HDDEA: How Data-Driven Entrepreneur Analyses Imperfect Information for Business Opportunity Evaluation

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For the award of Degree of

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IN

Computer science and Engineering

By

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2018-2022

CERTIFICATE

This is to certify that the thesis entitled "HDDEA: How Data-Driven Entrepreneur Analyses Imperfect Information for Business Opportunity Evaluation" is a Bonafied project work carried out by "**KUMARA HARI BABU**" bearing Reg No : **18GK1A0523**, worked under my supervision, and submitted in partial fulfilment of the requirements for the award of the degree of **BACHELOR OF TECHNOLOGY** in Computer Science and Engineering during the academic year **2018 -2022**

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DECLARATION

I, the student of Priyadarshini Institute of Technology & Management hereby declare that this thesis work entitled “How Data-Driven Entrepreneur Analyses Imperfect Information for Business Opportunity Evaluation” being submitted to the Department of **CSE, PITM** affiliated to **JNTU** university, **Kakinada** for the award of **BACHELOR OF TECHNOLOGY** IN Computer Science and Engineering is a record of bona fide work done by me and it has not been submitted to any other Institute or University for the award of any other degree or prize.

KUMARA HARI BABU

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TABLE OF CONTENTS

CHAPTER NO.	TITLE	PAGE NO.
1	**1. INTRODUCTION**	3
	1.1 Background	
	1.2 Problem Statements	
	1.3 Motivation	
	1.4 Aim of The Project	
	1.5 Object of The Project	
	1.6 Purpose	
2	**2. LITERATURE REVIEW**	6
	2.1 Introduction	
	2.2 Advantages	
	2.3 Proto Type & Algorithm	
3	**3. S/W SPECIFICATIONS**	12
	3.1 Technology Design	
	3.2 Advantages of Using Python	
	3.2.1 readability	
	3.2.2 high productivity	
	3.2.3 less learning time	
	3.3 Python Installation	
	3.3.1 installing python in windows	
	3.3.2 installing python in mac	
	3.3.3 interacting with python	
4	**4. ANALYSIS**	16
5	**5. SYSTEM REQIREMENTS**	19
	5.1 H/W Requirements	
	5.2 S/W Requirements	
6	**6. SYSTEM DESIGN**	21
	6.1 Modules	
	6.1.1 POMDP model	
	6.1.2 sufficient statistics	

6.1.3 DP model

6.2 Feasibility Study

6.2.1 economic feasibility

6.2.2 technical feasibility

6.2.3 social feasibility

6.3 System Architecture

6.4 UML Diagrams

6.5 Goals

6.5.1 user use case

6.5.2 class diagram

6.5.3 sequence

6.5.4 start chart

6.5.5 activity diagram

7	**7. IMPLEMENTATION**	**32**
8	**8. SAMPLE CODE**	**34**
9	**9. I/P & O/P DESIGN**	**38**
10	**11. SYSTEM TESTING**	**46**
11	**11. CONCLUSION**	**51**
12	**12. REFERENCE**	**54**

ABSTRACT

Abstract High market uncertainty impedes an entrepreneur's ability to evaluate the state of the market for a business opportunity. For many entrepreneurial ventures, data collection and analysis techniques and technologies are becoming an important source to manage uncertainty. This trend is often referred to as "data-driven entrepreneurship." We consider a dynamic approach using data to overcome market uncertainty for business opportunity related evaluations. In particular, we examine the entrepreneur's investment portfolio in which each investment generates expected returns and some information about a specific aspect of the market for a single business opportunity. We develop a model that analyses imperfect market data (e.g., financial, social, regulatory), while factoring in the entrepreneur's risk preference and operational shortages of resources, routines, reputation, and regulations. Our numerical findings show that, rather than pursuing the highest expected returns, an entrepreneur may choose perfect information, risk hedging, or market-controlling investments based on his/her cash level and risk preference. Hence, the entrepreneur, fuelled by the availability of data analysis, could overcome uncertainties and obtain better insights for business opportunity decisions. Index Terms-Business opportunity evaluation, decision making under uncertainty, data-driven entrepreneurship, entrepreneurship, operational entrepreneurship, operations management (OM), partially observed Markov decision process (POMDP)

