**Architecture Document**

**Project Title**: Ethanol Blends as an alternative to replace Fossil Fuels

**Name**: Ruchit Shivani

**Registration number**: RA2211031010131

1. **Application**: Microservices Architecture is well-suited due to its modular nature, enabling efficient handling of different processes like data collection, preprocessing, ML model training, and API-based predictions.

It also has the following features:

* **Scalability**: Each service (data ingestion, model training, predictions, and visualization) operates independently, making it easier to scale components as needed.
* **Flexibility**: Different services can use different technologies, such as Python for ML models, PostgreSQL for data storage, and Flask/FastAPI for APIs.
* **Maintainability**: Since each service is separate, updates to one component (e.g., ML model improvement) won’t disrupt others.
* **Efficient Data Processing**: Services dedicated to data extraction, transformation, and storage ensure optimized data handling before feeding into ML models.

1. **ER Diagram**

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AI-generated content may be incorrect.

1. **Architecture Diagram**

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AI-generated content may be incorrect.**

1. **Data Exchange Contract**

Data Sets:

* Ethanol Production Data (Yearly production volume, country-wise trends)
* Energy Consumption Data (Renewable vs. fossil fuel usage)
* ML Model Training Data (Historical production and consumption patterns)
* Government Policies (Regulations affecting ethanol adoption)
* Emissions Data (Impact of ethanol blends on CO₂ and other emissions)
* Fuel Prices (Ethanol vs. gasoline price trends)
* Production Costs (Cost per liter of ethanol production by region)

Mode of Exchanges:

**APIs**:

* Fetch real-time energy consumption and ethanol production data.
* Connect with external fuel price and emissions data sources.
* Retrieve policy changes affecting ethanol adoption.

**File-based Exchange**:

* Bulk dataset uploads for ML model training.
* Periodic reports on production costs and market trends.