

COMP4913

Capstone Project

Simulation Game for Learning Algorithmic Trading

Programme-Stream Code:

Supervisor:

Student Name:

Student ID:

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Dr YIU Man Lung Ken

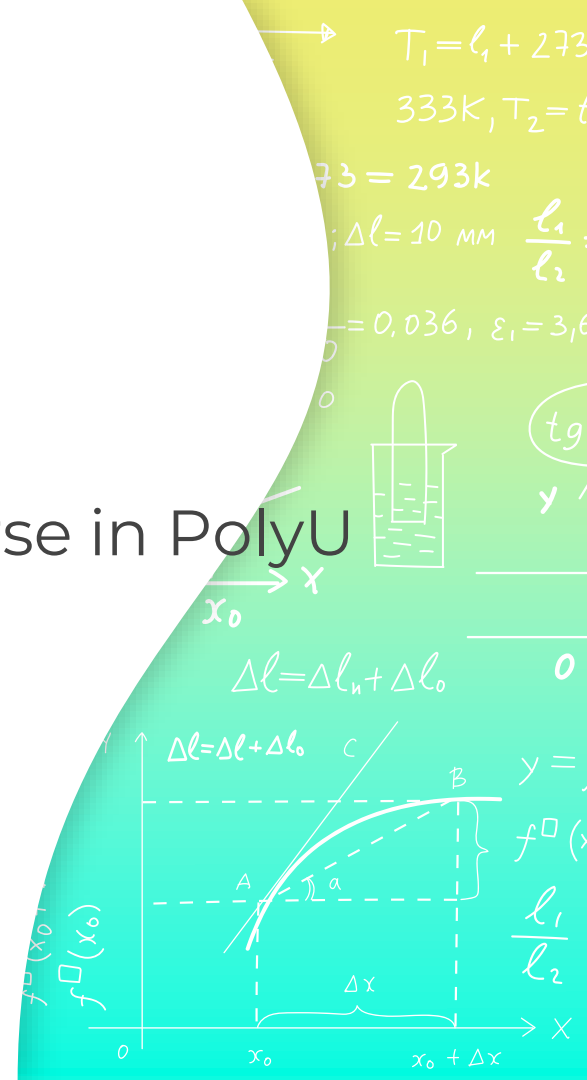
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Project Overview

Algorithm trading

- Complex field
- Trading knowledge
- Programming skill to execute
- Challenging for beginner

Proposed solution

- Web-base software
 - Provide user interface for user to interact with.
- Purpose:
 - Allow users to learn about algorithm trading through the game play in a risk-free environment.
- Target:
 - Beginner



