AI-Based Intraday Market Decision Support System

1.Problem Statement

Intraday trading requires traders to make rapid buy and sell decisions within very short time frames by continuously monitoring real-time market data such as price movements, volume, volatility, and technical indicators. Financial markets generate a massive volume of high-frequency data every second, making manual analysis extremely challenging. Traders must process multiple charts, indicators, and timeframes simultaneously, which increases cognitive load and decision fatigue.

Although modern trading platforms offer a wide range of technical indicators and charting tools, these tools function in isolation and require traders to manually interpret the signals. They lack intelligent interpretation, contextual understanding of market conditions, and the ability to combine multiple indicators into meaningful insights. As a result, traders often face information overload, delayed decision-making, and inconsistent trading outcomes. Emotional bias, stress, and human errors further reduce the effectiveness of manual intraday trading strategies.

Existing algorithmic trading systems primarily focus on fully automated trade execution, which may not be suitable for all traders due to regulatory constraints, risk management concerns, and lack of user trust in automated systems. Many traders prefer decision support rather than automated execution, allowing them to retain control while benefiting from intelligent analysis.

Therefore, there is a clear need for an AI-based decision support system for intraday trading that can analyze real-time market data, identify significant price-action patterns and technical signals, and generate timely, structured alerts. Such a system should assist traders by providing actionable insights and reducing analysis complexity, while avoiding automatic trade execution. The proposed solution aims to enhance decision accuracy, reduce human error, and improve trading efficiency by combining artificial intelligence with real-time market analysis.

2. Objectives of the Project

Primary Objective

The primary objective of this project is to design and develop a web-based Decision Support System (DSS) for intraday trading that assists traders in analyzing real-time or simulated market data. The system aims to provide intelligent insights through technical analysis and price-action signals, helping traders make informed entry and exit decisions while keeping the human trader in control by avoiding automatic trade execution.

Secondary Objectives

The secondary objectives of the project are:

1. **Automated Technical Indicator Calculation**
   To automatically compute commonly used technical indicators such as RSI, MACD, EMA, and Bollinger Bands from market data, thereby reducing manual analysis effort and minimizing calculation errors.
2. **Candlestick Pattern Detection**
   To implement rule-based logic for identifying important candlestick patterns like Doji, Hammer, and Engulfing patterns, which indicate potential trend reversals or market indecision.
3. **Interactive Data Visualization**
   To develop a real-time, interactive web dashboard that displays price charts along with technical indicators and detected patterns, allowing traders to visually analyze market conditions efficiently.
4. **Alert-Based Decision Support**
   To generate timely and actionable alerts for potential breakout points and trend reversals based on combined indicator and pattern analysis, supporting traders in making faster and more structured decisions.
5. **User-Friendly Web Interface**
   To ensure the system is easy to use, responsive, and accessible through a web browser, making it suitable for traders with varying levels of experience.

3. Abstract

Intraday financial markets generate large volumes of high-frequency data, making manual analysis complex and error-prone for traders. While existing trading platforms provide technical indicators, they lack intelligent interpretation and contextual decision support. This project proposes an AI Based Intraday Market Decision Support System that assists traders by automatically analyzing real-time market data and identifying key price-action signals. The system processes intraday OHLCV data to compute technical indicators such as RSI, MACD, EMA, and Bollinger Bands, and applies rule-based methods to detect significant candlestick patterns and breakout points. Real time alerts and an interactive visualization dashboard are provided to enhance market clarity and support timely decision-making. The proposed system focuses strictly on analysis and decision support without executing trades, ensuring user control and risk awareness. The modular architecture allows scalability and future integration of machine learning–based trend prediction models. This project demonstrates the practical application of time-series analytics and intelligent decision-support techniques for improving intraday trading efficiency.

