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(57) Abstract :

A real-time waste management system is provided that integrates edge-AI processing with comprehensive sensor inputs and in-bin sterilization to enhance waste segregation and biohazard control. The system features a sensor head module with an RGB/NIR camera mounted behind a protective window and equipped with a privacy filter, alongside a multi-gas sensor weight cel, and proximity senso. An Edge AI module processes and fuses the multimodal data using quantized machine learning to classify waste and compute risk scores, directing a motorized diverter mechanism to route items into segregated compartments, one of which, equipped with a needle-safe chut includes an in-bin UV-C sterilization unit featuring UV-C LED sources, light pipes, reflector systems and dose sensor. Safety interlock circuitry ensures deactivation under unsafe conditions.

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