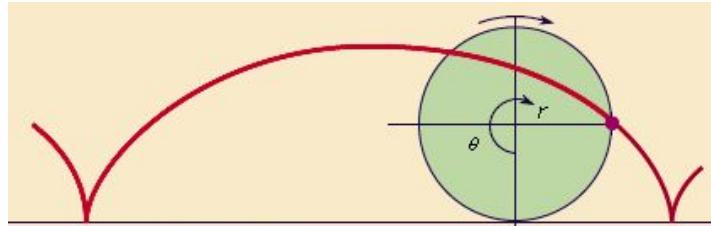
For my portion of the project, I modelled the classical cycloid curve on the surface of a sphere using ChatGPT and Gemini. The cycloid is known for minimizing the time of travel for a ball rolling down a curve.



The reason I wanted to tackle this problem for pattern generation is to test AI's ability to visualize shapes and patterns outside of the confines of the language model. The image generator can use language to generate shapes and patterns, but I want to test its ability to create images or shapes outside of these guidelines.

Physical Background

The cycloid is known for being the curve generated from fixing a point on a circle and rolling the circle along a surface.



Mathematical Background

The cycloid is a curve “immersed” in the plane. It is typically parametrized by the following formula:

$$\langle x(t), y(t) \rangle = \langle r(t - \sin(t)), r(1 - \cot(t)) \rangle$$

It has this graphical representation on the plane:



Spherical Case

However, when we write the parametrization of the cycloid restricted to the surface of the sphere, we have to consider a restriction on our “domain.” The equation below is the parametrization for a sphere, with $0 < t < 2\pi$

$$\langle x(t), y(t) \rangle = \langle \cos t, \sin t \rangle$$

The parametrization for the cycloid on a sphere is quite a bit more complicated, however:

$$qx = a((q - \cos \omega) \cos t + \cos \omega \cos t \cos qt + \sin t \sin qt)$$

$$qy = a((q - \cos \omega) \sin t + \cos \omega \sin t \cos qt - \cos t \sin qt)$$

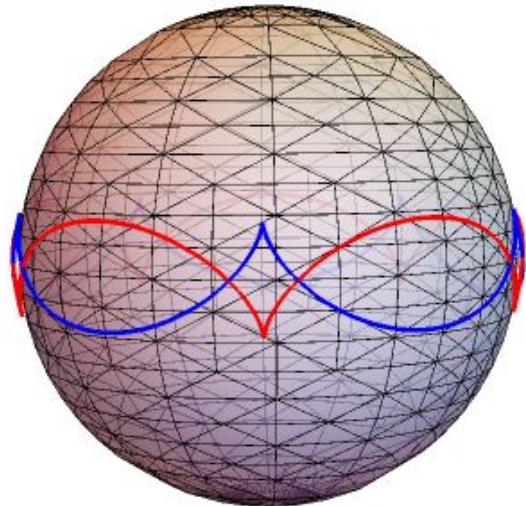
$$qz = a \sin \omega (1 - \cos qt)$$

Implications & Consequences

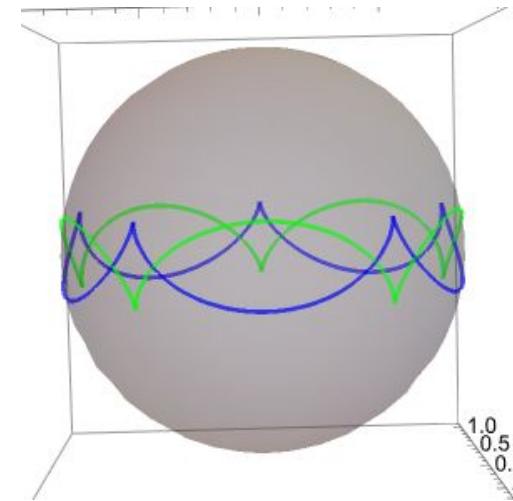
- Creation of mathematics can be used for good or evil
 - Think biomedical engineering vs. radar systems
- AI can be harmful to acquiring new math skills
 - classical helicopter vs climbing simile
 - AI is really not great at mathematics
- Overreliance can harm the integrity/universality of mathematics
- Minor: if AI does coding/modelling incorrectly it can harm computers
- AI can repurpose math for its own purposes (harms privacy of research)

The Good: ChatGPT and Gemini can model Geometry

- ChatGPT and Gemini under enough guidance can model curves using Mathematica



A Cycloid created by ChatGPT



A cycloid created by Gemini

The Bad: It takes A LOT of Prompt Engineering. So much in fact you'd be better off doing it yourself

ChatGPT (Link to conversation [here](#).)

- ChatGPT took ~7 prompts to make the cycloid (though it did have some background on how to create graphs from the earlier part of the conversation)
- ChatGPT was able to generate the mathematics needed, but struggled with placing the cycloid on the sphere. You would get weird images like [this](#)
 - Fixes: prompting ChatGPT by asking it to check specific calculations and being more specific about restrictions on numbers

Gemini (Link to conversation [here](#).)