INTRODUCTION

INTRODUCTION

BACK GROUND:

Understanding the nature and sources of uncertainty that underlie entrepreneurial decision making have been a primary focus of entrepreneurship research. The infusion of data analysis techniques (i.e., inspecting, transforming, and modelling data with the goal of supporting decision-making) and technologies (e.g., data analytics) in entrepreneurship has generated new ways of dealing with uncertainty. For example, the constant flow of “big data” acquired through social media apps (e.g., Twitter) has been analysed to overcome opportunity-related uncertainties in healthcare. A growing number of venture capitalists have employed automated data analysis techniques to evaluate business investments. We refer to the trend of data-driven techniques and technologies in shaping activities of the entrepreneurial process (i.e., opportunity recognition, development, and evaluation) as “data driven entrepreneurship”.

PROBLEM STATEMENTS:

Nevertheless, business opportunity evaluation with a data driven technique may not be an easy or direct process. The success of the business opportunity is subject to external market factors, including market conditions for entrepreneurs in general and regulatory frameworks affecting access to consumer and labour markets and finance. The entrepreneur may have a very limited or no control over such external conditions. Therefore, the information flow necessary to conclude the economic outlook of the market positive or negative for the business opportunity may not be available (i.e., the market information may be imperfect). Furthermore, the “true market” may be hidden when that information is not observable. For example, in the developing clean energy market of Turkey, the government’s mixed signals on a feed-in-tariff (a government policy mechanism aimed to accelerate investment in clean energy) made it difficult for entrepreneurs faced with the shortage of resources to evaluate the prospects of the opportunity.

MOTIVATION:

In this paper, we study the business opportunity evaluation from the data-driven perspective of entrepreneurship, and ask: How could the entrepreneur analyze imperfect market information in order to evaluate the business opportunity? Furthermore, when the entrepreneur’s resources are lacking, routines are nonexistent, reputation has not been established, or operating regulations are inadequate these shortages of resources, routines, reputation, and regulations pose operational constraints we refer to as operational shortages of the 4Rs on overcoming market uncertainty. In addition, the entrepreneur, in general, evaluates an opportunity based on his/her individual risk preferences (e.g., high, medium, or low risk aversion).

AIM OF THE PROJECT:

From the data-driven perspective of entrepreneurship, entrepreneurs with different risk preferences and operational shortages could better deal with imperfect market information, so long as they could continuously monitor sources of uncertainty and analyze accumulated data to obtain insights for decision making. Importantly, data-driven entrepreneurship demands dynamic and algorithmic data analysis techniques to evaluate the business opportunity.

OBJECT OF THE PROJECT:

In this paper, we explore how to analyze real-time and imperfect data (e.g., data or statistics from external factors forming an observable process) in order to make an optimal portfolio of investments.

PURPOSE:

we study the business opportunity evaluation from the data-driven perspective of entrepreneurship, and ask: How could the entrepreneur analyze imperfect market information in order to evaluate the business opportunitymodel, the findings of our dynamic model are more realistic than standard static models.

LITERATURE REVIEW

LITERATURE REVIEW

Opportunity evaluation is the core of entrepreneurial decision making. Entrepreneurship scholars have extensively investigated how entrepreneurs make opportunity evaluation decisions based on individual factors (e.g., cognition and aspirations) combined with external factors (e.g., valuation of the market) (see for reviews). McKelvie et al. found that an increase in uncertainty decreases the entrepreneur’s willingness to act on an opportunity in the face of uncertain environmental conditions. Entrepreneurs must manage entrepreneurial risk, rationality, and high levels of uncertainty about markets when evaluating opportunities. Entrepreneurs are also advised to develop strategies to hedge adverse outcomes according to their risk preferences.

While research on operations management (OM) has studied the exploitation process of opportunities, subject to operational shortages of 4Rs (see for a review), (OM scholars have not yet explored “a deeper strategic understanding of evaluations of a recognized opportunity to determine if it represents an opportunity for the specific entrepreneur”. In the evaluation stage, entrepreneurs operate under significant uncertainty about the true value of an opportunity, and information is needed to assess that value. Shepherd and Patzelt note this issue in emerging operational entrepreneurship research, and call for processes to effectively capture and utilize information and improve entrepreneurs’ ability to refine the potential opportunities and to act upon subsequent potential opportunities.

