# **Preprocessing Steps for Multi-Food Image Dataset**

## **1. Tools and Libraries Used**

* **OpenCV (cv2):** Used for image reading, resizing, and quality (blurriness) checks.
* **Albumentations:** Utilized for data augmentation including rotation, flipping, and brightness/contrast adjustment.
* **NumPy:** For pixel normalization and numerical operations.
* **Matplotlib & Seaborn:** Used in visualization steps.

## **2. Image Resizing**

All images in the dataset were resized to a fixed dimension of **416x416 pixels** using OpenCV’s cv2.resize() function. This ensures uniform input size for the object detection model (YOLO) training and inference.

## **3. Image Quality Check**

To maintain dataset quality, images were checked for blurriness using the **variance of Laplacian** method:

* Each image was converted to grayscale, and the Laplacian variance was calculated.
* Images with variance below the threshold value of **100** were considered blurry and removed from the dataset.

This helped ensure that only clear, focused images are used for training.

## **4. Pixel Normalization**

Image pixel values were normalized by scaling from the original range of **[0, 255]** to **[0, 1]**. This step is essential for faster convergence during model training and helps stabilize the learning process.

Normalization was done by dividing pixel values by 255.0.

## **5. Data Augmentation**

To enhance model robustness and increase dataset diversity, various augmentation techniques were applied using the Albumentations library:

* **Random Rotation:** Images were randomly rotated within a ±15° range.
* **Horizontal Flipping:** Random horizontal flips were applied with a probability of 50%.
* **Brightness and Contrast Adjustment:** Random changes to brightness and contrast were introduced to simulate different lighting conditions.

Augmented images were saved alongside original images with a suffix (e.g., \_aug) in the filename. Corresponding annotations were adjusted accordingly to match augmented images.

## **6. Categories**

The dataset contains the following food categories, which were used consistently in annotations and model training:

* **naan**
* **roti**
* **daal**
* **rice**
* **chicken**
* **salad**
* **yogurt**
* **mixsweet**

## **Summary**

The preprocessing ensured a clean, consistent, and augmented dataset ready for training a multi-food detection model. Image quality checks and augmentations contribute to better model performance and generalization.