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Online Stock Forecasting with Portfolio Management

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Group-13 :

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Individual Group Member's Contribution Breakdown

For this project, all group members have/will be contributing equally.

Phase	Members
$ Project Meetings	All Members
$ Data Collection	All Members
$ UI development	All Members
$ Designing Web Services and Database	All Members
$ Designing Prediction Strategies	All Members
$ Integration and Testing	All Members
$ Report and Presentation	All Members

Project Overview

$ Our Project Aim

- $ Developing a web application which provides access to users, a reliable prediction of stock values of companies they are interested in.
- $ Especially designed for active daily or weekly short-term investors, since they usually do not have the time or resources to avail of commercial forecasting services or hire agents.

$ Using Technical analysis

- $ The technical analysis would based on the analysis if historical market data, we would get using Yahoo Finance APIs. We are collecting both the historical and real time data.

$ Development Environment

- $ The programming language would preferably be JAVA for developing the web services and the database would be PostgreSQL database.

Project Overview

Our project would mainly focuses on three aspects:

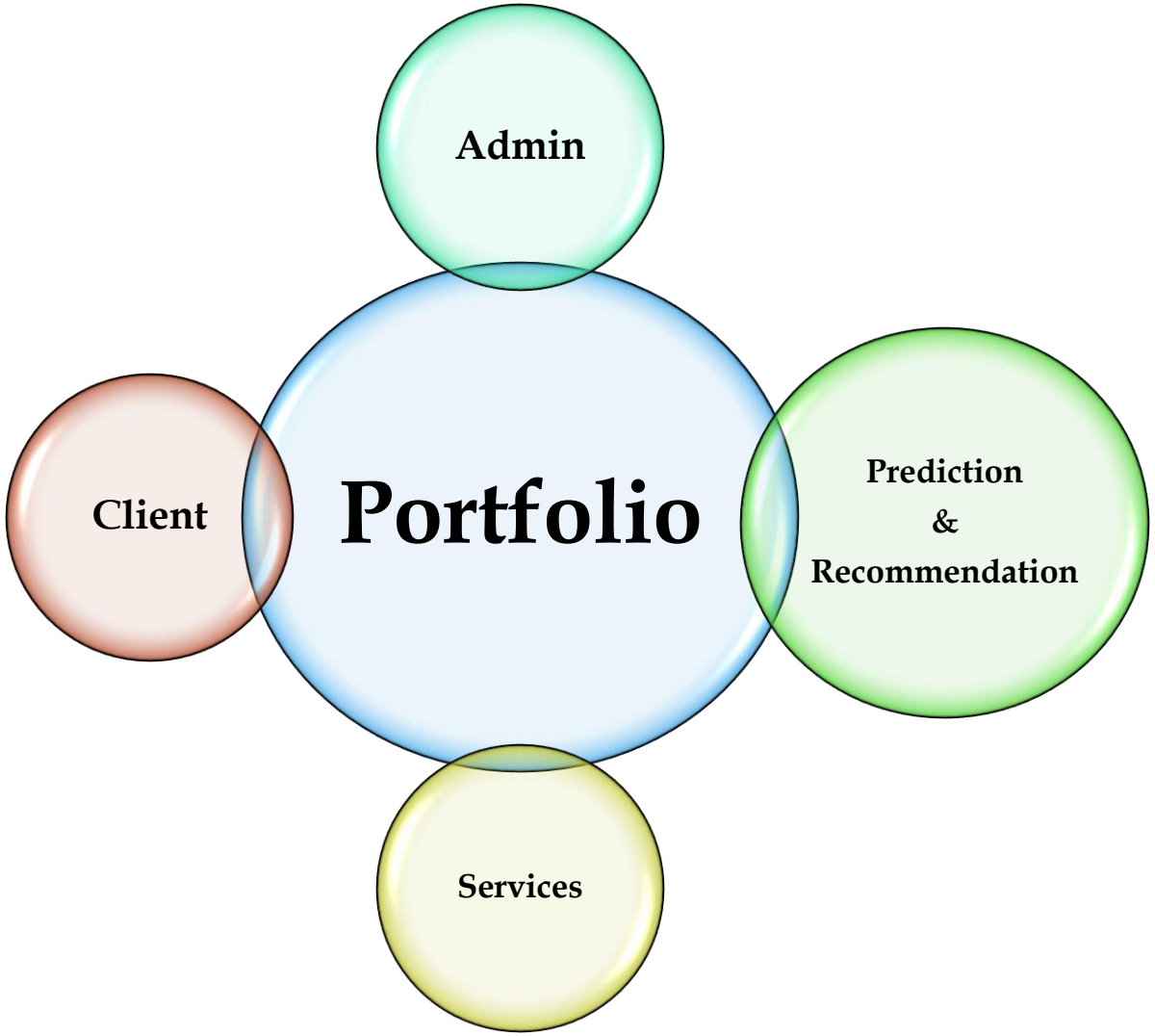
- **Real time data feed**
  - We have used real time data that is collected from Yahoo Finance API. So the prediction is based on real time data feeding and long term prediction is based on historical data, thus making it a realistic prediction advisory.
- **Prediction Strategies and Web Services**
  - We are providing prediction for both long term and short term.
  - These algorithms run as a back-end task and compute the prediction values for the various stocks completely abstracted from the User.
- **Easy Access to Web Interface**
  - The web application would be offering various functionalities to the end users like
  - Getting valuable information about the stocks.
  - Timely recommendations.
  - Some tips on how to deal with their current stocks etc.