- Gemini took 25 prompts to create the cycloid
- Gemini really struggled with generating the mathematics on its own and I had to help it with the creation of the cycloid. It was way over [complicated](#)
- Fixes:
 - Asking Gemini to check its computations and reduce the complexity of the model
 - Ask Gemini if it was using the correct commands

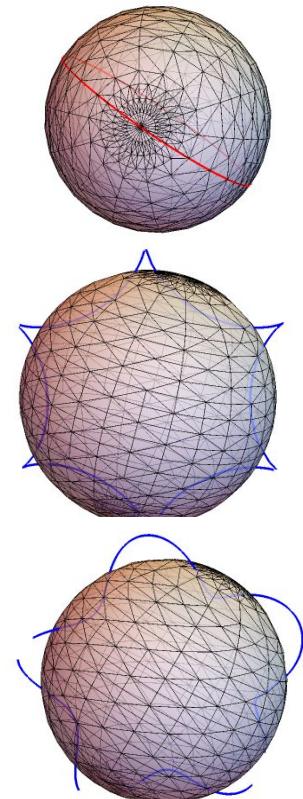
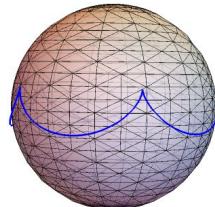
ChatGPT Prompts

"I would like you to use mathematics to generate me the equation for a geodesic in the sphere."

Bad Prompt: "Okay, this sphere looks great. Now, I want you to generate a cycloid that goes around the entire circle like the geodesic."

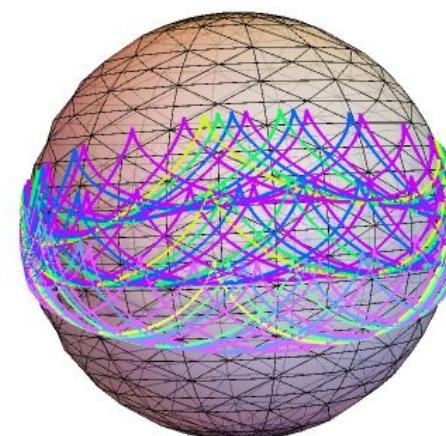
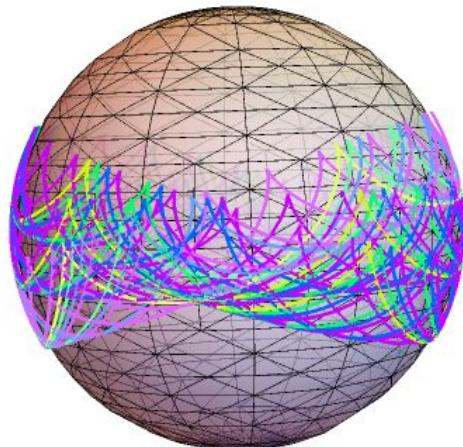
Bad Prompt: "The cycloid is still falling off of the sphere. Maybe you could impose some conditions on the parameterization?"

Good Prompt: "Sorry for all the confusion. I would like a cycloid on the surface of the sphere S^2 , so every point must satisfy $x^2+y^2+z^2=1$. I would like the rolling motion to occur along a great circle, the great circle given by the xy plane. The cycloid should rotate around the geodesic at a fixed radius r while also the cycloid stays on the sphere's surface."



ChatGPT Success

ChatGPT was very receptive to suggestions and new training, and was able to generate some very beautiful patterns:



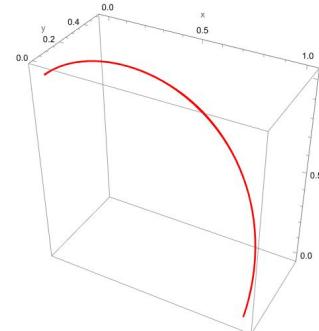
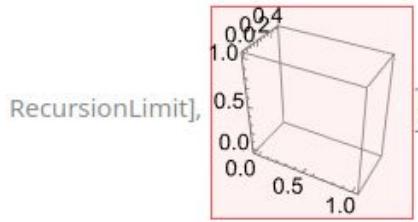
Gemini Prompting

Gemini had a very difficult time creating the Mathematica file, it took a bit of prompting to get going

"Dear Gemini, I would like you to please generate a mathematica file that models a cycloid along a geodesic of a sphere, $x^2+y^2+z^2=1$. "

"As is, this does not work. The disclaimer it outputs says: "An improperly formatted option was encountered while reading a Graphics3DBox. The option was not in the form of a rule." & "RGBColor called with 1 argument; 3 or 4 arguments are expected." & "Ignoring invalid graphics directive "Thickness[Skeleton[1]]"." & "Coordinate Skeleton[1] should be a triple of numbers, or a Scaled form." "

Show: Could not combine the graphics objects in Show[TerminatedEvaluation[

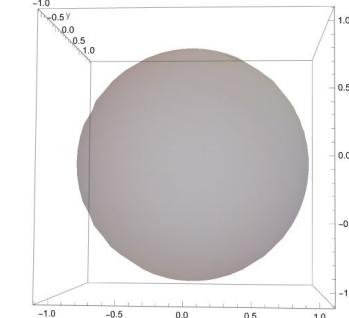
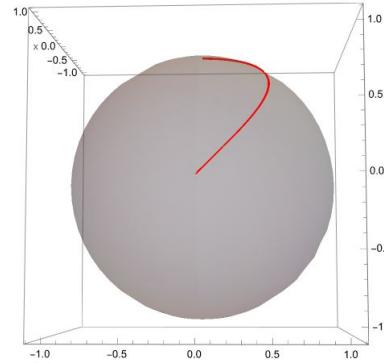


Gemini Prompt Headache Saga

Namely, I had some difficulty getting the cycloid to be on the sphere.