Prior studies on innovation and entrepreneurship have mainly recognized a stable and fixed entrepreneurial process for evaluating a new product/service idea that underlies a market opportunity. With the infusion of data-driven technologies, the entrepreneurial process has become less bounded (predefined) by structural boundaries of product scope and market search and temporal boundaries of entrepreneurial activities. The data-driven framework of Miller and Mork constitutes a process for data collection, transformation, and application of analysis techniques that underlie insights required for decision making.

Two notable research streams in entrepreneurship, opportunity creation and effectuation perspective of entrepreneurship, have studied the continuous re-evaluation and evolution of opportunity in less bounded entrepreneurial processes, as well as the accompanying uncertainty. However, owing to the complex and interrelated nature of less bounded processes, conventional research methods have been of limited use in capturing the dynamics of this phenomenon. Hence, there is a gap in the literature on operational and data-driven perspectives of entrepreneurship for novel data-driven techniques and technologies that shape the entrepreneurial process, including opportunity evaluation.

Studies on decision making under uncertainty have identified methods to address situations when the outcome probabilities are not, or cannot, be known precisely. Specifying mathematically tractable risky choice problems develop precise rules for rational decision making. Expected utility theory provides the backdrop for the normative status of rational decision making involving risky situations and risk preferences, as in investment decision making when outcomes are probabilistic. In contrast, the entrepreneurial decision maker may not know all possible outcomes of his/her actions, and does not know the probability distribution of those outcomes. In such cases, decision makers may be better off pursuing favorable outcomes utilizing decision technologies that allow for enhanced information flow.

Our study contributes to the operational and data-driven perspectives of entrepreneurship by refining decision making using a data-driven technique for the opportunity evaluation in a dynamic entrepreneurial process. Furthermore, we contribute to entrepreneurial decision making under uncertainty by identifying the tradeoff between expected returns and market information, and providing insights into how data-driven investment portfolio can be used to manage this tradeoff, while accounting for the entrepreneur's risk preference and operational shortages of the 4Rs. In particular, we consider a Markovian model to address the changes in business opportunity-related evaluations in uncertain and complex environments, such as in a hidden market, where the decision maker cannot directly estimate the outcome probabilities.

Modeling the highly uncertain nature of the market using a Markovian model has long been recognized as a reasonable approach, and Markov models have been used primarily to describe the dynamic behavior of financial markets. Although POMDPs are used in various fields, including financial analysis and engineering , they have not been used extensively in entrepreneurial decision making, with the notable exception of L´evesque and Maillart. L´evesque and Maillart analyze a POMDP in an optimal stopping problem, which requires "the consideration of not only the decision maker's uncertainty about the viability of the opportunity, but also the environmental conditions that influence the context in which the opportunity assessment is made" [18, p. 279]. They obtain probability thresholds based on the information cost, the payoff structure, and information quality. Their results indicate the ideal time for the decision maker to stop accumulating information and to either accept or reject an opportunity. In a similar vein, we analyze a POMDP model in a portfolio optimization problem that considers the probabilistic relation between the hidden and observable processes. Our study differs from that of L´evesque and Maillart in two ways. First, the entrepreneur decision maker in our study evaluates external factors of uncertainty(e.g., consumer market and regulation), while factoring in operational shortages, and then determines an investment portfolio for market observability. Second, we examine whether the entrepreneur can exert partial control over the market state changes in a Markov chain. Hence, our datadriven technique, a PODMP model, manages "true uncertainty" cases of high complexity and uncertainty , which contributes to a better understanding of entrepreneurial decision making under uncertainty.

