Week 1: Initial Setup

1. **Day 1-2**:
    - Install and configure Python and necessary dependencies (`YOLO`, `OpenCV`, etc.).
    - Create a basic file structure for the project.
2. **Day 3-4**:
    - Familiarize yourself with the YOLO model for object detection.
    - Test YOLO on sample images to ensure proper installation.
3. **Day 5-7**:
    - Set up video input handling using OpenCV.
    - Create a basic script to load and process video frames.

Week 2: Core Development

1. **Day 8-10**:
    - Implement the object and sub-object detection functionality.
    - Define hierarchical associations (linking sub-objects to parent objects).
2. **Day 11-12**:
    - Design the JSON output format and create logic to structure detection results.
    - Save outputs to a file.
3. **Day 13-14**:
    - Test detections on a variety of video inputs.
    - Refine accuracy for hierarchical associations.

Week 3: Advanced Features

1. **Day 15-16**:
    - Implement the functionality to crop and save sub-object images from detected frames.
2. **Day 17-18**:
    - Optimize inference for real-time performance (10–30 FPS on CPU).
    - Profile preprocessing, inference, and postprocessing speeds.
3. **Day 19-21**:
    - Benchmark performance on sample videos.
    - Document results and optimization strategies.

Week 4: Testing and Documentation

1. **Day 22-23**:
    - Conduct rigorous testing on diverse video inputs to ensure reliability.

    - Handle edge cases like overlapping or occluded objects.
2. **Day 24-25**:
    - Finalize the JSON output generation and sub-object image retrieval.
    - Verify outputs meet requirements.
3. **Day 26-28**:
    - Write detailed documentation, including setup instructions, usage examples, and performance benchmarks.

Week 5: Deployment and Presentation

1. **Day 29-30**:
    - Package the project for easy deployment (include `README.md`, `requirements.txt`, and sample inputs).
    - Prepare a demo video showcasing system capabilities.
2. **Day 31-35**:
    - Submit the codebase, JSON outputs, and benchmarking report.
    - Review and refine presentation materials.

Let me know if you need any adjustments or additional details!