

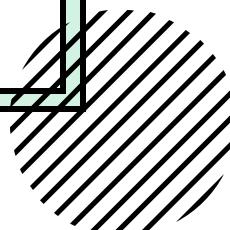
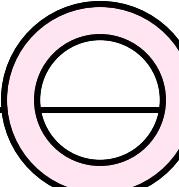
# **S O F T W A R E P R O J E C T L A B - 0 1**

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# Project Title – **ImgProc++**



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# Project Overview

**Objective :** Building a Command-Line image processing system capable of:

- Scaling (Upscaling\Downscaling)
- Denoising
- Sharpening
- Edge Detection

**Key Features :**

- CLI menu for selecting operations
- Basic vs Advanced algorithm comparisons
- Multithreading toggle
- Performance log to CSV file for comparison





# Algorithms/Methods

Features	Basic	Advanced
Scaling	Bilinear Interpolation	Lanczos
Denoise	Median Filter	Non-Local Means
Sharpening	Laplacian	Unsharp Masking

- ❑ For **Edge Detection**, only sobel operator will be used.



# ● Progress So Far

## Scaling:

- ❑ So far bilinear interpolation is in working condition



**Before**  
Resolution: 512 x 512



**After down sampling**  
Resolution : 128 x 128



# ● Progress So Far

## Denoising:

- Median Filtering and Gaussian blur have been implemented



**Before**  
Filled with sand-pepper noise



**After applying median filter**  
A bit blurry but with less noise



# ● Progress So Far

## Sharpening:

- Unsharp Masking is in working order for now



**Before**  
Blurry Image



**After sharpening**  
Less blurry but a bit choppy



# ● Progress So Far

## Edge Detection:

- Sobel Operator is fully functional



Before



After outlining the edges



# ● File Structure and Code Organization

## High Level Structure:

**src/**

- └ main.c
- └ scaling.c
- └ denoise.c
- └ sharpen.c
- └ edge.c
- └ utils.c
- └ bmp.c

**include/**

- └ scaling.h
- └ denoise.h
- └ sharpen.h
- └ edge.h
- └ utils.h
- └ bmp.h





# File Structure and Code Organization

## Module Breakdown

### **main.c (Controller Layer)**

- Entry point of the program
- Displays the menu-driven interface
- Handles user input
- Calls appropriate image processing functions
- Does not contain image-processing logic

### **BMP Handling Module (bmp.c / bmp.h)**

- Handles:
  - Reading BMP headers
  - Writing output images
- Keeps file-format logic separate from image processing





# File Structure and Code Organization

## Image Processing Modules

Each major feature has its own source and header file.

### Scaling Module

- Handles image resizing
- Implements bilinear interpolation
- Responsible only for pixel mapping and size conversion

### Denoising Module

- Applies smoothing filters
- Uses convolution with a kernel
- Reduces noise while preserving image structure





# File Structure and Code Organization

## Sharpening Module

- Enhances edges and fine details
- Uses high-pass filtering techniques

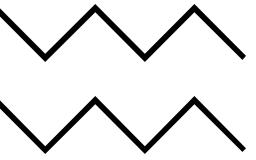
## Edge Detection Module

- Detects object outlines
- Uses Sobel Operator (gradient based)

## Utility Module (utils.c / utils.h)

- Common helper functions:
  - ASCII representation
  - Menu Overhaul
  - Copying Image
- Avoids code duplication across modules



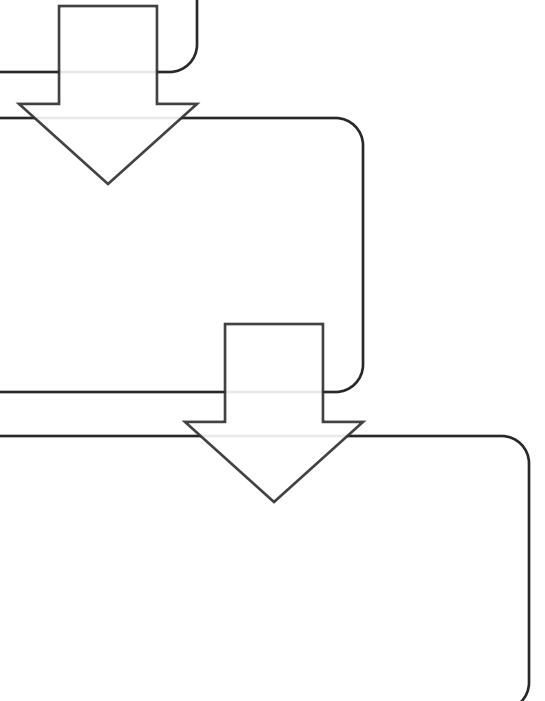


# Next Steps

Implementing remaining advanced algorithms

Multithreading support for functions

Exporting the data to CSV file for comparison





THANK  
YOU

