Code Meets Canvas

An Introduction to Algorithmic Art

Lloyd Seo

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for

Code Meets Canvas: An Introduction t...

algo-art

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members.acmucsd.com

Icebreaker

Introduce yourself to the people around you!

1. name
2. pronouns
3. year
4. college

Q. If you could see in only one color, what would it be?

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Agenda

1. What is Algorithmic Art?
2. Parametric Art
3. Generative Art
4. AI Art
5. Open Workshop
   Explore Art Creations!

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Algorithmic art is...

- Form of art created with **predefined criteria**
- Users can decide the **input** criteria, but not the **outcome**
- Emphasizes **randomness** and **geometry**

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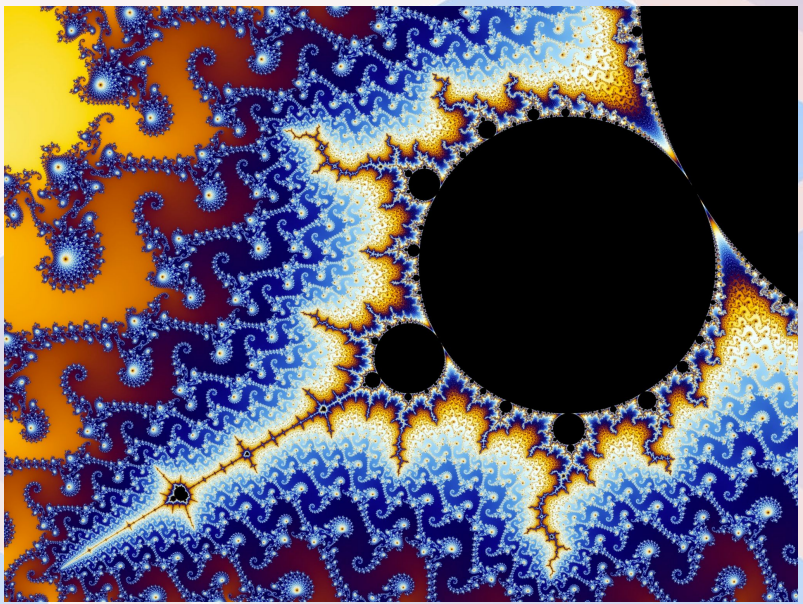
L-System



Mandelbrot Set

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Doesn’t have to be digital

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Types of Computer-Based Art

1. Parametric art
   - Modifying parameters
2. Generative art
   - Generative algorithms
3. AI art
   - AI techniques

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Getting Started

p5.js: acmurl.com/p5js

- JavaScript library for creating graphics and interactive content

Go to: acmurl.com/artlinks

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p5.js Tutorial

```
function setup() {
  //creates a canvas 600 pixels wide
  //and 400 pixels high
  createCanvas(600, 400);
}
function draw() {
  //sky blue background
  background(135, 206, 235);
  //sun in top right
  fill("yellow");//yellow

  stroke("orange"); //orange outline

  strokeWeight(20); //large outline

  circle(550, 50, 100);

```

- background(r, g, b)
- circle(x, y, r)

There are many other shapes:

- ellipse()
- square()
- triangle()
- line()

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p5.js Tutorial

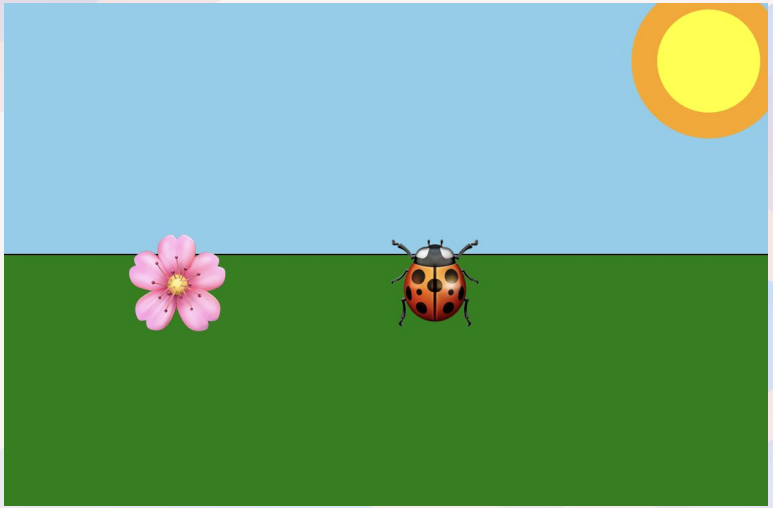
```
18    //grass on bottom half
19
20    stroke(0);//black outline
21
22    strokeWeight(1);//outline thickness
23
24    fill("green");
25
26    rect(0, 200, 600, 200);
27
28    //emojis
29    textSize(75)
30    text("🌸", 100, 250) //flower
31    text("🐞", 300, 250) //ladybug
32  }
```

