

Pencil Sketch Image Processing

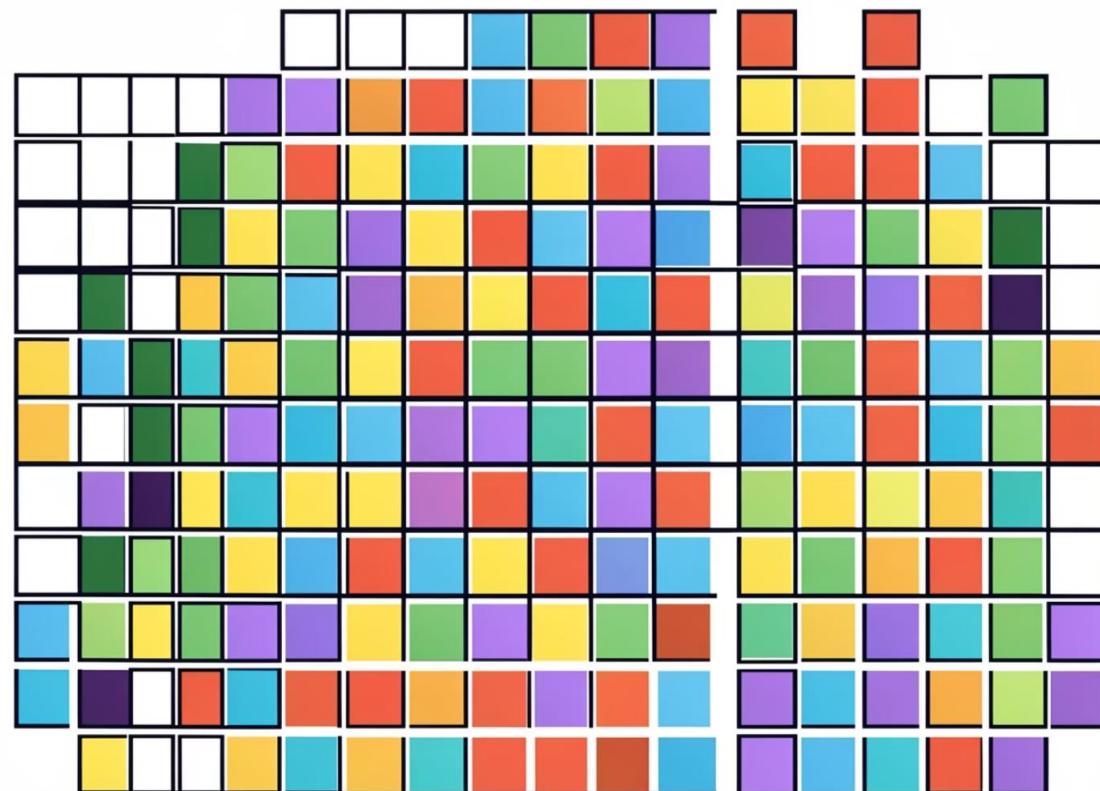
A Digital Image Processing Semester Project

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Digital Image Processing Overview



Digital Image Processing uses computers to improve images and extract useful information, and is widely used in medical, security, and artistic applications.



Project Objectives

1

Transform Images

Convert colorful images into realistic pencil sketches using computer vision techniques

