AI Research: AutoML-MultiAgent for AOI Tasks – Project Summary

I. Quantifiable Goals

1. Complete a **prototype** of the reasoning and NG/OK classification system within **30 days**, targeting a **minimum accuracy of 99.5%** (as per the updated requirement).
2. The project is currently being implemented **by one person**. Due to the system's complexity, adding more team members at this stage may not be efficient.
3. An **additional 14 days** is required to optimize the reasoning logic and prompts for the agent, resulting in a **total estimated timeline of 45 days**.
4. The system is designed to **automatically train and inspect** without manual intervention, providing **clear and explainable reasoning**, making it suitable for scalable and intelligent QA systems.

II. Hardware Requirements

2.1. Minimum Configuration (single local inference machine)

- **CPU:** Intel i9-13900KF.
- **RAM:** 64GB.
- **SSD:** 1TB NVMe.
- **HDD:** For storing logs and result data.
- **GPU:** RTX 4090 – 24GB VRAM.

2.2. Model Deployment Options

Option 1 – High Performance (2 machines)

- **Reasoning Agent:** Deepseek-RL-14B → ~19–24GB VRAM.
- **Vision Agent:** LLaMA-3.2-11B-Vision-Instruct → ~18–24GB VRAM.
- Suitable for scenarios requiring parallel execution and high accuracy.

Option 2 – Cost-Efficient (1 machine)

- Both agents run on **a single RTX 4090 machine**, sharing the Vision Agent model.
- Total VRAM usage: **~21–24GB**, fully utilizing GPU resources while maintaining accuracy.

III. Industrial Camera Requirements

- **Resolution:** Minimum 5MP, recommended 8MP–12MP.
- **Lens focal length:** 16mm or 25mm depending on the PCB type.
- **Frame rate:** ≥ 30 FPS (to avoid motion blur during movement).
- **Interface:** USB 3.0 / GigE / CameraLink.
- **Recommended brands:** Basler, Hikrobot, Dahua, IDS Imaging.
- **Lighting:** Use ring LED or backlight to eliminate shadows and ensure image stability.

IV. Manpower & Time Expect Completion

- **Manpower:** 1 person (fully familiar with the system and deployment process).
- **Estimated total time:** 45 days.
- Phase 1: 30 days to develop a complete prototype.
- Phase 2: Additional 14 days to optimize reasoning logic and agent prompts.