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# Capstone Project 1: Recipe Sharing API with Image Upload

Build a REST API for a recipe sharing platform where users can post recipes with images, search for recipes by ingredients, and rate others' recipes. This is similar to apps like Tasty or AllRecipes. The API should handle image uploads, process them (resize/compress), store recipe data, and provide search functionality.

## Deliverables

- Complete REST API with proper project structure
- Database schema/migrations
- Postman/curl collection for testing all endpoints
- README with API documentation and setup instructions

# Capstone Project 3: Student Grade Management System API

Build a REST API for managing student grades similar to university portals like Canvas or Blackboard. The system should support different user roles (students, teachers, admins), allow teachers to manage courses and grades, and provide students with their academic performance data including GPA calculation and grade statistics.

## Deliverables

- Complete REST API with proper structure
- Database schema with relationships
- Seed data script (sample users, courses, grades)
- API documentation (Postman collection or OpenAPI spec)
- README with role permissions matrix and setup guide

# Capstone Project 4: Movie Watchlist & Recommendation API

Build a REST API that integrates with external movie databases (like OMDB or TMDB) to help users manage their watchlists and get recommendations. Users can search for movies, add them to watchlists, rate watched movies, and get personalized recommendations based on their ratings and genres.

## Deliverables

- Complete REST API
- Database schema for user data and cached movies
- README with API documentation and external API setup
- Document explaining your caching strategy

# Capstone Project 5: Event Registration & Ticketing System

Build a REST API for event registration and ticketing (like Eventbrite). Users can browse events, register for events with limited capacity, and organizers can create events and manage registrations. The critical challenge is handling concurrent registrations to prevent overbooking when multiple users try to register for the last few spots simultaneously.

## Deliverables

- Complete REST API
- Database schema with proper constraints
- Concurrent booking test (simulate multiple users booking last spot)
- README with concurrency strategy explanation
- Document explaining your approach to preventing race conditions

# Capstone Project 6: Online Quiz Platform API

Build a REST API for an online quiz/exam platform (like Kahoot or Google Forms for exams). Teachers create quizzes with time limits, students take timed quizzes, and the system auto-grades submissions. The challenge is managing timed sessions accurately, preventing cheating (no peeking at answers), and handling concurrent quiz attempts.

## Deliverables

- Complete REST API
- Database schema for quizzes, questions, sessions, submissions
- README with API documentation
- Document explaining your timer implementation approach

# Capstone Project 7: Expense Tracker with Bill Splitting API

Build a REST API for tracking shared expenses and splitting bills among friends (like Splitwise). Users can create groups (roommates, trip groups), add expenses, and the system calculates who owes whom. The challenge is implementing the settlement algorithm to minimize the number of transactions needed to settle all debts.

## Deliverables

- Complete REST API
- Database schema with proper decimal/money types
- Settlement algorithm implementation with explanation
- README with API documentation and algorithm explanation
- Example scenarios showing settlement optimization
- Document explaining your money handling approach

# Capstone Project 8: Food Delivery Order Management API

Build a REST API for managing food delivery orders (like Uber Eats or DoorDash). Customers place orders, restaurants accept and prepare them, and drivers deliver them. The system must handle order lifecycle state transitions, real-time status updates, and coordinate between three user types. The challenge is implementing a robust state machine and ensuring valid state transitions.

## Deliverables

- Complete REST API
- State machine diagram showing all transitions
- Database schema with order state tracking
- README with API documentation and state machine explanation
- Document explaining your approach to preventing invalid state transitions

# Capstone Project 9: Workout & Fitness Tracker API

Build a REST API for tracking workouts and fitness progress (like Strava or MyFitnessPal). Users log workouts, track personal records, view progress over time, and compete on leaderboards. The challenge is handling time-series data efficiently, calculating streaks, computing aggregated statistics, and managing user achievements.

## Deliverables

- Complete REST API
- Database schema optimized for time-series queries
- Streak calculation algorithm implementation
- README with API documentation

# Capstone Project 10: Library Book Management System API

Build a REST API for a library management system (like your college library portal). Librarians manage books and inventory, students check out and return books, and the system handles reservations when books are unavailable. The challenge is implementing the checkout/return workflow with reservations, calculating fines for late returns, and managing the reservation queue.

## Deliverables

- Complete REST API
- Database schema with book copies and checkout tracking
- README with API documentation
- Document explaining your reservation queue and concurrent checkout handling