repeated lows cluster within a narrow tolerance band near the 78 price mark, producing an effectively horizontal support shelf. The vertical distance between the declining highs and flat support narrows over time, flagging range compression characteristic of a Descending Triangle. From these primitives the agent composes its three summaries: the `Structure Summary` reports "lower highs" over "relatively flat support"; the `Trend Summary` maps the recognized class to its empirical bearish bias, heightened breakdown probability once support is retested multiple times; and the `Symmetry Summary` abstracts the converging lines into a triangular shape descriptor used downstream for trigger/invalid level setting. The post-figure callouts (Lower Highs, dashed triangle edges, EMA overlays) are illustrative aids added for the reader; the pattern classification itself arises strictly from the bar-geometry analysis described above.

Figure 13 Case sample of the `TrendAgent` on DJI (2022). The agent fits an upward-sloping resistance line and flat support to recent closes, confirming successive higher highs and higher lows. It then generates three structured summaries: Resistance Line (upward slope), Support Line (untested flat base), and Price Behavior (higher highs/lows with pullback). The green "Bullish Signal" badge denotes the agent's final bullish assessment.

When the Trend Agent ingests the recent close-anchored K-line window in Figure 13, it fits a two-sided price channel to the rolling closes: a positively sloped upper boundary (resistance) and a relatively flat lower boundary (support). Repeated touches and near-touch rejections along the upper fit, combined with a long gap since the last interaction with support, signal that price action is tracking the upper rail of an advancing channel rather than oscillating symmetrically about its midline. The agent also tallies successive swing highs and lows; the resulting sequence is net higher, reinforcing an `upward trend` classification. These geometric diagnostics are distilled into the three text panels shown beneath the chart: (1) the `Resistance Line` summary notes a recent probe above the red boundary and its upward slope; (2) the `Support Line` summary records that price is far from a relatively flat blue base, implying untested downside room; and (3) the `Price Behavior` summary highlights the cluster of higher highs/higher lows and a pullback after resistance contact. The green "Bullish Signal" callout in the figure reflects this composite assessment: trend up, price extended near resistance, watch for either a breakout continuation or a tactical pullback entry toward support.

IndicatorAgent Case Sample

Context: Latest OHLC snapshot (past time_frame).

Relative Strength Index (RSI). The RSI values are mostly above 50, indicating a generally bullish trend. However, the RSI has been fluctuating, with recent values around 68.49, suggesting the market is approaching overbought conditions.

Moving Average Convergence Divergence (MACD). The MACD line is above the signal line, particularly in the recent data, indicating a bullish momentum. The MACD histogram is positive, which supports the bullish sentiment.

Rate of Change (ROC). The ROC values are positive, indicating upward momentum. The recent ROC value of 0.94 suggests continued bullish momentum.

Stochastic Oscillator. The %K and %D lines are both above 80, indicating overbought conditions. This suggests that while the market is bullish, it may be due for a correction or consolidation.

Williams %R. The Williams %R values are mostly above -20, indicating overbought conditions. This aligns with the Stochastic Oscillator, suggesting caution as the market may be overextended.

Conclusion. The overall sentiment is bullish, with several indicators suggesting strong upward momentum. However, the overbought conditions indicated by the Stochastic Oscillator and Williams %R suggest that traders should be cautious of potential pullbacks or consolidations. It may be prudent to monitor for any signs of reversal or weakening momentum before making significant trading decisions.
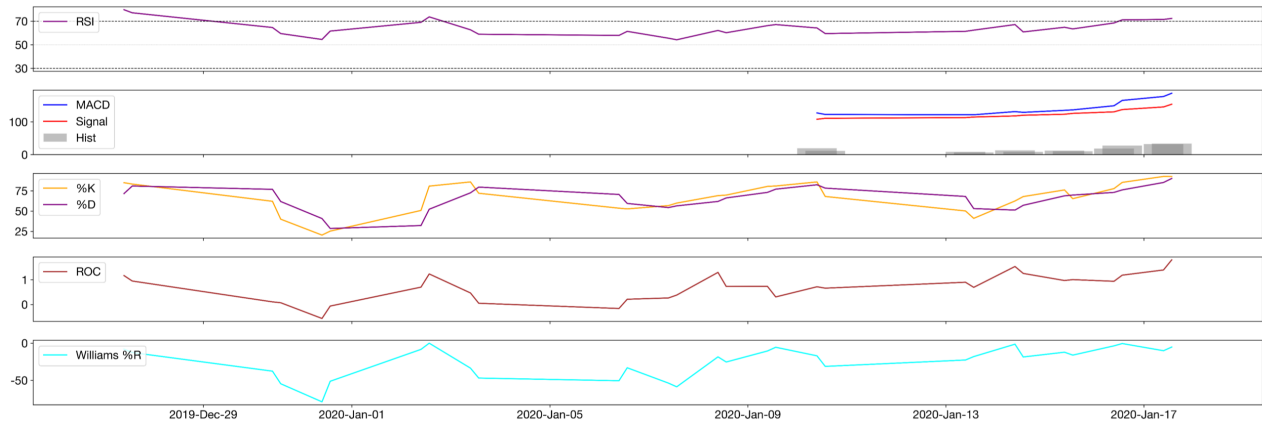

