Coding Project Ideas

Capstone: The Art of Approximation

Ojas Chaturvedi

November 9, 2023

Contents

Idea 1: Autonomous Drone Traffic Management System

Purpose: Develop a system to manage the traffic of autonomous drones in urban areas to ensure safety, efficiency, and compliance with regulations.

Member 1: System Architect

- Design the overall system architecture, including drone communication protocols and air traffic control algorithms.
- Ensure system scalability for handling thousands of drones simultaneously.
- Lead the integration of subsystems developed by other team members.

Member 2: AI Specialist

- Develop machine learning models for collision avoidance and optimal path planning.
- Train models using simulations and real-world data.
- Implement real-time decision-making algorithms for dynamic environments.

Member 3: Communications Engineer

- Establish secure and reliable communication channels between drones and the control system.
- Develop protocols for emergency handling and drone identification.
- Optimize network for low latency and high throughput.

Member 4: Regulatory and Compliance Officer

- Ensure the system complies with aviation and local government regulations.
- Develop a framework for privacy and data protection.
- Liaise with regulatory bodies and participate in the development of new regulations.

Idea 2: AI-Based Precision Medicine Platform

Purpose: Build an AI-powered platform that can analyze genetic data, medical records, and research to provide personalized treatment recommendations.

Member 1: Bioinformatics Scientist

- Develop algorithms for processing and analyzing large genomic datasets.
- Work on integrating genetic data with patient electronic health records (EHR).
- Lead the research on disease markers and drug response prediction.

Member 2: Machine Learning Engineer

- Build predictive models for disease risk and treatment outcomes.
- Implement natural language processing to extract insights from medical literature.
- Ensure the interpretability and fairness of AI models.

Member 3: Data Security Expert

- Design a secure infrastructure to protect sensitive health data.
- Ensure compliance with HIPAA and other health data protection regulations.
- Implement robust access controls and audit trails.

Member 4: Clinical Specialist and User Experience Designer

- Provide clinical expertise to guide the platform's development.
- Design the user interface for clinicians and patients, focusing on usability.
- Facilitate clinical trials and collect user feedback for continuous improvement.

Idea 3: Smart City Infrastructure and Services Integration Platform

Purpose: Develop a centralized platform that integrates various smart city services like traffic management, waste management, energy usage, and emergency services for improved efficiency and citizen experience.

Member 1: Urban Planner and System Integration Specialist

- Lead the design of the platform's architecture to integrate with existing city infrastructure.
- Coordinate with city officials and urban planners to ensure the platform meets the needs of the city.
- Oversee the integration of IoT devices and sensors across the city.

Member 2: Data Scientist and Analyst

- Analyze data from city services to find optimization opportunities.
- Develop predictive models for service demand and resource allocation.
- Implement analytics dashboards for city officials to monitor and manage services.

Member 3: Data Security Expert

- Design and maintain the network of IoT devices and sensors.
- Ensure reliable data collection and transmission.
- Implement security measures to protect the network from cyber threats.

Member 4: Clinical Specialist and User Experience Designer

- Create a user-friendly interface for citizens to interact with city services.
- Develop mobile and web applications for service requests, information dissemination, and feedback.
- Conduct user testing to refine the platform's usability.

Idea 4: Ocean Cleanup and Monitoring Autonomous Fleet

Purpose: Design and program an autonomous fleet of vessels and drones to clean up ocean waste and monitor marine health.

Member 1: Marine Robotics Engineer

- Design the autonomous navigation system for the vessels and underwater drones.
- Develop the control algorithms for waste collection and data gathering.
- Oversee the deployment and maintenance of the robotic fleet.

Member 2: Environmental Data Scientist

- Process and analyze data collected by the fleet to track pollution levels and marine biodiversity.
- Develop models to predict the movement of waste patches and the impact of cleanup efforts.
- Collaborate with environmental organizations to align efforts with conservation goals.

Member 3: Software and AI Engineer

- Implement machine learning algorithms for image recognition to identify different types of waste.
- Develop the AI for real-time decision making in dynamic ocean conditions.
- Integrate AI with robotic systems for efficient cleanup operations.

Member 4: Communications and Outreach Coordinator

- Develop a platform for sharing real-time data and insights with the public and research institutions.
- Coordinate with global environmental agencies to maximize the impact of the cleanup operations.
- Handle media relations and build educational campaigns about ocean health.