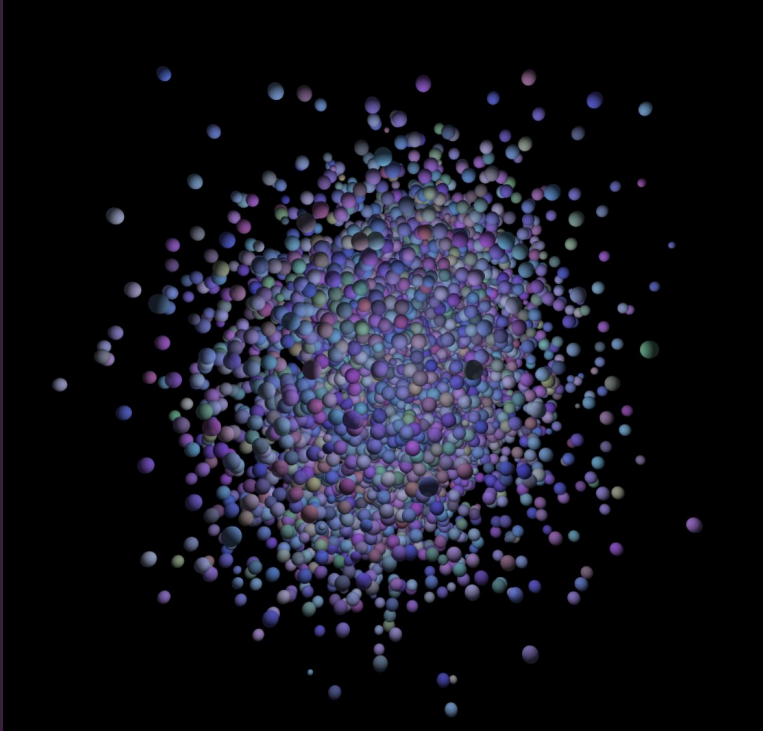


# Chaotic Harmony

Final Project  
IAT 460  
Rabab Altarazi

# Core Concept

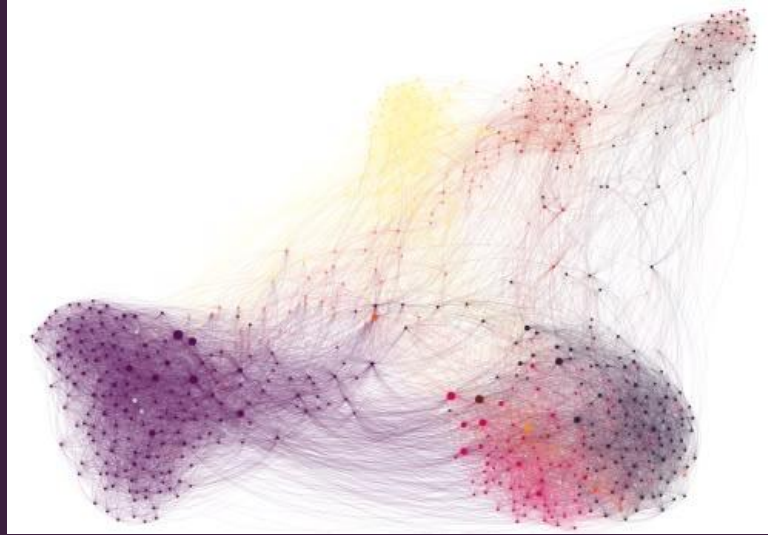


- **Particles** emerge from chaos to **form images** through swarm-like behavior
- **3D space**
- Music directly moves particles through audio analysis

# Generative Art Principles

- System creates **unique outputs from:**  
fixed rules + variable inputs (audio/image)
- **Emergent complexity** from simple particle interactions

# Swarm Inspiration



- Decentralized coordination (particles find their place)
- Balance between individuality and collective behavior

# Implementation



## 1. Image Processing:

- Pixel → Particle mapping with brightness thresholds
- 3D spatial distribution (X/Y/Z coordinates)

## 2. Audio Reactivity:

- FFT frequency analysis → Visual parameters
- Bass (size/pulse) vs Treble (position jitter)

## 3. Swarm Engine:

- Separation/alignment forces (post-formation)
- Staggered activation for organic flow

