SmartEats: Eating Smart Made Easy for University Dining

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ABSTRACT

Team Name: PlateData | **Team Number:** 7

University students face significant challenges in making informed nutritional decisions in dining halls due to limited access to detailed nutritional information. While the paper labels display basic allergen warnings, students must estimate macronutrient content and portion sizes with their naked eyes. If you are into working out and strength training in any capacity, you will likely have daily protein goals, and that becomes a challenge when you have to guess how many grams of protein are in a dish. SmartEats addresses this gap by providing an AI-powered web application that automatically extracts, enriches, and analyzes nutritional data from university dining hall menus. Using machine learning to generate comprehensive nutritional profiles and enabling personalized meal planning with filtering and tracking capabilities, SmartEats allows students to make informed dietary choices aligned with their health goals, dietary restrictions, and nutritional requirements.

1. INTRODUCTION

University dining halls serve thousands of students daily, yet nutritional transparency remains limited. Current systems provide basic allergen information but lack the detailed macronutrient data that students need for informed meal planning. Students with specific dietary goals, whether for athletic performance, weight management, medical conditions, or personal wellness, are left to guess nutritional content, leading to suboptimal food choices and frustration.

This problem is particularly acute for students tracking macronutrients (protein, carbohydrates, fats), managing caloric intake, or following specialized diets. Without accurate nutritional data, students cannot effectively plan balanced meals, track their consumption patterns, or make comparisons across dining options. SmartEats transforms this experience by leveraging artificial intelligence to provide comprehensive, accessible nutritional analytics.

2. MOTIVATION / WHY THIS IDEA

The motivation for SmartEats stems from direct observation during work as a student employee at Ikenberry Dining Hall. Daily interactions with students revealed a consistent pattern: while food labels displayed allergen information and basic identifiers, students had no reliable way to determine macronutrient content or portion-based nutritional values. Students interested in nutrition tracking were forced to make rough estimates, often leading to inaccuracies.

This information gap is both common and consequential. Students pursuing fitness goals need accurate protein intake data. Students managing medical conditions require precise carbohydrate or sodium tracking. International students adapting to new cuisines benefit from understanding nutritional composition. Yet existing dining hall systems provide no mechanism to access this essential data at the point of decision-making.

SmartEats is important because nutrition literacy and informed food choices directly impact student health, academic performance, and long-term wellness habits. By democratizing access to nutritional data through automated AI-powered enrichment, SmartEats removes barriers to healthy eating and enables students to take ownership of their dietary decisions. This problem is interesting from both a technical and social perspective: it combines data engineering, machine learning, and user experience design to address a real, daily challenge faced by university communities nationwide.

3. PROPOSED FEATURES

SmartEats will implement the following core features, designed to be achievable within the course timeline while providing substantial value to users:

Core Features (MVP):

- **Automated Daily Menu Collection:** Web scraping infrastructure to automatically collect daily menus from university dining hall data sources, with scheduled updates to maintain current information.
- **AI-Powered Nutritional Enrichment:** Integration with large language models (LLM) APIs to generate comprehensive nutritional estimates including calories, macronutrients (protein, carbohydrates, fats), key vitamins and minerals, and common allergen identification for menu items lacking detailed nutritional data.

- **Searchable Nutrition Database:** Normalized PostgreSQL database storing dining halls, menu items, daily menus, and enriched nutritional profiles with efficient querying capabilities.
- **Meal Planning Interface:** User-facing web application enabling students to browse current dining hall offerings, view detailed nutritional information, and filter items by dietary preferences and nutritional criteria.
- **User Authentication:** Secure Google OAuth integration allowing students to create accounts, save meal preferences, and access personalized features.
- **Basic Nutritional Tracking:** Ability for users to log selected meals and view cumulative nutritional totals for tracking daily intake.

Extended Features (Full Vision):

- **Historical Data Analytics:** Trend analysis showing nutritional patterns over time, popular items, and seasonal menu variations.
- **Personalized Recommendations:** ML-based meal suggestions tailored to individual nutritional goals, dietary restrictions, and past preferences.
- **Comparative Analytics:** Visual comparisons of nutritional content across dining halls and meal periods to optimize meal selection.
- **Goal Setting & Progress Tracking:** User-defined nutritional targets with progress visualization and achievement tracking.
- **Mobile-Responsive Design:** Optimized interface for on-the-go access while students are at dining halls making real-time food decisions.

4. APPLICATION FUNCTIONALITY

SmartEats operates through an integrated data pipeline and user-facing web application. The backend automatically collects menu data daily through scheduled tasks, processes this unstructured data using AI to generate nutritional estimates, validates and normalizes the results, and stores enriched data in a relational database. Each AI-generated nutritional profile includes confidence scoring to help users assess estimate reliability.

On the frontend, students interact with SmartEats through an intuitive web interface. After authenticating via Google OAuth, users can browse current menus organized by dining hall and meal period. The interface displays comprehensive nutritional information for each item, including macronutrient breakdown, calorie content, and allergen warnings. Users can apply filters based on dietary preferences (vegetarian, vegan, gluten-free) or nutritional criteria (high-protein, low-carb).

The meal planning workflow allows students to select items they plan to consume, building a virtual tray that calculates aggregate nutritional totals. This enables informed decision-making before committing to food choices. Selected meals can be logged to a personal nutrition diary, creating a trackable history of dietary intake over time. The application presents data through clear visualizations, making complex nutritional information accessible to users without specialized knowledge.

System reliability is maintained through robust error handling, data validation, and deduplication logic. The architecture supports scalability to multiple dining facilities and can accommodate future feature additions such as barcode scanning for packaged items or integration with fitness tracking applications.

5. ACKNOWLEDGEMENT & AUTHORSHIP

The SmartEats concept and initial prototype were created by Max Zhang as a personal project prior to this course. The original implementation utilized Next.js, TypeScript, and OpenAI's GPT-4o-mini API to demonstrate the feasibility of automated nutritional data enrichment. This prior work validated the core idea and identified key technical challenges.

For this course project, our team will rebuild SmartEats from scratch using the required Django framework and PostgreSQL database, applying concepts and skills learned throughout INFO 490. The course implementation will meaningfully extend the original concept by incorporating structured software engineering practices including proper database schema design with Django ORM, RESTful API development, comprehensive user authentication with Google OAuth, CI/CD deployment pipelines, and production-ready web application architecture.

All team members: Jongbin Lee, Matupoom Soontornthanon, Max Zhang, and Yuran Zhang, will contribute equally to the implementation. The team collaboratively developed the feature requirements, system architecture, and implementation strategy for the course project.