I2.01 MOST-Based Video Analysis of Disassembly Operations

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Problem Statement

- Develop a **faster, automated approach** to **MOST time studies** using **computer vision**
- Evaluate **accuracy and consistency** compared to **traditional time study methods**
- Reduce **human error** an improve **process analysis** for **real-world applications**

Objectives

- Critique AI Performance within Time Studies
- Benchmark Traditional Time Study Methods and Provide Comparison Matrix
- Design and Pilot a Teachable Training Module for Time Studies
- Understand AI Models Methodologies in Time Studies

Ethical and Environmental

Ethics
- Data Bias
- Privacy Risk
- Accountability Gaps

Environment
- High Energy Use
- Carbon Footprint Concerns

Software Toolkit

Development Environment: Python, Jupyter, Anaconda

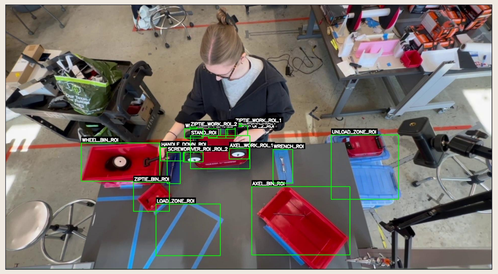
Data Preparation: Roboflow

Computer Vision Models: Ultralytics YOLOv8, MediaPipe

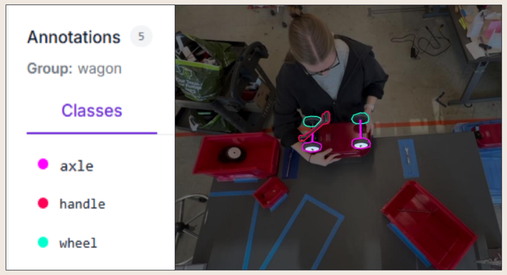
System Integration and Analysis: OpenCV, PyTorch

Collaboration and Development Support

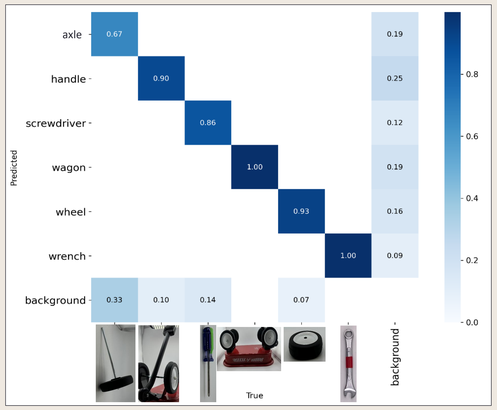
Developing Computer Vision Model



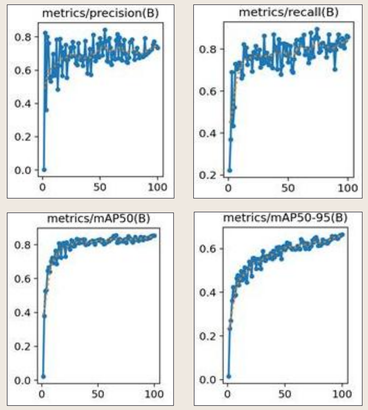
ROI Zones



Roboflow Object Annotations



Final Model Confusion Matrix for Object Detection



Final Model Training Curves for YOLO Object Detection

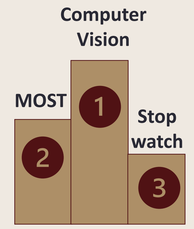
Time Study Comparison Matrix

Metric	Stopwatch Method	MOST Analysis	Computer Vision
Time	57.4 sec	55.44 sec	52.56 sec
Accuracy	Standard Time: 57.4 sec	Absolute Error: 1.96 sec Percent Error: 3.41%	Absolute Error: 4.84 sec Percent Error: 8.43%
Speed	Slow (manual timing)	Moderate	Fast, Can be done passively
Cost (Setup and Labor)	Low setup, High labor	Moderate setup, high analyst labor	High setup, Low ongoing labor
Objectivity and Repeatability	Low, observer bias and inconsistent timing	High, standardized, repeatable coding	Extremely high, algorithmic consistency, unbiased
Limitations	Human error and fatigue, Hawthorne effect	Extensive training, limited motion categories, time consuming	Lighting, camera placement, ethics, dataset quality, user skillset

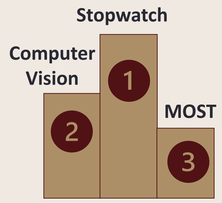
Managerial Insights

AHP Approach:
We used AHP to weight key criteria through pairwise comparisons and combine them with method performance, producing a data-driven ranking of Stopwatch, MOST, and Computer Vision for decision-making.

Accuracy Priority



Cost Priority



Future Work

Research
- Increase data set size and variability
- Evaluate repeatability and reliability

Implementation
- Pilot model in production environment
- Enhance benchmarks

Industry
- Monitor model performance
- Track KPIs

Team Members

Tyler Haug — Team Member
Kenya Frias Rodriguez — Team Member
Jade Ong — Team Member
Claire Pauwels — Project Manager

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