**AI-Powered Market-Aware Stock Screening: Summary**

**1️⃣ Goal**

* Build a **stock screening tool** (not a perfect entry system)
* Use technical indicators, Fibonacci levels, and market context to **rank stocks by probability of favorable moves**
* Include **NIFTY/BANKNIFTY regime** and optionally **predicted index movement** to make stock selection more robust

**2️⃣ Pipeline Overview**

**Step 1: Data Collection**

* Download historical OHLCV data for each stock + NIFTY + BANKNIFTY using yfinance
* Compute stock indicators using your existing overlays:
  + EMA20/EMA50
  + RSI
  + VWAP
  + Fibonacci retracement (Fib%)
  + Zigzag swings / volume analysis
* Compute **NIFTY/BANKNIFTY regime**:
  + Bullish (+1) if EMA20 > EMA50
  + Bearish (-1) if EMA20 < EMA50
  + Optional: add other regime indicators

**Step 2: Define Target for ML**

* Stock-level target: 5-day forward return
* df['future\_return'] = df['Close'].shift(-5)/df['Close'] - 1
* df['target'] = (df['future\_return'] > 0.02).astype(int) # 1 = bullish move
* NIFTY/BANKNIFTY target (if used): same 5-day horizon
* Last 5 rows are unusable (future unknown)

**Step 3: Feature Engineering**

* Stock features:
  + EMA20, EMA50, RSI, VWAP, Fib%, Volume, Zigzag
  + NIFTY/BANKNIFTY **current regime**
  + Optional: NIFTY/BANKNIFTY **predicted probability**
* Index features (for separate ML prediction):
  + EMA20/50, RSI, VWAP, Fib%, Volume, regime

**Step 4: Modeling Approach**

**Option A: Current regime only**

* Train stock model using **stock indicators + current NIFTY/BANKNIFTY regime**
* Pros: Simple, robust, no data leakage
* Recommended as **first implementation**

**Option B: Current regime + predicted index movement**

* Train index model (NIFTY/BANKNIFTY) to predict 5-day movement probability
* Feed predicted probability as additional feature into stock model
* Pros: Forward-looking, slightly better accuracy
* Cons: Model error propagation, more complexity
* Recommended as **second-stage upgrade**

**Step 5: Model Choices**

* **XGBoost / LightGBM** — best for tabular, noisy financial data
* **RandomForest** — simpler, interpretable alternative
* **Optional**: LSTM / Transformer for sequence modeling if using multi-day patterns

**Step 6: Stock Model Training**

* Each row = 1 training data point
* Target = 1 if stock moves > threshold in 5 days
* Stack all stocks together for a **general model**
* Optional: train **individual stock models** for key tickers

**Step 7: Real-Time Screening**

1. Compute **today’s stock indicators**
2. Compute **current NIFTY/BANKNIFTY regime**
3. Optional: predict NIFTY/BANKNIFTY 5-day probability
4. Input features into stock ML model → output **probability score**
5. Rank stocks → generate watchlist
6. Overlay probability + key indicators on charts for visual screening

**3️⃣ Key Principles & Insights**

1. **Shifted 5-day return**: Each row predicts future 5-day outcome
2. **Market awareness matters**: Stock success depends on NIFTY/BANKNIFTY regime
3. **Start simple**: Current market regime only
4. **Add complexity gradually**: Predicted index probability as extra feature
5. **General model vs per-stock model**: Start with a **general model** for screening; optionally fine-tune individual models later
6. **Multi-task learning (optional)**: Predict stocks + index simultaneously, but simpler 2-step approach is easier and effective

**4️⃣ Implementation Roadmap**

1. **Collect data** for stocks and indices
2. **Compute indicators and regime features**
3. **Compute 5-day forward targets** for stocks and indices
4. **Create features for stock ML model** (stock indicators + current regime)
5. **Train stock model** (XGBoost recommended)
6. **Optional**: train index model for forward prediction and feed probabilities into stock model
7. **Use trained model for screening**: probability + indicator overlays → watchlist
8. **Iterate**: fine-tune features, horizons, and hyperparameters

**5️⃣ Outcome**

* A **market-aware stock screener** that ranks stocks by probability of success
* Incorporates **technical indicators, Fib levels, Zigzag swings, and market regime context**
* Ready to be upgraded with **forward-looking index predictions** for improved accuracy

Train Model to specific stocks  
  
**1️⃣ Concept: General → Stock-Specific**

1. **General Model**
   * Trained on **all stocks combined**
   * Features: stock indicators + current market regime (NIFTY/BANKNIFTY)
   * Purpose: broad screening, rank all stocks by probability of success
   * Pros: scalable, robust, captures general patterns across many stocks
2. **Stock-Specific Fine-Tuning**
   * Take the **general model** weights/structure as a starting point
   * Retrain using **only one stock’s historical data**
   * Can use additional features or tuned hyperparameters for that stock
   * Purpose: improve prediction accuracy for high-priority tickers