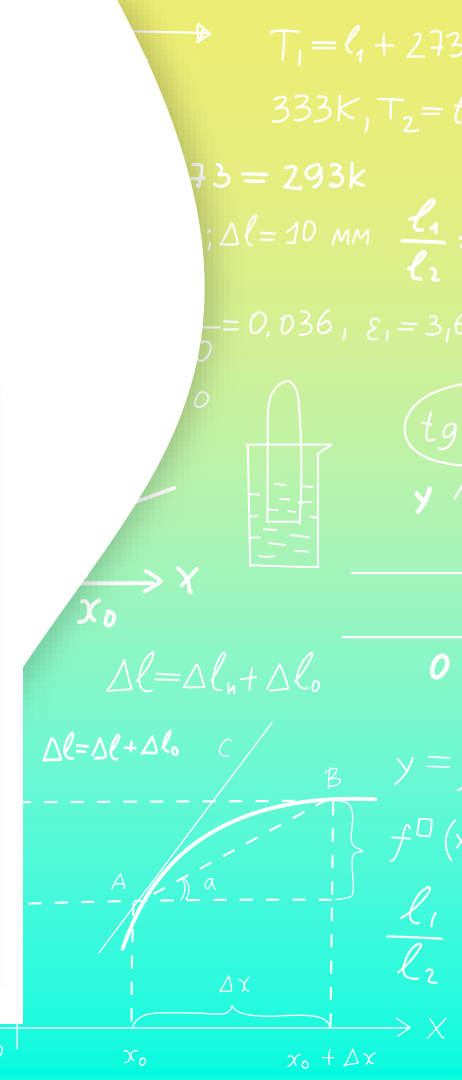
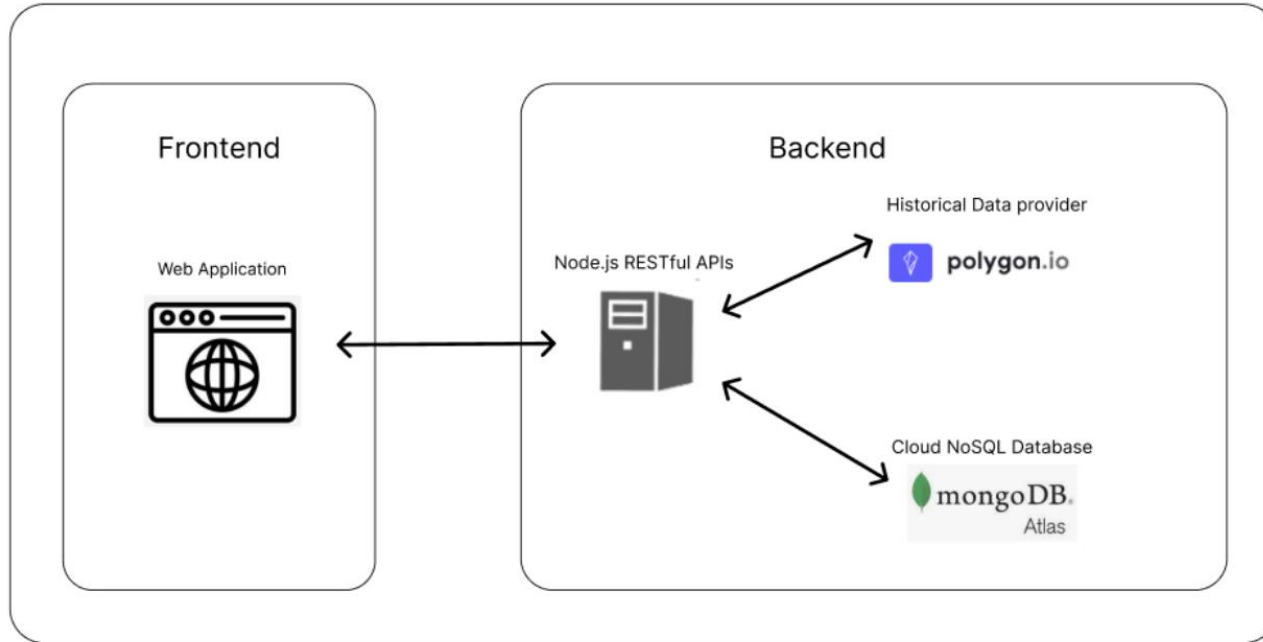
Development Details

- Web-based software
 - Frontend (React)
 - Backend (RESTful APIs server using Node.js)
- Data
 - Using past market data
 - Polygon.io (getting updated data in daily)
- Database
 - Store user data (e.g., rules set)
 - MongoDB