Brief Literature Review

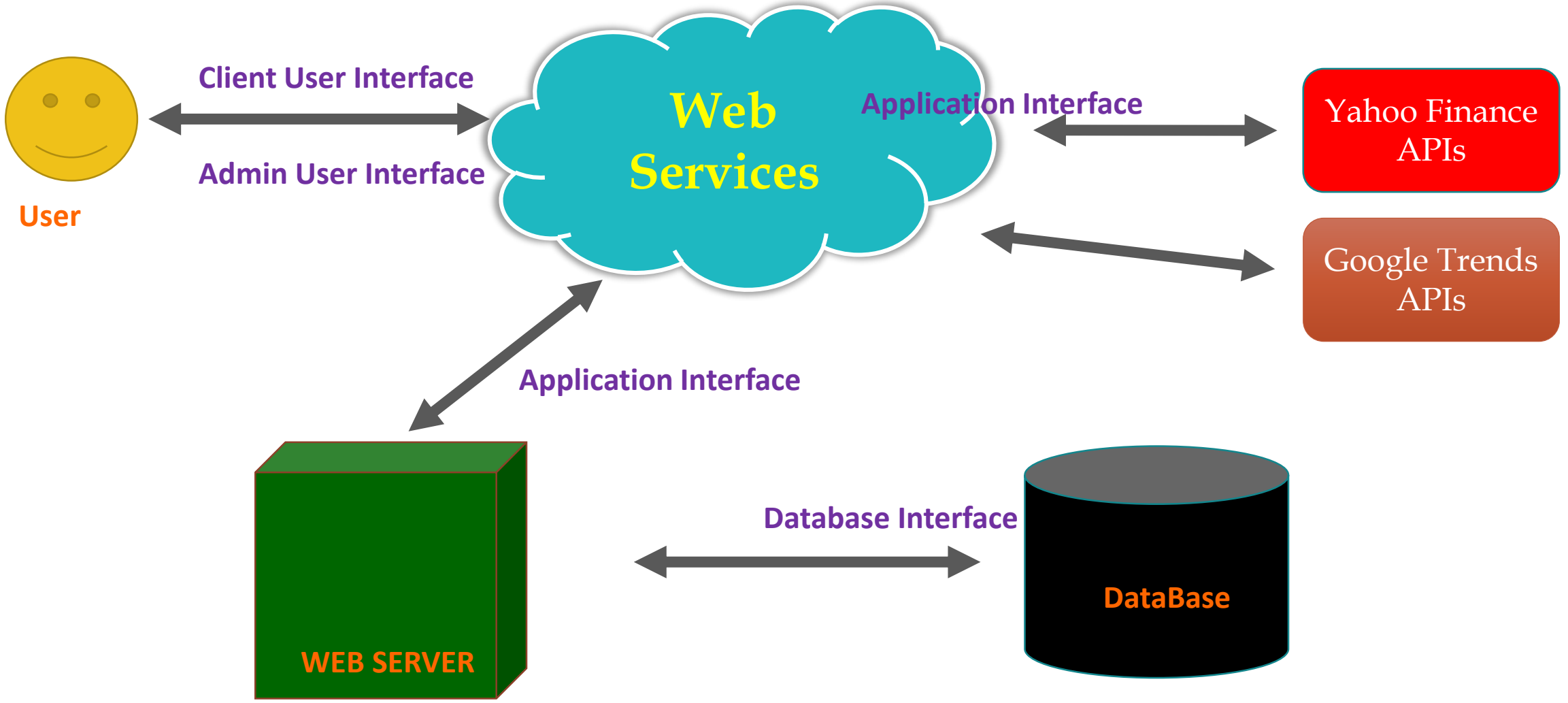
Website Name		Morningstar.com	SmartMoney.com	Wikinvest
Company		Morningstar, Inc.	SmartMoney Magazine	Wikinvest
Web Address		www.morningstar.com	www.smartmoney.com	www.wikinvest.com
Subscription Price		free to $21.95/mo.	free; $5.95/mo. or $58/yr.	free
Portfolio Updates (Frequency of Updates)		automatic (delayed quotes)	automatic (delayed quotes), real-time $58/yr.	automatic (delayed quotes)
Email Alerts (News/Price Targets/Dividends/Splits)		yes (news/dividends/splits)	yes (price targets)	yes (news)
Email Reports (Security Values/Market Summary)		yes (security values)	yes (security values)	yes (security values)
Additional Analysis Tools	Stock Screening/Mutual Fund Screening	yes	yes	
	Financial Planning	yes	yes	
	Interactive Charting	yes	yes	yes
Transactions Handled	Deposit/Withdrawal; Buy/Sell	yes	yes	yes
	Short/Cover		yes	yes
	Margin			yes
	Dividends (Cash/Stock/Splits/Reinvest)	yes	yes	yes
	Receive/Deliver Security			
	Interest Income	yes		
	Treatment of Fees/Commissions	yes	yes	yes
Reports	Current Holdings	yes	yes	yes
	Holdings by Lots			
	Cash Portfolio Status	yes	yes	yes
	Tax Schedules (Interest/Dividends/Capital Gains)			
	Projected Cash Flows			
	Customized Reports/Views	yes	yes	yes
Performance Reports	Security/Industry/Asset Class/Investment Style	yes (security)	yes (security/asset class)	yes (security/industry/asset class)
	Portfolio (Single/Multiple)	yes (single)	yes	yes
	Holding Period/Between Period Returns	yes	yes	yes (holding period)
	Value-Weighted IRR/Time-Weighted Returns	yes	yes (time-weighted)	yes (time-weighted)
	Tax-Adjusted Returns			
	Benchmark Comparison	yes	yes	yes
Import/Export Data		yes	yes	yes