"This looks interesting the way you are going about it. It will not plot a sphere, however, and the cycloid is not appearing on the sphere. Would it maybe be better to just find an explicit parametrization for the cycloid and plot it using a sphere parameterization with a grid outline? What are some ways I can prompt you to make this happen?"

"It says that D is not a valid variable. This looks good thus far, and it looks like it is only plotting one of the lengths of the cycloid. I would like the cycloid to wrap around the sphere such that they look like a sort of frilly line. Imagine it almost like a sinwave that wraps around the entirety of the sphere and loops back to itself. It would be really nice too if the geodesic was where the xy plane was: the great circle that serves sort of like the equator. "

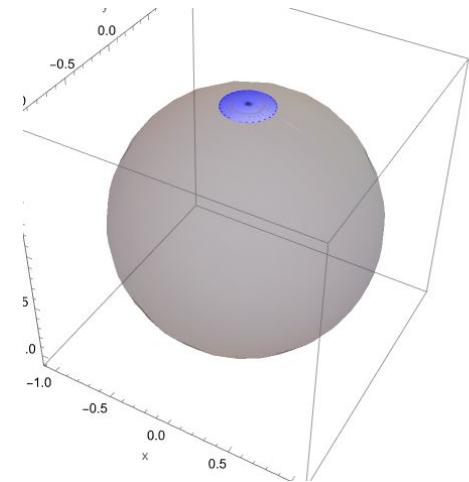


Then, it broke.

Gemini Prompt Headache Saga

For some reason, Gemini just stopped plotting the curves on the sphere and had a really hard time fixing it. Then, it fixed it and started giving it a little cap.

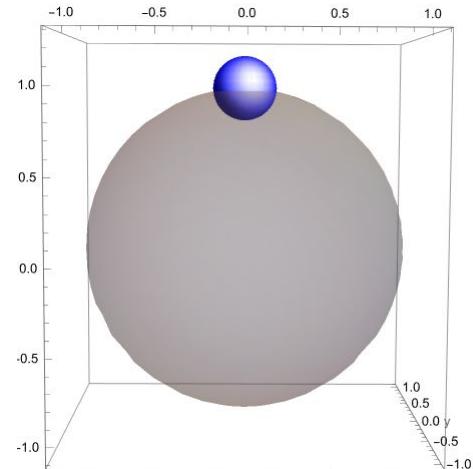
"Thank you for the suggestion, it seems there are no errors in the calculations, however, I think you're maybe overcomplicating things with the Graham-Schmidt process. Couldn't you choose some cos term in place of the perpendicular term with a different parameter, say t with a phase shift omega? Also, it seems that mathematica is not plotting the curves still. Do you think there is a problem with the color or values not being receives or something of that nature? It seems thatit looks okay and the colors are fine too but it is not plotting the geodesic or the cycloid. I expect to see them plotted, but they are not showing up. Can you check and make sure that cxFinal and all of the components are defined and the computations are sound? "



Gemini Prompt Headache Saga

Then, Gemini started creating a plot of the sphere on the sphere

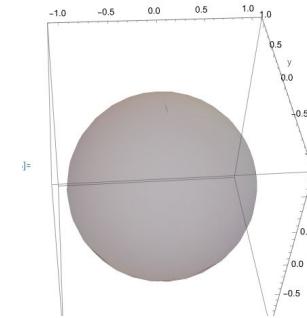
"I was expecting the curves to show up, but unfortunately they are not there either. Are your new definitions correct? It might be better to think about this without these tangent and perpendicular components and just find some kind of parametrization for the cycloid purely in terms of terms with cos and sin in them, right? "



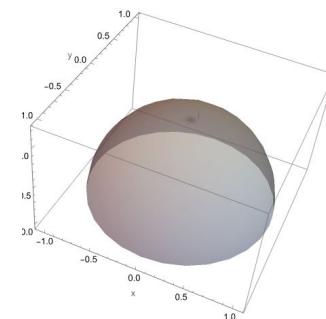
Gemini Prompt Headache Saga

Now, I realized there was a problem with the sphere and the curves

"I see a problem with your sphere plot, if you have defined theta and phi to be multiples of pi, then the parameter itself needs to be just a natural number, otherwise the angles are going to look strange. Just define theta and phi as some parameter and change the domain or fix the domain. "



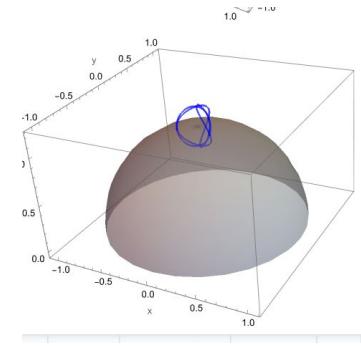
"I'm still seeing a problem with the spheretheta and the spherephi: remember, we want this to be a sphere of radius 1 with not a ton of overlap. It seems that what would happen is there would be a significant amount of overlap. Instead of using the spherical plot3d, why not just directly parametrize a sphere and write it as a parametric plot instead? "