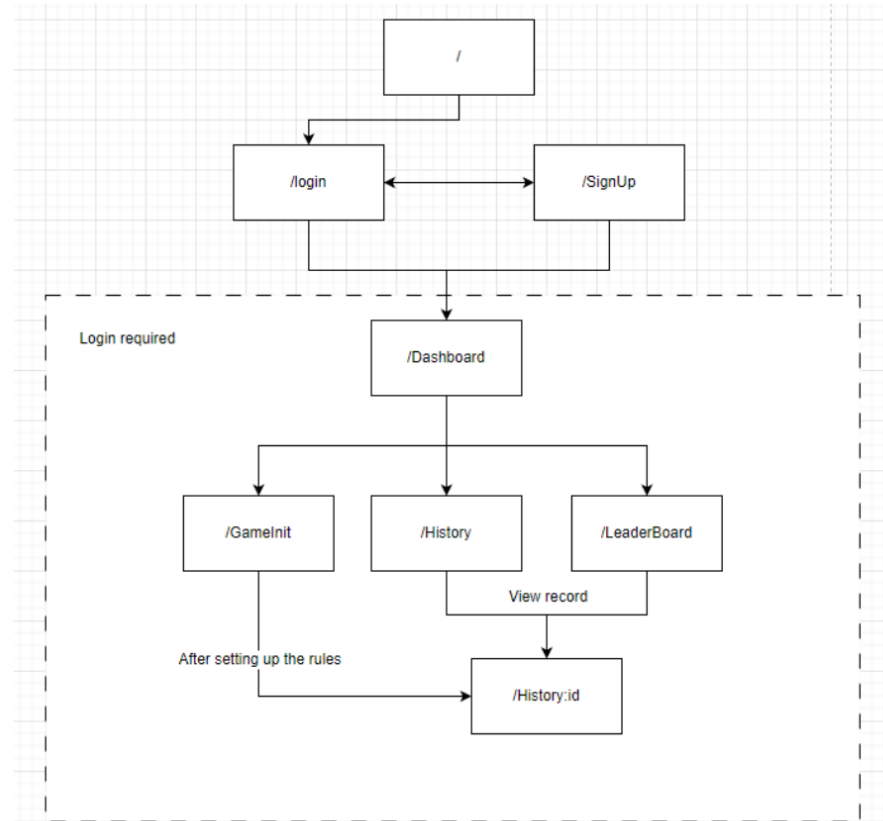
Development Details

- System architecture



Development Details

- Navigation map of the website
- The system require login
- After login (three main functions)
 - New game
 - History
 - Leader board



Game Level

- Three game level
 - Dollar Cost Averaging (DCA)
 - Martingale
 - Custom rules set

