ART-TOK

The game card to learn and enjoy

Maria Jose Viveros Riquelme

Professor Patricia McManus

ITAI 1378

Context

The story begins with Leonardo da Vinci, a genius who was never satisfied with merely painting or inventing, because his curiosity always pushed him further. In his quest to break the barriers of time, he built a machine that transported him straight into our century. But instead of being celebrated as a great scholar, Leonardo discovered that fame was now measured in TikTok followers. He decided to embrace this new era, and with his innate talent, he became an influencer.

What was surprising is that, while learning to edit his videos, he also discovered how to manipulate reality itself. He began transforming the world's most important paintings, applying image segmentation techniques as if they were modern filters: extreme thresholding, exaggerated edges, unrealistic saturation, and many other transformations. For him, every painting became a digital canvas he could manipulate to gain more likes and comments.

How to play?

- And this is where the players come into action. Each player begins with **2 primary cards** in hand, which can be: **Thresholding, Edge Detection, Region-Based, Clustering, or Deep Learning/Semantic Segmentation**.
- From the **“artworks” deck**, players draw cards that represent paintings altered by Leonardo da Vinci’s machine. The first player draws an artwork and places it **face up**. Then, the player must decide:
- **Play one or more primary cards** to interact with the visible artwork, applying effects according to the technique on the card.
- **Or draw a card from the secondary deck**, if they prefer to wait or combine strategies before using their primary cards.
- After the first player completes their action, the turn passes to the next player, who repeats the same process: analyzing the visible artwork and deciding whether to play cards from their hand or draw from the secondary deck.

Thresholding
Splits the image into background and object based on an intensity value.

Type: General Technique (1 point)

- Usability: *****
- Complexity: *****
- Rarity: *****
- Impact: *****
- Fun Factor: *****

Brightness Adjustment Card
Prepares the image for thresholding.

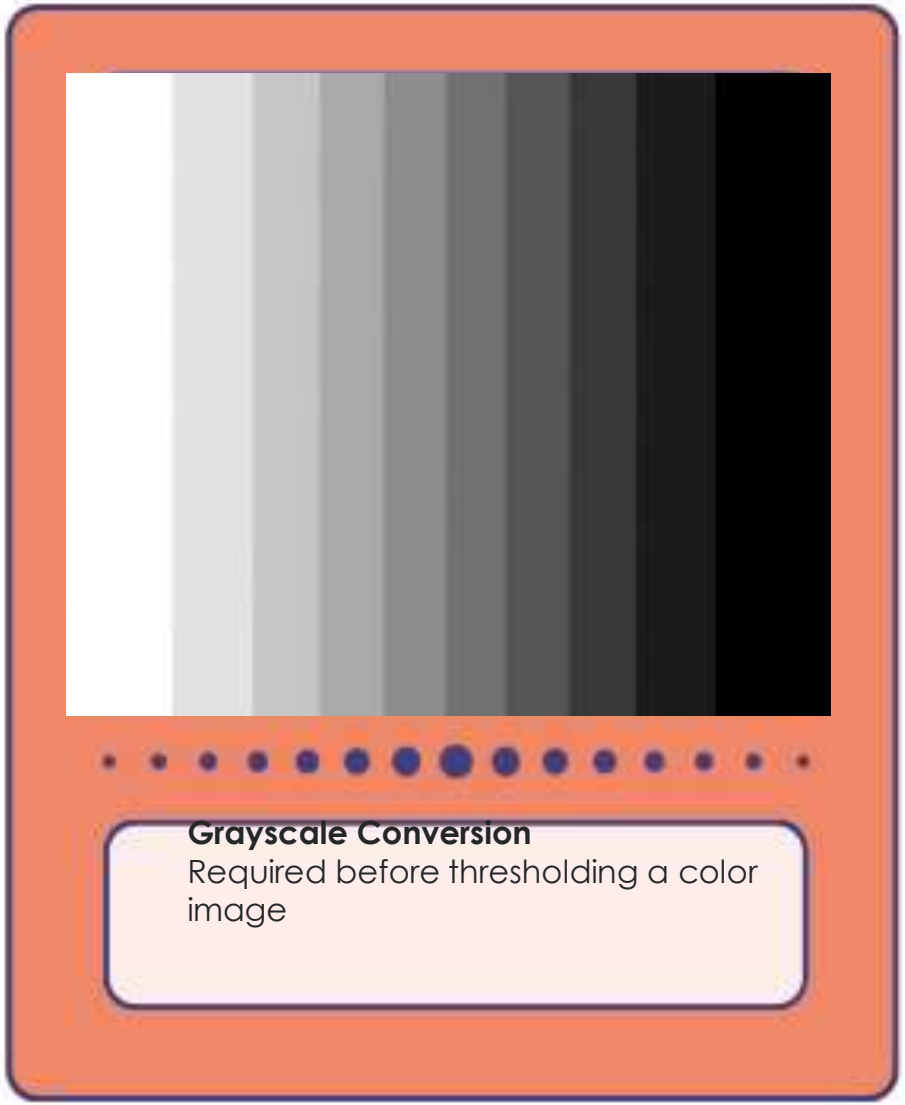
Type: Specific Technique (2 point)

- Usability: ***
- Complexity: ***
- Rarity: *
- Impact: **
- Fun Factor: ***

Contrast
Increasing contrast spreads pixel values apart.