- rect(x, y, width, height)
- circle(x, y, radius)
- text(text, x, y)

We can make it interactive:

- Try changing the ladybug's coordinates to (mouseX, mouseY)

Parametric Art



NOT algorithmic

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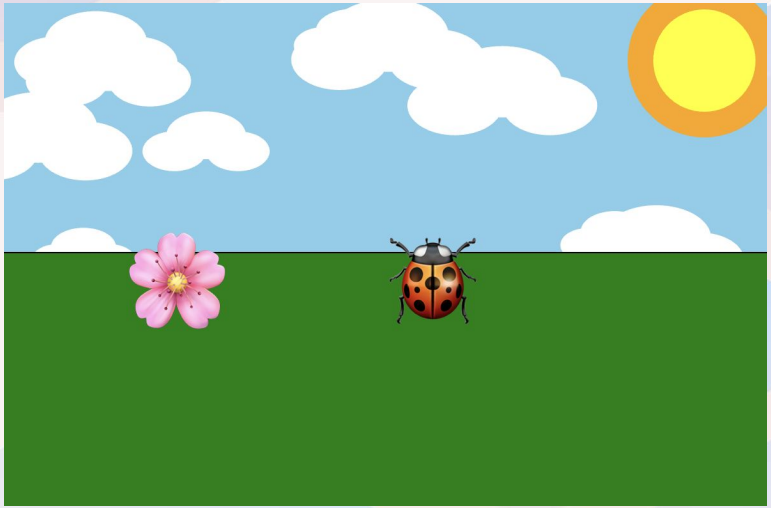
Parametric Art (w/ Randomness)



Algorithmic Art is:

- Geometric and **random**
- Controlled input but **random** output

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Adding Random Clouds

```
function setup() {
  //creates a canvas 600 pixels wide
  //and 400 pixels high
  createCanvas(600, 400);
  noLoop();
  //sky blue background
  background(135, 206, 235);
  drawClouds(10);
}
```

Code Order:

1. setup()
2. draw() runs in a continuous loop

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Adding Random Clouds

```
37 function drawClouds(numClouds) {
38   for (let i = 0; i < numClouds; i++) {
39     let x = random(width); // Random x position
40     let y = random(height / 2); // Random y position in the upper half
41     let cloudSize = random(50, 100); // Random size for cloud
42
43     drawCloud(x, y, cloudSize);
44   }
45 }
46
47 function drawCloud(x, y, size) {
48   noStroke();
49   fill(255); // White color for clouds
50
51   // Draw three ellipses to form a cloud shape
52   ellipse(x, y, size, size * 0.6); // Center part of the cloud
53   ellipse(x - size * 0.4, y + size * 0.2, size * 0.8, size * 0.5); // Left part of the
     cloud
54   ellipse(x + size * 0.4, y + size * 0.2, size * 0.8, size * 0.5); // Right part of
     the cloud
55 }
```

- Randomized clouds turns this into algorithmic art

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Generative Algorithms

- Mandelbrot Set
- Koch Curve
- Trees
- L-Systems

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Fractals

“A rough or fragmented geometric shape that can be split into parts, each of which is a reduced-size copy of the whole.” - Benoit Mandelbrot

