**📈 Project Summary: Analyzing Herd Behavior in Tesla’s Stock**

**1. Idea: Examining Tesla Stocks During Two Key Periods**

The goal of this project is to detect **herd behavior** in Tesla's stock during two specific periods:

* **First Trump Election (2016):** During this period, Elon Musk was not closely associated with Trump.
* **Second Trump Election (2020):** By this time, Musk had a more established connection with Trump, being part of government advisory groups.

**Why These Periods?**

The hypothesis is that **Elon Musk's association with Trump** might have influenced investor behavior, leading to **herding phenomena**. During the first election, when Musk was less politically involved, Tesla’s stock was less likely to experience herding driven by political sentiment. In contrast, during the second election, Musk’s increased visibility and political involvement might have triggered herd-like trading behavior.

**📏 Measurements to Detect Herding**

To detect herding, we will use the following measurements:

1. **Volume Spike Analysis:**
   * Herding might be indicated by significant spikes in trading volume, especially after a surge in positive or negative sentiment on social media.
   * Threshold: Volume spikes exceeding **2 standard deviations** from the 30-day rolling average.
2. **Sentiment-Return Correlation:**
   * Check if changes in sentiment correlate significantly with stock returns.
   * Threshold: Pearson correlation coefficient **r > 0.4** with **p-value < 0.05**.
3. **Cross-Sectional Absolute Deviation (CSAD):**
   * Measures the dispersion of individual stock returns relative to the market return.
   * Formula:

CSADt=1N∑i=1N∣Ri,t−Rˉt∣CSAD\_t = \frac{1}{N} \sum\_{i=1}^{N} |R\_{i,t} - \bar{R}\_t|

* + If **CSAD decreases** while the market moves sharply, it may indicate herding.

1. **Price-Volume Cointegration / Granger Causality:**
   * Investigate if sentiment **Granger-causes** trading volume or price movement, indicating that sentiment drives trading activity.
2. **Event Analysis:**
   * Analyze specific days with major news or statements from Musk or Trump to detect abnormal trading patterns.

**🗂️ Data Sources**

We will use two main types of data:

1. **Social Media Data (Reddit):**
   * Scrape posts and comments from Tesla-related subreddits.
   * Extract sentiment scores, post volume, and specific keywords related to Musk and Trump.
2. **Financial Data (Tesla Stock):**
   * Collect historical stock prices, daily returns, P/E ratios, and trading volumes.
   * Data can be obtained from financial APIs like Yahoo Finance, Alpha Vantage, or official SEC filings.

**🧠 Methods and Analysis Techniques**

1. **Statistical Methods:**
   * **Difference-in-Differences (DiD):**
     + Compare Tesla’s herding indicators between the first and second Trump elections.
     + Control for general market trends by using similar stocks as a reference (e.g., GM or Ford).
2. **Regression Models:**
   * Test for the significance of sentiment-returns correlation.
   * Apply regression to model the relationship between trading volume and sentiment spikes.
3. **Decision Trees (Machine Learning):**
   * Train a model on the identified herding characteristics from Tesla’s data.
   * Apply the model to other stocks to detect similar herding behavior.
   * If another stock shows similar patterns, it may indicate that this stock is also experiencing herding.

**🚀 Innovative Extension: Predictive Herding Model**

After detecting herding in Tesla, we aim to:

* Develop a **classification model** (e.g., decision tree) trained on Tesla’s herding periods.
* Test the model on other stocks to identify if they show similar behavior when exposed to comparable conditions.
* This model could help predict herding potential in other volatile or heavily discussed stocks, thereby improving understanding of market dynamics.