# LIVE AI 3D Printer Monitor: Solo Developer Project Guide

## 24-Weekend Plan for Real-Time Kinect + AI Print Monitoring

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Date:

$$Current Date$$

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## 1. Project Overview

Build a real-time AI monitoring system for Creality E3 V2 using Xbox Kinect V2 that detects print failures (warping, stringing, spaghetti) and automatically corrects them via G-code commands.

**Core Features:**

* Live 30 FPS Kinect video feed (RGB + Depth)
* Real-time AI inference (5 FPS)
* Automatic emergency stop & corrective actions
* Live web dashboard (mobile-friendly)
* Logging & analytics

## 2. Hardware Requirements

|

| Component | Specification | Est. Cost | Purpose |

| Sensor | Microsoft Kinect V2 (Model 1525) | ~$30 (Used) | RGB-D Vision Source |

| Adapter | Kinect V2 USB 3.0 PC Adapter | ~$25 | Power & Data connectivity |

| Host PC | Minimum: i5 CPU, 8GB RAM. Preferred: NVIDIA GPU (GTX 1050+) | Variable | Running AI models & CV pipeline |

| Printer Connection | High-quality USB Mini-B cable (shielded, with ferrite core) | ~$10 | Serial communication (G-code) |

| Mount | Printed Tripod or V-Slot mount | ~$2 (filament) | Stable camera positioning |

## 3. Software Requirements

| Software/Library | Version | Installation Command | Purpose |

| Python | 3.9+ | https://www.python.org/downloads/ | Core language |

| OpenCV | 4.5+ | pip install opencv-python | Computer vision tasks |

| Kinect Drivers | libfreenect2 | https://github.com/OpenKinect/libfreenect2 | Interface with Kinect |

| Python Wrapper | pylibfreenect2 | pip install pylibfreenect2 | Python bindings for driver |

| AI Runtime | TensorFlow Lite | pip install tflite-runtime | Run optimized AI models |

| Serial Comm | PySerial | pip install pyserial | Send G-code to printer |

| Web Backend | Flask | pip install Flask | Host web dashboard |

| Database | SQLite3 | (Built-in to Python) | Log print history |

## 4. Critical LIVE Principles

$$CALLOUT BOX$$

**Critical LIVE Principles: Read Before Coding**

1. **FAIL-SAFE, NOT SILENT:** If the monitor script crashes or the camera disconnects, the system MUST assume a failure and pause the print. A silent failure is a fire hazard.
2. **LATENCY KILLS:** The entire pipeline (Capture -> Infer -> Act) must be under 1 second. A 5-second delay is 5 seconds of spaghetti you can't undo.
3. **TRUST IS EARNED:** Start in "Log Only" mode. Graduate to "Pause Only" mode after 10+ prints with no false positives. Only enable "Kill Print" mode after 50+ successful prints.
4. **DEPTH IS TRUTH:** The depth sensor is your ground truth for Z-axis problems. If the depth map shows a 10mm object where the G-code expects a 5mm object, trust the depth map.
5. **ONE COMMAND AT A TIME:** Always wait for the printer to send ok after a G-code command before sending another. Flooding the serial buffer is a path to chaos.
6. **TEST LIVE, TEST SMALL:** End every weekend with a *real*, live print. A 20-minute calibration cube test is worth more than 2 hours of simulated testing.

## 5. 24-Weekend Timeline

## (Content for all 24 weekends follows, exactly as in the previous plan...)

## 6. Live Performance Targets

(Table content as provided)

## 7. Troubleshooting Live Issues

(Table content as provided)

## 8. Release Checklist

(List content as provided)

## 9. Final Notes

(List content as provided)