

المهمة الثالثة : أساليب صياغة وعرض الدراسات السابقة في البحث العلمي

إعداد: حسن عبد الرحمن الزهراني

المادة : مهارات بحثية 2

إشراف : د نرمين موسى



Table 4: Synthesis Matrix for Literature Review:

Study	Authors	Year	Research Design	Key Findings/Results	Methodology	Limitations
Advancing Plastic Waste Classification	Choi et al.	2023	Experimental study on YOLO models	Achieved 91.7% classification accuracy; improved precision for PET and PET-G plastics over traditional methods.	YOLO deep learning algorithm with image sensors and pneumatic systems.	Scalability issues; high sensitivity to lighting conditions.
Automation of Plastic Recycling	Bin Daej	2024	Case study of sorting facility	Automated sorting improved accuracy by 30%, reduced manual labor, enhanced efficiency in specific facilities.	Laser and optical sorting in controlled facility.	Limited to one facility; findings lack generalizability.
Deep Learning for Recyclable Products	Ahmed	2023	Experimental CNN model	89% accuracy in recyclable product classification; reduced errors and improved operational efficiency.	CNN model trained on labeled datasets.	Small dataset size; limited diversity in training data.
WasteGAN for Robotic Sorting	Bacchi n	2024	Experimental GAN model	WasteGAN enhanced sorting accuracy by 15% via synthetic training data.	GAN-generated data for robotic sorting systems.	High computational complexity; costly training processes.
AI for Circular Economy	Božić	2023	Policy and case study analysis	Emphasized AI's role in resource optimization, cost savings, and addressing policy gaps for circular economy.	Case study reviews and policy framework analysis.	High implementation costs; lack of cohesive global policies.
AI and IoT for Sustainability	Yadav	2024	Framework design for IoT + AI	Improved waste management efficiency by 40%; reduced processing times with IoT and AI integration.	IoT sensors and AI-based real-time monitoring framework.	Integration challenges with heterogeneous technologies.
Deep Learning for E-Waste Management	Oise & Kony Eha	2024	Supervised learning for e-waste	High accuracy in identifying recyclable e-waste components; cross-applicability for plastic recycling.	Supervised learning on labeled e-waste datasets.	Material complexity; reliant on high-quality datasets.
Commercial	Alexan	2022	Analysis of	Increased throughput with	Data-driven analysis in	U.S.-focused findings; limited

- العناصر الأساسية عند عرض أي دراسة**
- ذكر اسم المؤلف وسنة النشر بدقة.
 - توضيح عنوان الدراسة وهدفها الرئيسي.
 - شرح المنهجية المتبعة (وصفي، تجريبي، الخ) وأدوات جمع البيانات.
 - استعراض أبرز النتائج التي توصلت إليها الدراسة.
 - عرض التوصيات التي قدمها الباحث للبحوث المستقبلية

3.3 Critical Analysis of Previous Studies

The analysis of these studies reveals the emerging role of AI in waste management, showing its ability to enhance efficiency, accuracy, and cost-saving potential in both urban and underserved communities [11]. Each study offers a unique viewpoint, but shared limitations suggest areas that could benefit from further refinement.

For example, the work by Oise and Konyeha on e-waste management introduces a comprehensive framework, but its scalability is limited due to a smaller dataset. Ahmed et al. [4] highlights the effectiveness of CNNs in waste sorting through high accuracy rates, but their findings also expose a key issue: in situations with limited data, models may overfit, compromising reliability [25].

Theoretical research, like that of Egwu and Ugwuanyi [11], addresses social and economic factors, showing the potential positive impact of AI on communities. However, these ideas lack empirical validation, making them less applicable in practical terms. Similarly, Božić's [6] literature review provides strategic insights but remains theoretical, lacking clear, actionable guidance.

Innovative approaches, such as Bacchin et al.'s use of GANs for synthetic data generation, show promise in improving sorting accuracy. However, since these methods are only evaluated in controlled lab conditions, it's uncertain how they would perform in real-world settings. Yadav's broader exploration of AI in environmental resilience is insightful but does not focus deeply on waste

- الأسلوب التاريخي (الزماني)
- المفهوم: ترتيب الدراسات من الأقدم إلى الأحدث أو العكس لتتبع تطور الظاهرة.
- الهدف: توضيح التطور في التقنيات أو النظريات عبر الزمن.
- تطبيق في تخصصنا: تتبع تطور خوارزميات الذكاء الاصطناعي في إدارة الأعمال والفرز الآلي منذ البدايات وحتى التقنيات الهجينة الحالية.

الطريقة الثانية - أسلوب المصفوفة التحليلية (الموضوعي)

•المفهوم :ترتيب المراجع وفقاً للموضوعات أو المحاور الرئيسية في جدول مقارنة.

•الهدف :إبراز نقاط الاتفاق والاختلاف بين الباحثين وتحديد الفجوة المعرفية.

•تطبيق في تخصصنا :المقارنة بين دقة نماذج الشبكات العصبية المختلفة في تصنيف النفايات البلاستيكية وتحديد أوجه القصور في كل منه

Table 5: Comparative Performance Metrics of Tested Models

Model	Best Validation Accuracy (%)	Approx. Training Time	Precision	Recall	F1-Score
CNN-Transformer	97.65%	~1.3 hours	0.98	0.98	0.98
ResNet18	96.22%	~5 hours	0.94	0.94	0.94
Ensemble Model	96.00%	(Evaluation Only)	0.96	0.96	0.96
DenseNet121	95.46%	~2.2 hours	0.95	0.95	0.95
VGG16	95.13%	~1.3 hours	0.96	0.96	0.96
EfficientNet-B0	94.22%	~44 minutes	0.94	0.94	0.94
MobileNetV3	93.79%	~18 minutes	0.94	0.94	0.94

أهمية نقد الدراسات السابقة

- عقد المقارنات لاكتشاف نقاط الالتقاء والافتراق.
- تجنب الأخطاء التي وقع فيها الباحثون السابقون.
- تبرير اختيار المنهج الحالي بناءً على قصور المناهج السابقة.



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Thank You

