Task session 3: Implement an Image Smoothing Filter

Concept:

Image smoothing is a common technique used in image processing to reduce noise and make images more visually appealing. One way to achieve image smoothing is by applying an averaging filter (also known as a mean filter) to the image. The averaging filter replaces each pixel in the image with the average of its neighbouring pixels, effectively reducing high-frequency noise.

Code:

Your task is to implement an averaging filter using Python and the OpenCV library. You can use the following code as a starting point:

```python
Import cv2
Import numpy as np

# Load an image
Image = cv2.imread('input.jpg')

# Define the kernel size
Kernel_size = (5, 5)

# Apply the averaging filter
Averaged_image = cv2.blur(image, kernel_size)

# Display the original and filtered images
Cv2.imshow('Original Image', image)
Cv2.imshow('Averaged Image', averaged_image)
Cv2.waitKey(0)
```

Cv2.destroyAllWindows()

```

**Creativity:**

Now, here's where the creativity comes in! Your task is to enhance the code and make it more interactive and engaging for your students. Here are some ideas:

1. **Interactive Kernel Size:** Allow the user to specify the kernel size interactively using input from the keyboard. This will give your students the opportunity to experiment with different kernel sizes and see how they affect the output image.

2. **Visualize the Kernel:** Display the kernel as an image to show your students how the averaging filter works. You can use a heatmap or a grayscale image to represent the weights of the kernel.

3. **Add a Slider for Thresholding:** Allow the user to specify a threshold value for thresholding the output image. This will allow your students to experiment with different threshold values and see how they affect the output image.

4. **Add a Slider for Brightness:** Allow the user to adjust the brightness of the output image using a slider. This will allow your students to see how the brightness affects the appearance of the output image.

5. **Add a Slider for Contrast:** Allow the user to adjust the contrast of the output image using a slider. This will allow your students to see how the contrast affects the appearance of the output image.

6. **Add a Slider for Saturation:** Allow the user to adjust the saturation of the output image using a slider. This will allow your students to see how the saturation affects the appearance of the output image.
```

7. **Add a Button for Resetting:** Add a button that allows the user to reset the output image to the original image. This will allow your students to experiment with different settings and easily revert back to the original image.