Type: Specific Technique (3 point)

- Usability: *****
- Complexity: ***
- Rarity: **
- Impact: ***
- Fun Factor: **



Grayscale Conversion
Required before thresholding a color image

Type: Specific Technique (2 point)

- Usability: ***
- Complexity: **
- Rarity: ****
- Impact: ***
- Fun Factor: *

Noise Filter
Reduces risk of failure when applying thresholding.

Type: Specific Technique (3 point)

- Usability: *****
- Complexity: ****
- Rarity: ****
- Impact: ***
- Fun Factor: ***

Edge detection
Finds boundaries using sharp intensity changes.

Type: General Technique (1 point)

- Usability: *****
- Complexity: *****
- Rarity: *****
- Impact: *****
- Fun Factor: *****

Enhancement
Increase contrast.
Make edges more visible.

Type: Specific Technique (3 point)

- Usability: ***
- Complexity: *****
- Rarity: ***
- Impact: ***
- Fun Factor: *

Detection
Apply edge detector.
Generate edge map.

Type: Specific Technique (3 point)

- Usability: ***
- Complexity: **
- Rarity: ***
- Impact: ****
- Fun Factor: **

Localization
Thin edges.
Connect edges into boundaries.

Type: Specific Technique (2 point)

- Usability: **
- Complexity: ***
- Rarity: *
- Impact: ***
- Fun Factor: ***

Smoothing
Reduce noise.
Create cleaner gradients.

Type: Specific Technique (1 point)

- Usability: ****
- Complexity: **
- Rarity: ****
- Impact: ***
- Fun Factor: ***

Segmentation
Separate objects from background.
Highlight distinct boundaries.

Type: Specific Technique (1 point)

- Usability: ***
- Complexity: ***
- Rarity: ***
- Impact: ****
- Fun Factor: ***

Rare Technique

Watershed
Treats the image as a topographic surface and segments by catchment basins.

Type: Rare Technique (4 point)

- Usability: *****
- Complexity: *****
- Rarity: *****
- Impact: *****
- Fun Factor: *****

Region-based
Expands homogeneous regions starting from group pixel with similar characteristics.

Type: General Technique (1 point)

- Usability: ***
- Complexity: ***
- Rarity: ****
- Impact: *****
- Fun Factor: *

Expand Regions by Adding Neighbors
Add neighbors that are similar to the region based on defined criteria.

Type: Specific Technique (3 point)

- Usability: ****
- Complexity: ***
- Rarity: *****
- Impact: *****
- Fun Factor: *****

Include Pixels that Meet Similarity Criteria
Compare intensity, color, or texture with the current region (Homogeneus)

Type: Specific Technique (2 point)

- Usability: *****
- Complexity: *
- Rarity: *
- Impact: ***
- Fun Factor: ****

Seed Points
- Select one or more initial pixels as seeds.
- Seeds represent the regions you want to segment.

Type: Specific Technique (2 point)

- Usability: **
- Complexity: ***
- Rarity: **
- Impact: ***
- Fun Factor: *

Clustering
Groups pixels based on color, texture, or position.

Type: General Technique (1 point)

Usability: *****

Complexity: *****

Rarity: *****

Impact: *****

Fun Factor: *****

Fuzzy C-Means (FCM)
Pixels can belong to multiple clusters with varying degrees.
Handles uncertainty and gradual boundaries better than K-Means.

Type: Specific Technique (3point)

- Usability: **
- Complexity: ****
- Rarity: *****
- Impact: **
- Fun Factor: *

Mean Shift
Groups pixels by finding dense regions in feature space.
Does not require specifying the number of clusters beforehand.

Type: Specific Technique (4 point)

- Usability: ****
- Complexity: ****
- Rarity: ****
- Impact: ****
- Fun Factor: *****

Hierarchical Clustering
Builds a tree of clusters based on pixel similarity.
Can capture nested structures in images.

Type: Specific Technique (3 point)

- Usability: ****
- Complexity: ***
- Rarity: **
- Impact: ****
- Fun Factor: *****

K-Means Clustering
Partitions pixels into *K* clusters.
Minimizes the variance within each cluster.
Popular due to simplicity and speed.

