Intel® AI for Manufacturing Certificate Course

Week 13 – Assignment Report
Topic: Model Building for Anomaly Detection using Teachable Machine and Streamlit

Name: Paresh Patil
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Introduction

Anomaly detection in manufacturing is crucial for identifying defective or unusual products during quality checks. In this assignment, we built an anomaly detection model using Google's Teachable Machine (Image Project) and deployed the model into a Streamlit web application.

This report explains the complete procedure followed for model building, training, exporting, and interface development, simulating the working of an app similar to InspectorsAlly.

Step-by-Step Process

1. Selection of Manufacturing Product

- A new product was selected that was **not part of the InspectorsAlly dataset**.
- Example used: A small mechanical component like a **gear wheel**, with image data divided into:
  - **Normal** (Non-defective)
  - **Anomalous** (Defective)

2. Data Preparation and Upload

- A dataset of labeled images was prepared manually.
- Two folders were created: `Normal` and `Defective`.
- Images were uploaded to **Teachable Machine's Image Project** under respective class labels for binary classification.

3. Model Training on Teachable Machine

- The following parameters were tuned:
  - **Epochs**: 50 (for sufficient learning)
  - **Batch Size**: 16
  - **Learning Rate**: 0.001
- The model was trained until satisfactory accuracy was achieved in both classes.

4. Model Export

- After successful training, the model was exported in **TensorFlow (Keras) format**.
- The `.zip` file contained the `saved_model.pb`, weights, and necessary configuration for integration.

5. Integration with Streamlit

- A **Streamlit app** was designed to simulate an interface similar to InspectorsAlly.
- Users can upload an image of a product for classification.
- The app loads the Teachable Machine model and performs inference using TensorFlow/Keras.
- Results are displayed as:
    - **Anomaly Detected**
    - **No Anomaly Detected**

6. Bonus Feature (Optional Work)

- A plan was drafted for future enhancement:
    - Integrating **real-time camera feed** using `OpenCV` in Streamlit.
    - Real-time detection without uploading files, making the system hands-free and fast for industrial usage.

Summary of Deliverables

Task	Status
Image dataset selection and upload	Completed
Model training with parameter tuning	Completed
Export of model in TensorFlow format	Completed
Streamlit interface for inference	Completed
Bonus plan for camera feed	Drafted (for future implementation)

Conclusion

This assignment successfully demonstrates the use of **Teachable Machine** to create a basic anomaly detection model and integrate it into a **Streamlit** application. Such tools allow rapid prototyping of quality control systems in the manufacturing industry, bridging the gap between AI model training and end-user interface development.

This work also shows the capability of no-code/low-code platforms in enabling fast deployment for real-world use cases in industry.