**2️⃣ Why It Works**

* Many patterns are **shared across stocks** (EMA20/50 crossover, RSI signals, Fib% levels)
* Some patterns are **stock-specific** (volatility, microstructure, idiosyncratic reactions)
* By starting with a general model, the model **already understands broad technical patterns**
* Fine-tuning lets it **adapt to the quirks of one stock** without losing general knowledge

**3️⃣ How to Implement**

**Step 1: Train General Model**

general\_model.fit(X\_all\_stocks, y\_all\_stocks)

**Step 2: Fine-Tune for Specific Stock**

X\_stock, y\_stock = get\_stock\_data('RELIANCE.NS')

stock\_model = copy.deepcopy(general\_model) # start from general model

stock\_model.fit(X\_stock, y\_stock) # fine-tune on stock

* If using **XGBoost**, you can:
  + Continue training with xgb.train on stock-specific data
  + Or retrain with **small learning rate** and fewer trees

**4️⃣ Practical Considerations**

* **Data Size**: You need enough historical data for the specific stock (3–12 months minimum)
* **Regular Updates**: Fine-tuned models may need periodic retraining if stock behavior changes
* **Feature Consistency**: Ensure the same features are used in both general and stock-specific models
* **Evaluation**: Compare stock-specific model vs general model performance; keep both if general is already strong

**5️⃣ Hybrid Strategy (Recommended)**

1. **Use general model** for **all stocks in watchlist** → rank broadly
2. **Fine-tune for top 5–10 favorite stocks** → higher-confidence signals
3. **Combine outputs**:
   * Use general model for broad screening
   * Use stock-specific model for precise probability and chart annotation

This keeps your **pipeline scalable** but gives **extra precision for priority stocks**.

✅ **TL;DR**

* General model = broad, scalable, robust screening
* Stock-specific fine-tuning = better accuracy for high-priority tickers
* Approach = **train general → fine-tune specific**
* Use hybrid: general model for ranking + fine-tuned for top favorites

| **Stage** | **Algorithm** | **Rationale** |
| --- | --- | --- |
| General Model | **XGBoost** | Works extremely well on tabular data, handles noisy daily indicators, fast, interpretable |
| Large Portfolio Scaling | **LightGBM** | Faster training/inference for hundreds of stocks |
| Baseline / Interpretability | **Random Forest** | Quick, robust, easy to explain feature importance |
| Sequence Modeling (optional) | **LSTM / Transformer** | Only if you want to model multi-day temporal patterns like EMA crossovers or zigzag sequences; not essential at daily granularity |

1. Start **simple, robust, fast**: XGBoost/LightGBM + general → stock-specific pipeline
2. Only move to Transformers/LSTM once:
   * You want to capture multi-day temporal patterns
   * You have validated that ML is hitting a performance ceiling
3. Use ML for production-ready screener first; deep learning can be an **upgrade path**, not the starting point

| **Group** | **Columns (examples)** | **Keep?** | **Normalization / Notes** |
| --- | --- | --- | --- |
| **Price-based (main asset)** | Close, Open, High, Low, Adj Close | ✅ Yes | Normalize or use returns (better). |
| **Returns / Ranges** | future\_return, Range\_pct | ✅ Yes | Already scaled. |
| **Volume-related** | Volume, Cum\_Vol, Cum\_TPV, VWAP | ✅ Yes | Apply log(1+x) or rolling z-score normalization. |
| **EMA / SMA / BB** | EMA\_20, EMA\_50, BB\_mid\_20, BB\_upper\_20, BB\_lower\_20 | ✅ Yes | Normalize as % of Close → (EMA\_20 / Close) - 1. |
| **Momentum indicators** | RSI\_14, MACD, MACD\_signal, %K, %D | ✅ Yes | Standardize (z-score over rolling window). |
| **Volatility indicators** | ATR\_14 | ✅ Yes | Divide by Close for scale invariance. |
| **Fibonacci, Zones, Zigzag** | Fibo\_, Zone, Zigzag, Peak, Trough | ⚠️ Optional | Often noisy; test correlation before keeping. |
| **Market context (NIFTY, BANKNIFTY)** | All columns with prefix NIFTY\_ or BANKNIFTY\_ | ✅ Yes | Normalize as % deviation from their EMAs (e.g., (NIFTY\_Close/NIFTY\_EMA\_20)-1). |
| **Categorical** | Fibo\_Status\_Last\_Close, NIFTY\_Trend, BANKNIFTY\_Trend | ✅ Yes | Label encode (0,1,2). |

| **Type** | **Technique** | **Formula / Method** | **Notes** |
| --- | --- | --- | --- |
| **Price / EMA / BB** | Ratio normalization | (feature / Close) - 1 | Keeps scale relative to asset price. |
| **Volume / Cum\_Vol** | Log scaling | np.log1p(feature) | Reduces skew. |
| **Indicators (RSI, MACD, etc.)** | Z-score rolling | (x - x.rolling(20).mean()) / x.rolling(20).std() | Adapts dynamically. |
| **ATR** | Relative volatility | ATR\_14 / Close | Makes volatility comparable. |
| **Market indices** | Relative strength | (NIFTY\_Close / NIFTY\_EMA\_20) - 1 etc. | Adds macro context in normalized form. |