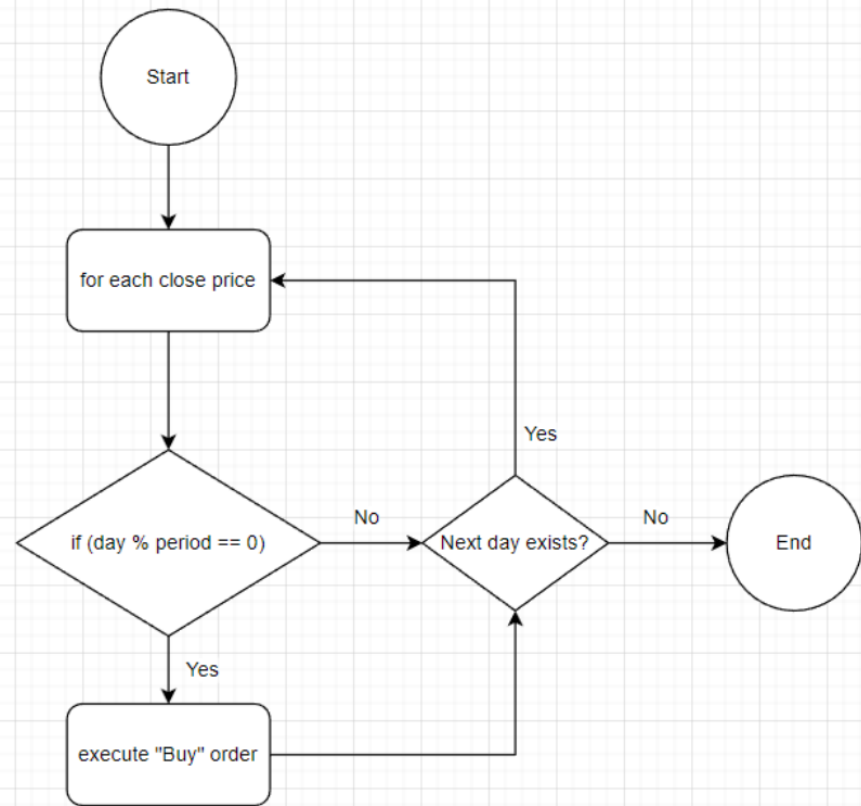


$$T_1 = t_1 + 273$$

$$333K, T_2 = t$$

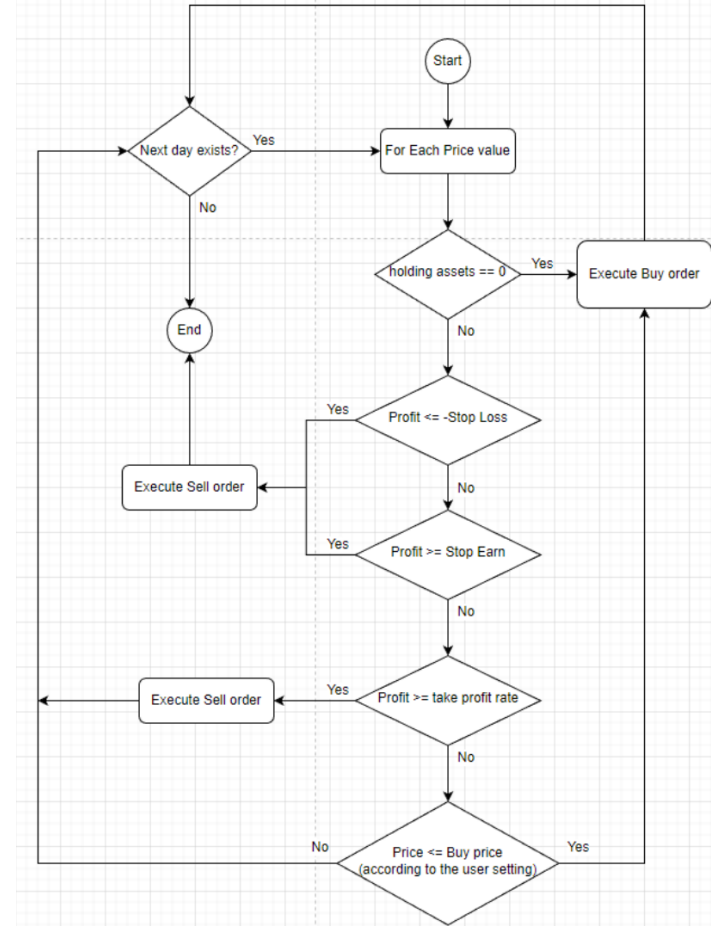
DCA

- Good strategy for beginners who are just starting to invest
- it is simple to understand
- Parameters
 - Invest period
 - Invest amount
- let them feel what it is



