



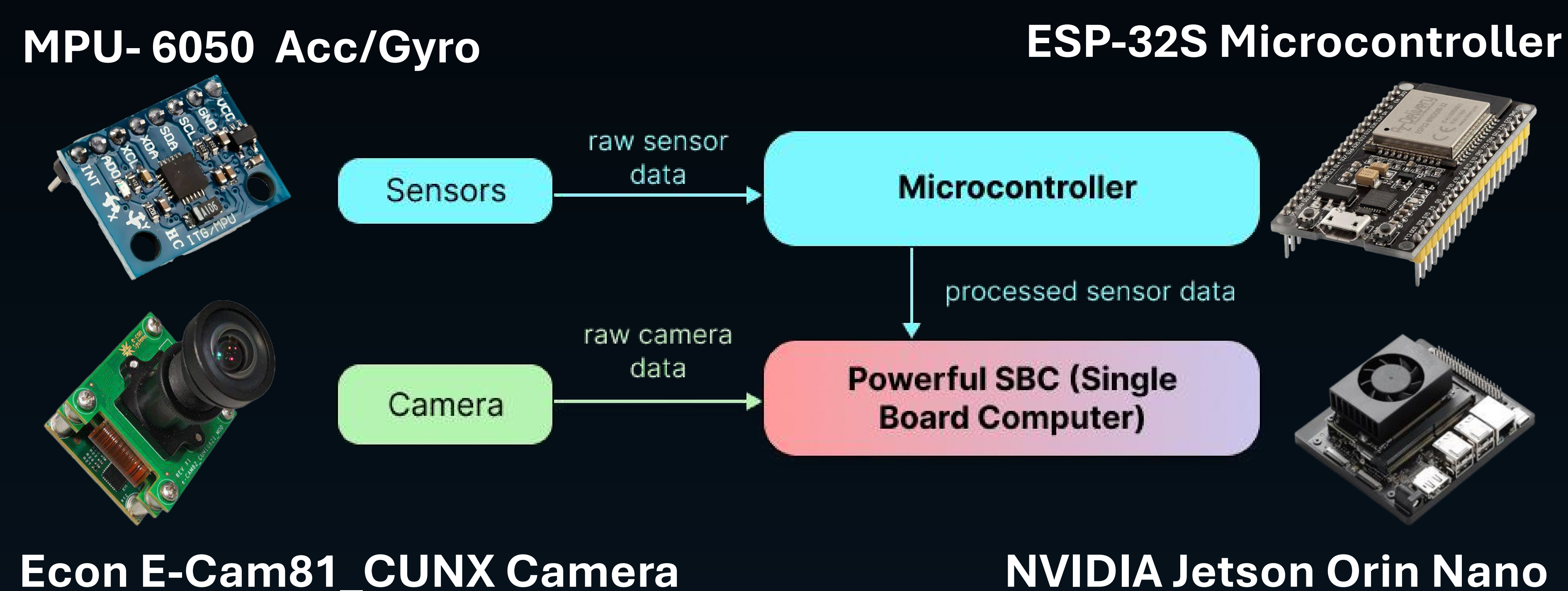
P.E.T.E: Procedure Execution Tracking Engine

