NoshNurture - Technical Algorithm Documentation

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1. Executive Summary

NoshNurture utilizes a hybrid intelligence system combining Google's Gemini Pro Vision (Multimodal AI) for unstructured data processing and deterministic algorithms for core business logic like recipe matching and waste calculations.

2. Gemini AI Integration (src/lib/gemini-service.ts)

A. Optical Character Recognition (OCR) & Expiry Detection

• Input: Base64 Image (Camera capture/Upload)

• Model: gemini-flash-latest

• Technique: Zero-shot prompting with structured JSON schema enforcement.

• Logic: Extracts `productName`, `expiryDate` (normalized to DD-MM-YYYY), and `batchNumber`. Uses regex post-processing to validate date formats.

B. Voice Processing (Speech-to-Inventory)

• Input: Natural language transcript string.

• Logic: Semantic Entity Extraction (NER) to identify Item Name, Quantity, Unit and Dates (relative or absolute).

• Rules: Auto-converts 'next week' -> strict date. Defaults 'confidence' score based on ambiguity.

C. Recipe Suggestion Engine (LLM Fallback)

• Function: `getRecipeSuggestions`

• context: Generates 3-5 quick recipes specifically for a single expiring ingredient when deterministic matching fails.

3. Deterministic Recipe Matching Engine

Located in: src/app/api/recipes/suggestions/route.ts

A. Ingredient Normalization

• Library: Custom normalization in `src/lib/ingredients`.

• Logic: Converts brand names (e.g., 'Amul Butter') to canonical forms ('butter'). Handles known synonyms and unit variations.

B. Fuzzy Matching Logic

• Primary: Exact canonical match.

• Secondary: Substring/Fuzzy match.

• Threshold: A match is valid ONLY IF length_ratio >= 0.6. This prevents false positives like matching 'powder' to 'garlic powder'.

C. Ranking Algorithm

1. Availability Ratio: (Matched Ingredients / Total Ingredients) - Higher is better.

2. Waste Reduction Score: Prioritizes recipes using ingredients that are expiring within 7 days.

3. Time Efficiency: Shorter cooking time acts as a tie-breaker.

4. OpenFoodFacts Integration

• Barcode Lookup: Queries `world.openfoodfacts.org` API v2.

• Enrichment: Retrieves Product Name, Front Image, and Nutriments.

• Health Analysis: Calculates `is_healthy` boolean based on thresholds:

  - Sugar > 10g/100g: High Sugar

  - Sat Fat > 5g/100g: High Fat

• Diet Inference: Checks ingredients text against regex (milk|egg|meat) to flag Vegan/Vegetarian status.

5. Sustainability & Waste Logic

• Mass Estimation: Converts units (pcs, packets, ml) to kg using heuristic density factors (e.g., 1 p c "H 0 . 2 k g) .

• ROI Calculation: (Waste Reduced Kg) × (Fixed Cost Multiplier) = Money Saved.