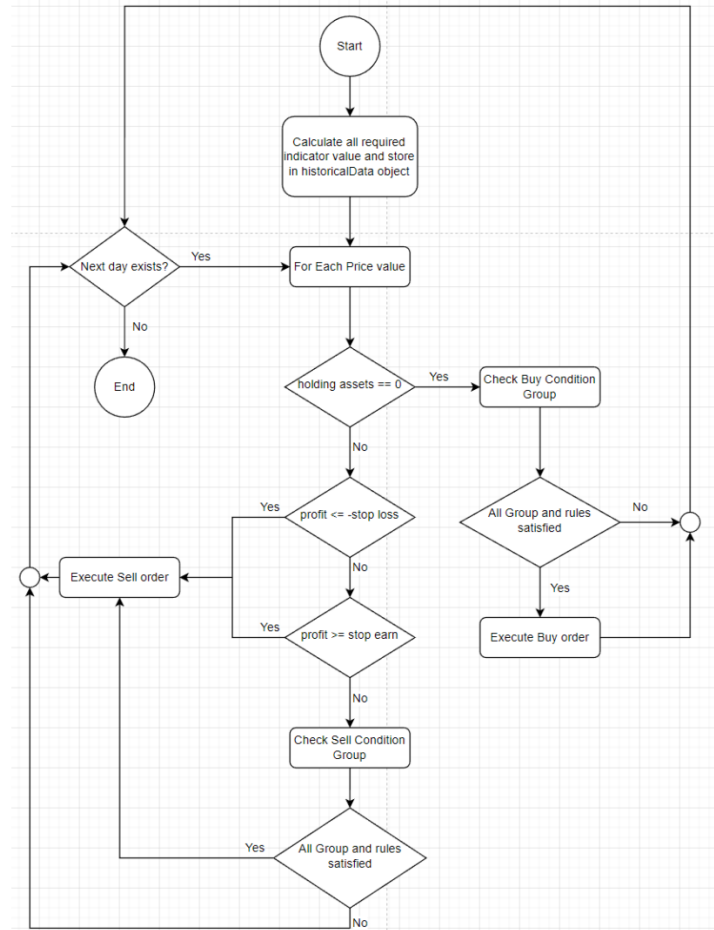
Martingale

- Betting strategy
- Logic:
 - When Lose
 - Increasing the amount of the next bet.
E.g., double the investment
 - Then once win, it will recover all loss with some profit
- High risk algorithm
 - Implementing some risk management concept here such as stop loss
 - to let user to learn this concept



Custom Rules

- Rule-setting options
 - open,
 - high,
 - low,
 - close prices
 - and volume
- Some technical indicators
 - SMA: Simple Moving Average
 - EMA: Exponential Moving Average
 - ADX: Average Directional Index
 - RSI
 - MACD
 - Stochastic Oscillator



