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Lab 03

Reflective Journal

In this simulation lab, I investigated how AI systems analyze sensor data in real-time and how this impacts system performance. The challenge entailed producing random sensor data, analyzing it with a simple AI function, and showing CPU and memory performance indicators. This arrangement represents the computational infrastructure required for real-time AI applications like self-driving cars and industrial robotics.

An important takeaway from the data processing phase was that, while processing times were largely consistent, occasional spikes occurred. These oscillations were most likely caused by background jobs or system scheduling methods, highlighting the need to improve task execution in real-world circumstances where latency is crucial. Furthermore, the CPU utilization simulation revealed information about the linear growth in CPU activity during sustained computations. It highlighted how quickly real-time workloads can exhaust CPU resources if parallelization techniques or hardware acceleration (e.g., GPUs) are not employed. One of the issues I encountered was simulating a more realistic real-time system in which tasks are interdependent rather than sequential. To address this, future simulations could include more complex AI models or use multiprocessing to split jobs over many CPU cores.

Additionally, the memory utilization simulation demonstrated how memory allocation affects performance. As memory blocks were allocated, the system's memory usage gradually rose, but performance only worsened noticeably around saturation. This emphasizes the significance of effective memory management, particularly in AI systems that must process big datasets in real-time.

Overall, this lab helped me understand the hardware requirements and computing methodologies needed for real-time AI simulations. The lessons obtained can be used to optimize systems that require high responsiveness, such as robotics and AI-driven control systems.