Application Components

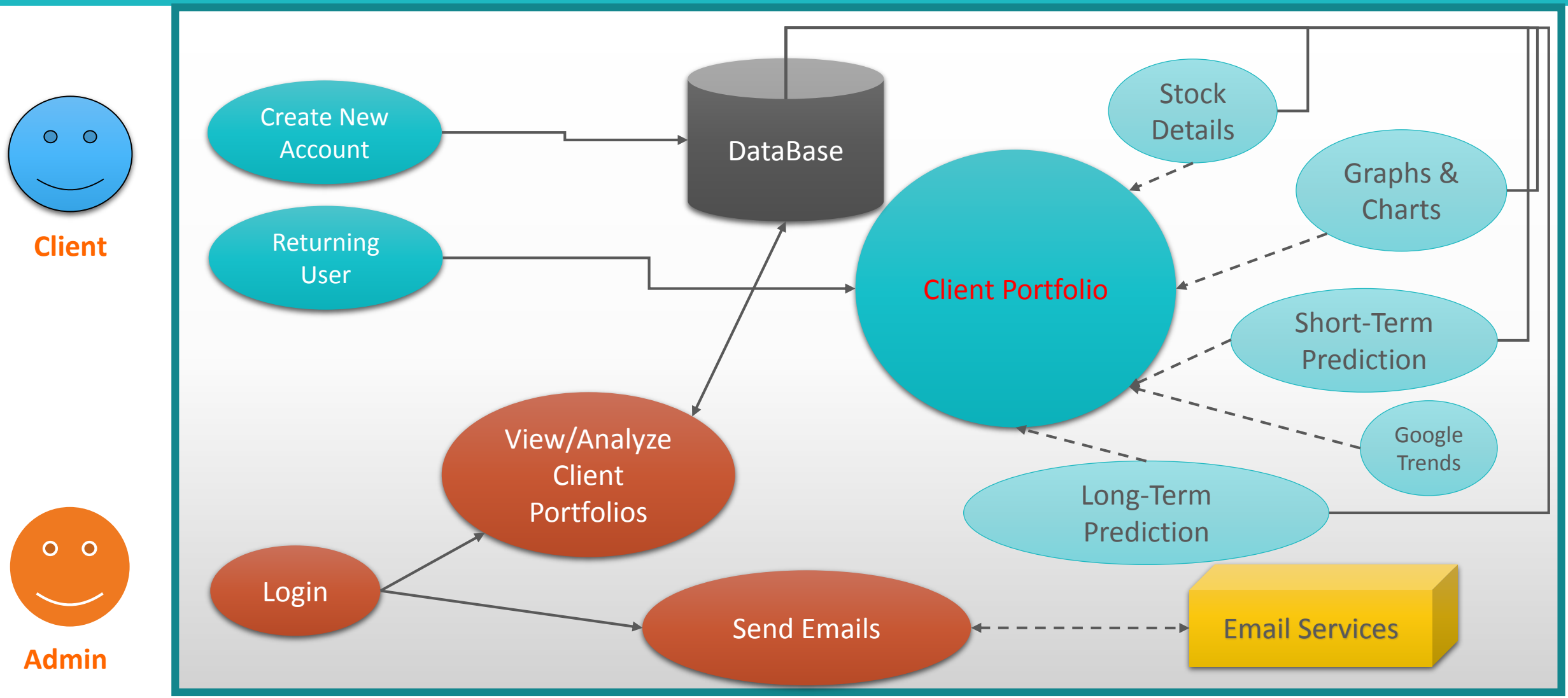
Main Components



High-level Block Diagram



High-level Use Case



Why Stock Prediction ?

It's all about $$$ ..

Why do anyone invest in stock markets ?

$. To become a part owner of the business

$. *To receive profits which are named as* ***Dividends***.

- Stocks are at a relatively high potential in terms of returns when compared to mutual funds and bonds.

The potential comes at a price of high risk of losing some or the total investments at times.

Hence, investors are interested in stock predictions.

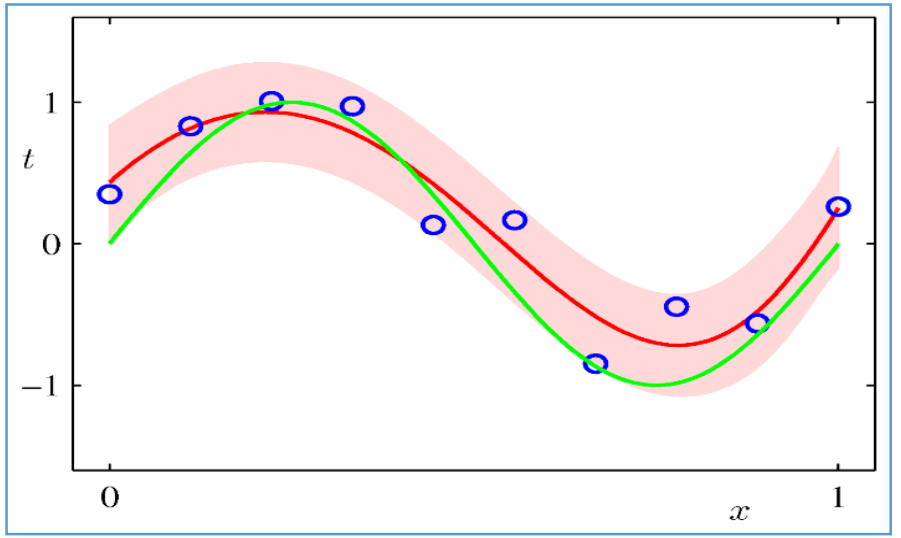
Short term Prediction Strategy - Bayesian

- To predict intra-day stock prices

- Duration
  - Prediction window: 15 min to 1 day
  - Future prediction: 1 to 15 min

About Bayesian….

- Curve fitting is the process of constructing a curve, or mathematical function, that has the best fit to a series of data points, possibly subject to constraints
- Previous data is used to fit the curve and can be used to predict future value.
- Bayesian linear regression is a prediction with the probability of random variable



Long term Prediction Strategy – AI & Machine Learning

- Artificial Intelligence is used as a key tool to predict the stocks based on long-term periods.

