Agent-based Computational Investing Recommender System

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Introduction

- The financial landscape is complex and volatile by nature, making timely information about market trends is critical to strategic success.

- People prefer to trade online through the Web use online financial services rather than using full-service brokerages.

- There are more threats or opportunities to lose or make money.

- The stocks' data change continuously, while trading information and news regarding financial status of the companies are instantly available.

Agent-based Computational Investing

- It is a complex, dynamic and adaptive system where agents are interacting with each other based on rules to process economic information, perceive the environment and take action.

- Current fully automated trading systems are totally automatic and independent from human decisions.

The stock market roller coaster.

Problem Statement

- Practitioners try to guide the timing and selection process of investment typically relying on one of two available main frameworks, called technical analysis and fundamental analysis. Stocks price prediction is very non-stationary and time-varying and none of these is sufficient and absolutely superior to the other.

Problem Statement

- Financial markets are too sensitive; they're affected by so many elements (such as government policies, sanctions, international dependencies, etc.) that it's quite impossible to realize predictions with enough confidence.

- The economic situation which developed after 2008 has made this lack of forecasting precision quite clear.

2008 - MAJOR MARKET FALLS

- New York - down 33.84%
- London - down 31.3%
- Paris - down 42.7%
- Frankfurt - down 40.4%
- Mumbai - down 51.9%
- Singapore - down 49.2%
- Sydney - down 41.3%
- Hong Kong - down 48.3%
- Shanghai - down 65.2%
- Tokyo - down 42.1%

Recommender Systems

- Recommender systems are employed to help people to select and make their choices based on the knowledge which they have.

- Content-based recommender system brings up those web pages with contents similar to users' queries.

- Collaborative recommender systems accumulate items ratings from other users and make recommendations depending on those ratings.

Recommender System (hybrid approach)
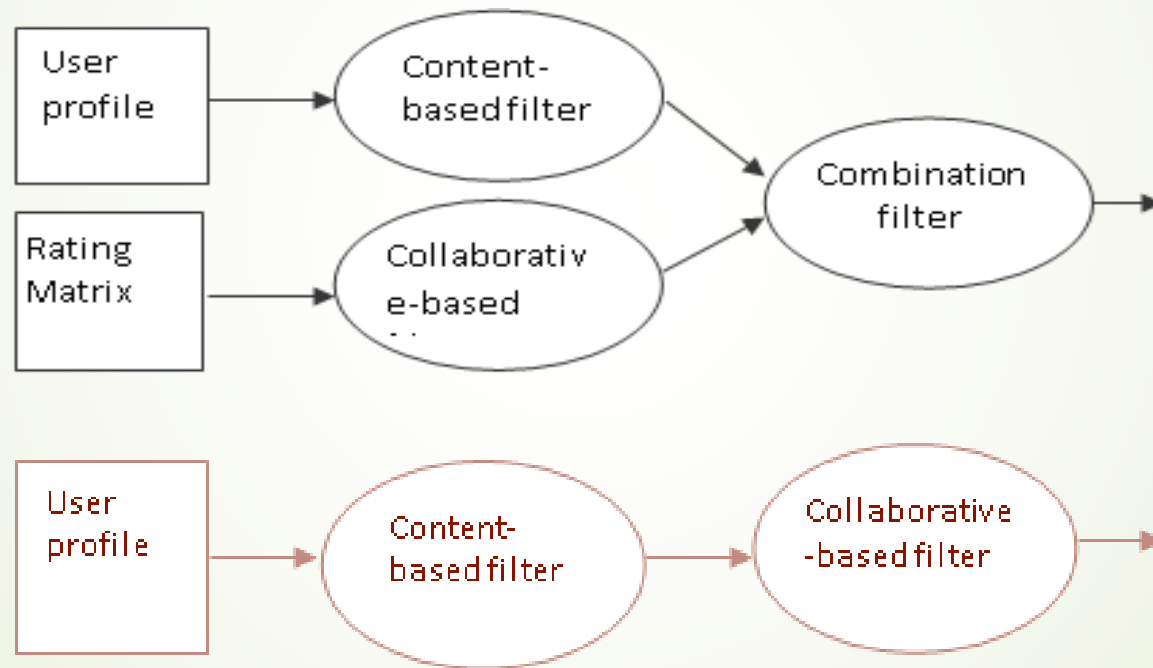
Problem Statement

- Users mainly are not happy with the recommendations which are not of their interest. This recommendation error is called false positive and it will lower their trust in the future.

