**Stock Market Analysis and Prediction Web Application**

**Introduction**

This web application provides investors and traders with technical insights and stock price predictions. It integrates real-time financial data, technical analysis, and predictive modeling to help users make informed investment decisions. The tool is designed for both beginners and experienced traders.

**Objective**

1. Fetch real-time and historical stock market data from reliable APIs.
2. Automate calculation and visualization of technical indicators (RSI, MACD, Bollinger Bands, Moving Averages).
3. Implement predictive models for forecasting stock prices.
4. Offer a user-friendly interface for analysis without programming knowledge.
5. Enable data export and generate trading signals (buy/sell/hold).

**Tools Used**

**Backend:** Python, Flask, yfinance, Pandas, NumPy  
**Visualization:** Matplotlib, Seaborn  
**Frontend:** HTML, CSS, JavaScript  
**Data Storage:** JSON files, Flask session management

**System Architecture**

* **Frontend:** HTML templates, CSS/JS assets, responsive interface.
* **Backend:** Flask server, authentication, analysis engine
* **Data Layer:**
  + **Financial Data Module:** Fetches stock data from Yahoo Finance.
  + **Data Processing Module:** Cleans data, calculates indicators, and prepares features for prediction.

**Data Flow:**

User Input → Flask Server → Data Acquisition → Data Processing → Analysis → Visualization → Results

**Methodology**

1. **Data Acquisition:** Validate stock symbols, fetch historical and real-time data, handle missing values.
2. **Technical Analysis:**
   * Moving Averages (SMA for 5,10,20,50 days)
   * RSI (Relative Strength Index)
   * MACD (Moving Average Convergence Divergence)
   * Bollinger Bands
   * Williams %R
3. **Predictive Modeling:** Linear trend extrapolation, mean reversion, volatility adjustment, multi-indicator consensus.

**Key Formulas**

**RSI:**

RS = Average Gain / Average Loss (14-period)

RSI = 100 - (100 / (1 + RS))

**MACD:**

MACD = EMA(12) - EMA(26)

Signal = EMA(9) of MACD

Histogram = MACD - Signal

**Bollinger Bands:**

Middle Band = SMA(20)

Upper = SMA(20) + 2\*StdDev

Lower = SMA(20) - 2\*StdDev

**Williams %R:**

%R = (Highest High - Close) / (Highest High - Lowest Low) × -100

**Web Application Details**

* **Login/Registration:** Secure authentication.
* **Dashboard:** Stock input, date selection, and analysis display.
* **Charts:** Interactive visualizations of prices and indicators.
* **API Endpoints:** Prediction, symbol validation, CSV export.
* **Session Management:** Temporary JSON storage, auto-cleanup, session timeout.

**Results and Findings**

* Accurate calculation and display of technical indicators.
* Short-term predictions (1–7 days) have 60–80% confidence.
* Medium/long-term predictions useful for trend direction.
* Fast response time (5–10 seconds), charts generated in real-time.
* Supports multiple simultaneous analyses with efficient memory management.

**Future Enhancements**

1. Implement advanced ML models (LSTM, ensembles).
2. Real-time data streaming and alerts.
3. Database integration (PostgreSQL/MongoDB).
4. Portfolio management and options analysis.
5. Additional indicators and fundamental analysis integration.

**Conclusion**

The application effectively combines real-time data, technical analysis, and predictive modeling in an intuitive web interface. It provides professional-grade analysis tools, accessible to all users, and offers a strong foundation for future enhancements, including advanced machine learning and real-time trading features.