Type: Specific Technique (4point)

- Usability: **
- Complexity: *****
- Rarity: *****
- Impact: ***
- Fun Factor: *

Deep Learning/ Semantic Segmentation
Neural networks that learn precise masks from labeled data.

Type: General Technique (1 point)

- Usability: ****
- Complexity: *****
- Rarity: ****
- Impact: *****
- Fun Factor: ****

Fully Convolutional Networks (FCNs)
Replace fully connected layers with convolutional layers.
Output a pixel-wise class map

Type: Specific Technique (4 point)

- Usability: ****
- Complexity: ****
- Rarity: **
- Impact: ****
- Fun Factor: ***

U-Net
Encoder-decoder structure with skip connections.
Preserves spatial information for precise boundaries.

Type: Specific Technique (2 point)

- Usability: **
- Complexity: *****
- Rarity: *****
- Impact: **
- Fun Factor: **

SegNet
Encoder-decoder network with pooling indices.
Efficient memory usage and decent accuracy.

Type: Specific Technique (2 point)

- Usability: ****
- Complexity: ***
- Rarity: **
- Impact: **
- Fun Factor: *****

DeepLab
Uses atrous convolutions for multi-scale context.
Supports accurate segmentation of objects at different scales.

Type: Specific Technique (2 point)

- Usability: **
- Complexity: ****
- Rarity: *****
- Impact: ***
- Fun Factor: ***

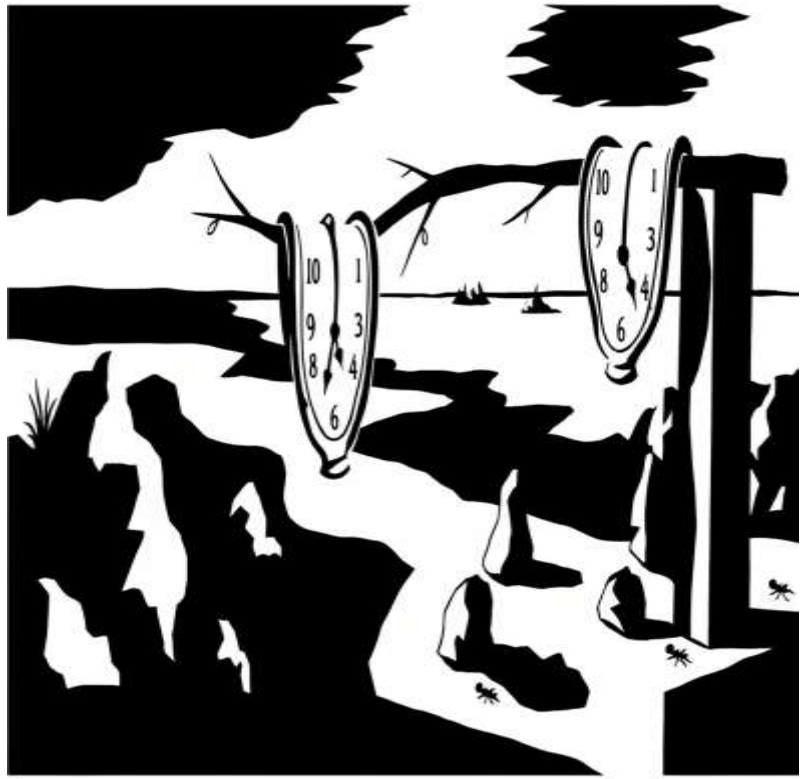
ART DESK

Mona Lisa
Painted by Leonardo da Vinci (c. 1503–1506).
Portrait of a woman with an enigmatic smile.
Masterpiece of the Renaissance.

- General Technique: **Thresholding**
- Specific Technique: **Brightness Adjustmen**
- Specific Technique: **Contrast**
- Combination: Thresholding + **Edge Detecton**

The Starry Night
Painted by Vincent van Gogh (1889).
Depicts a swirling night sky over a quiet village.
Expresses emotion through bold color and movement

- General Technique: **Thresholding**
- Specific Technique: **Noise Filter**
- Specific Technique: **Brighteness adjustment**
- Combination: **Thresholding + Region based**



The Persistence of Memory
Painted by Salvador Dalí (1931).
Famous for melting clocks in a surreal landscape.
Iconic work of the Surrealist movement.

- General Technique: **Thresholding**
- Specific Technique: **Grayscale Conversation**
- Specific Technique: **Noise Filter**
- Combination: **Thresholding + Edge Detection**

Girl with a Pearl Earring
Painted by Johannes Vermeer (c. 1665).
Portrait of a young woman wearing an exotic turban and a pearl earring.

