Project: Global Commodity Price Disparity Analyzer for Export Opportunities

Research Topic:

- **Identifying Export Opportunities Using NLP**: Analyzing global news articles to detect regions where commodity prices are low and identifying potential export opportunities to regions with higher prices.
- **Key NLP Tasks**: Named Entity Recognition (NER) for commodities and locations, sentiment analysis to infer price trends, and information extraction to identify price disparities.

Product:

A **web-based dashboard** that:

1. Scrapes and analyzes global news articles in real-time.
2. Identifies regions with low commodity prices and regions with high demand or higher prices.
3. Provides actionable insights for exporters.
4. Includes **beautiful visualizations** such as:
    - **Interactive world maps** highlighting price disparities.
    - **Trend graphs** showing price fluctuations over time.
    - **Heatmaps** for demand and supply hotspots.
    - **Export route suggestions** based on price differences and logistics.

Features:

1. **Commodity Price Disparity Detection**:
    - Use NLP to extract commodity names, prices, and locations from news articles.
    - Compare prices across regions to identify disparities.
2. **Real-Time News Analysis**:
    - Continuously scrape news from global sources (e.g., Reuters, Bloomberg, local news outlets).

    - Use NLP to filter and analyze relevant articles.
3. **Visualization Dashboard**:
    - **Interactive World Map**: Show regions with low prices (green) and high prices (red) for selected commodities.
    - **Price Trend Graphs**: Display historical price trends for specific commodities.
    - **Heatmaps**: Visualize demand and supply hotspots.
    - **Export Route Suggestions**: Highlight optimal export routes based on price differences and logistics data.
4. **Alerts and Notifications**:
    - Send email or SMS alerts when significant price disparities are detected.

Technical Stack:

- **NLP Libraries**: SpaCy, Hugging Face Transformers, NLTK.
- **Web Scraping**: BeautifulSoup, Scrapy.
- **Backend**: Flask/Django for API development.
- **Frontend**: React.js or Dash for interactive visualizations.
- **Visualization Tools**: Plotly, D3.js, Mapbox for maps.
- **Database**: PostgreSQL or MongoDB for storing news and price data.
- **Deployment**: Docker, AWS/GCP for cloud hosting.

Workflow:

1. **Data Collection**:
    - Scrape global news articles related to commodities (e.g., wheat, rice, oil, gold).
    - Use APIs from news aggregators like NewsAPI or GDELT.
2. **NLP Processing**:
    - Perform Named Entity Recognition (NER) to extract commodities, prices, and locations.
    - Use sentiment analysis to infer price trends (e.g., "prices are dropping in Region X").
    - Extract and normalize price data from text.
3. **Price Disparity Analysis**:
    - Compare prices across regions for the same commodity.

    - Identify regions with low prices (export opportunities) and regions with high prices (target markets).
4. **Visualization**:
    - Build interactive dashboards to display insights.
    - Use maps, graphs, and heatmaps to make the data visually appealing and easy to understand.
5. **Export Suggestions**:
    - Integrate logistics data (e.g., shipping costs, trade routes) to suggest optimal export routes.

Example Use Case:

- **Commodity**: Wheat.
- **News Article**: "Wheat prices in Ukraine drop to $200/ton due to surplus production."
- **Analysis**:
    - Extract "Ukraine" as the location and "$200/ton" as the price.
    - Compare with global prices (e.g., wheat is $300/ton in Pakistan).
- **Insight**: Export wheat from Ukraine to Pakistan for a potential profit of $100/ton.
- **Visualization**:
    - Highlight Ukraine in green (low price) and Pakistan in red (high price) on the world map.
    - Show a trend graph of wheat prices in both regions over time.

Real-Life Challenge:

- **Global Trade Optimization**: Helping businesses identify profitable export opportunities by leveraging real-time news data.
- **Economic Growth**: Enabling small and medium enterprises (SMEs) to participate in global trade.

Deliverables:

1. **Research Paper**:

    - Document the NLP techniques used for entity extraction, sentiment analysis, and price disparity detection.
    - Evaluate the accuracy of the system in identifying export opportunities.
2. **Fully Functional Software Product**:
    - A web-based dashboard with real-time news analysis and visualization.
    - Export suggestions with actionable insights.
3. **Presentation**:
    - Demonstrate the system with live examples and visualizations.