2

Apply Algorithms

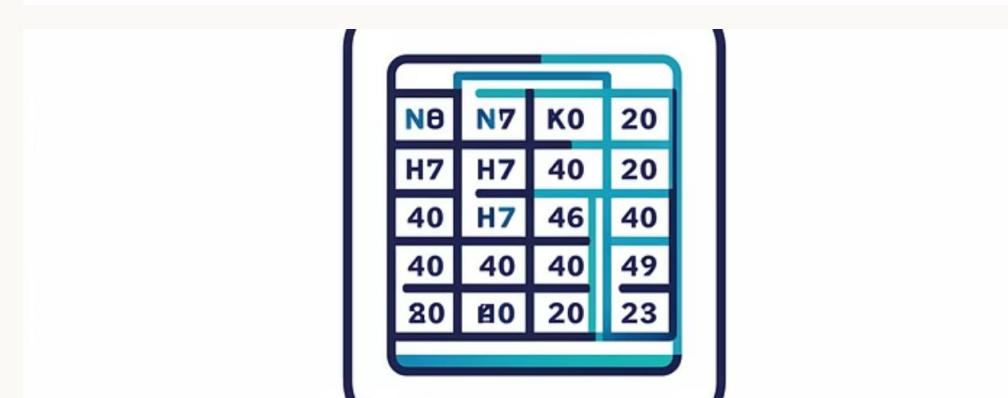
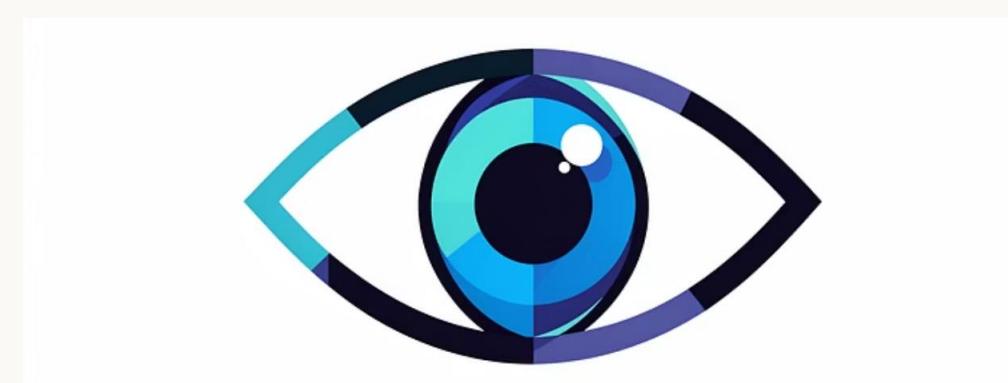
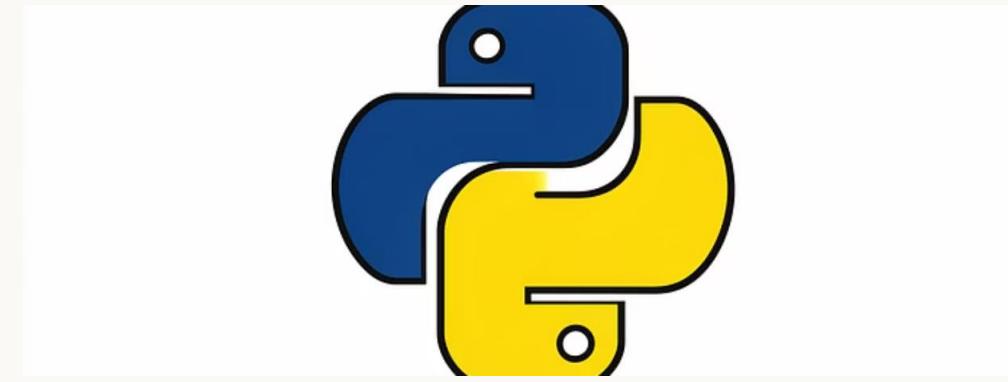
Implement edge detection and image filtering algorithms to extract structural features

3

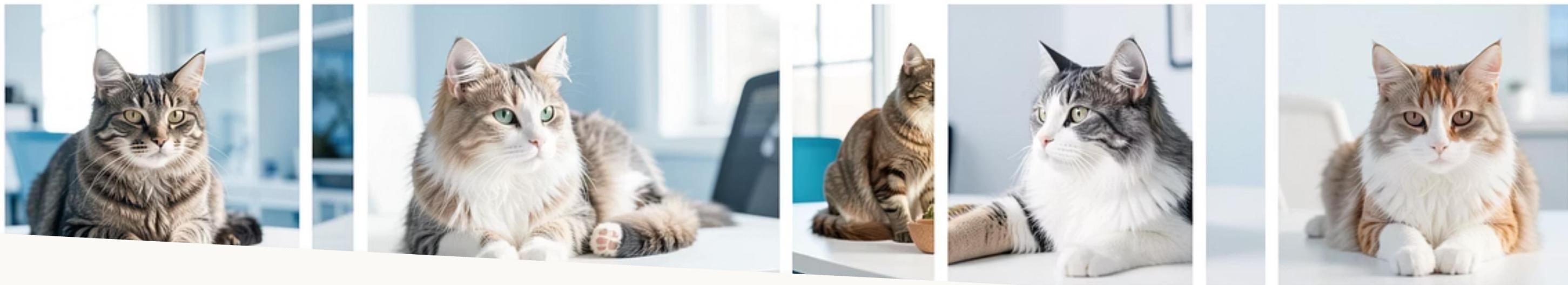
Demonstrate Skills

This project demonstrates practical skills in digital image processing using Python.