PROPOSED SYSTEM

INTRODCUTION:

we study the business opportunity evaluation from the data-driven perspective of entrepreneurship, and ask: How could the entrepreneur analyze imperfect market information in order to evaluate the business opportunity? Furthermore, when the entrepreneur's resources are lacking, routines are nonexistent, reputation has not been established, or operating regulations are inadequate these shortages of resources, routines, reputation, and regulations pose operational constraints—we refer to as operational shortages of the 4Rs—on overcoming market uncertainty. In addition, the entrepreneur, in general, evaluates an opportunity based on his/her individual risk preferences (e.g., high, medium, or low risk aversion) .From the data-driven perspective of entrepreneurship, entrepreneurs with different risk preferences and operational shortages could better deal with imperfect market information, so long as they could continuously monitor sources of uncertainty and analyze accumulated data to obtain insights for decision making .Importantly, data-driven entrepreneurship demands dynamic and algorithmic data analysis techniques to evaluate the business opportunity. In this paper, we explore how to analyze real-time and imperfect data (e.g., data or statistics from external factors forming an observable process) in order to make an optimal portfolio of investments

ADVANTAGES

1. Here the data accepted only unlimited or control over such external conditions.

2. In a result will get more profit companies
3. We can be detected the true market

PROTO TYPE AND ALGORITHM:

In this paper author is analyzing past entrepreneur investment portfolio (all companies in which entrepreneur already invest money) using POMDP (Partial Observed Markov Decision Model) model. POMDP model will be initialize with states (Low, High, Medium) called Z values and this Z matrix will be filled with all past invested amount values. By applying Emission Matrix (Markov Model) using Numerical values we can predict optimized portfolio which can helps us in better understanding next company in which organization can invest money.

To implement this project i downloaded portfolio of one organization from internet and by applying POMDP model we can get optimized information of a company in which entrepreneur can invest amount. This application will give High Investment, Low and Medium Investment companies.

Dataset i kept inside portfolio folder inside project folder and below are some values from dataset

Date,GOOG,AAPL,FB,BABA,AMZN,GE,AMD,WMT,BAC,GM,T,UAA,SHLD,XOM,RRC,BBY,MA,PFE,JPM,SBUX
1989-12-29,0.117203,0.352438,3.9375,3.48607,1.752478,2.365775,1.766756,0.166287,0.110818,1.827968,
1990-01-02,0.123853,0.364733,4.125,3.660858,1.766686,2.398184,1.766756,0.173216,0.113209,1.835617,

In above dataset all decimal values are the invested amount and GOOG is the stock name of google and AAPL is for apple and AMZN is for amazon. Similarly u can get rest companies name by giving its short name

ALGORITHM

Dynamic Programming

Initialization

Initialize the set of aggregate states Π, and wealth

levels X

Set t = T − 1

while t $\geq$ 0 do

for x $\in$ X do

for π $\in$ Π find optimal policy u∗

T −1 (π , x) using

(9) do

calculate vt (π , x) for optimal policy u∗

T −1 (π , x)

using (9)

Set t $\leftarrow$ t − 1

end for

end for

end while

SOFTWARE SPECIFICATIONS

SOFTWARE SPECIFICATIONS

TECHNOLOGY DESCRIPTION:

Python is an open source, high-level programming language developed by Guido van Rossum in the late 1980s and presently administered by Python Software Foundation. It came from the ABC language that he helped create early on in his career. Python is a powerful language that you can use to create games, write GUIs, and develop web applications. It is a high-level language. Reading and writing codes in Python is much like reading and writing regular English statements. Because they are not written in machine-readable language, Python programs need to be processed before machines can run them. Python is an interpreted language. This means that every time a program is run, its interpreter runs through the code and translates it into machine-readable byte code. Python is an object-oriented language that allows users to manage and control data structures or objects to create and run programs. Everything in Python is, in fact, first class. All objects, data types, functions, methods, and classes take equal position in Python. Programming languages are created to satisfy the needs of programmers and users for an effective tool to develop applications that impact lives, lifestyles, economy, and society. They help make lives better by increasing productivity, enhancing communication, and improving efficiency. Languages die and become obsolete when they fail to live up to expectations and are replaced and superseded by languages that are more powerful. Python is a programming language that has stood the test of time and has remained relevant across industries and businesses and among programmers, and individual users. It is a living, thriving, and highly useful language that is highly recommended as a first programming language for those who want to dive into and experience programming.

ADVANTAGES OF USING PYTHON

Here are reasons why you would prefer to learn and use Python over other high level languages:

Readability

Python programs use clear, simple, and concise instructions that are easy to read even by those who have no substantial programming background. Programs written in Python are, therefore, easier to maintain, debug, or enhance.