4. Literature Review

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1. J. Brown and L. Wang (2021)
This study explores the application of artificial intelligence techniques in financial market decision support systems. The authors focus on AI-assisted tools that analyze market trends, technical indicators, and historical data to provide actionable insights to traders. The research highlights that decision support systems improve trading accuracy while allowing human traders to retain control over execution. The study emphasizes the importance of interpretability and trust in AI-driven trading environments.

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2. A. Verma and N. Joshi (2021)
This paper presents a real-time stock market visualization and decision support dashboard designed for intraday traders. The system integrates live price data with technical indicators such as moving averages and momentum oscillators. The results show that visual overlays and structured dashboards reduce information overload and enhance trader efficiency during high-frequency trading scenarios.

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3. S. Chen, Y. Li, and L. Wang (2022)
The authors propose an algorithmic approach for candlestick pattern recognition in short-term stock market analysis. The system detects patterns such as Doji, Hammer, and Engulfing using rule-based logic applied to OHLC data. Experimental analysis demonstrates that candlestick-based pattern recognition can effectively indicate potential trend reversals in intraday trading.

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4. T. Singh and A. Mehta (2022)
This research investigates intraday trading signal generation using technical indicators including RSI, MACD, EMA, and Bollinger Bands. The study evaluates the effectiveness of combining multiple indicators to identify breakout and reversal

points. The findings suggest that multi-indicator analysis improves signal reliability compared to single-indicator approaches.

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5. E. Davis and R. Patel (2023)
This paper introduces the concept of human-in-the-loop decision support systems for financial trading. The authors argue that alert-based systems that assist traders without executing trades automatically enhance user trust and risk awareness. The study concludes that decision support platforms are more suitable than fully automated trading systems for discretionary intraday traders.

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6. P. Verma, S. Gupta, and R. Mehta (2023)
The authors present a web-based decision support platform for financial market analysis using real-time data processing and interactive dashboards. The system provides indicator computation, alert generation, and visualization features through a centralized web interface. The study emphasizes that web-based DSS architectures improve accessibility, scalability, and usability for active traders.

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5. System Requirement Specification (SRS)

1. Introduction

1.1. Purpose

The purpose of this System Requirement Specification (SRS) document is to define the functional and non-functional requirements of the AI-Based Intraday Market Decision Support System. The system is designed to assist intraday traders by analyzing real-time or simulated market data, computing technical indicators, detecting price-action patterns, and generating timely alerts to support informed trading decisions without executing trades automatically.

1.2 Scope

The proposed system provides real-time or near real-time analysis of intraday financial market data using historical or live OHLCV (Open, High, Low, Close, Volume) data. The system computes technical indicators such as RSI, MACD, EMA, and Bollinger Bands, detects candlestick patterns and breakout conditions, and presents insights through an interactive web-based dashboard. The system generates alerts for potential entry and exit opportunities while keeping the trader in full control of decision-making.

1.3 Definitions, Acronyms, and Abbreviations

- **AI** – Artificial Intelligence
- **DSS** – Decision Support System
- **SRS** – System Requirement Specification
- **RSI** – Relative Strength Index
- **MACD** – Moving Average Convergence Divergence
- **EMA** – Exponential Moving Average
- **OHLCV** – Open, High, Low, Close, Volume
- **User** – Trader using the system

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2. Overall Description

2.1 Product Perspective

The system is a standalone, web-based decision support application developed using Python-based frameworks. It integrates market data sources with technical analysis libraries and visualization tools. The system focuses purely on analysis, visualization, and alert generation, and does not support automated trade execution.