Tools and Technologies



- 1** Python 3.x
Main programming language with lots of libraries for image processing.
- 2** OpenCV
Library for image processing and computer vision tasks.
- 3** NumPy
Handles arrays and math operations efficiently.
- 4** Matplotlib
Displays images and plots results.
- 5** Jupyter Notebook
Interactive environment for coding and visualizing results



Dataset Description

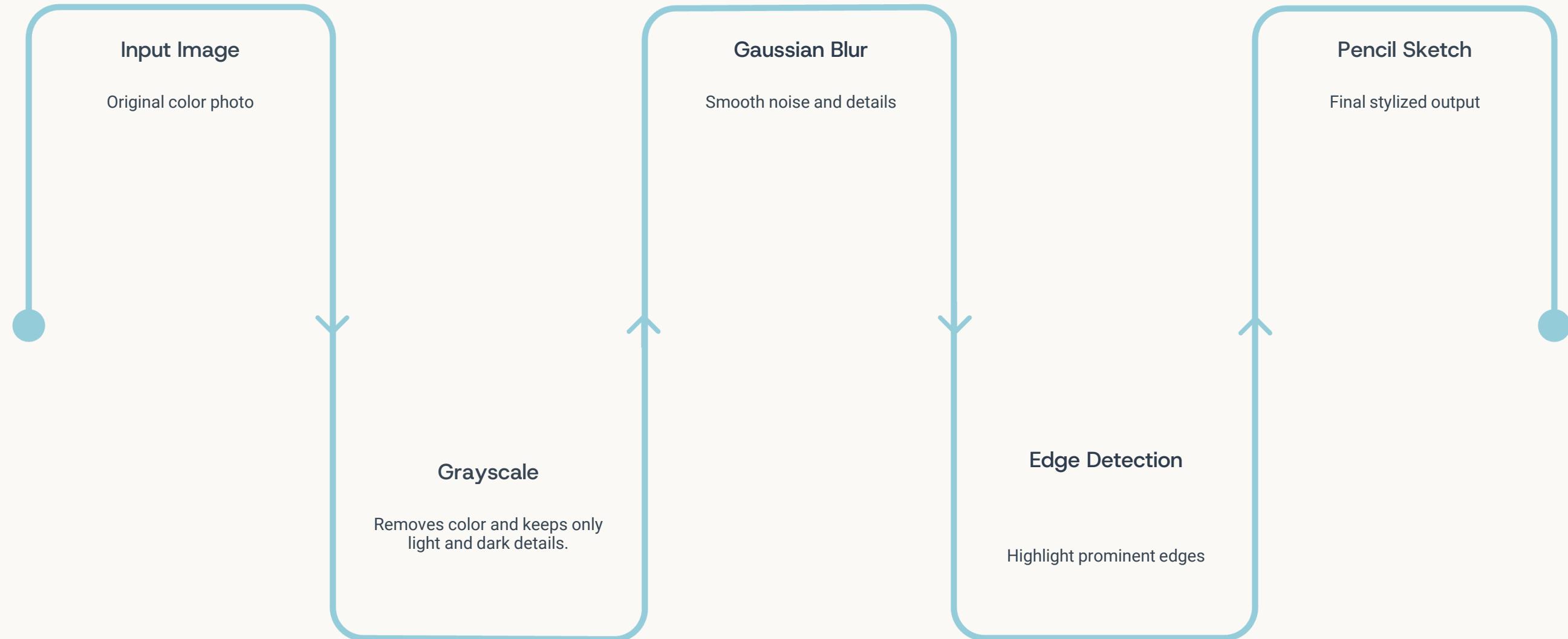
The dataset has **color photos** of cats.

The images are chosen to **show how the algorithm works on different types of pictures and lighting**.

Format: JPEG and PNG (RGB color).