# Creative Decisions

## Aesthetic:

- Glowing particles create "**digital fireflies**" effect
- **3D depth** enhances musical responsiveness

## Technical:

- WebGL enables smooth performance
- **Parameter ranges tuned** for reliability

## Interactive:

- Direct **manipulation and customization** preserves artistic intent

# Examples



# Customization

SettingsMediaColors

Formation Speed:

Bass Reactivity:

Treble Reactivity:

Rotation Speed:

Loop Duration (s):

START

RESET FORMATION

TOGGLE LOOP

Press R to rotate

SettingsMediaColors

Image URL:  
Paste image URL

LOAD IMAGE

Or Upload:  
Choose File No file chosen

Audio URL:  
Paste audio URL

LOAD AUDIO

Or Upload:  
Choose File No file chosen

Or Use Mic:  
USE MICROPHONE

SettingsMediaColors

Bright Areas

Bright R:  
Bright G:  
Bright B:

Bright Preview:

Dark Areas

Dark R:  
Dark G:  
Dark B:

Dark Preview:

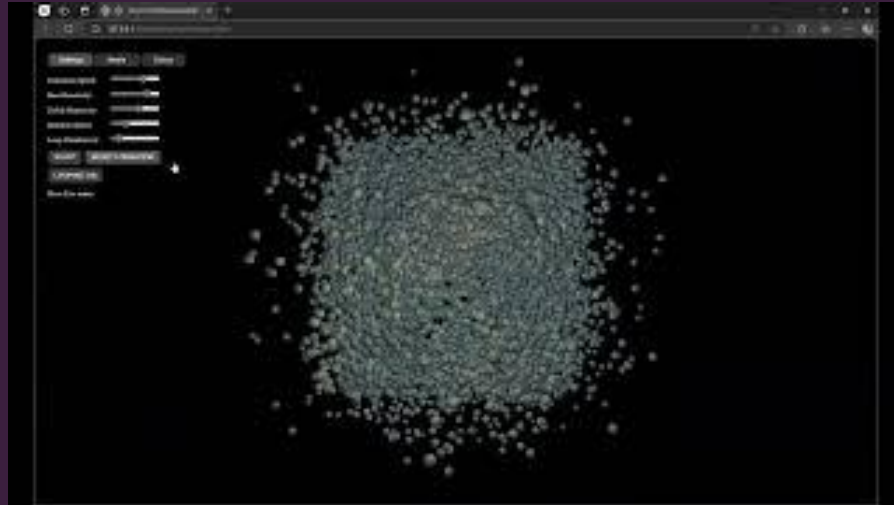
Color Blend:

APPLY COLORS

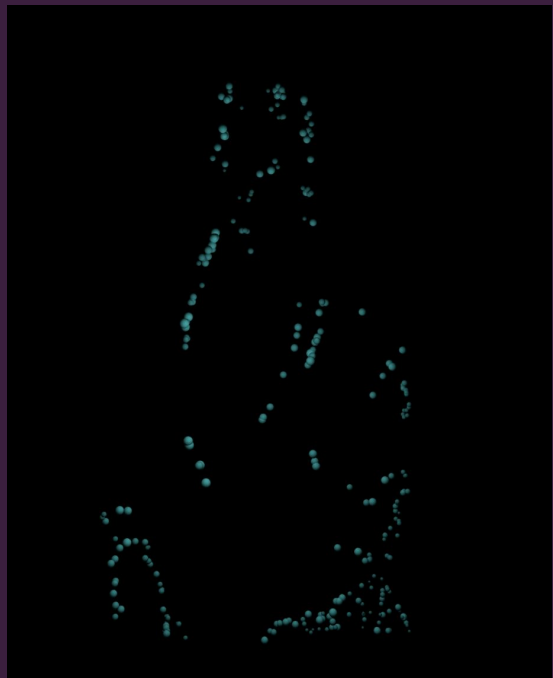


# Demo

<https://youtu.be/Qqs9HW7QwII>



# Challenges



- Particle clustering
- Audio sync issues

# Results

- Efficient recognition of **source image** post-formation
- Clear audio-visual correlations
- **Infinite variations** from same ruleset

<https://docs.google.com/presentation/d/1jXaMIjqTFuqLBAIEZ3e7y0ykAZDQkqtri2P36Lcumqc/edit?usp=sharing>