- Machine Learning Technique: Support Vector Machine

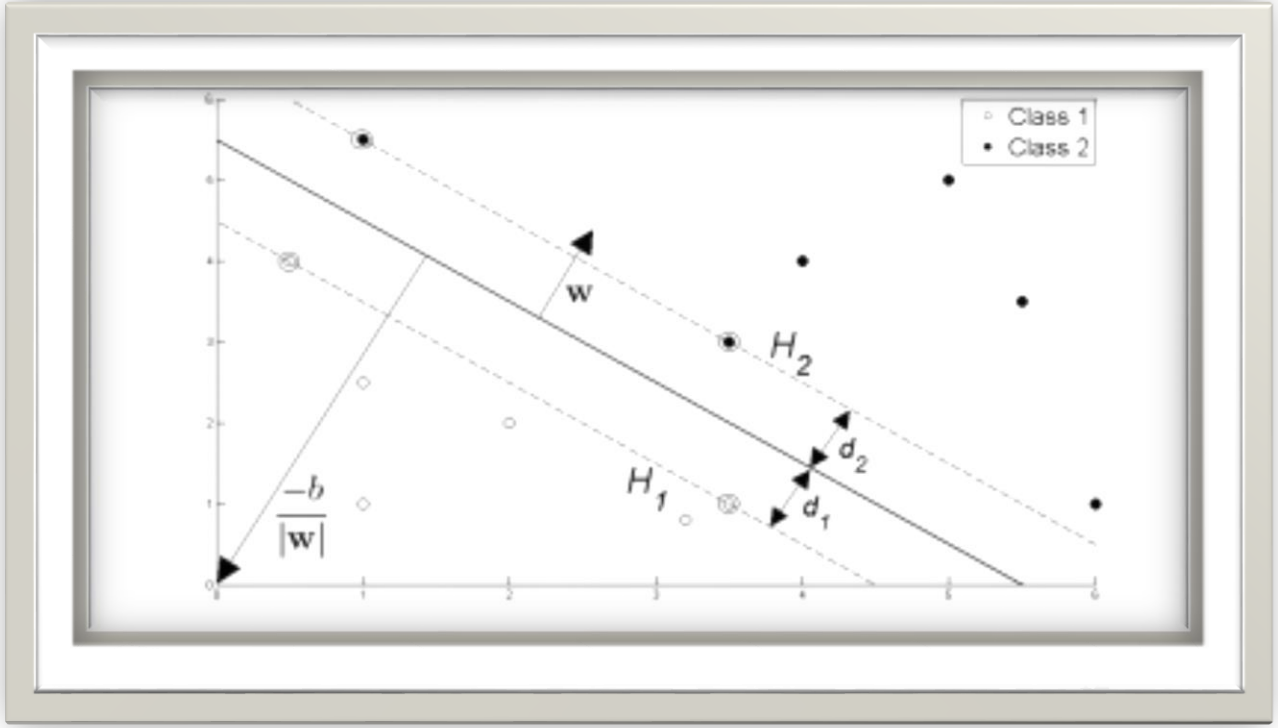
- Artificial Neural Networks

Support Vector Machines (SVM)

- Support vector machines (SVM) are a set of supervised learning methods used for classification and regression analysis.

- Given a set of training data SVM can classify data points as one of two classes.

- This is done by intersecting a hyperplane through the feature space that separates one cluster of similarly labeled training data from another.



Advantages and Disadvantages of SVM

Advantages:

- High Accuracy
- Theoretical guarantees of resistance towards over-fitting data
- Absence of local minima
- Sparseness of the solution and capacity control.

Disadvantages:

- High algorithmic complexity.
- Choice of the kernel
- Memory requirements are huge in large scale tasks

Artificial Neural Networks (NN)

- Neural Networks are able to deal with *uncertain, fuzzy, or insufficient data* which fluctuate rapidly in very short periods of time, neural networks (NNs) have become very important method for stock market predictions.