- Many high-return projects need long-term commitment of capital. Meanwhile, most of the investors are reluctant to invest in a project for long period and are not enough confident.

Problem Statement

- Each trader has different style of investment from another investor, some of them are concerned about long term returns and some are more aggressive risk takers. Some may prefer to know what the other investors with the same favour are investing for, or there may be some novice investors which would like to know the professional investor's profile.
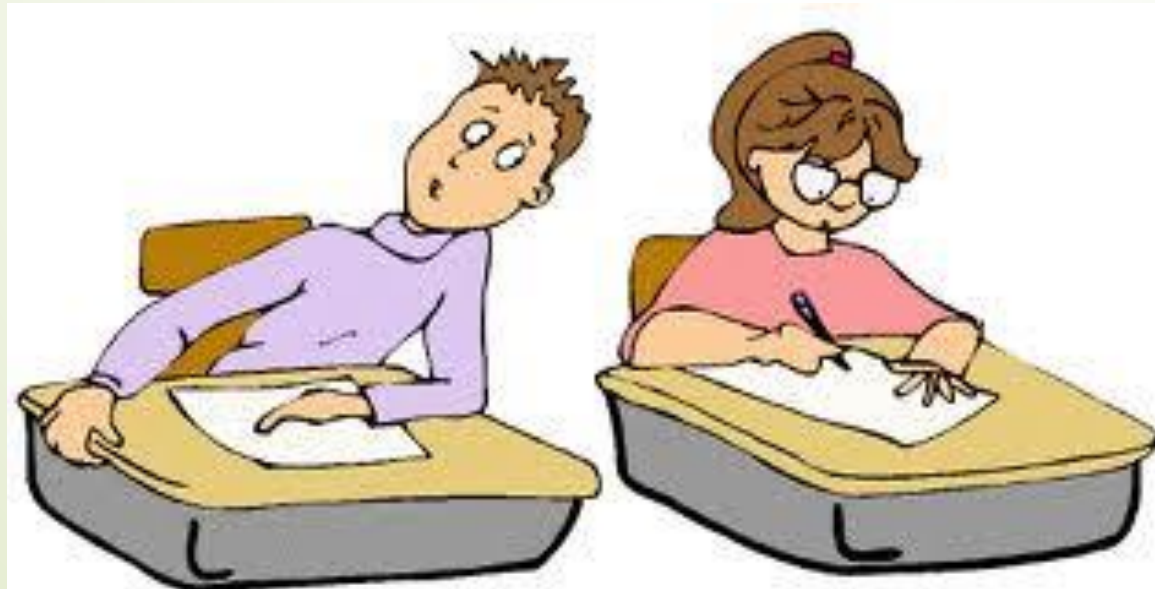