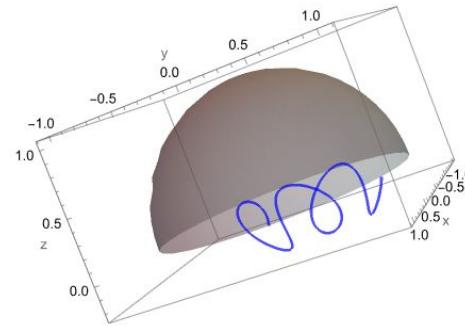
Gemini Prompt Headache Saga

The sphere then turned into the half-sphere

"A bit of a problem here, only half of the sphere is showing up and neither of the curves are being plotted. Be sure to check your number on the sphere plot. I think you're overcomplicating the cycloid with the theta and the phi, why not just define it in terms of a single parameter t and modify the domain inside of the plot? "



"We are getting very close, but it seems that your cycloid is not being plotted on the surface of the sphere. It is being plotted like a sphere, but the 3d plot is not the correct radius. The problem here is that we have likely gotten a pretty good plot of the cycloid, but the sphere is not having it on the surface. We need to check on the radius of our sphereplot, and also make sure that the cycloid. You also did not listen to my parametrization I mentioned earlier for the cycloid $\langle \cos(t)+r\cos(\omega t), -\sin(t)+r\sin(\omega t), r\sin(\omega t) \rangle$ and it seems you have reverted back to the other one. "

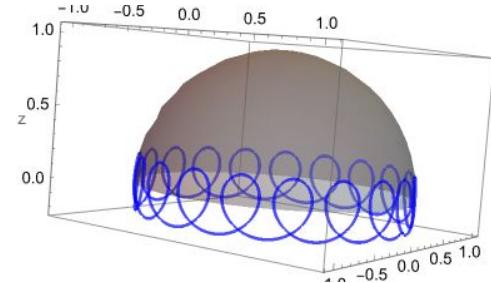
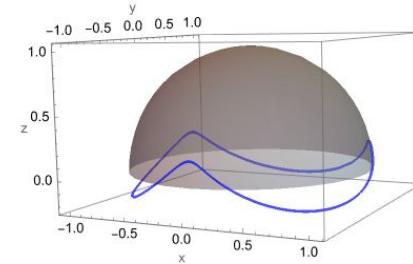


Gemini Prompt Headache Saga

Getting Closer!

“Only half of the sphere is showing up still, when I expected the entire thing to show up. It seems your sphere plot is correct. Also for the cycloid, you need to be careful and make sure that all of the inputs on the sins and cosines match (aside from the omega term.) For instance, the first term of your x component in the cycloid is ranging from $\cos(0)$ to $\cos(1)$, whereas the $\sin(2\pi t)$ is ranging from 0 to 1 as expected. Make sure you correct that for all of the czFinal, cyFinal and czFinal. “

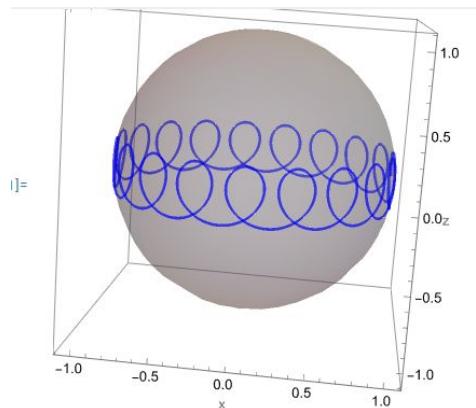
“We are close, however, the sphere is still not fully showing up. Is your domain full for the sphere? I was expecting it to show up in its entirety, but it seems to be not plotting it correctly. Your parameters seem fine, but maybe you have `sphereTheta` and `spherePhi` swapped? maybe that's why it's not plotting bottom portion? “



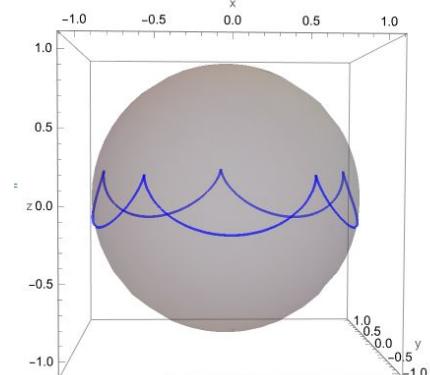
Gemini Prompt Headache Saga

SUCCESS!

"Gemini, here is the parametrization for a sphere:
 $\langle r \sin(\phi) \cos(\theta), r \sin(\phi) \sin(\theta), r \cos(\phi) \rangle$ where $0 < \phi < \pi$,
 $0 < \theta < 2\pi$."



"This is almost good, but the omega should just have the number of revolutions without a 2π attached to it. Also, can you change the number of revolution to 5 instead?"



