Project Name: Advanced Energy-Efficient, Cost-Effective E-Waste Recycling for Critical Metals Using Deep Learning-Assisted Optical Sensor-Guided Sorters

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***Technology Summary**: There is a significant opportunity to improve domestic recycling by addressing the inefficiencies in manual sorting. Critical metals are often wasted due to poor e-waste sorting. Our project leverages innovative deep learning, optical sensing, and robotics to enhance e-waste identification and sorting, boosting domestic metal supplies, reducing waste, and supporting national security. This technology also has potential applications in other manufacturing industries.*

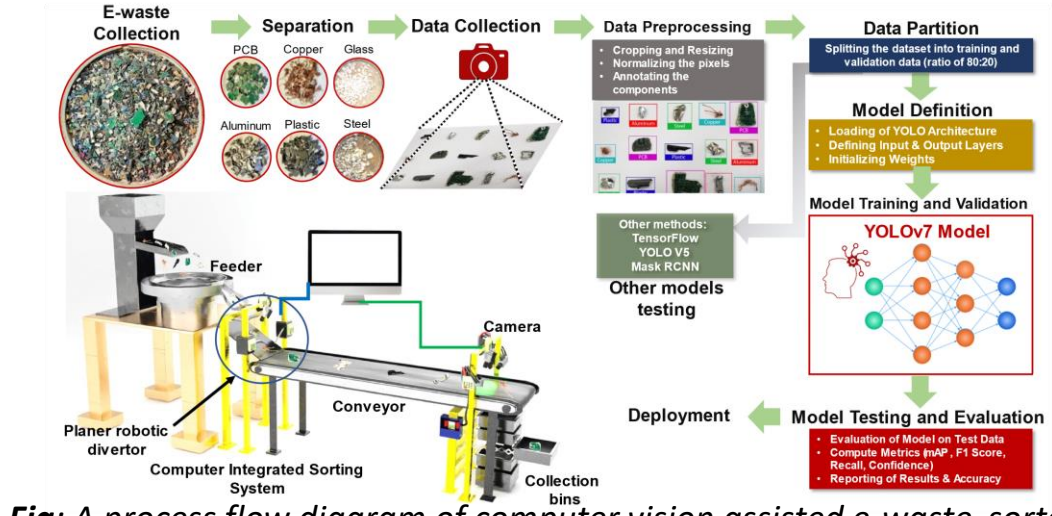

***Fig**: A process flow diagram of computer vision assisted e-waste sorter.*

***Impact:** Advanced deep-learning-assisted optical sorting using robotics will significantly boost efficiency, save energy, and benefit the environment by enhancing e-waste recycling and advanced manufacturing systems. This innovative sorting will generate additional revenue for recyclers by turning waste into valuable by-products, increasing the recovery of critical elements, and reducing foreign dependency. It also improves product quality through more accurate sorting. The technology's impact extends to other industries like food, parcel sorting, mineral separation, quality control, and remanufacturing.*

***The project's key idea and goals**: The complex nature of e-waste limits the effectiveness of traditional sorting methods, which typically rely on physical properties like density, size, and magnetic or electrostatic fields. Most current e-waste sorters can only sort two components at a time. This project aims to develop a multicomponent e-waste sorter using optical sensors, computer vision, precision robotics/mechatronics, and deep learning algorithms. Our objectives include enhancing optical recognition algorithms, integrating them with computer-controlled material handling and robotic sorting systems, and designing, fabricating, and testing a pilot-scale multichannel sorter for e-waste recycling.*