

Data 606 - Capstone Project Ideas

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Idea 1- Real-Time Automated Data Pipeline for Advertising

Problem statement

- Advertising data is scattered across different platforms, making it hard to analyze in real-time. Delays in decision-making, scalability issues and manual processing slow down ad performance and reduce revenue.

Real-Time Automated Data Pipeline for Advertising

Approach to Addressing the Problem

- Leverage scalable streaming technologies (e.g., Apache Kafka, Spark Streaming) to continuously collect data from various sources.
- Automate ETL processes to clean and transform the data, ensuring it is high-quality and unified in a cloud-based repository.
- Integrate the cleaned data with real-time ML models and live dashboards that help adjust ad placements and bids.

Real-Time Automated Data Pipeline for Advertising

Justification for Solving the Problem

- Real-time decision-making is critical in advertising for improving ad performance.
- Processing huge amounts data points manually is impractical; automation minimizes delays and errors.
- Optimized, data-driven bidding improves key metrics like Click Through Rate and Return On Investment, leading to better revenue.

Real-Time Automated Data Pipeline for Advertising

Potential Advantages of Solving the Problem

- Enhanced ad performance through precise and reduced data latency.
- Reduced manual intervention and improved operational efficiency.
- Scalable solution that handles increasing data volumes seamlessly.
- Cost savings, while ensuring real-time insights.

Idea 2- AI-Driven Predictive Model for Highway Deterioration Forecasting

Problem statement

- Road infrastructure deteriorates over time due to heavy usage, particularly from freight traffic, leading to costly repairs, safety hazards, and disruptions. However, current maintenance approaches are often reactive, addressing damage only after it occurs. The challenge lies in predicting road deterioration in advance to enable proactive maintenance, reduce unexpected failures, and optimize resource allocation.

AI-Driven Predictive Model for Highway Deterioration Forecasting

Approach to Addressing the Problem

- **Predictive Modeling:** Utilize advanced machine learning techniques to forecast road deterioration trends.
- **Feature Identification:** Determine key factors influencing road wear, such as traffic intensity, road conditions like the roughness .
- **Risk Assessment:** Develop a framework to identify high-risk road segments prone to faster deterioration.
- **Proactive Decision-Making:** Provide insights to transportation agencies for optimizing maintenance schedules and resource allocation.
- **Scalability & Adaptability:** Ensure the approach can be applied across different regions and road networks for broader impact.

AI-Driven Predictive Model for Highway Deterioration Forecasting

Justification for Solving the Problem

- **Cost Efficiency:** Preventive maintenance is more cost-effective than reactive repairs.
- **Infrastructure Longevity:** Helps extend the lifespan of road networks.
- **Safety Improvement:** Reduces the risk of accidents caused by deteriorated roads.
- **Traffic Optimization:** Minimizes disruptions due to unexpected road failures.
- **Data-Driven Decision Making:** Supports evidence-based planning for transportation agencies.

AI-Driven Predictive Model for Highway Deterioration Forecasting

Potential Advantages of Solving the Problem

- **Reduced Maintenance Costs:** Optimized resource allocation leads to significant cost savings.
- **Enhanced Road Safety:** Early identification of deterioration prevents hazardous conditions.
- **Efficient Freight Movement:** Better-maintained roads support smoother and more reliable transportation.
- **Policy and Planning Support:** Helps governments implement long-term infrastructure strategies.
- **Scalability:** The methodology can be expanded to various regions and road types.

THANK YOU