Lessons Learned from Gemini

- Provide Gemini with the equations or give a vague idea about what the equations should look like
- Be sure to check and make sure that it is actually prompting the thing you are trying to plot
- Try to have some background knowledge on the app that you're using, otherwise it is going to be very difficult to catch mistakes just based off of prompting



AI and Yarn: Crochet Pattern Creation

The Prompt and the AI

For my section of the project, I wanted to see how GenAI would generate a crochet pattern. I also wanted to see how different programs, all of which are programmed for different uses, would interpret the same prompt:

Please generate a beginner crochet pattern for a 1 foot tall axolotl

The AI I used were:



ChatGPT



Crochet Pattern
Maker



ChatGPT Results

ChatGPT is, in essence, a do-it-all GenAI. From generating text and images to helping students with math homework, it gets used for everything.

When I input the prompt, it returned:

- An organized pattern
- A list of common abbreviations
- A list of specific materials

Upon following the pattern, I received a small, slightly misshapen axolotl with a small head, four tiny legs, and a flat tail.



ChatGPT Results

Here's a beginner-friendly crochet pattern for a **1-foot-tall axolotl plushie!** This pattern uses simple stitches and minimal shaping, making it great for new crocheters.

Materials

- Yarn: Worsted weight (Size 4) yarn in:
 - Main body color (e.g., pink)
 - Gills color (e.g., darker pink or red)
- Hook: 4mm (G) crochet hook
- Safety Eyes: 12mm black plastic safety eyes (or black yarn for embroidered eyes)
- Stuffing: Polyester fiberfill
- Tapestry Needle: For sewing pieces together
- Stitch Marker: To keep track of rounds
- Scissors

Abbreviations (U.S. Terms)

- MR – Magic Ring
- SC – Single Crochet
- INC – Increase (2 SC in one stitch)
- DEC – Decrease (single crochet 2 together)
- SL ST – Slip Stitch
- CH – Chain
- FO – Fasten Off

Pattern

Body (Main Oval Shape)

1. MR, 6 SC in ring (6)
2. INC in each stitch around (12)
3. (SC, INC) around (18)
4. (2 SC, INC) around (24)
5. (3 SC, INC) around (30)
6. (4 SC, INC) around (36)
 - 7-25. SC around (36) (**keep working until about 9 inches long**)
7. (4 SC, DEC) around (30)
8. (3 SC, DEC) around (24)
9. (2 SC, DEC) around (18)
10. (SC, DEC) around (12)



Crochet Pattern Maker Results

Crochet Pattern Maker is a GenAI that, as the name suggests, is designed specifically to create crochet patterns!

When I input the prompt, it returned:

- An organized pattern
- An explanation for a less commonly used stitch
- A list of specific materials
- Tips and an inspirational message

Upon following the pattern, I received something akin to an axolotl rug, with all of the pieces sewn to either side.



Crochet Pattern Maker Results

Beginner-Friendly Axolotl Crochet Pattern (1 foot tall)

Materials:

Medium weight yarn (approx. 300g) in shades of brown, pink, and white
Size J (6.0mm) crochet hook
Polyester fiberfill for stuffing
Black embroidery floss for eyes
Scissors, tapestry needle, and stitch markers

Body Pattern:

Start with the Body:

Ch 60 (or any multiple of 6 plus 3).

Row 1: dc in 4th ch from hook, dc in each st across, turn. (59 dc)

Row 2 - 7: ch 3 (counts as first dc), dc in each st across, turn. (59 dc)

Row 8: ch 3, dc2tog (see Special Stitches), dc in each st across, turn. (30 dc)

Repeat Row 8 until piece measures about 6 inches tall.

Special Stitches:

dc2tog (double crochet 2 together): (Insert hook in next st, yarn over, draw up a loop) twice, yarn over, draw through all 3 loops on hook.

Tips and Variations:

To create a more realistic axolotl, you can add some texture to the body using a stitch pattern or some fabric paint.

You can also add some weight to the bottom of the body to make it more stable.

Experiment with different yarn colors and textures to create different axolotl varieties.

Happy Crocheting!

Remember to have fun and be patient with yourself as you work on this pattern. Don't hesitate to ask for help if you need it. Good luck, and I hope you love your new axolotl friend!

Compare/Contrast

ChatGPT:



- Pattern was consistent throughout (no hallucinations/memory issues)
- Proportions were slightly off
- Materials list was clear and easy to follow
- Instructions for limbs and other additional pieces were easy to follow.

Full patterns can be found [here](#).

Crochet Pattern Maker:



- Pattern had issues with consistency
- Proportions were slightly off
- Materials list was clear and easy to follow
- Instructions for limbs and other additional pieces were unclear, and simply described as shapes, rather than including a pattern.

Man & Art: Pattern Recognition



- (A) Product Goals
- (B) Engines
- (C) Prompting
- (D) Results
- (E) Ethical Concerns



Thematic and Visual concepts

In the scope of art, each AI engine was used to generate a either visual product that demonstrated a thematic and technical understanding of well-known works or be able to make connections of how works have created recognizable patterns within their given style.

Each prompt in this section is precisely engineered to directly evaluate how well the AI can produce the desired response with these criteria:

1. Does the response reflect an accurate representation of the styles requested?
2. Can the AI apply known themes/techniques to generate similar work but of a different style?
3. Are there critical connections made to vital themes?
4. How well did the AI understand each prompt without reiteration?



What did I use?

A landscape painting by Claude Monet, showing a harbor with many sailboats on the water under a hazy sky. In the foreground, there's a green hillside with some figures walking.

