	Lembar Kerja Mahasiswa **Mata Kuliah Pengolahan Citra Digital Praktik (203311-20)** **Program Studi Informatika** **Fakultas Sains & Teknologi – Universitas Teknologi Yogyakarta**
	Identitas Mahasiswa

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Kelompok Prak	**Kel. I**

Soal 1.

Berdasarkan demo di kelas, tambahkanlah fitur pada aplikasi yang telah anda buat pada Lembar kerja minggu ke-9 antara lain:

1. 1 button dengan nama "**Erosi**" yang akan melakukan erosi pada citra hasil deteksi tepi Canny yang sebelumnya sudah Anda buat
2. 1 text box dengan label "**St. El. Size**" yang akan menerima input berupa bilangan bulat dan nantinya akan digunakan untuk menentukan ukuran structuring element yang digunakan pada operasi morfologi
3. 1 button dengan nama "**Closing**" yang akan melakukan operasi closing pada citra hasil deteksi tepi Canny yang sebelumnya sudah Anda buat

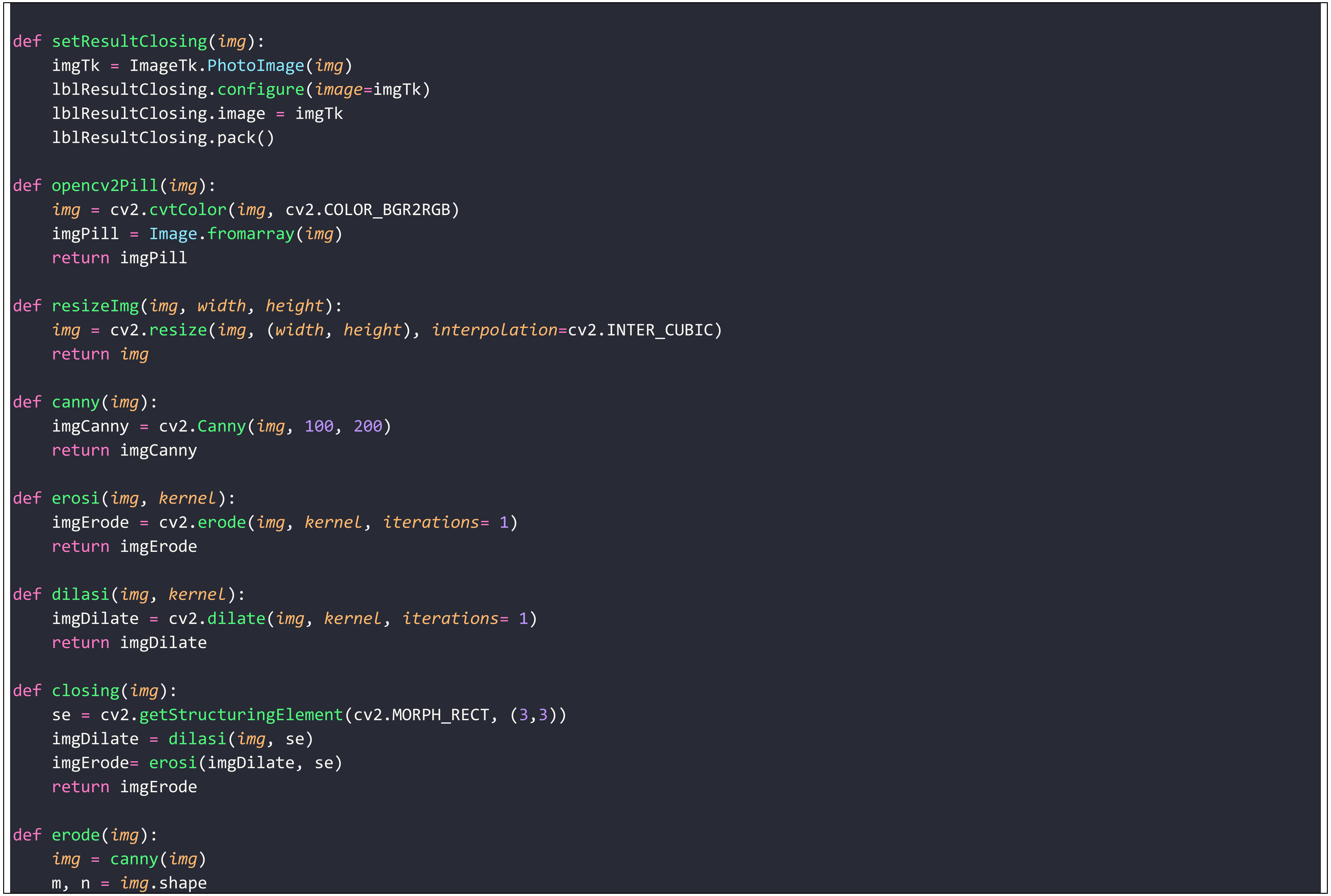
Pastikan pada tugas kali ini Anda menggunakan program GUI yang sudah Anda buat untuk pertemuan ke-9. Pastikan juga aplikasi mampu menampilkan citra asli dan citra hasil deteksi tepi dan citra hasil morfologi **dalam satu jendela secara berdampingan**. Buatlah layout GUI yang menarik dan tetap mudah digunakan.