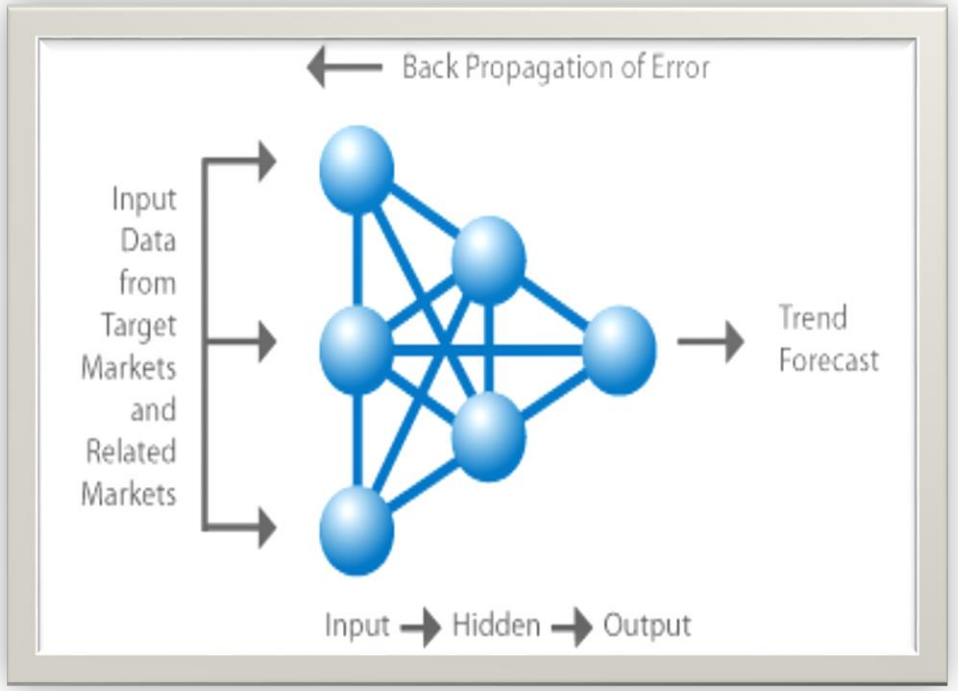
- In essence all forms of time series prediction

are fundamentally the same. Namely given

data $x=x(\tau)$ which varies as a function of time τ,

it should be possible to learn the function that

maps $x\tau+1=x\tau$.



Advantages and Disadvantages of Neural Networks

Advantages:

- Neural networks often exhibit patterns similar to those exhibited by humans. However this is more of interest in cognitive sciences than for practical examples.
- Easy to implement unlike SVN (requiring good linear algebra)

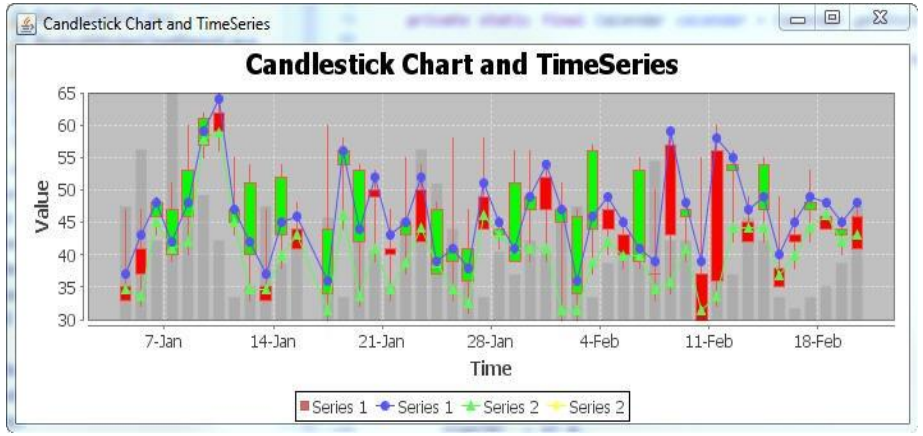
Disadvantages:

- Requires high processing time for large neural networks.

Displaying Patterns and Trends

- We propose using patterns to reduce the uncertainty of forecast.