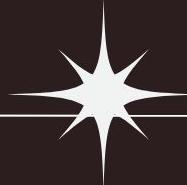
Critical Thinking and
Pattern Application

- Chat GPT
- Consensus AI

Visual Mimicking of
Patterns

- CrAlyon

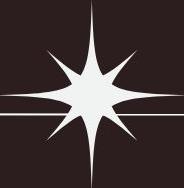




Generative Writing VS Generative Imaging

1. What is considered the best ranking of artists from the 19th century based on the popularity of their artwork, how well-known they are, and the lasting effect of their work? *How have their artworks influenced thematic patterns in modern art?*
2. In impressionist paintings, *how well have the thematic undertones influenced contemporary art?*

1. Generate an image that *mimics the technique and subject of Monet's Waterlilies.*
2. Create a painting that *resembles* a work of art from Van Gogh's "Sunflowers" series.
3. Generate an image that uses the *thematic undertones of surrealism and impressionism* but in the *style* of 21st-century art-works.



Generative Writing

Chat GPT

Consensus



RESULTS

Response:

“Impressionism and Surrealism, though originating in the 19th and early 20th centuries, continue to influence thematic patterns in 21st-century art, literature, film, and digital media. Their impacts are seen in various ways:

Impressionism’s Influence on 21st-Century Thematic Patterns:

Impressionism, with its emphasis on fleeting moments, light, and personal perception, has shaped modern artistic and cultural themes in the following ways:

- **Subjectivity & Personal Experience** –... Modern storytelling often reflects the emotional and sensory experience of characters rather than rigid narratives.
- **Light and Atmosphere in Digital Art & Film-** Films like La La Land (2016) use soft color palettes and natural lighting reminiscent of Impressionist paintings.
- **Urban Life and Transience ...**
- **Environmental Themes..."**

“Surrealism, with its emphasis on the subconscious, dream imagery, and the absurd, has significantly shaped contemporary themes:

- **Psychological Exploration & Identity** – The Surrealist focus on dreams and the subconscious resonates in contemporary explorations of mental health.., identity, and altered states of consciousness.
- **Blurring Reality & Fiction** –...Inception (2010) and series like Black Mirror, incorporates surreal themes of reality distortion, questioning truth and perception.
- **Technology and the Uncanny** – AI, virtual reality, and post-humanist themes often borrow from Surrealist motifs of the uncanny and subconscious fears about technology's impact on identity.
- **Social and Political Dissonance** – Surrealist rebellion against logic has inspired contemporary resistance art...
- **Dreamlike Aesthetics in Fashion & Design** – Contemporary visual culture, including fashion, advertising, and social media aesthetics, frequently embraces dreamlike, surreal imagery to evoke emotional depth and subconscious associations.”

Generative Writing

Chat GPT

Consensus

Response:

"Impressionist paintings, known for their vibrant colors and innovative techniques, have significantly influenced contemporary art by introducing themes of modernity, urbanization, and cultural exchange. These thematic undertones continue to resonate in today's art world."

Influence on Contemporary Art

Urbanization and Modernity: Impressionism captured the essence of urban life and industrialization, reflecting the social changes of the 19th century. This focus on urban landscapes and modern life has influenced contemporary artists to explore themes of urbanization and industrialization in their work, integrating elements like cityscapes and modern life into their art.

Cultural Exchange: The integration of Oriental elements in Impressionist art highlighted the importance of cultural exchange, which continues to inspire contemporary artists to incorporate diverse cultural influences into their work. This blending of styles and techniques has enriched the global art scene ."

"Artistic Techniques and Styles: Impressionism's break from traditional art forms, with its emphasis on light, color, and brushwork, paved the way for modern art movements. Techniques developed by Impressionists, such as the use of bright colors and loose brushwork, are still prevalent in contemporary art, influencing artists' approaches to composition and style .

Social and Political Themes: Impressionism's focus on everyday life and its secular worldview challenged traditional artistic norms, encouraging contemporary artists to address social and political issues through their work. This legacy of using art as a medium for social commentary remains strong in contemporary art .

Impressionism's thematic undertones of urbanization, cultural exchange, and modernity have profoundly influenced contemporary art. By challenging traditional norms and embracing new techniques and themes, Impressionism has left a lasting impact on how artists perceive and depict the world, continuing to inspire and shape artistic expression today."



Consensus vs Chat GPT

While both responses are insightful, Chat GPT's response is stronger in tracing specific thematic influences, while Consensus' response provides a more comprehensive historical context but needs clearer contemporary connections.

Consensus:

Stronger Thematic Cohesion

More Focused on Specific Contemporary Trends

Chat GPT:

Broader Historical Perspective

Well-Defined Artistic Lineage

RESULTS



"Lily Pads"

- Basic concept is understood, yet the AI fails to produce the same style that Monet's impressionist strokes invoke
- When the prompt is repeated, the AI will not produce an image that has the same foreground/background depth that Monet creates with reflection and sparseness of the lily pads.



"Sunflowers"

- Basic concept is understood, but the AI pulls from his other famous works which was found to be unavoidable.
- With each shot of the prompt, the AI incorporated Starry Night's swirling strokes and color which are not evident in his Sunflower series.