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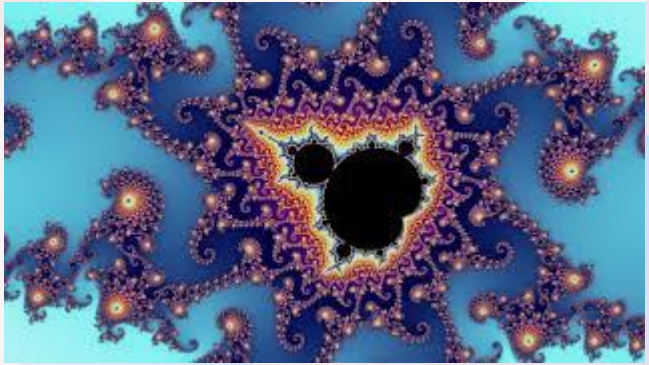
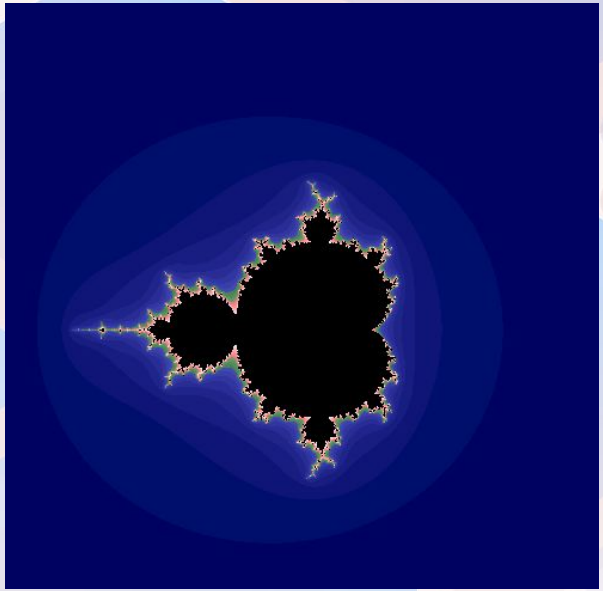
Fractals: Mandelbrot Set





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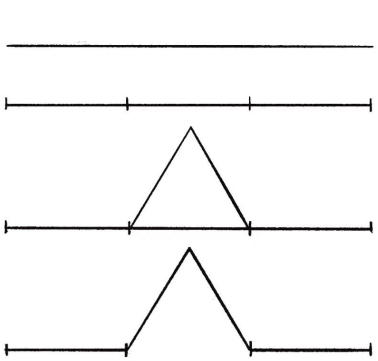
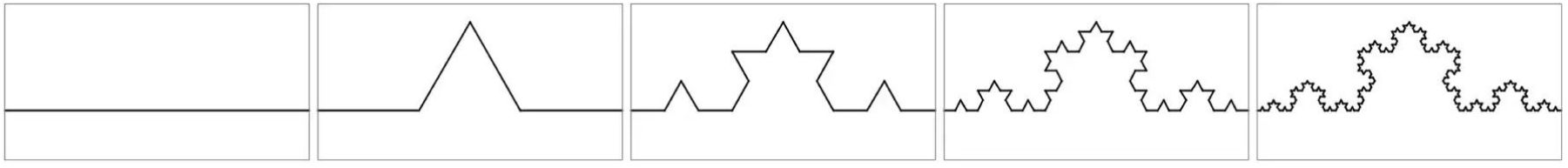
Fractals: Koch Curve

1. Start with a line.
2. Divide the line into three equal parts.
3. Draw an equilateral triangle (all three sides are equal) by using the middle segment as its base.
4. Erase the base of the equilateral triangle (the middle segment from step 2).
5. Repeat steps 2 through 4 for the remaining lines again and again.





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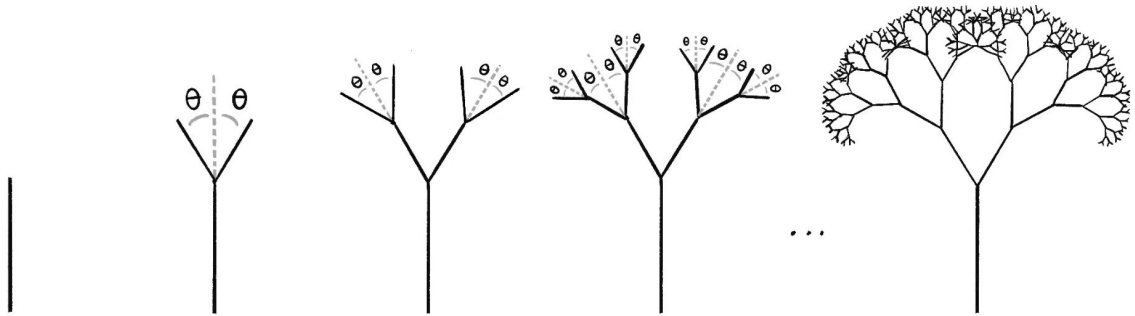
Fractals: Recursive Tree