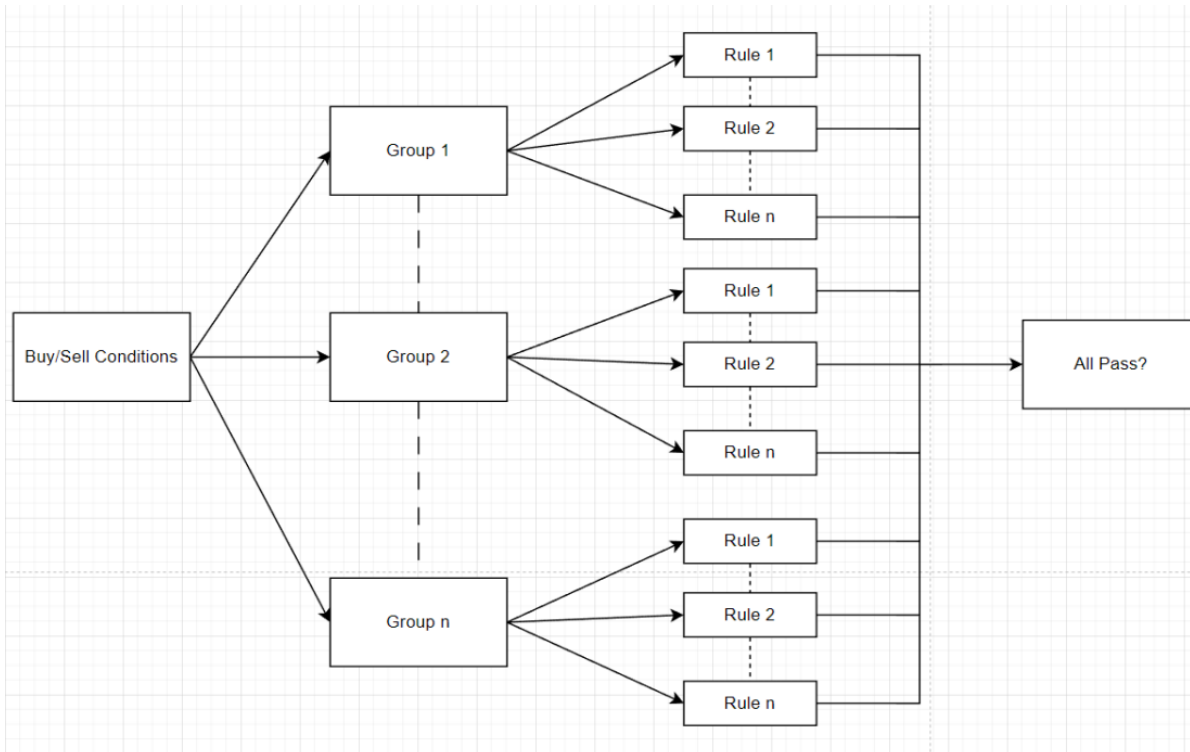
Custom Rules

- User need to setup Buy and Sell Conditions
 - Each condition form with different groups
 - Each group contains different rules
 - Three group operation
 - And: all rules should pass
 - Not: all rules should not pass
 - Count: only number of rules need to pass



Custom Rules

- structure of the condition



$$T_1 = t_1 + 273$$

$$333\text{K}, T_2 = t_2$$

$$73 = 293\text{K}$$

$$\Delta l = 10\text{ mm} \quad \frac{l_1}{l_2}$$

$$= 0,036, \varepsilon_1 = 3,6$$



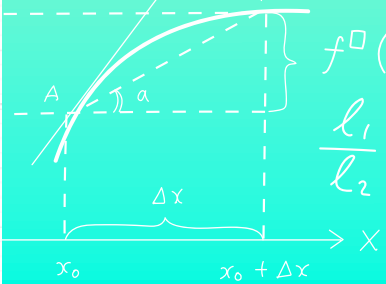
$$tg$$

$$y$$

$$x_0 \rightarrow x$$

$$\Delta l = \Delta l_n + \Delta l_0$$

$$l = \Delta l + \Delta l_0$$



Record

- After setting up the algorithm
- Website will send the request to the server and ask for simulation.
- The response data will show in here.
- Generate buy/sell marker in the candle stick chart
- Profit movement chart
- Investment Summary
- etc

Record Summary

Rules Review



Profit Movement



Investment Summary

Total Invested

€ 1000

No. Trade

€ 9

Holding USD

\$ 0.00

Holding Coin Value

€ 1006.64

Maximum Drawdown

↓ -12.42%

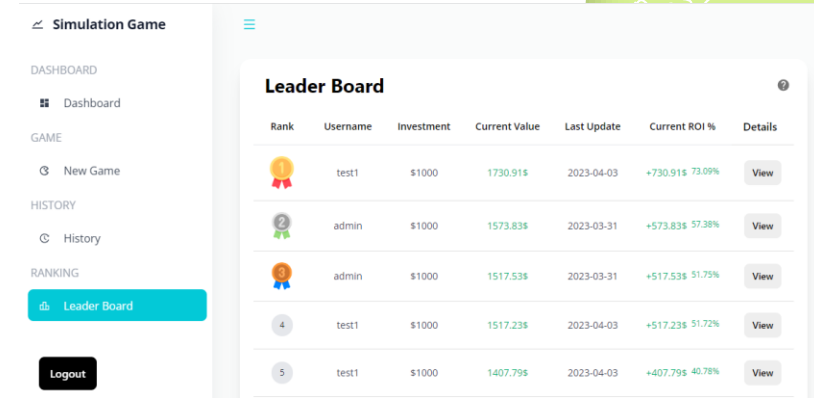
Return on Investment (ROI)