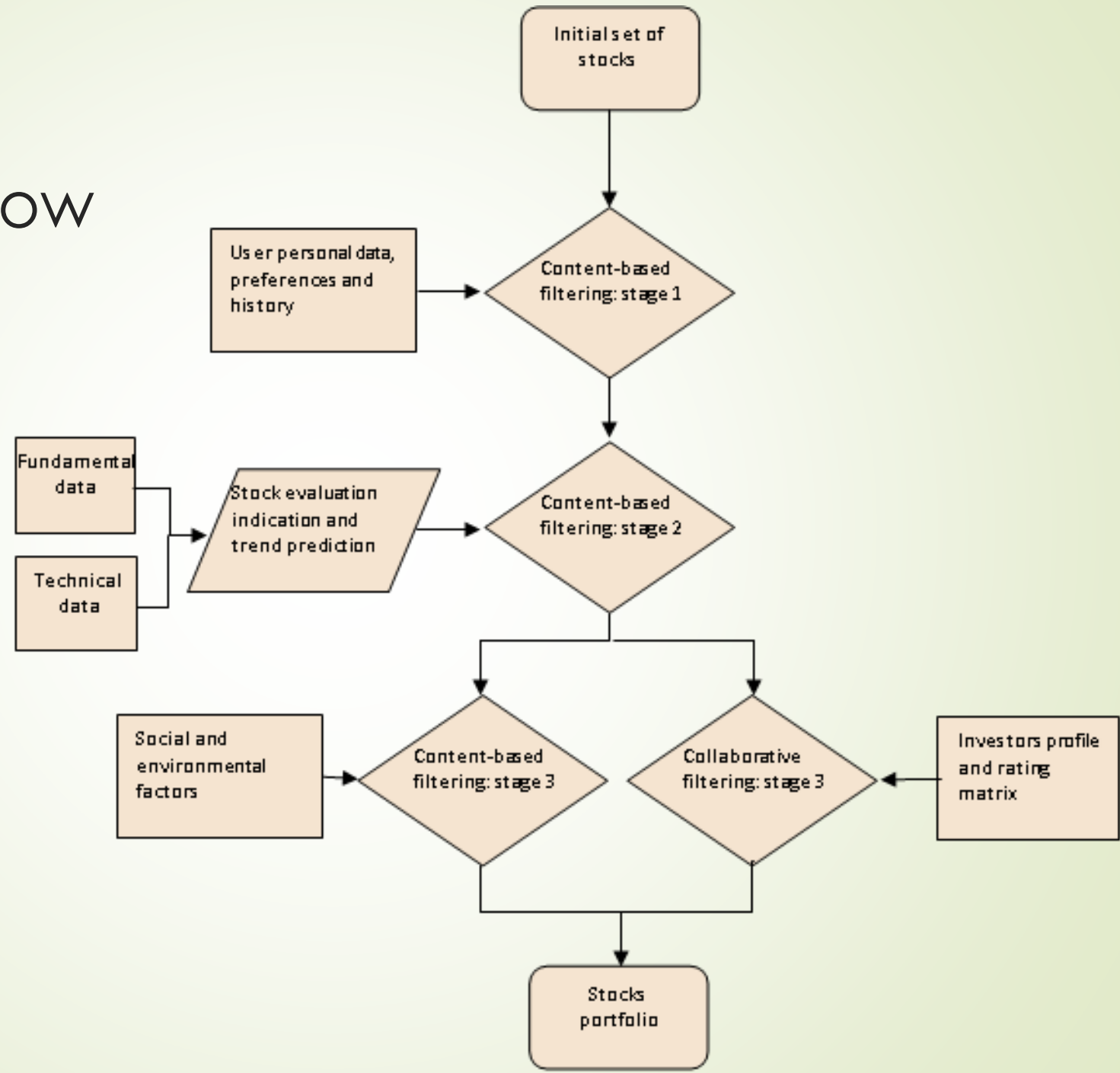# Agent-based Computational Investing Recommender System (ACIRS)
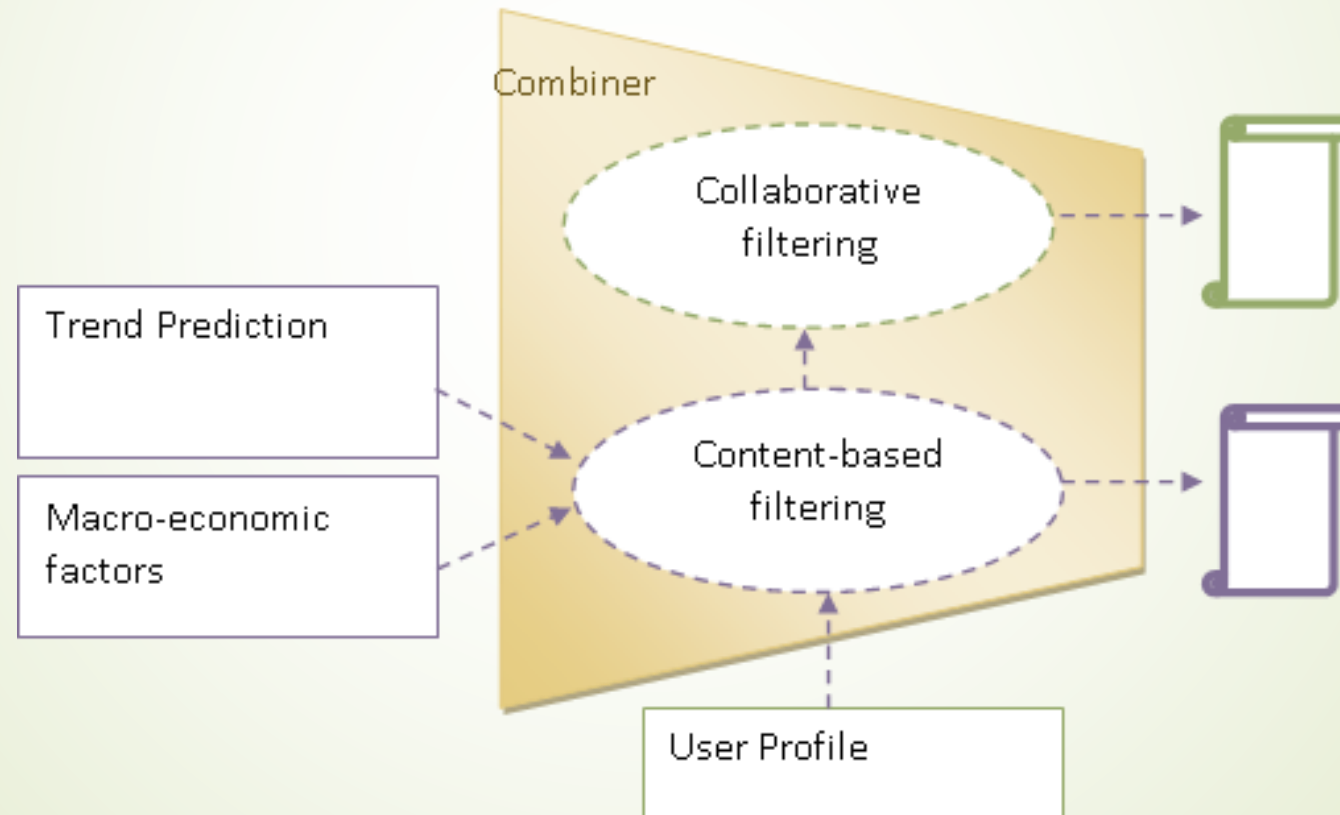
ACIRS' Framework
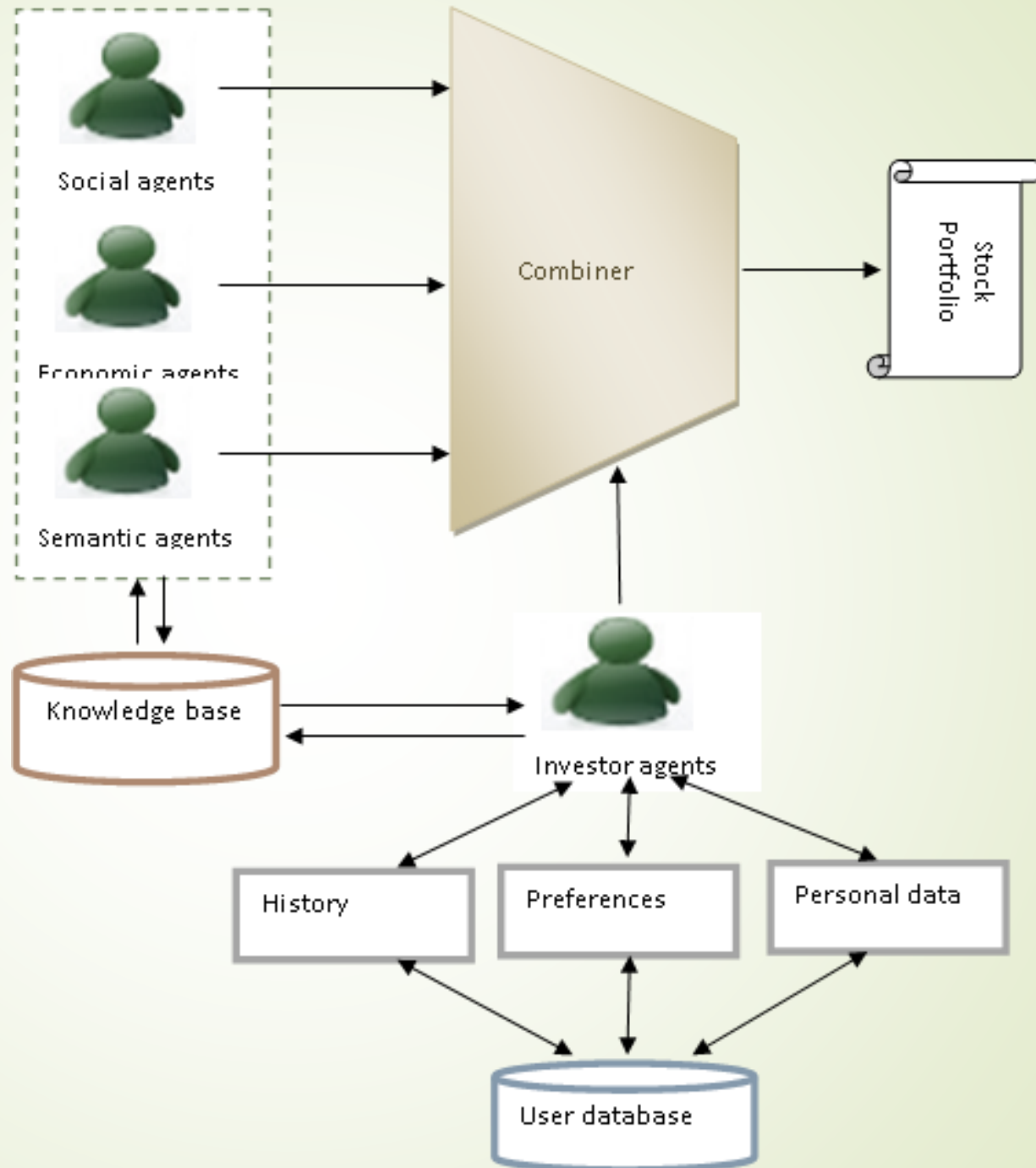
ACIRS' Process flow

