

# Development of an AI powered Digital Platform for Investment Management

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**Abstract - The proposed system implements a web-based platform that offers a range of investment management services like risk-based profiling and matching of similar investors to form capital pools using Machine Learning, highly-customized term sheets and contract terms, to an alternative investment company/ individual.**

**Keywords - Stocks, Investment Management, Machine Learning, Artificial Intelligence, Decision-Making, Risk Assessment, Support Vector Regression, Profit, Loss, ROI.**

## I. INTRODUCTION

The fundamentals of investing lie in data identification, asset valuation and risk management. Artificial Intelligence (AI) techniques apply to many aspects of financial investing such as credit risk assessment, and machine learning techniques for stock valuation. The concepts of AI encapsulate knowledge-based Data Mining, Machine Learning (ML), and natural language processing (NLP) techniques.

Over the years, there has been development of algorithms and techniques in the field of Computer Science and Data Science, such as:

- Expert systems based on Knowledge interpretation and Data Mining Techniques.
- Genetic algorithms and neural networks on the concepts of Data Science.
- NLP and image processing techniques for sensory/motor modules.

These algorithms satisfy the prerequisites needed for accurate investment planning and digital trading systems.

## II. NEED FOR DIGITIZING INVESTMENTS

Alternative Investment management industry (Private Equity, Venture Capital) has faced a highly skewed, semi-efficient performance, esp. in India. While digital technologies can help, the industry has not taken up mainstream digital transformation so far, mainly due to its analytical complexity and dependence on local market presence & sector expertise. With latest advancements in AI (esp. deep learning), this niche space can be significantly disrupted along core parts of its value chain[1]

India's growth story is strongly dependent on the

development of its SME sector and new-age innovative firms. Many of these firms are dependent on capital to drive this growth. Since business loan system in India are highly selective and risk-averse (more than 90% of the loan applications are rejected in India), most small & medium enterprises raise through alternative investment management industry (private equity, venture capital, angel networks and private banks) for growth.[2]

However, the investment industry beyond online distribution has remained averse to digital transformation, especially due to the complexity of investment analysis. As a result, most alternate investment firms have remained semi-efficient. The alt. investments industry in India fail to allocate more than 30% of their available capital, which amounts to an opportunity loss of \$1.7 Trillion globally, and close to INR 50,000 Crores in India. Also, about 94% of the industry produces less than 2x as return (while the top 6% produces 10x returns).

## III. RELATED WORK

Stock predictions have existed for a long time in the past. They use historic stock data [2] to determine the results for the next few years. The probability may vary from algorithm to algorithm and module to module. Some use CNN models and some use fuzzy systems. The most important aspect irrespective of the model is the ROC and AUC that each model decides [3].

Like the other models this model too will aim at predicting the existing values in the stock listing and map it onto a graph with varying accuracy from kernel to kernel[4] investor to view. Here, we have used Amazon's historic stock data for 2018. Once the investor and company come to commensurable terms, the deal is put on the table and contracts are formed.

### IV. COMPANY MODULE

The company registers on the portal with their unique company ID, company name, representative name and other various fields. These fields allow the company to authenticate and validate themselves on the portal for further usage.

An account is created for the company and an entry is made to the database. The company then chooses a project domain in which they can publish their monetary needs. They can decide a vesting period that they want for the investor to be associated with the project.

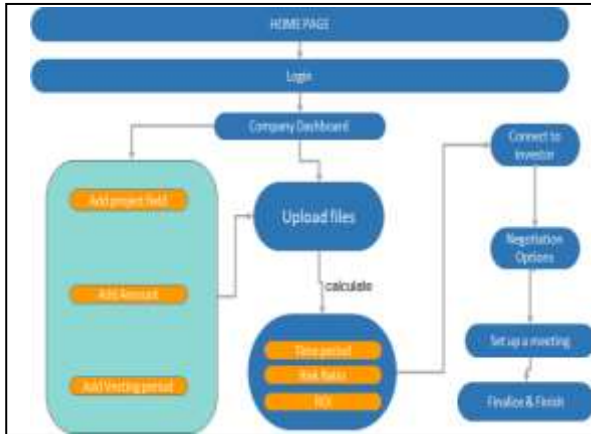


Fig. 1. Company Module

The company is given a button to enable the option to upload a document. They must upload a ‘Comma Separated Values’ file or commonly called as csv file, of their historic stock data consisting of dates, opening, closing, high, low, Adjacent Close and Volume. This csv file is used by the algorithm to determine the profit, loss, Risk Ratio, Prediction values and other results for the is in the database, they are taken to a home page.