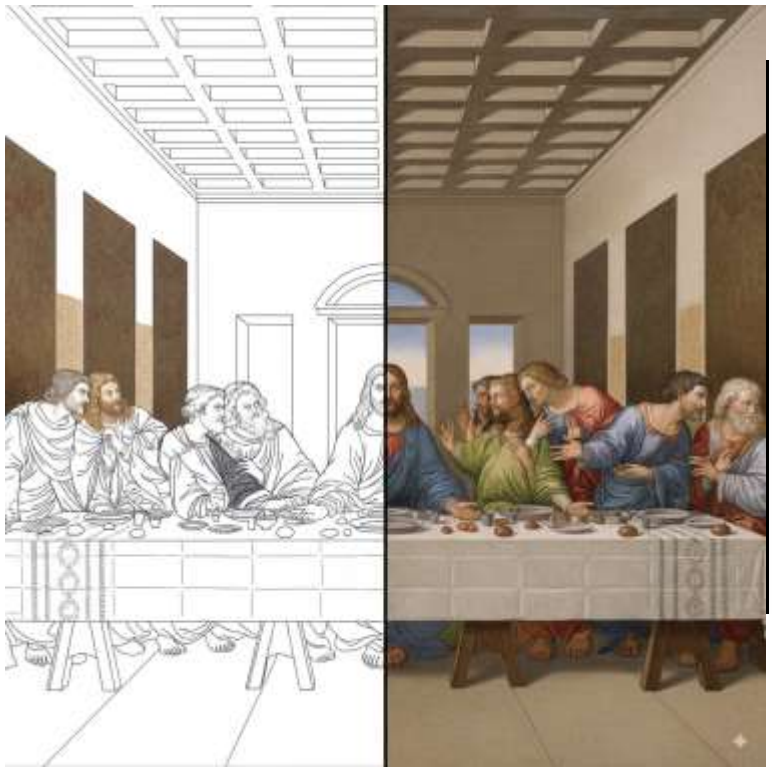
- General Technique: **Deep Learning/ Semantic Segmentation**
- Specific Technique: **Fully Convolutional Network (FNC)**
- Specific Technique: **Contrast**
- Combination: **Deep Learning + Edge Detection**

Guernica
by Pablo Picasso (1937)
Depicts the horrors of the bombing of Guernica with fragmented, distorted figures.
Famous for its monochromatic palette

- General Technique: **Deep Learning/ Semantic Segmentation**
- Specific Technique: **Segmented with SegNet**
- Specific Technique: **Brightness Adjustment Card**
- Combination: **Deep Learning + Watersheed**

The Scream
by Edvard Munch (1893)
Shows a figure with an agonized expression against a turbulent sky.
Famous for its vivid colors and expression of intense emotion.

- •General Technique: **Deep Learning/ Semantic Segmentation**
- Specific Technique: **Segmented with SegNet**
- Specific Technique: **Contrast**
- Combination: **Deep Learning + Region Based**



The Last Supper
by the pinter Leonardo da Vinci (1495–1498)
A Renaissance mural depicting Jesus with his twelve apostles as he announces his betrayal

- General Technique: **Edge Detection**
- Specific Technique: **Enhacement**
- Specific Technique: **Noise Filter**
- Combination: **Edge Detection** + **Deep Learning**

Neo-Frida" – AI-generated portrait
A digital reinterpretation of Frida Kahlo's iconic visage, created by AI in real-time. Combines the artist's distinctive facial features with modern, algorithmic textures and colors

- General Technique: **Edge Detection**
- Specific Technique: **Smothing**
- Specific Technique: **Contrast**
- Combination: **Edge Detection** + **Deep Learning**

Mona Lisa
Painted by Leonardo da Vinci (c. 1503–1506).
Portrait of a woman with an enigmatic smile.
Masterpiece of the Renaissance.

- General Technique: **Edge Detection**
- Specific Technique: **Enhacement**
- Specific Technique: **Contrast**
- Combination: **Edge Detection** + **Deep Learning**

The Scream
by Edvard Munch (1893)
Shows a figure with an agonized expression against a turbulent sky.
Famous for its vivid colors and expression of intense emotion.

- •General Technique: **Deep Learning/ Semantic Segmentation**
- Specific Technique: **Segmented with SegNet**
- Specific Technique: **Contrast**
- Combination: **Deep Learning + Region Based**

The Scream
by Edvard Munch (1893)
Shows a figure with an agonized expression against a turbulent sky.
Famous for its vivid colors and expression of intense emotion.

- General Technique: **Region-based.**
- Specific Technique: **Seed Points.**
- Specific Technique: **Noise Filter**
- Combination: **Region Based + Deep Learning**

The fruits and Vegetables
by the real life.

- General Technique: **Clustering.**
- Specific Technique: **K-means.**
- Specific Technique: **Noise Filter**
- **Combination: Clustering + Deep Learning**