Edge-AI Engineer

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Objective:

Develop an AI-powered image analysis system for detection, classification, and segmentation of the following dry fruits and nuts:

1. Cashew
2. Grapes
3. Badam (Almond)
4. Dried Grapes (Raisins)

Task 1: Object Detection & Classification

- Dataset Preparation:
  - Collect and create a custom dataset with **at least 25 labeled images per class**.
  - Annotate each image using **bounding boxes** with **class labels** (Cashew, Grapes, etc.).
- Model Development:
  - Train **one object detection model** using **transfer learning**:
    - **PyTorch**

      OR

    - **TensorFlow**
  - Leverage pre-trained models depending on framework compatibility.
- Inference and Evaluation:
  - Run inference on a **video file** containing instances of all four classes.
  - Apply a **confidence threshold ≥ 0.4** to filter predictions.
  - Ensure at least **70% classification/detection accuracy** across all objects in the video.

Task 2: Segmentation with Color & Shape Extraction

- Dataset Annotation:
    - Extend the dataset with **segmentation masks** (instance or semantic).
- Model Training:
    - Train a segmentation model in any framework.
- Feature Extraction:
    - For each segmented object, extract:
        - **Dominant color** (e.g., brown, green)
        - **Approximate shape** (e.g., round, oval, irregular)
    - Overlay segmentation results with class, color, and shape on the image/video frame.
- Visualization & Accuracy:
    - Visualize final outputs with mask boundaries and extracted features.
    - Evaluate:
        - Segmentation accuracy
        - Clarity of output overlays

Deliverables:

1. Trained Models
    - Trained Inferencing model each from PyTorch or TensorFlow
2. Inference Outputs
    - Detection and segmentation results on the test video,and image at least 10 images(not used in training)
3. Exported Models
   Ensure at trained model is exported in both:
    - **ONNX**
    - **TFLite**
    - Include brief notes on conversion steps and any model limitations post-export.
4. Reproducible Inference Script
    - Provide a Python script or Jupyter notebook to run inference end-to-end
5. Documentation (Mandatory: Self-Written)
    - Brief report covering:
        - Workflow overview
        - **Model performance** (accuracy metrics, segmentation IOU, etc.)
        - **Visual samples** of results
        - **Challenges faced** and how they were addressed
        - **(Important)**: Documentation must be written in your **own words**, reflecting personal understanding—**not generated by any LLM (Large Language Model)**.

Optional Enhancements (Bonus Points)

- Framework Comparison:
    - Analyze and compare both models/frameworks based on:
        - Accuracy
        - Inference time
        - Model file size
- Error Analysis:
    - Identify and discuss:
        - Common misclassifications
        - Typical segmentation errors or confusion between classes
- Complete Pipeline Reproducibility:
    - Ensure all steps (from dataset loading to final inference) run from a **single script or notebook**, with **clear instructions**.

COMPANY OVERVIEW

Kruthak Technology

Pioneering AI Edge Innovation for a Smarter Future

The word "Kruthak" is derived from Sanskrit and can have several meanings depending on the context. The most common meanings associated with "Kruthak" are "accomplished," "created," or "done." It conveys a sense of completion, achievement, or ***something that has been brought into existence with purpose and skill***.

In the context of a company like Kruthak Technology, the name could symbolize the creation of innovative solutions and the accomplishment of technological feats. It implies that the company is focused on achieving and creating impactful, well-crafted products.

At Kruthak Technology, we are at the cutting edge of AI edge solutions, crafting products that redefine the intersection of **mechanical engineering ,Embedded system and artificial intelligence.** We specialize in designing, developing, and deploying high-performance AI-powered products tailored to a wide range of sectors—agriculture, consumer markets, and beyond. With a relentless drive for innovation, we aim to shape India's AI ecosystem with solutions that not only push technological boundaries but also deliver practical, real-world impact.

Our Mission: Our mission is clear: to reshape the AI edge landscape in India by bridging the gap between mechanical engineering expertise and AI innovation. We are committed to creating advanced, robust products that integrate seamlessly into real-world applications, solving critical problems with engineering precision and technological brilliance.

Our Vision: We envision a future where AI is deeply embedded into the fabric of industries, enhancing both mechanical processes and daily life. Through precision engineering and breakthrough AI technology, we aim to lead the way in developing solutions that enhance productivity, optimize efficiency, and improve the quality of life—from the shop floor to the farm field.

What We Do: Kruthak Technology designs end-to-end AI edge solutions that leverage mechanical engineering principles and AI technology to solve complex challenges. Our products are engineered to offer unmatched reliability and precision, helping industries—from agriculture to consumer markets—elevate their operations and achieve unparalleled efficiency.

THANK YOU…