On the homepage, the investors are able to give preferences suitable for their proposal. They can filter projects by field of interest, vesting period, amount, time period, risk, returns, etc.

|    | A          | B         | C       | D       | E       | F       | G        |
|----|------------|-----------|---------|---------|---------|---------|----------|
| 1  | Date       | Adj Close | Open    | High    | Low     | Close   | Volume   |
| 2  | 03-12-2018 | 1772.36   | 1769.46 | 1778.34 | 1730    | 1772.36 | 6862300  |
| 3  | 04-12-2018 | 1668.4    | 1756    | 1770.34 | 1665    | 1668.4  | 8694500  |
| 4  | 06-12-2018 | 1699.19   | 1614.87 | 1701.05 | 1609.85 | 1699.19 | 8789400  |
| 5  | 07-12-2018 | 1629.13   | 1705.07 | 1718.93 | 1625.46 | 1629.13 | 7576100  |
| 6  | 10-12-2018 | 1641.03   | 1623.84 | 1657.99 | 1590.87 | 1641.03 | 7494800  |
| 7  | 11-12-2018 | 1643.24   | 1678    | 1679.47 | 1619.6  | 1643.24 | 6244700  |
| 8  | 12-12-2018 | 1663.54   | 1669    | 1704.99 | 1660.27 | 1663.54 | 6598000  |
| 9  | 13-12-2018 | 1658.38   | 1680    | 1692.12 | 1641.5  | 1658.38 | 5271300  |
| 10 | 14-12-2018 | 1591.91   | 1638    | 1642.57 | 1585    | 1591.91 | 6367200  |
| 11 | 17-12-2018 | 1520.91   | 1566    | 1576.13 | 1505.01 | 1520.91 | 8829800  |
| 12 | 18-12-2018 | 1551.48   | 1540    | 1567.55 | 1523.01 | 1551.48 | 6523000  |
| 13 | 19-12-2018 | 1495.08   | 1543.05 | 1584.53 | 1483.18 | 1495.08 | 8792200  |
| 14 | 20-12-2018 | 1460.83   | 1484    | 1509.5  | 1432.69 | 1460.83 | 9991800  |
| 15 | 21-12-2018 | 1377.45   | 1464.99 | 1480    | 1363.96 | 1377.45 | 13640300 |

Fig. 2. Snapshot of amazon.csv file used in this model.

### V. INVESTOR MODULE

The investors, like the company, must also register themselves on the portal before being able to make any transactions. The registration demands basic identification details to validate the user. Once the user is in the database, they are taken to a home page.

On the homepage, the investors are able to give preferences suitable for their proposal. They can filter projects by field of interest, vesting period, amount, time period, risk, returns, etc.

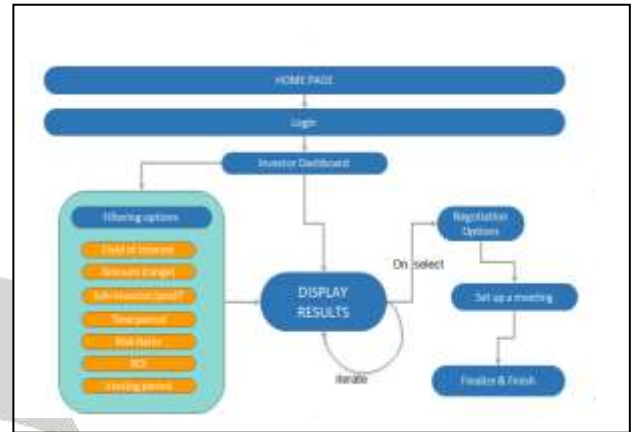


Fig. 3. Investor module

Once their filters are determined, the algorithm displays an assortment of projects and their demands. The investors may choose to browse through various projects is below threshold set by the investors, then it is not displayed for them and select those of their liking. On successful completion of deciding a project to invest in, they can request further documentation necessary for processing formalities.

$$Risk\ Ratio = \frac{Reward}{maxRisk}$$

### VI. IMPLEMENTATION

The Platform caters to both, Investors and Small Medium Enterprises (SME’s)/Companies in need for a venture. The user has to first register themselves as either the investor or company in order to avail the services. The portal calculates the risk profit (Reward), Loss (Risk) and Risk Ratio of the file provided by the company.