Figure 14 Case sample of the IndicatorAgent on DJI (2019–2020). From top to bottom, the panels show: (i) the four-hour RSI with neutral (50) and overbought thresholds, (ii) the MACD line and its signal line with histogram, (iii) the Stochastic %K/%D oscillator, (iv) the RoC rate-of-change, and (v) Williams %R. This multi-panel visualization presents the raw indicator series that define the momentum and oscillator primitives underlying the agent's "bullish but extended" assessment.

Given the latest OHLCV window, the Indicator Agent applies its momentum/oscillator transform suite (RSI, MACD, ROC, Stochastic, Williams %R) and aggregates the resulting state vector into a concise risk read. RSI has held above the neutral 50 line for most of the lookback and is presently in the high–60s (~ 68), signaling sustained upside participation but proximity to the classic overbought band. MACD remains above its signal line with a positive histogram bulge, confirming that upside momentum is still in force. ROC readings are modestly positive ($\approx 1\%$), reinforcing a persistent upward rate of change rather than an exhausted spike. At the same time, fast oscillators cluster in warning territory: both Stochastic %K/%D and Williams %R sit in overbought zones (> 80 and > -20, respectively), indicating that the advance is stretched and vulnerable to a pause or mean reversion (Achelis, 2013). The agent therefore issues a composite summary of "bullish but extended": upside bias intact, yet tactical entries should respect exhaustion risk, tighten stops, scale position

size, or await a reset toward support before adding exposure.

G   Indicator Explanation

Among the selected indicators, MACD is particularly representative due to its strengths in trend-following. MACD is designed to indicate momentum shifts by analyzing the divergence between two exponential moving averages (EMAs). It is calculated as:

$$\mathcal{E}_t = \alpha \cdot \mathcal{P}_t + (1 - \alpha) \cdot \mathcal{E}_{t-1} \qquad \mathcal{M}_t = \mathcal{E}_t^{(f)} - \mathcal{E}_t^{(s)} \qquad \mathcal{S}_t = \mathcal{E}_{\mathcal{M}_t}$$

The exponential moving average (EMA), denoted as $\mathcal{E}_t$, is a weighted average of past prices that assigns greater significance to more recent observations, thereby making it more responsive to recent price changes. Specifically, $\mathcal{P}_t$ represents the current price at time t, $\mathcal{E}_{t-1}$ is the EMA value from previous timestep, and $\alpha \in (0, 1)$ is the smoothing factor that determines the relative weight of the current price versus past EMA values. The factor α is typically computed as $\alpha = \frac{2}{N+1}$ where N is the number of time periods (Achelis, 2013). Overall, EMA offers a smoothed representation of price trends, emphasizing recent movements while retaining historical context.

In our system, we define a fast EMA $\mathcal{E}_t^{(f)}$ with $N = 12$ and a slow EMA $\mathcal{E}_t^{(s)}$ with $N = 26$. The momentum signal $\mathcal{M}_t$ is then computed as the difference: $\mathcal{M}_t = \mathcal{E}_t^{(f)} - \mathcal{E}_t^{(s)}$ The signal line $\mathcal{S}_t$ is constructed as a 9-period EMA over the MACD sequence $\mathcal{E}_{\mathcal{M}_t}$: $\mathcal{S}_t = \mathcal{E}_{\mathcal{M}_t}$. A bullish signal occurs when $\mathcal{M}_t$ crosses above $\mathcal{S}_t$, indicating upward momentum, whereas a downward crossover suggests growing bearish pressure. This formulation makes $\mathcal{M}_t$ effective for capturing mid-term trend shifts (e.g., on 4-hour charts), while filtering out high-frequency price noise (Appel, 2005).

H   The Use of Large Language Models (LLMs)

Large Language Models (LLMs) were employed **only** as supportive instruments to enhance the readability and grammatical precision of our academic writing. In particular, GPT-4o was utilized to aid in refining portions of the manuscript, including the introduction and methodology. The authors maintain complete responsibility for the intellectual content, encompassing the formulation of research questions, the design of methods, and the verification of experimental findings.