Jazib Waqar Raza

Professor Kenny Davila Castellanos

CSC 381

18 November 2025

<div align="center">Self Evaluation</div>

<div align="center">**Project:** "Seamless Social Media Collage Creator"</div>

Evaluation Criteria:

1. **Code Submission + Documentation**

    My completed final prototype is submitted as a Jupyter Notebook ("final_project_JazibWR.ipynb"), along with a dataset directory ("images") preloaded with six images. This ensures the project remains executable in case the full dataset import from the cloud fails. The submission also includes an output directory for the final collage (note that Jupyter overwrites the previous output with the newest iteration). These details are outlined in the "README.md" file, which illustrates the exact steps to run the project. The code is further supplemented by inline comments explaining the execution, alongside cell-by-cell outputs to validate each stage.

2. **Basic Image Processing Techniques Used**

    My project framework is heavily rooted in the assignments completed throughout the course, utilizing the core toolstack of OpenCV, NumPy, and Matplotlib. I implemented foundational techniques drawn directly from class concepts to handle specific processing

needs: utilizing cv2.COLOR_BGR2YUV to isolate the luminance channel for tonal adjustment and driving the edge detection pipeline via cv2.Canny, albeit with custom parameters. Finally, I employed affine transformations to orient the image as desired, specifically via cv2.getRotationMatrix2D to first compute the necessary rotation matrix and then cv2.warpAffine to fulfill this geometric adjustment. These choices ensured that the pipeline was partially built on reliable foundations that are well understood.

3. Advanced Image Processing Techniques Used

Given the narrow scope of digital image processing without venturing into full Computer Vision or Deep Learning, the best way to gauge the advanced nature of this project is through the use of custom-built elements that allowed fine-tuning. There were three notable examples of this with the first being the enhancement stage. I initially utilized built-in OpenCV methods (HE + CLAHE) but was unsatisfied with the overblown look. Instead, I ideated from the assignments to create a custom Cumulative Distribution Function (CDF) for a weighted blended approach. After tweaking by feel on the dataset, I settled on a value of 0.7 original + 0.3 equalized, striking a balance that preserved the original feel while uplifting details like dark spots. The second was the feature detection stage, where the Probabilistic Hough Transform was filtered to only seek lines in the horizontal sphere (within 45 degrees). Perceptually, I found that strong horizontal features were more effective for alignment than vertical ones, which often added unnecessary complexity. Finally, I implemented a custom alpha-compositing function to manually adjust the blending size at boundary edges, smoothing the transitions between the bordering collage images.

4. Model Complexity

I believe that with the project's multiple stages stemming from enhancement, line detection, transformation, alignment, and finally to blending, it successfully fulfills the goal of combining differing digital image processing procedures in a non-trivial way to form a subjective output. This complexity is best illustrated by the significant hurdle regarding the transformation-to-alignment step which required multiple iterations. Initially, the plan was to automatically transform images based on lines via mesh warping and patch-wise stitching, but that resulted in poor outputs with sizable black portions. The second iteration approached it via automatic layering by matching edges and placing images on top of one another. This was also flawed as large overlaps led to 'ghostly' sections and persistent black voids. I ultimately inverted the goal from 'fix then crop' to simply transforming the images by rotation with cubic interpolation before cropping them into defined sizes, arranging them in groups of 4 or 6 to fill the 9:16 format. This coincidentally made the final blending feature manageable as it established fixed pixel sections for the operation rather than requiring dynamic boundary detection.

5. Good Data Usage

Data collection was easier than expected. Since the pipeline was intended for personal use, I first compiled 10 images from my own archives to establish a baseline, then added another 10 from royalty-free sources like Unsplash and Pexels to test a wider range of external formats. I configured the dataset to randomly choose groups of 4 or 6 images, resulting in a permutation space of millions of possible outputs. These differing combinations

allowed me to subjectively tweak the pipeline based on the unique image relations in each case. Later on to meet the ideal dataset range case, I added 12 more images (half personal, half online) to bring the total to 32, providing even more combinations to fine-tune parameters across diverse visual cases.

6. Good Experimentation + Evaluation

This section is tricky to articulate since the project's objective aligned more with the aesthetic rather than analytical findings, as such the procedures were not driven by strict quantitative measures but rather than iterative refinements by visual judgement. This led to most testing coming up organically in search of the desired look I wanted. With hat said, there were still moments of comparative analysis when adjusting parameters such as the histogram equalization blend ratio, the Canny thresholds, and the feather size for seam blending. These variations are shown with figures in the final report to illustrate how different settings affected the output, emphasizing that the visual results drove the choices more than the numeric parameters themselves.

7. Project Objectives

Reflecting on this timeline, I am very happy to share that the project fully functions and fulfills all the core functionalities I had laid out in the original proposal to create automated tool that harmonizes brightness, aligns linear features, and blends seams for a seamless aesthetic collage output. Each of these procedures was achieved from continuous tweaks and iterations and although I utilize a fixed 9:16 output instead of switching between 4:5, I had stated that objective merely as a bonus. To sum it all up, the finished result now works well to bring raw images to a polished, social-media-ready output with the click of a button.

Team Contribution:

This was a solo project led by me, and as such all the developments of this project took place under my control, which was a great learning experience and also quite fulfilling as it sets out to solve a problem I face frequently curating social media content!