2.2 Product Functions

- Fetching real-time or historical intraday market data
- Computing technical indicators automatically
- Detecting candlestick patterns and breakout signals
- Visualizing charts with indicator overlays
- Generating real-time alerts for decision support
- Displaying alerts and insights through a dashboard

2.3 User Classes and Characteristics

User Type	Description
Trader (User)	Views charts, indicators, patterns, and alerts to assist intraday trading decisions

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2.4 Operating Environment

- **Operating System:** Windows 10 or higher
- **Programming Language:** Python
- **Framework:** Streamlit / Web Framework
- **Data Analysis Libraries:** Pandas, NumPy
- **Visualization:** Matplotlib, Plotly
- **Database (Optional):** SQLite
- **Data Source:** Yahoo Finance / Broker API

2.5 Design and Implementation Constraints

- Accuracy depends on data source reliability
- Indicator performance depends on market volatility

- Real-time responsiveness depends on internet speed
- Alerts are advisory and not guaranteed predictions

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3. Functional Requirements

3.1 Trader (User) Module Requirements

- User shall be able to view real-time or historical intraday market data
- User shall view candlestick charts for selected instruments
- User shall view technical indicators overlaid on charts
- User shall receive alerts for breakout or reversal signals
- User shall customize indicator parameters

3.2 Data Analysis Requirements

- System shall compute RSI, MACD, EMA, and Bollinger Bands
- System shall analyze OHLCV data continuously
- System shall detect predefined candlestick patterns
- System shall identify potential breakout conditions

3.3 Alert Generation Requirements

- System shall generate alerts based on indicator conditions
- Alerts shall be displayed in real time on the dashboard
- System shall avoid executing any trades automatically

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4. Non-Functional Requirements

4.1 Performance Requirements

- System shall process data with minimal delay
- Charts and indicators shall update smoothly
- Alerts shall be generated in near real time

4.2 Security Requirements

- System shall protect user session data
- API keys (if used) shall be securely handled

4.3 Reliability Requirements

- System shall operate continuously during market hours
- Market data shall be handled without corruption
- Alerts shall remain consistent across sessions

4.4 Usability Requirements

- User interface shall be simple and intuitive
- Charts and alerts shall be easy to interpret
- System shall be usable by beginner and experienced traders

4.5 Scalability Requirements

- System shall support additional indicators in the future
- Architecture shall allow ML model integration later
- System shall support multiple market instruments

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5. Hardware and Software Requirements

5.1 Hardware Requirements

- Intel i5 processor or higher
- Minimum 8 GB RAM
- Stable internet connection

5.2 Software Requirements

- Windows 10 or higher
- Python
- Streamlit / Web Framework
- Pandas, NumPy
- Matplotlib / Plotly

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6. System Architecture Overview

The system consists of the following components:

- Market Data Source
- Data Processing & Indicator Engine

- Pattern Recognition Module
- Alert Generation Module
- Visualization Dashboard

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7. Future Enhancements

The current AI-Based Intraday Market Decision Support System provides technical analysis, pattern detection, visualization, and alert-based decision support. In the future, the system can be enhanced in several ways to improve accuracy, usability, and functionality:

1. **Machine Learning–Based Trend Prediction**
   Future versions of the system can integrate machine learning models such as LSTM or Transformer-based time-series models to predict short-term price movements and trend probabilities.

2. **Multi-Timeframe Analysis**
   The system can be extended to analyze multiple timeframes (e.g., 1-min, 5-min, 15-min) simultaneously, providing stronger confirmation signals for intraday trading decisions.

3. **Strategy Back testing Module**
   A back testing feature can be added to allow traders to test indicator-based or rule-based strategies on historical intraday data before applying them in live markets.

4. **Personalized Alert Configuration**
   Traders can be given the ability to customize alert conditions, risk parameters, and indicator thresholds based on their trading style and risk appetite.

6.Existing System and Proposed System

The evaluation of the existing intraday trading practices compared with the proposed AI-based decision support system highlights the need for intelligent, real-time analytical assistance in high-frequency trading environments.