1. Draw a line.

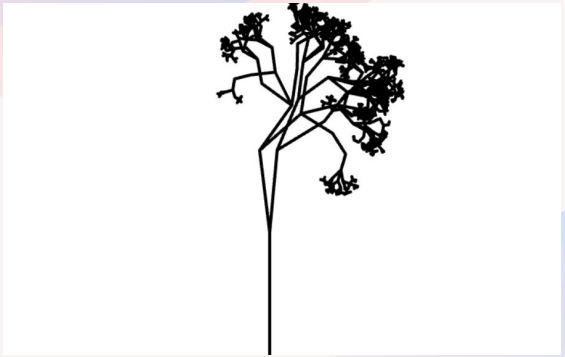
2. At the end of the line, (a) rotate to the right and draw a shorter line and (b) rotate to the left and draw a shorter line.

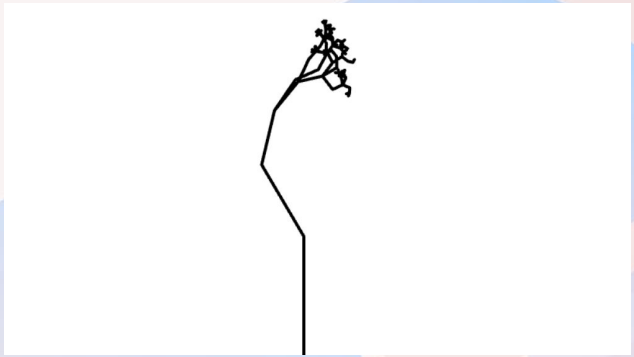
3. Repeat step 2 for each new line, again and again and again.

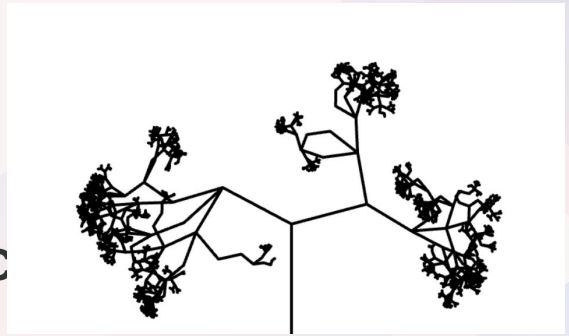


- How can we make this random?

Fractals: Recursive Tree







- How can we make this random?

C

Fractals: L-Systems

Alphabet: Characters that can be included
Axiom: Starting point of the system
Rules: Tells you how different characters should be succeeded

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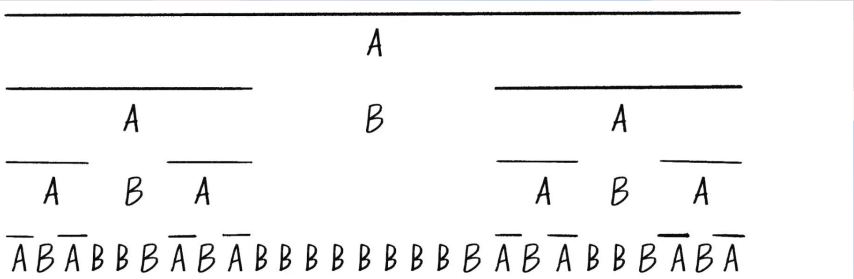
Fractals: L-Systems

Alphabet	A, B
Axiom	A
Rules	A → ABA B → BBB

A	Draw a line forward.
B	Move forward (without drawing a line).

Generation 0	A
Generation 1	ABA
Generation 2	ABABBBABA
Generation 3	ABABBBABABBBBBBBBBABABBBABA



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Fractals: L-Systems

F	Draw a line and move forward.
G	Move forward (without drawing a line).
+	Turn right.
–	Turn left.
[	Save current state.
]	Restore current state.