Hasil Script

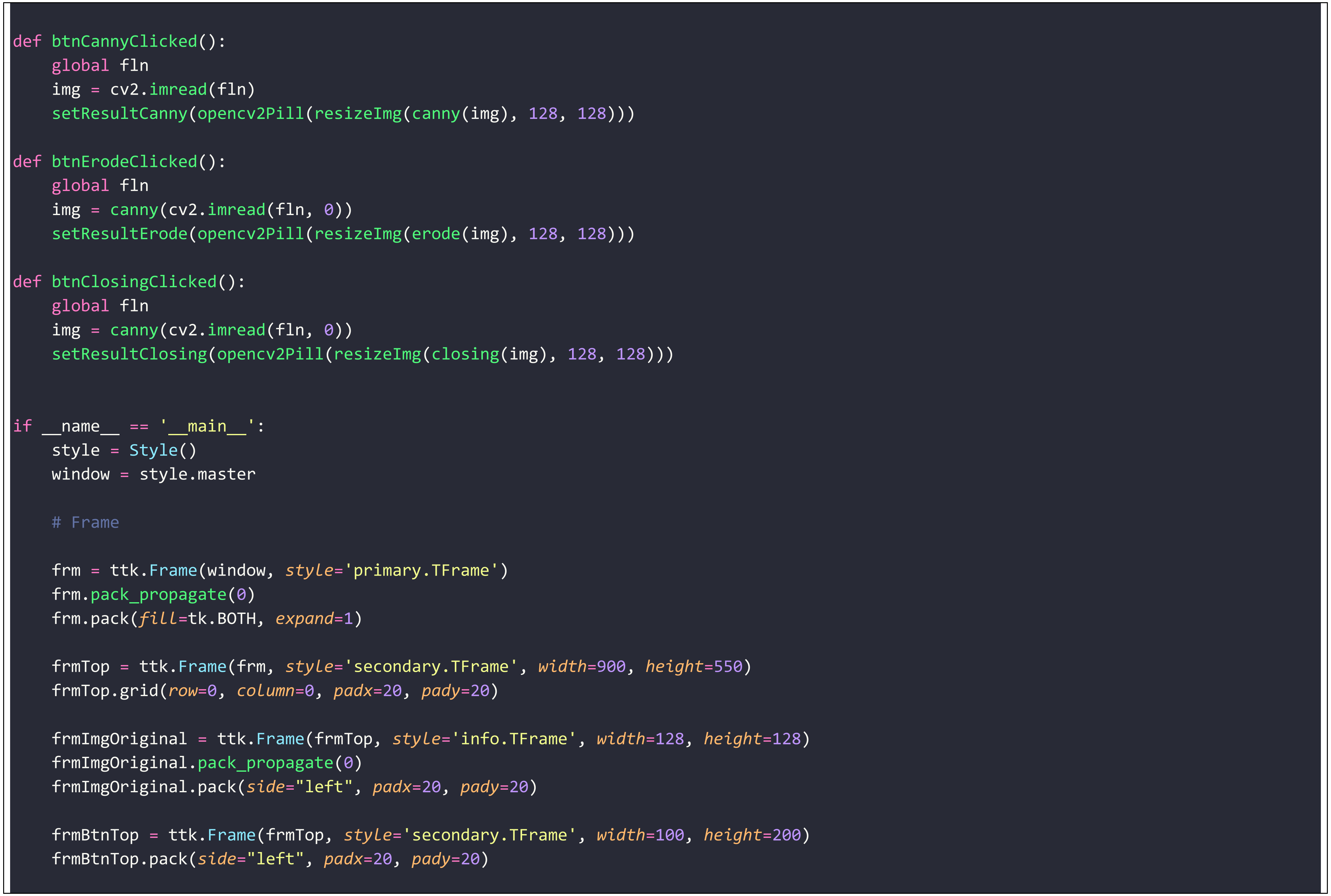
//tuliskan script python Anda di sini

```python
# 5200411488 - Arieska Restu Harpian Dwika

import cv2
import numpy as np
import os
from tkinter import *
from tkinter import font
from tkinter import filedialog
from ttkbootstrap import Style
from tkinter import ttk
import tkinter as tk
from PIL import Image, ImageTk
```

```python
def setOriginal(img):
    imgTk = ImageTk.PhotoImage(img)
    lblImgOriginal.configure(image=imgTk)
    lblImgOriginal.image = imgTk
    lblImgOriginal.pack()

def setResultFilter(img):
    imgTk = ImageTk.PhotoImage(img)
    lblResultFilter.configure(image=imgTk)
    lblResultFilter.image = imgTk
    lblResultFilter.pack()

def setResultCanny(img):
    imgTk = ImageTk.PhotoImage(img)
    lblResultCanny.configure(image=imgTk)
    lblResultCanny.image = imgTk
    lblResultCanny.pack()

def setResultSobel(img):
    imgTk = ImageTk.PhotoImage(img)
    lblResultSobel.configure(image=imgTk)
    lblResultSobel.image = imgTk
    lblResultSobel.pack()

def setResultPrewitt(img):
    imgTk = ImageTk.PhotoImage(img)
    lblResultPrewitt.configure(image=imgTk)
    lblResultPrewitt.image = imgTk
    lblResultPrewitt.pack()

def setResultErode(img):
    imgTk = ImageTk.PhotoImage(img)
    lblResultErode.configure(image=imgTk)
    lblResultErode.image = imgTk
    lblResultErode.pack()
```



```python
def setResultClosing(img):
    imgTk = ImageTk.PhotoImage(img)
    lblResultClosing.configure(image=imgTk)
    lblResultClosing.image = imgTk
    lblResultClosing.pack()

def opencv2Pill(img):
    img = cv2.cvtColor(img, cv2.COLOR_BGR2RGB)
    imgPill = Image.fromarray(img)
    return imgPill

def resizeImg(img, width, height):
    img = cv2.resize(img, (width, height), interpolation=cv2.INTER_CUBIC)
    return img

def canny(img):
    imgCanny = cv2.Canny(img, 100, 200)
    return imgCanny

def erosi(img, kernel):
    imgErode = cv2.erode(img, kernel, iterations= 1)
    return imgErode

def dilasi(img, kernel):
    imgDilate = cv2.dilate(img, kernel, iterations= 1)
    return imgDilate

def closing(img):
    se = cv2.getStructuringElement(cv2.MORPH_RECT, (3,3))
    imgDilate = dilasi(img, se)
    imgErode= erosi(imgDilate, se)
