Integration with Kafka

The producer sends the data to the Topic.

- A Kafka consumer subscribes to the topic.
  On receiving a message:
- The message is parsed and validated.
- Preprocessing is applied. In our use case, we already had the data, so preprocessing was applied earlier to the data, and clean and processed data was sent by the producer.
- The trained XGBoost Model is loaded.
- The model predicts the predictor variable, for us it is CO(GT).
- The result is stored either in memory or a CSV File.

Real-Time Operation Workflow

1. Data Ingestion- Continuous stream of data via the producer.
2. Prediction Pipeline- Lightweight preprocessing and prediction ensuring low latency.
3. Output and Usage- Predictions can be displayed, stored or used to trigger alerts if it reaches or crossed thresholds.

Production Considerations for Real-Time

Model Deployment: FastAPI and Docker
Kafka Broker: Cloud hosted Kafka (Confluent)
Fault Tolerance: Add Retries
Scaling: Consumer group with partitions
Monitoring: Grafana and prometheus