Cleantech: Transforming Waste Management with Transfer learning

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Phase 1 – Brainstorming & Ideation

- Problem Statement: Inefficient sorting and processing of waste.
- Proposed Solution: Use transfer learning to classify waste types.
- Target Users: Municipal waste facilities, recycling plants.
- Expected Outcome: Accurate, automated waste sorting system.

Phase 2 – Requirement Analysis

- Technical Requirements: Python, TensorFlow, OpenCV.
- Functional Requirements: Real-time classification with >90% accuracy.
- Constraints: Limited labeled datasets, embedded performance.

Phase 3 – Project Design

- System Architecture: Camera → Preprocessing → Model → Output.
- User Flow: Waste image → Classification → Sorting.
- UI: Dashboard for category & confidence, manual override option.

Phase 4 – Project Planning (Agile)

- Sprint 1: Data collection & labeling.
- Sprint 2: Model selection & training.
- Sprint 3: Integration and deployment.
- Member Roles: Data, Model, Integration.
- Timeline: Weeks 1–6 with milestone check-ins.

Phase 5 – Project Development

- Tech Stack: Python, TensorFlow, OpenCV, Docker.
- Process: Data pipeline → Training → Validation → CI/CD.
- Challenges: Data imbalance (augmentation), model underfitting (layer tuning).

Phase 6 – Testing & Validation

- Tests: Accuracy, real-time use, edge cases.
- Bug Fixes: Preprocessing, threshold tuning.
- Final Accuracy: >92%.
- Deployment: Docker, Raspberry Pi/Jetson Nano.

Final Submission

- Project Report
- Demo Video (3–5 minutes)
- GitHub Repository
- Presentation Deck