    return imgErode

def erode(img):
    img = canny(img)
    m, n = img.shape
    # k = 5 # 3, 5, 7, 9
    k = int(txtStElSize.get())
    kernel = np.ones((k,k), dtype=np.uint8)
    constant = (k-1) // 2
    imgErode = np.zeros((m,n), dtype=np.uint8)

    for i in range(constant, m-constant): # (2, m-2)
        for j in range(constant, n-constant): #(2, n-2)
            temp = img[i-constant:i+constant+1, j-constant:j+constant+1]
            product = temp * kernel
            imgErode[i,j] = np.min(product)

    txtStElSize.delete(0, END)
    return imgErode

def browseImage():
    global fln

    fln = filedialog.askopenfilename(initialdir=os.getcwd(), title="Select Image File",
                                     filetypes=(
                                         ("All Files", "*.*",),
                                         ("PNG File", "*.png"),
                                         ("JPG File", "*.jpg"))
                                     )

    img = opencv2Pill(resizeImg(cv2.imread(fln), 128, 128))
    setOriginal(img)

def filtering():
    global fln

    img = cv2.imread(fln)

    kernel = np.array(
            [
            [0, -1, 0],
            [-1,5, -1],
            [0, -1, 0],
            ],
            dtype='float')

    imgFilter = cv2.filter2D(img, -1, kernel)

    setResultFilter(opencv2Pill(resizeImg(imgFilter, 128, 128)))

def sobel():
    global fln

    img = cv2.imread(fln)
    gray = cv2.cvtColor(img, cv2.COLOR_BGR2GRAY)

    imgGaussian = cv2.GaussianBlur(gray,(3,3),0)
    imgSobelx = cv2.Sobel(imgGaussian,cv2.CV_8U,1,0,ksize=5)
    imgSobely = cv2.Sobel(imgGaussian,cv2.CV_8U,0,1,ksize=5)
    imgSobel = imgSobelx + imgSobely

    setResultSobel(opencv2Pill(resizeImg(imgSobel, 128, 128)))

def prewitt():
    global fln

    img = cv2.imread(fln)
    gray = cv2.cvtColor(img, cv2.COLOR_BGR2GRAY)

    imgGaussian = cv2.GaussianBlur(gray,(3,3),0)
    kernelx = np.array([[1,1,1],[0,0,0],[-1,-1,-1]])
    kernely = np.array([[-1,0,1],[-1,0,1],[-1,0,1]])

    imgPrewittX = cv2.filter2D(imgGaussian, -1, kernelx)
    imgPrewittY = cv2.filter2D(imgGaussian, -1, kernely)
    imgPrewitt = imgPrewittX + imgPrewittY

    setResultPrewitt(opencv2Pill(resizeImg(imgPrewitt, 128, 128)))
```