- **Candle Stick Pattern**
- **Head and Shoulders**

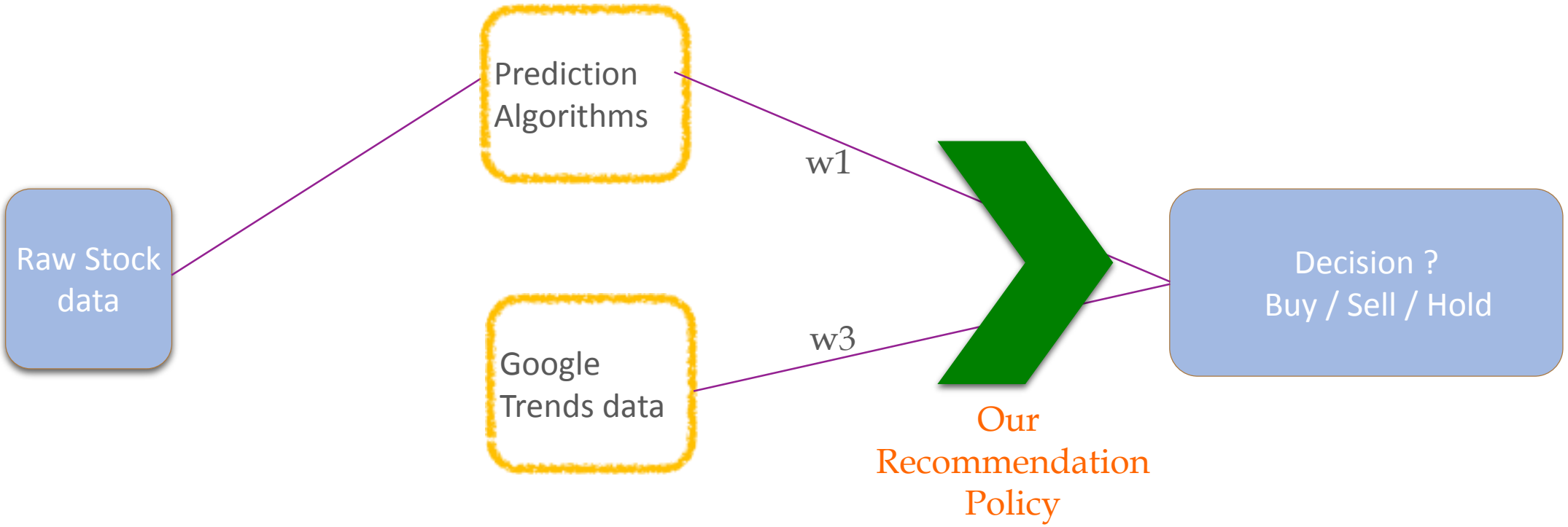


Google Trends :

- Google Trends is a public web facility of Google Inc., based on Google Search, that shows how often a particular search-term is entered relative to the total search-volume across various regions of the world.
- A stock price rise or fall can be correlated to its web search frequency

Decision Making ! – Our Recommendation Policy

- Ultimately, the stock analysis is to make a decision whether to buy, sell or hold a stock.



Anticipated Web Services

Client User Interface

- saveUserInfo()
- IsExisitingUser()
- getUserPersonalData()
- updateUserPersonalData()

- buyStock()
- sellStock()
- holdStock()

- getLongTermPredictions()
- getShortTermPrediction()
- generateCandleStickPatternGraph()
- generateHeadAndShoulderPatternGraph()

Admin Interface

- getRegisterdUsers()
- gerUserPersonalData()
- getUserPortfolio()
- sendEmails()
- analyseUserPortfolio()

Anticipated Web Services

Application Interface

- getHistoricalDataYahoo()
- getRealTimeDataYahoo()

- getLongTermPrediction()
- getShortTermPrediction()

- getFinalRecommendation()

- runBayesian()
- runSVM()
- runNeuralNetworks()
- getGoogleTrendValue()

Database Interface

- getClientUserInfo()
- insertClienUsertInfo()
- updateClientUserInfo()

- insertIntoDBHist()
- insertIntoDBReal()

- insertIntoClientUserPortfolio()
- updateClientUserPortfolio()

Achieved Tasks

- ✓ Project Phase 1 – Data Collection Module
  - ✓ Java module for Data Collection
    - ✓ Historical Data + Real-Time Data
  - ✓ Using Yahoo APIs
- ✓ Bayesian Curve Prediction
  - ✓ Short Term Prediction Ready using Bayesian Curve Fitting
- ✓ Database Design and Schema
  - ✓ Stock Data related schema have been completed and ready.
- ✓ High-level System Use Case Diagram is completed.
- ✓ Algorithm for Neural Networks
  - ✓ A basic prototype of working code of the algorithm is written and tested on a set of stock data.

Our Anticipated Plan of Work

Tasks	Feb-20	Mar-06	Mar-15	Mar-27	Apr-06	Apr-15	Apr-20	Apr-27
Database Design								
User Interface (UI) Design								
Developing Database Interface Webservices								
Developing User Interface Webservices								
Developing Application Interface Webservices								
Implementing Short-term Prediction Algo								
Implementing Long Term Prediction - SVM								
Implementing Long Term Prediction - NN								
Integrating Google Trends in Application								
System Testing and Debugging								
Documentation and Presentations