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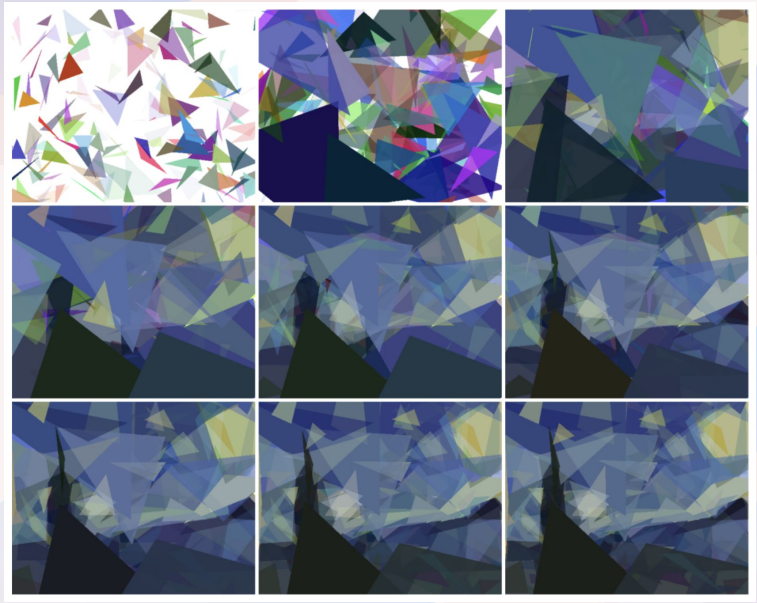
Evolutionary Art: Genetic Algorithms



- Population: Collection of paintings
- Individual: Each painting
- Chromosomes: Triangles

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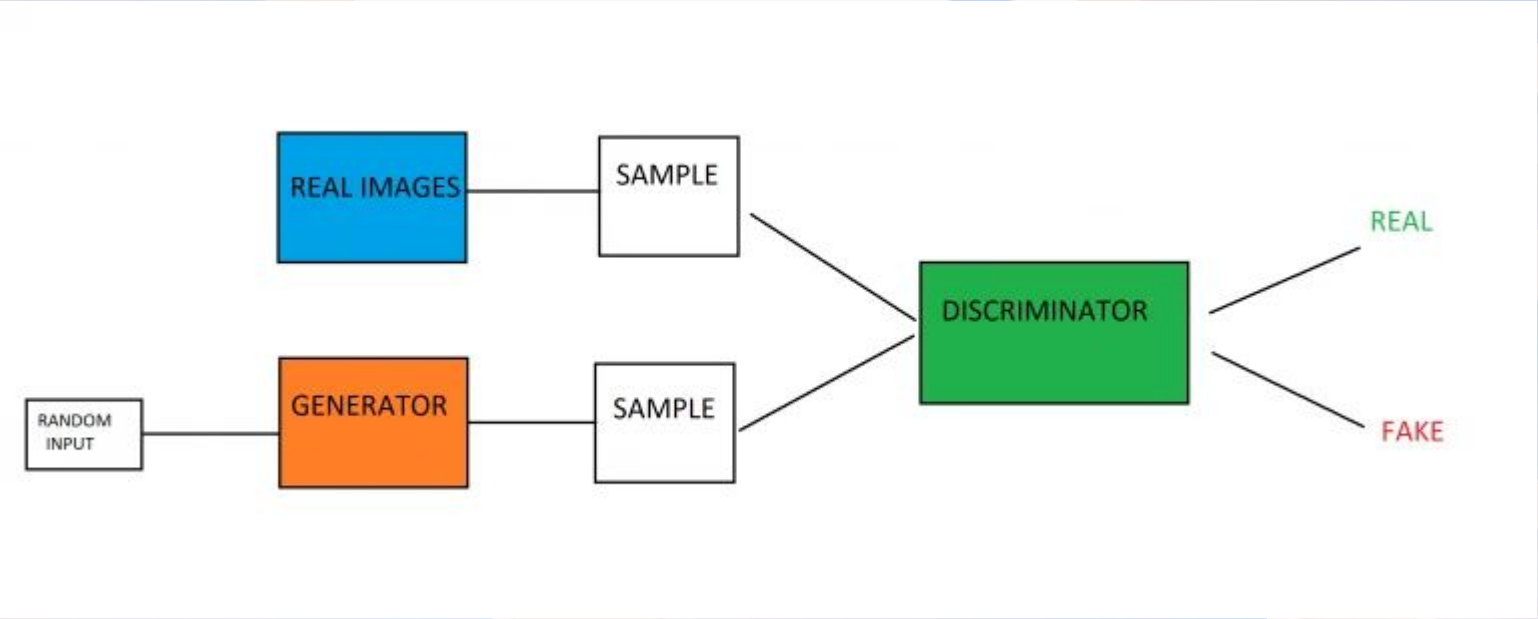
Generative Adversarial Network (GAN)