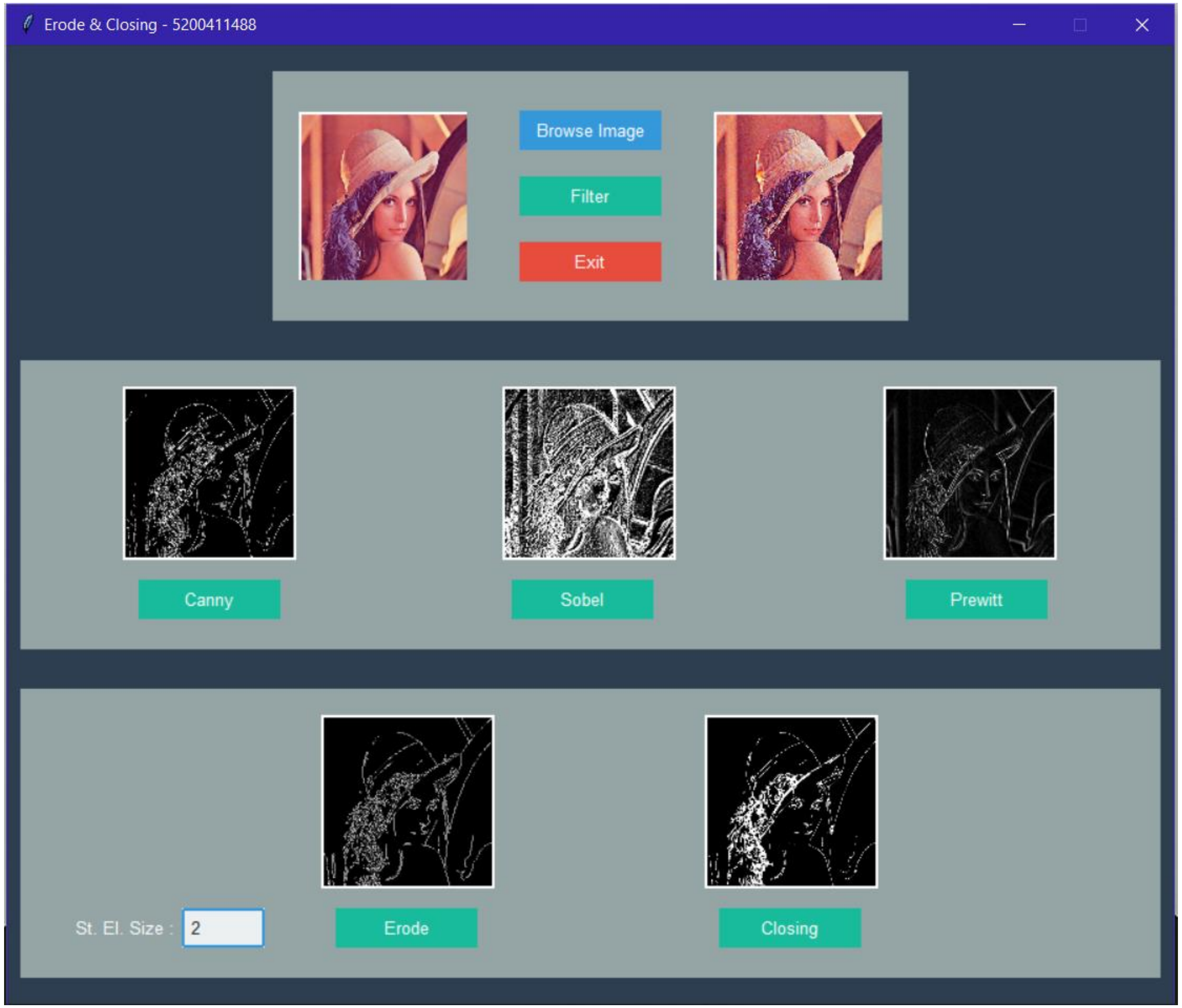


```python
def btnCannyClicked():
    global fln
    img = cv2.imread(fln)
    setResultCanny(opencv2Pill(resizeImg(canny(img), 128, 128)))

def btnErodeClicked():
    global fln
    img = canny(cv2.imread(fln, 0))
    setResultErode(opencv2Pill(resizeImg(erode(img), 128, 128)))

def btnClosingClicked():
    global fln
    img = canny(cv2.imread(fln, 0))
    setResultClosing(opencv2Pill(resizeImg(closing(img), 128, 128)))


if __name__ == '__main__':
    style = Style()
    window = style.master

    # Frame

    frm = ttk.Frame(window, style='primary.TFrame')
    frm.pack_propagate(0)
    frm.pack(fill=tk.BOTH, expand=1)

    frmTop = ttk.Frame(frm, style='secondary.TFrame', width=900, height=550)
    frmTop.grid(row=0, column=0, padx=20, pady=20)

    frmImgOriginal = ttk.Frame(frmTop, style='info.TFrame', width=128, height=128)
    frmImgOriginal.pack_propagate(0)
    frmImgOriginal.pack(side="left", padx=20, pady=20)

    frmBtnTop = ttk.Frame(frmTop, style='secondary.TFrame', width=100, height=200)
    frmBtnTop.pack(side="left", padx=20, pady=20)
    frmImgFilter = ttk.Frame(frmTop, style='info.TFrame', width=128, height=128)
    frmImgFilter.pack_propagate(0)
    frmImgFilter.pack(side="left", padx=20, pady=20)


    frmMid = ttk.Frame(frm, style='secondary.TFrame', width=500, height=550)
    frmMid.grid(row=1, column=0, padx=10, pady=(10,20))

    frmImgCanny = ttk.Frame(frmMid, style='info.TFrame', width=128, height=128)
    frmImgCanny.grid(row=0, column=0, padx=10, pady=(20,2))
    frmImgCanny.grid_propagate(0)

    frmImgSobel = ttk.Frame(frmMid, style='info.TFrame', width=128, height=128)
    frmImgSobel.grid(row=0, column=1, padx=10, pady=(20,2))
    frmImgSobel.grid_propagate(0)

    frmImgPrewitt = ttk.Frame(frmMid, style='info.TFrame', width=128, height=128)
