**Data Collection and Preprocessing Phase**

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| Date | 20 June 2025 |
| Team ID | SWTID1750316859 |
| Project Title | ASL - Alphabet Image Recognition |
| Maximum Marks | 6 Marks |

**Preprocessing:**

The images will be preprocessed by resizing, normalizing, augmenting, denoising, adjusting contrast, detecting edges, converting color space, cropping, batch normalizing, and whitening data. These steps will enhance data quality, promote model generalization, and improve convergence during neural network training, ensuring robust and efficient performance across various computer vision tasks.

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| **Section** | **Description** |
| Data Overview | Total number of images in the dataset: 87000. |
| Resizing | All images are resized to a target size of 128x128 pixels. |
| Normalization | Pixel values are rescaled from the range [0, 255] to [0, 1] by dividing by 255. |
| Data Augmentation | Randomly rotated images by up to 20 degrees and zoomed in on images randomly by upto 15%. |
| Denoising | Used cv2.fastNlMeansDenoisingColored to perform non- local means denoising. |
| Edge Detection | Used cv2.Canny to find edges. The parameters 100 and 200 are the lower and upper hysteresis thresholds. Edges with intensity gradient more than the upper threshold are sure to be edges, and those below the lower threshold are sure not to be edges. Those between these two thresholds are classified based on their connectivity. |
| Color Space Conversion | Converted both the original and cropped images from BGR to RGB for correct display with Matplotlib. |
| Image Cropping | Crop images to focus on the regions containing objects of interest. |
| Batch Normalization | In TensorFlow/Keras, batch normalization is implemented as a dedicated layer (tf.keras.layers.BatchNormalization). Adding this layer directly to the model architecture handles the normalization process automatically during training and inference, making manual implementation for each batch unnecessary. |
| **Data Preprocessing Code Screenshots** | |
| Loading Data |  |
| Resizing |  |
| Normalization |  |
| Data Augmentation |  |
| Denoising |  |
| Edge Detection |  |
| Color Space Conversion |  |
| Image Cropping |  |
| Batch Normalization | In TensorFlow/Keras, batch normalization is implemented as a dedicated layer (tf.keras.layers.BatchNormalization). Adding this layer directly to the model architecture handles the normalization process automatically during training and inference, making manual implementation for each batch unnecessary. |