**Data Collection and Preprocessing Phase**

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| Date | 19 June 2025 |
| Team ID | SWTID1749821186 |
| Project Title | Enhancing Product Reliability: Leveraging Transfer Learning for Fault Detection |
| 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 | The dataset contains grayscale images of casting products labeled as either defective (def\_front) or good (ok\_front). It was sourced from Kaggle and includes 7348 images. |
| Resizing | All images are resized to a uniform target size of 224×224 pixels to match the input requirements of the VGG16 model. |
| Normalization | Pixel values are normalized to the range [0, 1] by dividing by 255. This helps the model converge faster during training. |
| Data Augmentation | Techniques such as horizontal flipping, rotation, zooming, and shifting are applied to artificially expand the dataset and improve generalization. |
| Denoising | Gaussian blur and median filters are optionally applied to reduce noise in the images and enhance feature clarity. |
| Edge Detection | Canny edge detection is used to highlight prominent edges and structural features in the casting images. |
| Color Space Conversion | Images are converted from grayscale to RGB format to be compatible with pre-trained models like VGG16. |
| Image Cropping | Cropping is applied to remove irrelevant background and focus on the casting region of interest. |
| Batch Normalization | Batch normalization layers are used in the neural network to stabilize and accelerate training by normalizing inputs to each layer. |
| **Data Preprocessing Code Screenshots** | |
| Loading Data |  |
| Resizing |  |
| Normalization |  |
| Data Augmentation |  |