    frmImgPrewitt.grid(row=0, column=2, padx=10, pady=(20,2))
    frmImgPrewitt.grid_propagate(0)

    frmBtnMid = ttk.Frame(frmMid, style='secondary.TFrame', width=848, height=43)
    frmBtnMid.grid(row=1, column=0, columnspan=3, padx=10, pady=(3,20))
    frmBtnMid.grid_propagate(0)


    frmBottom = ttk.Frame(frm, style='secondary.TFrame', width=800, height=550)
    frmBottom.grid(row=2, column=0, padx=10, pady=(10,20))

    frmImgErode = ttk.Frame(frmBottom, style='info.TFrame', width=128, height=128)
    frmImgErode.grid(row=0, column=0, padx=(175,0), pady=(20,2))
    frmImgErode.grid_propagate(0)

    frmImgClosing = ttk.Frame(frmBottom, style='info.TFrame', width=128, height=128)
    frmImgClosing.grid(row=0, column=1, padx=50, pady=(20,2))
    frmImgClosing.grid_propagate(0)

    frmBtnBottom = ttk.Frame(frmBottom, style='secondary.TFrame', width=848, height=43)
    frmBtnBottom.grid(row=1, column=0, columnspan=3, padx=10, pady=(3,20))
    frmBtnBottom.grid_propagate(0)


    # Button

    btnBrowse = ttk.Button(frmBtnTop, text='Browse Image', style='info.TButton', cursor="hand2", width=12, command=browseImage)
    btnBrowse.pack(side='top', pady=10)

    btnFilter = ttk.Button(frmBtnTop, text='Filter', style='success.TButton', cursor="hand2", width=12, command=filtering)
    btnFilter.pack(side='top', pady=10)

    btnExit = ttk.Button(frmBtnTop, text='Exit', style='danger.TButton', cursor="hand2", width=12, command=lambda: exit())
    btnExit.pack(side='top', pady=10)

    btnCanny = ttk.Button(frmBtnMid, text='Canny', style='success.TButton', cursor="hand2", width=12, command=btnCannyClicked)
    btnCanny.grid(row=0, column=0, padx=80, pady=(10,0))

    btnSobel = ttk.Button(frmBtnMid, text='Sobel', style='success.TButton', cursor="hand2", width=12, command=sobel)
