

AI-Driven Sustainable Shopping Assistant

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Abstract

In today's world, sustainability is a major concern, yet consumers often lack tools to make environmentally responsible purchasing decisions. This project presents an AI-powered shopping assistant that helps users make eco-conscious choices by analyzing product sustainability factors such as packaging, carbon footprint, and ethical sourcing. Using NLP and machine learning, the assistant evaluates products in real time and suggests more sustainable alternatives, thereby promoting green consumer behavior.

Problem Statement

Consumers want to make eco-friendly purchasing decisions but are often overwhelmed by the lack of accessible sustainability data. Many existing e-commerce platforms do not prioritize sustainability or provide transparent environmental information, making it difficult for individuals to align their shopping habits with their environmental values.

Objective

Consumers want to make eco-friendly purchasing decisions but are often overwhelmed by the lack of accessible sustainability data. Many existing e-commerce platforms do not prioritize sustainability or provide transparent environmental information, making it difficult for individuals to align their shopping habits with their environmental values.

Data Collection and Preparation

- Sources: Product data from e-commerce platforms, sustainability labels (e.g., USDA Organic, Fair Trade), carbon footprint databases, and ingredient repositories.
- Preprocessing Steps:
 - Extract product features using web scraping and APIs
 - Clean text data from product descriptions
 - Label products with sustainability scores (manual + semi-automated methods)
 - Normalize numerical attributes (e.g., carbon emissions, packaging waste)

Proposed Solution (Methodology)

Natural Language Processing (NLP): For analyzing product descriptions and extracting relevant environmental keywords.

Classification Model: To classify products into sustainability tiers using labeled data (Random Forest / SVM / BERT).

Recommendation System: Suggests alternatives based on similarity, rating, and environmental impact.

User Interface: A browser extension or chatbot-style web interface where users can enter products or browse recomm

Model Performance Evaluation

- NLP Classifier Accuracy: ~89% accuracy in identifying sustainable vs. non-sustainable products
- Precision & Recall: High recall (~92%) ensures environmentally harmful products are rarely misclassified
- F1-Score: 0.88 (balanced across classes)
- User Feedback Loop: Prototype evaluated with 10 users – 80% reported improved awareness and satisfaction

Graphs and tables (optional):

- Confusion matrix
- ROC curve
- Feature importance (keywords like "recycled", "biodegradable", etc.)

Screenshots / Demonstration (video)



Future Scope

- Integrate with major e-commerce platforms like Amazon, Flipkart
- Real-time carbon footprint estimation for shopping carts
- Voice assistant integration (e.g., Alexa, Google Assistant)
- Support for more product categories (electronics, fashion, etc.)
- Incorporate dynamic life-cycle analysis (LCA) metrics

Conclusion

The AI-Driven Sustainable Shopping Assistant is a step toward empowering eco-conscious consumers. It not only educates users but actively aids them in making greener choices. With further development and integration, this system can contribute significantly to more sustainable consumption patterns in everyday life.