It displays the results as tiles on the portal with other Another important feature of the portal is the Return on Investment (ROI) prediction[4]. The portal determines the ROI of the project based on the documents submitted. In this module, the dividend is calculated from the stock prices as follows:

$$Dividend = Final\ Price - Opening\ Price$$

This dividend demonstrates the end of the day surplus for the company. This dividend is added to the closing price

and this result is divided by the opening price to beget the ROI [4]. results from different companies.

$$ROI = \frac{Closing\ Price + Dividend}{Opening} \times 100$$



Fig. 4. Workflow diagram

The complete cycle is iterated till the investor and company comes to mutual agreement on the terms and conditions of the deal. The machine processes, cleans and consolidates useful data into lists and arrays. These arrays are used by the algorithm to calculate statistical requirements of the investor.

The Risk and Reward associated with the current valuation are computed and used to develop the risk ratio needed to determine whether the project is investment worthy [5]. A higher risk ratio determines higher profitability for the investor. If the valuation of a project

All these features are graphically displayed to the investors enabling them to take judicial decisions before blocking their capital. These graphs are supported by machine learning algorithms that help fit the data in a stream. The SVR module fits the arrays into 3 kernels (Linear, Polynomial, Radial Basis Function) providing a range of accuracy.

### VII. RESULTS

On observation, we can see that the evaluation obtained after computation, takes the form of an array of answers. Each value is co-dependent on the date and the price at the end of the day.

The block below shows the profit analysis in the form of an array. This array is later plotted on a 3D histogram model to pictographically represent all profit valuations.

|   |           |           |           |            |           |           |
|---|-----------|-----------|-----------|------------|-----------|-----------|
| [ | 8.880005  | 14.339966 | 86.180054 | 13.860108  | 34.150024 | 1.469971  |
|   | 35.98999  | 12.119995 | 4.569946  | 10.130005  | 27.550049 | 41.47998  |
|   | 25.5      | 15.01001  | 50.030029 | 104.270019 | 14.800049 | 40.119995 |
|   | 9.959961] |           |           |            |           |           |

Fig. 5. Profit Array

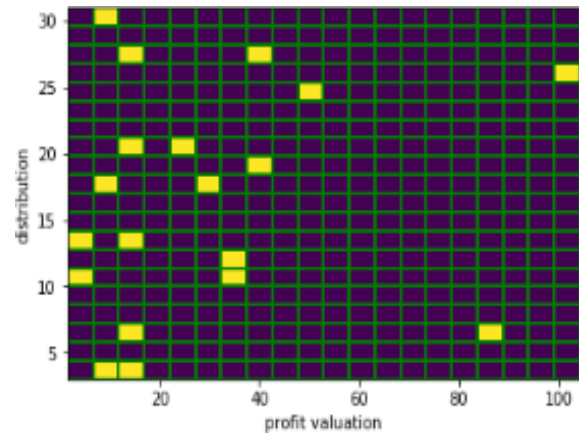


Fig. 6. 3D histogram for Profit

Similarly, loss to is calculated in an array channel and represented graphically for visual assistance [5].

|   |            |            |          |           |           |           |
|---|------------|------------|----------|-----------|-----------|-----------|
| [ | 39.459961  | 91.        | 5.020019 | 79.609985 | 32.969971 | 58.400024 |
|   | 8.72998    | 38.5       | 53.      | 60.98999  | 16.98999  | 59.069995 |
|   | 51.310059  | 101.030029 | 39.      | 5.000005  | 63.889992 | 24.349976 |
|   | 23.000049] |            |          |           |           |           |

