Assignment 13:

Leather Anomaly Detection in Manufacturing

Project Overview:

In leather manufacturing industries, ensuring the quality of leather products is critical. Defects like color inconsistencies, physical damages, or improper processing can affect product quality and market value. This project automates the **visual inspection process** by using **computer vision and deep learning** techniques to detect different types of surface anomalies in leather products.

Objective:

To build an automated system that can classify leather images into various categories based on surface conditions, improving inspection efficiency and reducing manual errors.

Classes/Defect Types:

1. **Color**
    - Irregular color patches or discoloration in the leather surface.
2. **Cut**
    - Physical cuts, slits, or tears in the leather material.
3. **Poke**
    - Small puncture-like defects or holes on the surface.
4. **Good**
    - Defect-free, high-quality leather surfaces.
5. **Fold**
    - Wrinkles or folds formed during processing or handling.
6. **Glue**
    - Unwanted adhesive patches or residues left on the surface.

Importance:

- Reduces dependency on manual inspection.
- Minimizes faulty deliveries.
- Ensures consistent product quality.
- Helps in early detection of process errors.
- Speeds up the quality control workflow.

Technical Approach:

1. **Image Acquisition**: Capture high-resolution images of leather surfaces.
2. **Preprocessing**:
    - Resize and normalize images.
    - Apply contrast enhancement or denoising if needed.
3. **Deep Learning Model**:
    - Train a **Convolutional Neural Network (CNN)** model (like MobileNetV2, EfficientNet, or a custom CNN) on categorized images.
    - Use **Teachable Machine** for prototyping if necessary.
4. **Deployment**:
    - Integrate the trained model into a **Streamlit app** for real-time anomaly detection on uploaded images.

Expected Outcomes:

- Real-time classification of leather anomalies.
- Visual display of predictions with confidence scores.
- User-friendly interface for factory staff or quality control engineers.

Dataset Link:

https://www.mydrive.ch/shares/38536/3830184030e49fe74747669442f0f282/download/420937607-1629951964/leather.tar.xz

My Streamlit Project Link:

https://anomaly-detection-of-leather-6xpng82sqvhdrmyopnuawd.streamlit.app/