Methodology Overview



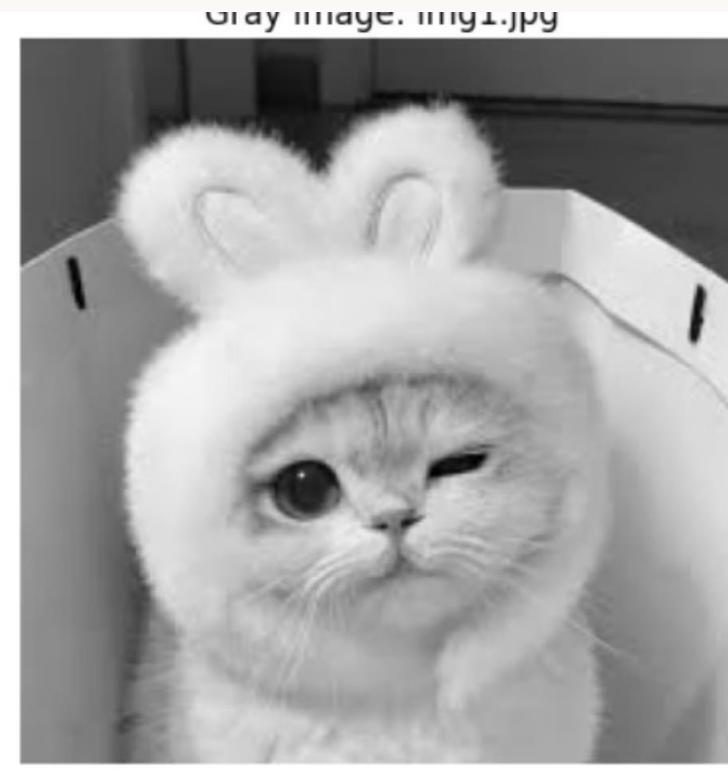
This project converts a normal image into a pencil sketch by following **step-by-step image processing techniques**, mentioned above.

Grayscale Conversion

The first step converts the color image into **grayscale** by removing color and keeping only **light and dark (brightness)** details.

Code :

```
// gray = cv2.cvtColor(img, cv2.COLOR_BGR2GRAY)
```



Images after grayscale conversion

Gaussian Blur Application

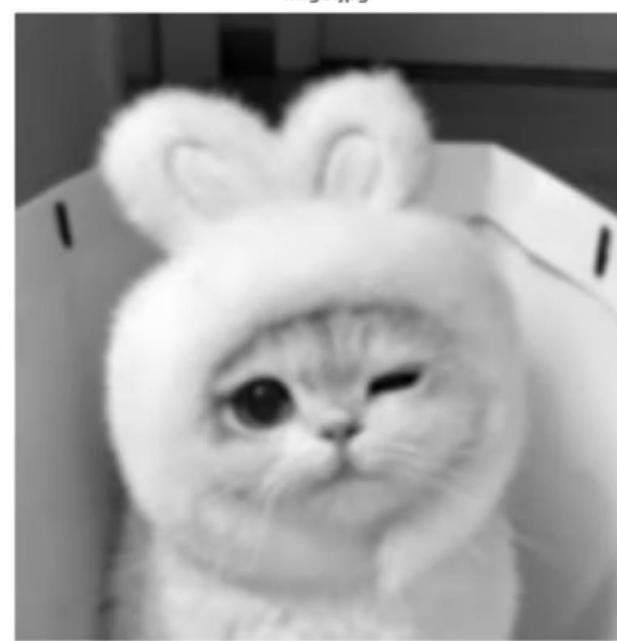
Gaussian blur is used to **smooth the grayscale image** and **remove noise** before detecting edges. This step helps avoid **false or unwanted edges** caused by small image details.

What it does:

- Softens the image by reducing sharp noise
- Makes edge detection more accurate

Code:

```
blur = cv2.GaussianBlur(gray, (5, 5), 0)
```



Canny Edge Detection Algorithm

Canny edge detection is used to **find clear outlines** in the image, which later form the pencil sketch.

- **Gradient calculation:** Finds areas where brightness changes sharply (possible edges).
- **Non-maximum suppression:** Makes edges thin and sharp by removing extra pixels.
- **Double threshold:** Separates **strong edges**, **weak edges**, and **non-edges**.
- **Edge tracking:** Keeps only real edges by connecting weak edges to strong ones.

Code:

```
edges = cv2.Canny(blur, 60, 100)
```



Results and Conclusion

Project Outcomes

This project successfully converts **color images into pencil sketches** while keeping important shapes and edges clear.

The results look **realistic and artistic** for different types of images.

Key Achievements

- Clear and accurate **edge detection**
- **Sketch-like appearance** similar to hand drawing
- **Fast processing** using OpenCV
- **Well-structured code** that is easy to reuse

Future Enhancements

- Add **color pencil sketch** effects
- Improve sketches using **texture effects**
- Apply the method to **real-time video**
- Build a **web-based interactive application**



```
Code:  
sketch = cv2.bitwise_not(edges)
```

Presentation Summary

- Converts color images into **pencil sketches** using Python & OpenCV
- Steps: **Grayscale** → **Gaussian Blur** → **Canny Edge Detection** → **Edge Inversion**
- Works on **different types of images**, producing **clear and artistic sketches**
- Can be extended to **color sketches**, **video processing**, or **web apps**