6.1 Existing System

The existing intraday trading system largely depends on manual analysis and basic trading platforms, which present several limitations:

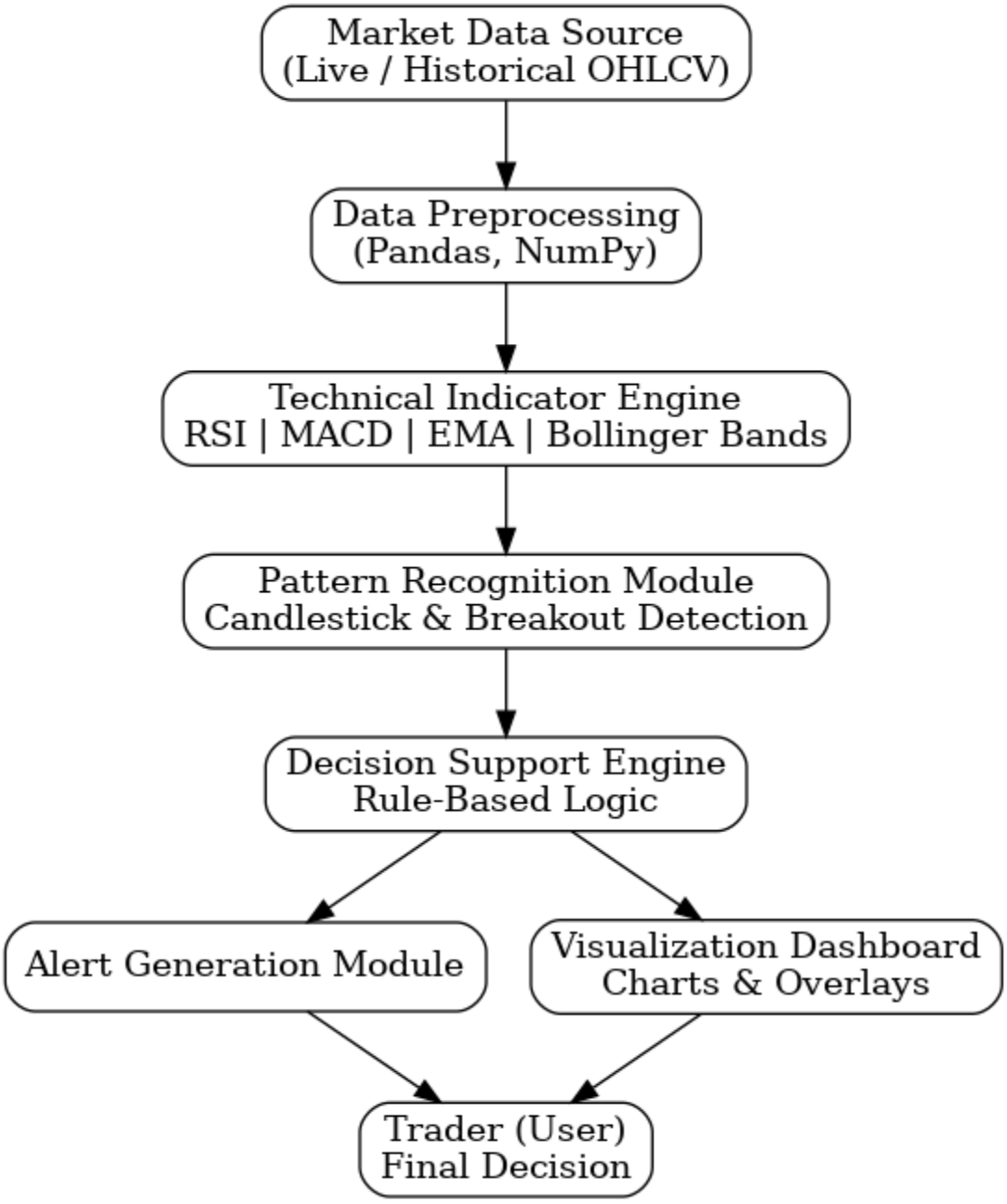
- **Manual Chart Analysis:**
  Traders manually analyze price charts across multiple timeframes, which is time-consuming and increases the chances of human error.
- **Basic Technical Indicators:**
  Existing platforms provide technical indicators, but they require traders to interpret signals independently without intelligent contextual support.
- **Lack of Structured Alerts:**
  Most systems do not provide reliable, real-time alerts for potential breakout or reversal opportunities.
- **High Dependency on Trader Experience:**
  Trading decisions heavily rely on individual trader expertise, discipline, and emotional control.
- **Information Overload:**
  Simultaneous monitoring of multiple indicators and instruments leads to cognitive fatigue and inconsistent decision-making.