Prototype and Evaluation

- Train the system using Neural Network machine learning technique .

- The required data for training and testing is supposed to be collected from Bursa Malaysia, and the data regarding investors is to be collected using a global survey.

- To evaluate the system in a real stock market using several samples of investors and stock and compare the ACIRS's recommendations, investors satisfaction and actual purchase or sell of the stocks through a survey.

Hypothesis and Research Questions

- H1. There is a strong linkage between investors' politic view, race and religion with their investment and stock selection.

- H2. Environmental factors, such as government policies, have a significant impact on stock market and time series forecasting.

- H3. Novice investors prefer to trust the professional investors' choice to buy the same stock at the same time.

- H4. A predictive financial volatility intelligent system which considers environmental factors and investors preferences in real-time, has much higher usability, accuracy and lower false positive rate.

- R1. Which environmental factors have the most effects on stock market?

- R2. How the environmental factors can be used in a real-time predictive system?

- R3. How efficient is a trading recommender system and how investors would trust such system?

- R4. How a prediction model can be tight up with recommendations produced by a recommender?

Research methodology
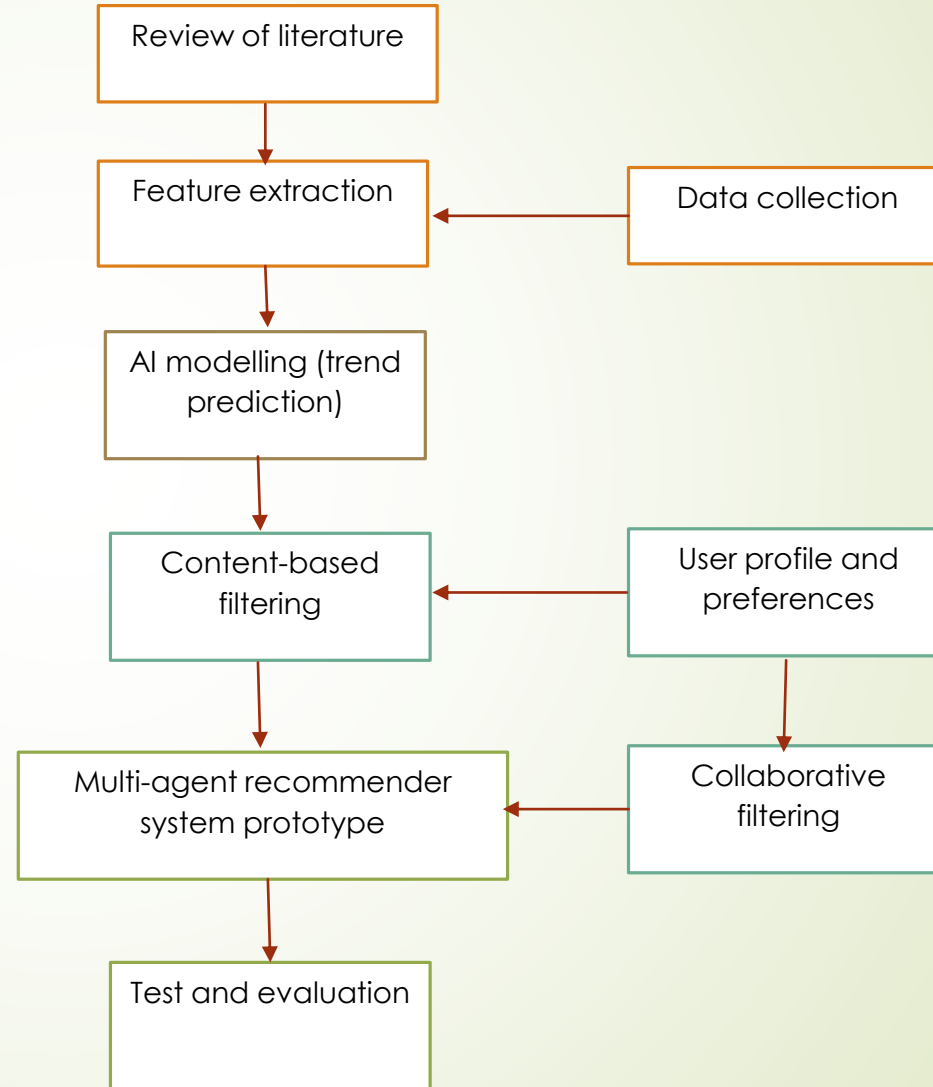
Research contributions

- This study contributes in two aspects. The first is development of a recommendation system using advanced technologies such as semantic ontologies and predictive algorithm which has not utilized by any recommendation systems. Using prediction in content-based algorithms employed by recommenders is quite innovative and opens a new area in this field.

- The second contribution aspect is the application of a recommender system in finance and stock market which has not applied before. Although there are some basic software that predict market trend, but there is no real-time recommender which consider environmental factors and propose stocks based on predicted future price, investors' styles and preferences. In addition, the system recommendations are also based on what the other investors with the same style and preferences have done. This significantly helps novice investors to make decision based on professional investors' actions.