Fig. 7. Loss Array

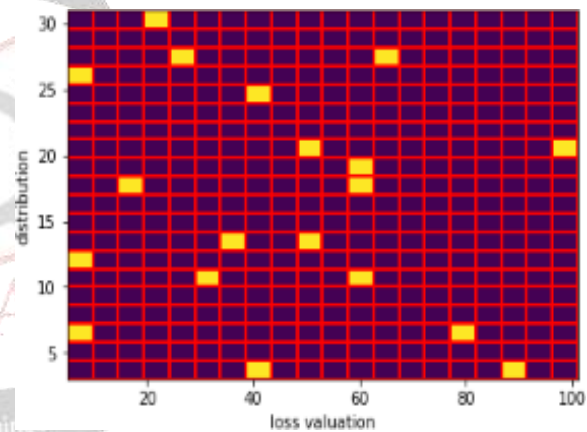


Fig. 8. 3D histogram for Loss

These 2 attributes come handy while computing the risk ratio for the company's project. The risk ratio, like its components, comes in the form of an array. This array is then plotted as a histogram to aid in investment decisions.

### VIII. OUTCOME

Proposed platform serves as chaperon for companies to reach out their investors and get funded. In turn, it enables investors to make smart investment decisions based on the materials received from companies. It gives remote exposure to companies who were regionally isolated and provides additional support in obtaining monetary help. This portal serializes a tedious investment process to a more comfortable approach.

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[ 0.22503836 0.15758204 17.16727646 0.17410012 1.03579175 0.02517073
4.12257416 0.31480506 0.0862254 0.16609291 1.62154592 0.6928342
0.49697857 0.14856979 1.28282126 17.73298135 0.2316493 1.64764002
0.41848489]
```

Fig. 9. Risk Ratio Array

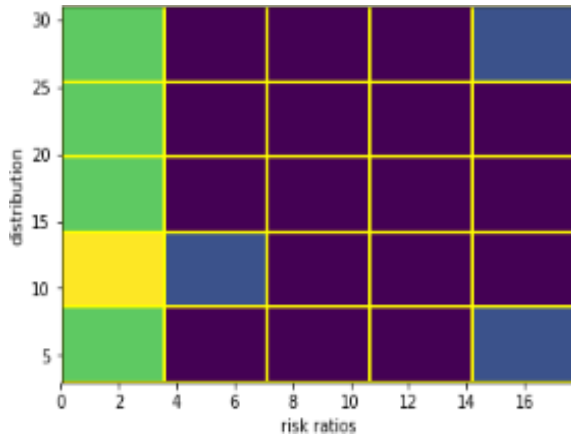


Fig. 10. 3D histogram for Risk Ratio

The final graph displayed by the portal is of utmost importance. It helps showcase the estimations, including how accurately the machine can predict and plot data points from the given dataset. The use of three kernels allows the system to account for a varied bias ranging from pure, to partially pure data-points. The client is offered an accuracy range from best to average scenarios making it work as a decision support system[6].

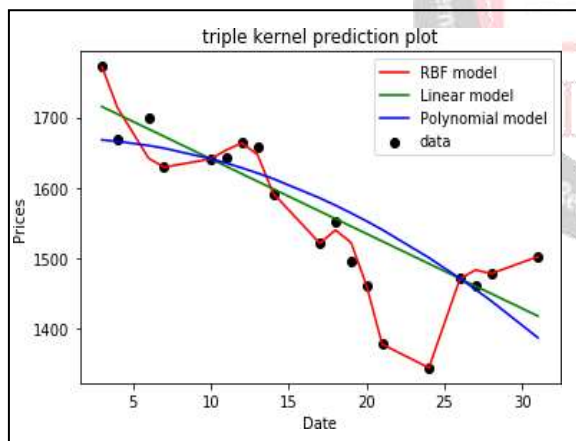


Fig. 11. Triple Kernel Prediction Plot

## IX. CONCLUSION

A web-based AI powered digital platform was proposed and implemented. It was demonstrated that, the proposed platform is quite promising in providing a large range of investment management services including risk-based profiling and matching of similar investors to form capital pools, highly-customized term sheets and contract terms to an alternative investment company/ individual.

The investors are given pre-fetched results with simplified steps to select projects of their liking based on their performance and expected growth.