RESULTS



- Generated here, the AI, though not fully producing an identifiable image, mimicked the aspects of surrealism by including otherworldly depictions like two moons.
- Impressionism commented on many social conflicts; the idea of “the weight of the world on someone's shoulders” shows a thematic connection.
- The AI applies the style of digital art with abstract techniques of Contemporary works.
- Though this looks hardly human-made to a trained eye, some may consider this work as a piece of art rather than a compilation of many works.



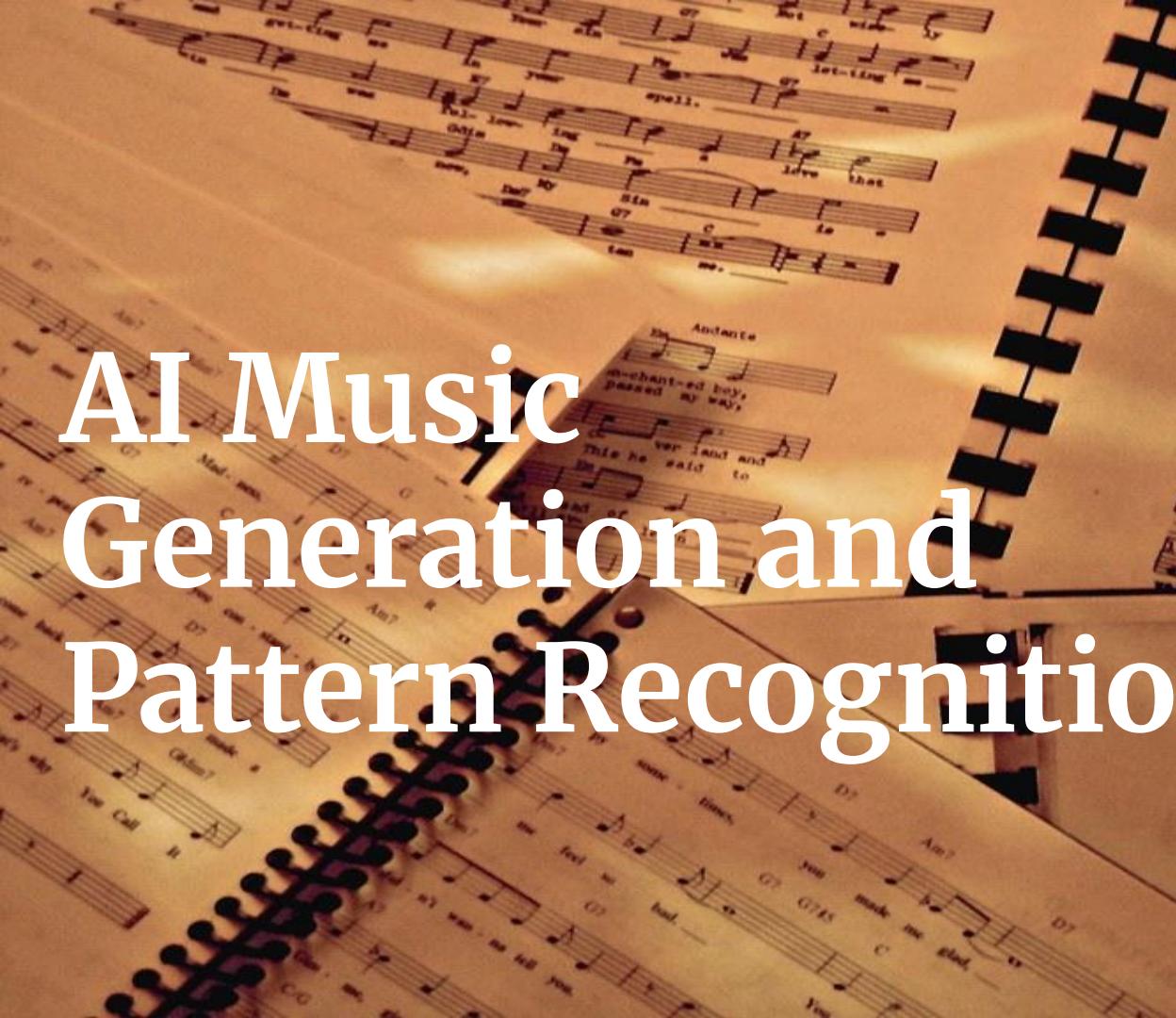
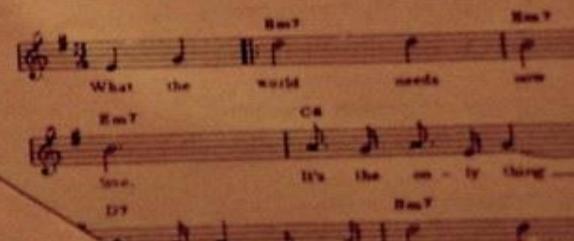
Ethical Concerns

- Artistic Integrity
- Privacy and consent
- Copyright
- Job displacement
- Bias and stereotypes



AI Music Generation and Pattern Recognition

What The World Needs



I aimed to experiment with AI's ability to generate original compositions and tested AI generated music for the creation of complex and varying compositions that covered multiple areas of music theory.