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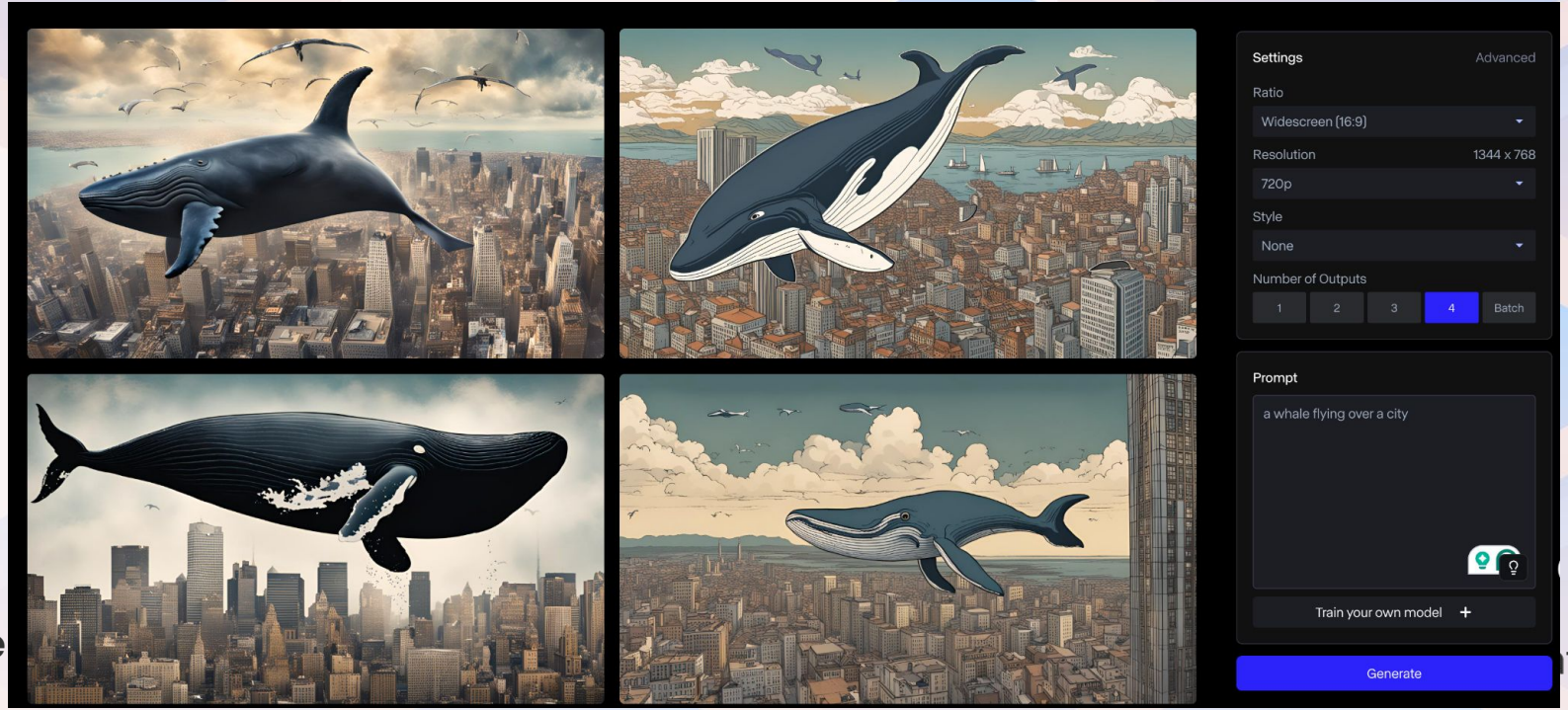
RunwayML


Settings
Advanced
Ratio
Widescreen (16:9)
Resolution
1344 x 768
720p
Style
None
Number of Outputs
1
2
3
4
Batch
Prompt
a whale flying over a city
Train your own model
+
Generate

Style Transfer

Style Image

Content Image

Output

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Resources

[Nature of Code]
[Coding Train]

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Open Workshop

Check out more sketches here:
acmurl.com/sketches

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Thank You

Do you have any questions?

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