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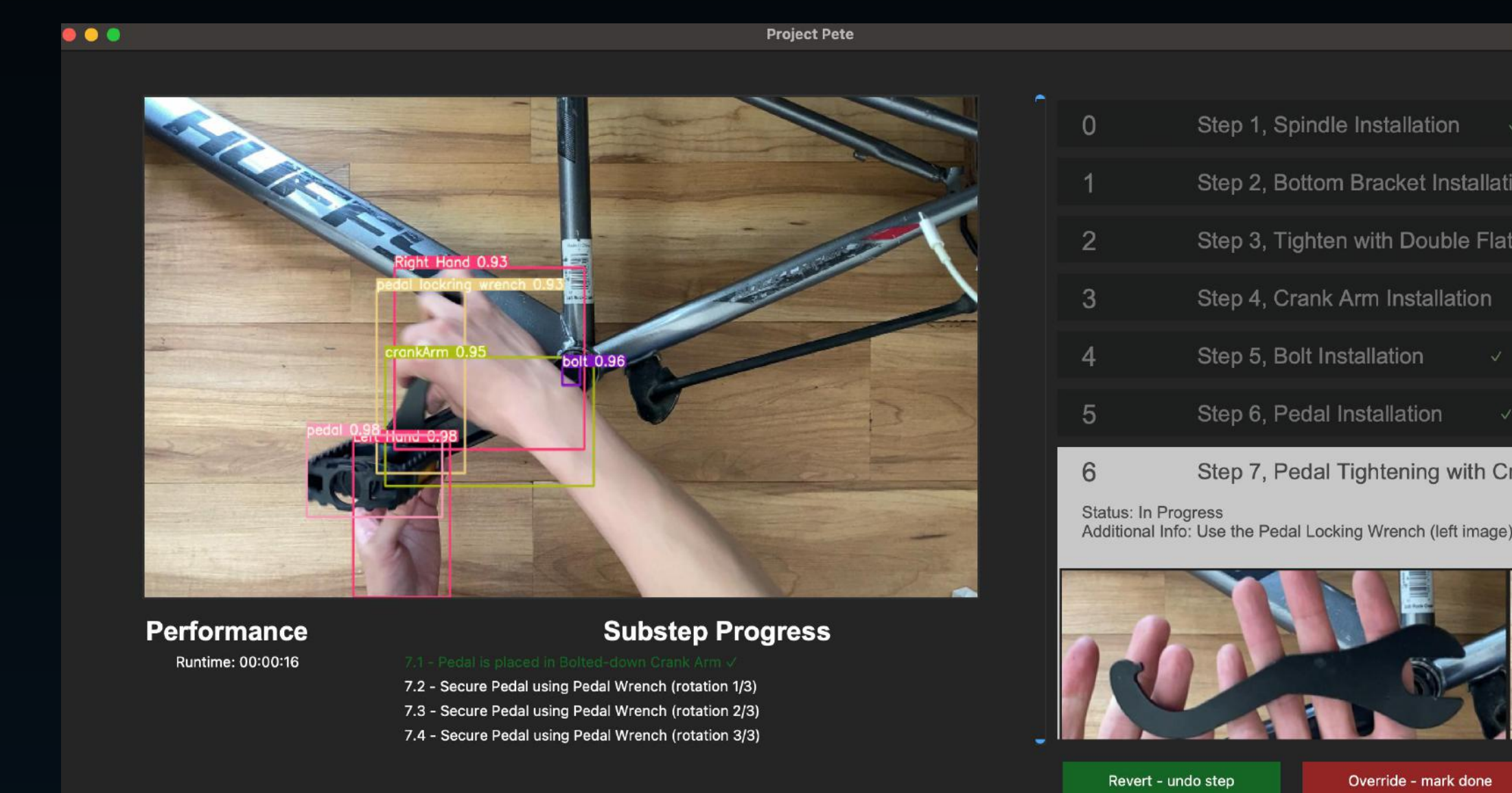
Background

Astronauts onboard the International Space Station (ISS) follow intricate step-by-step instructions and often encounter maintenance challenges when completing procedures. We propose an automated solution: a procedure-tracking system that uses a computer vision model and sensors to validate user progress.

Hardware Diagram



GUI



Each step in the procedure involves real-time image processing and identification of all elements involved, with specific substeps that must be satisfied before proceeding to the next step.

Software Flow

Camera Capture:

Transforms raw camera data into a workable live video feed

Sensor Capture:

Transforms raw gyro/acc/temp data to usable metrics

Detection Phase:

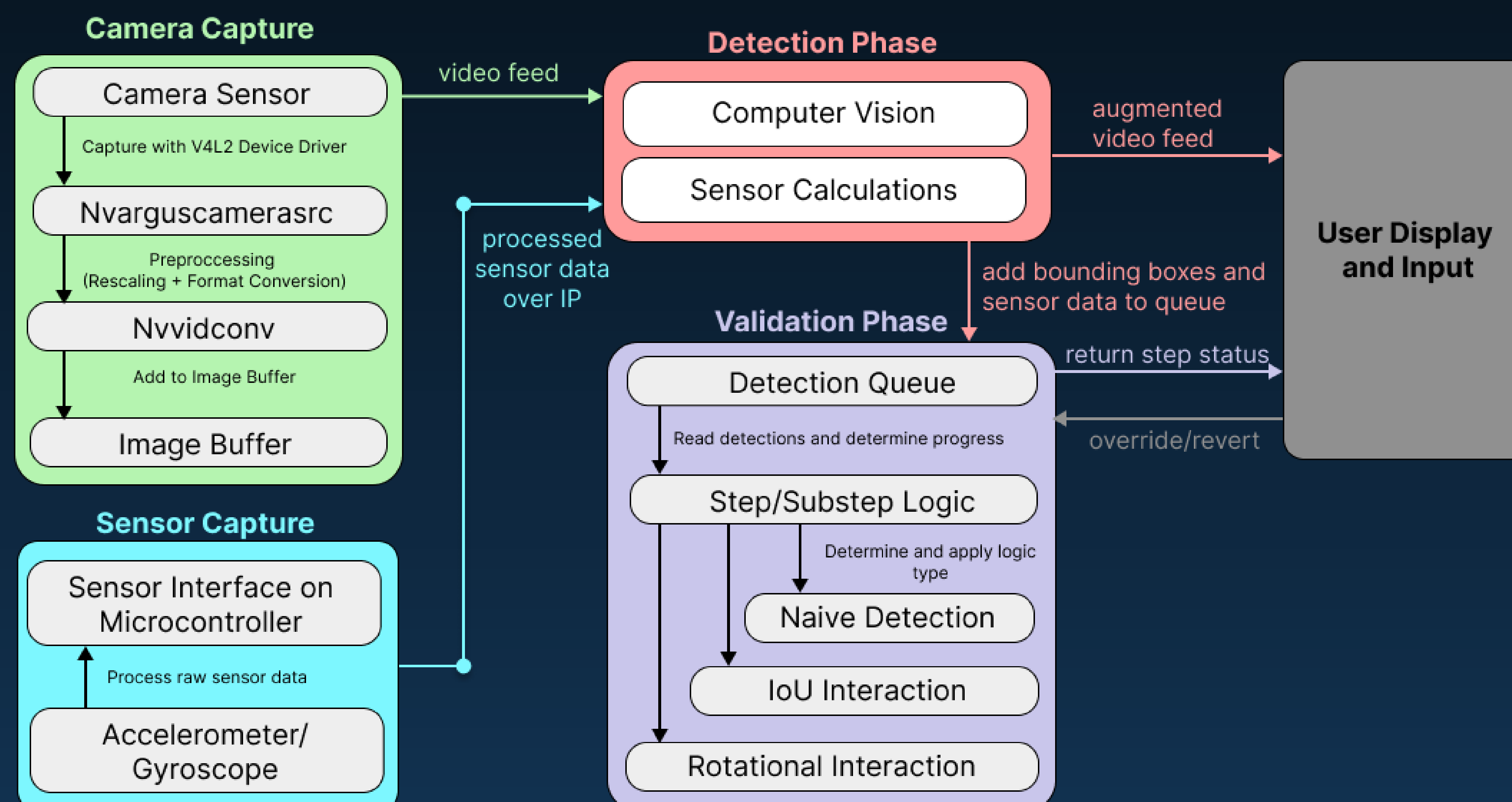
Computes bounding boxes and angular displacement