Engines Used:

Chat GPT

AIVA AI

Riffusion AI

Prompt and Result (Chat GPT)

Prompt: Compose a piece in the style of J.S. Bach with strict counterpoint, using a minor key, a steady tempo of 90 BPM, and four-part harmony

Result: An extensive string of code of Chat GPT's creation in an .xml format, a portion of which is attached here.

```
<beat-type>4</beat-type>
</time>
<clef>
  <sign>G</sign>
  <line>2</line>
</clef>
<clef>
  <sign>F</sign>
  <line>4</line>
</clef>
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  <duration>4</duration>
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<note>
  <pitch>
    <step>C</step>
```

Prompt and Result (AIVA)

AIVA AI worked best by giving it an “influence” piece to base its generative music off of and be influenced by. In order to test the extensiveness of the AI’s ability to I uploaded the jazz piece *So What*, Miles Davis to create a jazz influenced piece that would test AIVA’s attempt to incorporate the more difficult intricacies of jazz including the improvisational nature and the incorporation of a walking bass line.

The following results will play automatically while presenting.



Prompt and Result (AIVA)

AIVA AI worked best by giving it an “influence” piece to base its generative music off of and be influenced by. In order to test the extensiveness of the AI’s ability to analyze human created music and the ability to create a human likeness I uploaded the a portion of J.S. Bach’s *Fugue* to influence the AI to create a classical piece that heavily incorporates polyphonic modes, as well as a steady repetitive rhythmic foundation.

The following results will play automatically while presenting.



Prompt and Result (Riffusion AI)

Prompt: Compose a fugue in D minor, following Baroque voice leading rules, with a clear subject and countersubject

This resulted in a baroque fugue in D minor that Riffusion titled
River's Counterpoint

The following results will play automatically while presenting.



Prompt and Result (Riffusion AI)

The prompt given to Riffusion AI was to generate a minimalist piano piece in 5/4 time, keeping a steady ostinato pattern with occasional variations.

Which created this piece that Riffusion titled as *Stone Steps to Solace*

The following results will play automatically while presenting.



Prompt and Result (Riffusion AI)

Prompt: Generate an experimental piano piece in A \flat major, blending jazz harmonies with classical structure, at 80 BPM.

Result: A classical fusion piece that Riffusion titled *Metamorphasis in Ab*

The following results will play automatically while presenting.



Conclusion

While Riffusion AI ended up having the technical capacity to generate new music with specific prompting to create a specific sound. The result of the effectiveness of communicating emotion is really up to the interpretation of the listener. AI has the technical capacity, and I believe in time will grow in the emotional capacity, but it raises the question of if it will ever really be able to stand side-by-side to the emotional depth of a human experience.

Showing Patterns Within Different Coding Languages Using ChatGPT

- Coding languages such as Python, Java, JavaScript, etc. have their own syntax and rules that makes them unique.
- **Python:** simple structures, good for beginners, works well with data analysis/machine learning & web development (easy)
- **JavaScript:** fast for web-based apps & versatile, works well real-time applications, API's and single-page applications such with mobile and desktop apps (moderate-easy)

Prompts Used

- “I need a prompt for different coding languages. It needs to show patterns within different coding languages.”
- “I need variations of this prompt.”
- “Write code snippets for a loop for numbers 1-10 in python.”
- “Write code snippets for a loop for numbers 1-10 in HTML using JavaScript.”
 - Gave 5 examples and reasonings.
- “HTML using JavaScript using div id to create a loop from 1-10.”

HTML Coding Example That Uses JavaScript

```
<!DOCTYPE html>
<html>
  <head>
    <meta charset="UTF-8">
    <title>Loop Example: Numbers 1-10</title>
  </head>
  <body>
    <!-- Container where the numbers will be displayed -->
    <div id="output"></div>

    <script>
      // Get the output element by its ID
      const outputDiv = document.getElementById("output");

      // Initialize an empty string to store the numbers with line breaks
      let content = "";

      // Loop from 1 to 10 and append each number to the content string
      for (let i = 1; i <= 10; i++) {
        content += i + "<br>";
      }
    </script>
  </body>
</html>
```

- This code uses elements such as `<div>` with the id `numberContainer`
- Uses a loop that iterates numbers from 1-10
- Uses `
` tags for line breaks
- It shows the displays with the string within the `div` element

Code Examples Using Python

```
python
```

```
for i in range(1, 11):
    print(i)
```

Copy

```
python
```

```
i = 1
while i <= 10:
    print(i)
    i += 1
```

Copy

```
python
```

```
[print(i) for i in range(1, 11)]
```

Copy

- For this example, ChatGPT provided me with 3 different code snippets
- ChatGPT also explained to me why each of the snippets were different and how they still provided the same outcome
- Using the **for** loop: generates a numbers 1-10
- Using the **while** loop: continues as long as i is less than or equal to 10, this allows the number to print and increase by an increment of +1
- Using list comprehension: less conventional since list comprehension is used for lists and not creating a sequence of numbers

Overall Thoughts of ChatGPT

- ChatGPT can be used to help solve simple problems that someone may have in their coding
- Using ChatGPT to create all your code would not be beneficial. Code is created by the individual and it may not always be accurate to use ChatGPT
- Ethical Concerns:
 - Privacy and security
 - Inaccurate information
- Advantages:
 - Can be used for educational purposes (ex. studying, proofreading, learning new concepts, etc.)