    btnSobel.grid(row=0, column=1, padx=96, pady=(10,0))

    btnPrewitt = ttk.Button(frmBtnMid, text='Prewitt', style='success.TButton', cursor="hand2", width=12, command=prewitt)
    btnPrewitt.grid(row=0, column=2, padx=96, pady=(10,0))

    lblStElSize = ttk.Label(frmBtnBottom, text=f'St. El. Size : ', style='secondary.Inverse.TLabel')
    lblStElSize.grid(row=0, column=0, padx=(30,0), pady=(10,0))

    txtStElSize = ttk.Entry(frmBtnBottom, font="Normal 10",style='info.TEntry', width=7)
    txtStElSize.grid(row=0, column=1, padx=(0,4), pady=(10,0))

    btnErode = ttk.Button(frmBtnBottom, text='Erode', style='success.TButton', cursor="hand2", width=12, command=btnErodeClicked)
    btnErode.grid(row=0, column=2, padx=(50,0), pady=(10,0))

    btnClosing = ttk.Button(frmBtnBottom, text='Closing', style='success.TButton', cursor="hand2", width=12,
command=btnClosingClicked)
    btnClosing.grid(row=0, column=3, padx=(184), pady=(10,0))


    # Label
```

```
lblImgOriginal = ttk.Label(frmImgOriginal)
# lblImgOriginal.grid(row=0, column=0)

lblResultFilter = ttk.Label(frmImgFilter)
# lblResultFilter.grid(row=0, column=0)

lblResultCanny = ttk.Label(frmImgCanny)
# lblResultCanny.grid(row=0, column=0)

lblResultSobel = ttk.Label(frmImgSobel)
# lblResultSobel.grid(row=0, column=0)

lblResultPrewitt = ttk.Label(frmImgPrewitt)
# lblResultPrewitt.grid(row=0, column=0)

lblResultErode = ttk.Label(frmImgErode)
# lblResultErode.grid(row=0, column=0)

lblResultClosing = ttk.Label(frmImgClosing)
# lblResultClosing.grid(row=0, column=0)


window.title("Erode & Closing - 5200411488")
# window.geometry("1280x720")
window.resizable(0, 0)
window.mainloop()
```

Hasil Running Aplikasi

//paste-kan tampilan aplikasi Anda di sini


Erode & Closing - 5200411488
Browse Image
Filter
Exit
Canny
Sobel
Prewitt
St. El. Size : 2
Erode
Closing