Validation Phase:

Validates detection against ground truth

User Display and Input:

Shows bounding boxes and allows for manual override



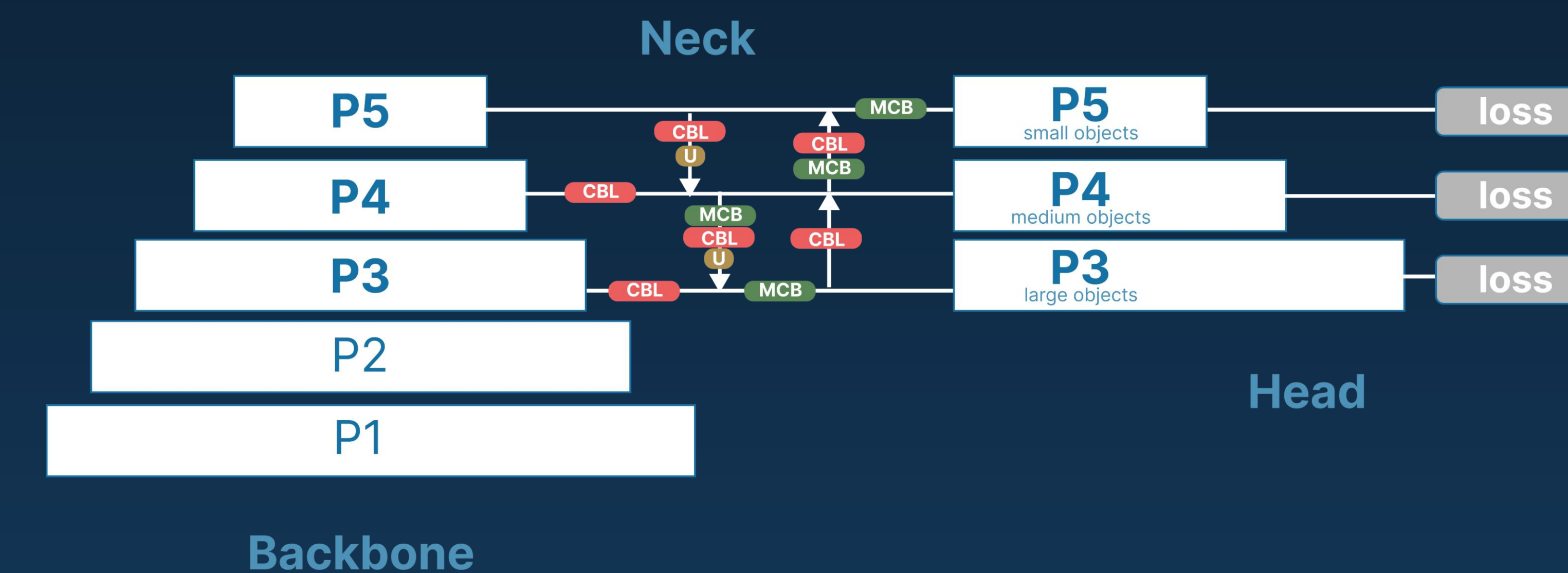
Computer Vision

Model and Performance:

Runs YOLOv7-tiny, a real-time object detection model built for edge devices. This smaller model provides faster inference speed and lower system cost due to reduced parameters (6M).

Dataset and Training Enhancements:

Training dataset were manually collected and labeled and augmented with CutMix augmentation. Training employed Transfer Learning on top of MS COCO dataset.



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