↑ 0.66%

You turn \$1000 into \$1006.64

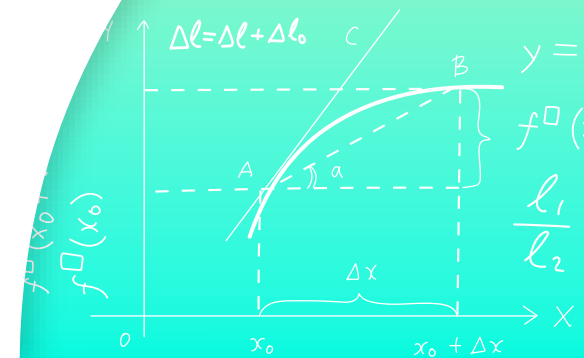
Leader Board

- Allow the users to look at other people's performance
- Ranking according to the ROI (Return on Investment)
- Only the Custom Rules will count
- Updated daily
 - simulation the real time market



The screenshot shows a web application titled "Simulation Game". On the left is a sidebar menu with sections: DASHBOARD (containing "Dashboard"), GAME (containing "New Game"), HISTORY (containing "History"), and RANKING (containing "Leader Board", which is highlighted in blue). Below the menu is a "Logout" button. The main content area displays the "Leader Board" for the "Simulation Game". It features a table with columns: Rank, Username, Investment, Current Value, Last Update, Current ROI %, and Details. The table lists five entries, with the first three having medal icons (Gold, Silver, Bronze). Each entry has a "View" button next to it.

Rank	Username	Investment	Current Value	Last Update	Current ROI %	Details
1	test1	\$1000	1730.91\$	2023-04-03	+730.91\$ 73.09%	View
2	admin	\$1000	1573.83\$	2023-03-31	+573.83\$ 57.38%	View
3	admin	\$1000	1517.53\$	2023-03-31	+517.53\$ 51.75%	View
4	test1	\$1000	1517.23\$	2023-04-03	+517.23\$ 51.72%	View
5	test1	\$1000	1407.79\$	2023-04-03	+407.79\$ 40.78%	View



Integration with Course in PolyU

- This game can be utilized in various courses at PolyU
- Finance, technology, Fintech course
- Such as COMP4141, COMP4531
- Help them to gain hands-on experience in related topic

6. Beyond Crowdfunding: Crowdsourcing and Monetisation of Crowdsourcing

7. E-Trading: Technology, Systems and Algorithmic Trading

Syllabus of COMP4141

1. Current state of the major thematic areas in the FinTech ecosystem such as infrastructure (e.g., identity, privacy, security), crowdfunding (e.g., types, platforms, applications), **e-trading (e.g., algorithmic trading)** and peer-to-peer (P2P) lending.

Syllabus of COMP4531

Demo



The image is a collage of mathematical and scientific diagrams and formulas. It features a green background with white text and formulas, a blue background with a white diagram of a container, and a white background with a blue diagram of a curve and its tangent line.

Green Background:

- Formulas: $T_1 = t_1 + 273$, $333K, T_2 = t_2 + 273 = 293K$, $\Delta l = 10 \text{ mm}$, $\frac{l_1}{l_2}$, $\epsilon = 0,036$, $\epsilon_1 = 3,6$.
- Diagram: A simple line drawing of a container with horizontal lines inside, representing a liquid level.
- Text: tg and y are written in a circle.

Blue Background:

- Diagram: A graph showing a curve $f(x)$ and its tangent line at point A . The x-axis is labeled x and the y-axis is labeled $f(x)$. The point A is at x_0 on the x-axis. The point B is at $x_0 + \Delta x$ on the x-axis. The horizontal distance between A and B is labeled Δx . The vertical distance between the tangent line at A and the curve at B is labeled $\Delta l = \Delta l_n + \Delta l_o$. The angle between the tangent line and the curve at A is labeled α .

White Background:

- Diagram: A simple line drawing of a container with horizontal lines inside, representing a liquid level.