6.2 Proposed System

The proposed AI-Based Intraday Market Decision Support System introduces an intelligent, structured, and trader-centric approach:

- **Automated Market Data Analysis**:
  The system automatically processes intraday OHLCV data and computes key technical indicators such as RSI, MACD, EMA, and Bollinger Bands.
- **Intelligent Signal Interpretation:**
  Rule-based algorithms analyze indicator combinations and candlestick patterns to identify meaningful price-action signals.
- **Real-Time Alerts:**
  Timely alerts for potential breakout points and trend reversals are generated to support faster and more confident decision-making.
- **Interactive Visualization Dashboard:**
  An intuitive dashboard overlays indicators, patterns, and alerts directly on market charts for improved clarity.
- **Human-in-the-Loop Design:**
  The system provides decision support without executing trades automatically, ensuring trader control and risk awareness.
- **Scalable and Modular Architecture:**
  The system supports future enhancements such as machine learning-based predictions, back testing, and broker API integration.

7.Block Diagram



8. Technology Details

The AI-Based Intraday Market Decision Support System integrates modern data analysis, artificial intelligence, and web-based visualization technologies to provide real-time market insights and decision support for intraday traders. The technologies used in this project are described below.

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1. Programming Language

Python

Python is the primary programming language used in this project due to its simplicity, readability, and strong ecosystem for financial data analysis and artificial intelligence. Python supports a wide range of libraries for time-series analysis, technical indicator computation, and web application development, making it suitable for building an intraday trading decision support system.

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2. Data Analysis and Processing Libraries

Pandas

Pandas is used for handling and processing intraday OHLCV market data. It enables efficient data manipulation, cleaning, resampling, and time-series analysis.

NumPy

NumPy provides high-performance numerical computation capabilities required for calculating technical indicators and performing mathematical operations on market data.

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3. Technical Indicator Libraries

Pandas TA / TA-Lib

These libraries are used to compute technical indicators such as RSI, MACD, EMA, and Bollinger Bands accurately and efficiently. They simplify the implementation of complex financial formulas.

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4. Data Visualization

Matplotlib

Matplotlib is used for generating static and basic dynamic charts, including candlestick charts and indicator plots.

Plotly

Plotly is used for interactive charting and visualization, allowing users to zoom, pan, and explore intraday market movements interactively within the dashboard.

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5. Web Application Framework

Streamlit

Streamlit is used to develop the web-based dashboard of the system. It allows rapid development of interactive user interfaces for displaying charts, indicators, and alerts in real time with minimal coding effort.

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6. Data Source Integration

Yahoo Finance / Broker APIs

Market data is fetched from publicly available data sources such as Yahoo Finance or broker-provided APIs. These data sources provide intraday price and volume data required for analysis.

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7. Alert and Notification System

Rule-Based Alert Engine

The system uses predefined rule-based logic to generate alerts based on indicator conditions, pattern detection, and breakout signals. Alerts are displayed within the dashboard in real time.

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8. Database Technology (Optional)

SQLite

SQLite can be used to store user preferences, alert history, and system logs. It provides a lightweight and easy-to-manage database solution suitable for small to medium-scale applications.

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9. Development Tools

- **Visual Studio Code:** Used as the primary code editor for development and debugging
- **Jupyter Notebook:** Used for testing indicator logic and data analysis
- **Git & GitHub:** Used for version control and code management

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10. System Deployment Environment

- **Operating System:** Windows 10 or higher
- **Hardware:** Minimum 8 GB RAM and stable internet connection
- **Browser: Google Chrome / Edge**