Higher productivity

Codes used in Python are considerably shorter, simpler, and less verbose than other high level programming languages such as Java and C++. In addition, it has well-designed built-in features and standard library as well as access to third party modules and source libraries. These features make programming in Python more efficient.

Less learning time

Python is relatively easy to learn. Many find Python a good first language for learning programming because it uses simple syntax and shorter codes. Runs across different platforms Python works on Windows, Linux/UNIX, Mac OS X, other operating systems and smallform devices. It also runs on microcontrollers used in appliances, toys, remote controls, embedded devices, and other similar devices.

PYTHON INSTALLATION

Installing Python in Windows

On this page, you will be asked to choose between the two latest versions for Python 2 and 3: Python 3.5.1 and Python 2.7.11. Alternatively, if you are looking for a specific release, you can scroll down the page to find download links for earlier versions.

You would normally opt to download the latest version, which is Python 3.5.1. This was released on December 7, 2015. However, you may opt for the latest version of Python 2, 2.7.11. Your preferences will usually depend on which version will be most usable for your project. While Python 3 is the present and future of the language, issues such as third party utility or compatibility may require you to download Python 2.

Installing Python in Mac

If you’re using a Mac, you can download the installation package from this link: https://www.python.org/downloads/mac-osx/

Running the Installation file: Once you’re finished with the download, you can proceed to installation by clicking on the downloaded .exe file. Standard installation will include IDLE, pip, and documentation.

Interacting with Python

Python is a flexible and dynamic language that you can use in different ways. You can use it interactively when you simply want to test a code or a statement on a line-by-line basis or when you’re exploring its features. You can use it in script mode when you want to interpret an entire file of statements or application program. To use Python interactively, you can use either the Command Line window or the IDLE Development Environment.

ANALYSIS

ANALYSIS

EXISTING SYSTEM

Nevertheless, business opportunity evaluation with a data- driven technique may not be an easy or direct process. The success of the business opportunity is subject to external market factors, including market conditions for entrepreneurs in general and regulatory frameworks affecting access to consumer and labor markets and finance. The entrepreneur may have a very limited or no control over such external conditions. Therefore, the information flow necessary to conclude the economic outlook of the marke-positive or negative-for the business opportunity may not be available (i.e., the market information may be imperfect). Furthermore, the “true market” may be hidden when that information is not observable. For example, in the developing clean energy market of Turkey, the government’s mixed signals on a feed-in-tariff (a government policy mechanism aimed to accelerate investment in clean energy) made it difficult for entrepreneurs faced with the shortage of resources to evaluate the prospects of the opportunity [13]

DISADVANTAGES

1. Here the data accepted only limited or no control over such external conditions.
2. In a result may be or may not be get profit
3. We can not be detected the true market

3.2 PROPOSED SYSTEM

we study the business opportunity evaluation from the data-driven perspective of entrepreneurship, and ask: How could the entrepreneur analyze imperfect market information in order to evaluate the business opportunity? Furthermore, when the entrepreneur’s resources are lacking, routines are nonexistent, reputation has not been established, or operating regulations are inadequate, these shortages of resources, routines, reputation, and regulations pose operational constraints-we refer to as operational shortages of the 4Rs—on overcoming market uncertainty. In addition, the entrepreneur, in general, evaluates an opportunity based on his/her individual risk preferences (e.g., high, medium, or low risk aversion).

From the data-driven perspective of entrepreneurship, entrepreneurs with different risk preferences and operational shortages could better deal with imperfect market information, so long as they could continuously monitor sources of uncertainty and analyze accumulated data to obtain insights for decision making (e.g.,). Importantly, data-driven entrepreneurship demands dynamic and algorithmic data analysis techniques to evaluate the business opportunity. In this paper, we explore how to analyze real-time and imperfect data (e.g., data or statistics from external factors forming an observable process) in order to make an optimal portfolio of investments.

3.1.3ADVANTAGES

1. Here the data accepted only unlimited or control over such external conditions.
2. In a result will get more profit companies
3. We can be detected the true market

3.3 SOFTWARE REQUIREMENTS SPECIFICATIONS

- Library of functions for real-time computer vision like numpy(), waitkey()
- Developed python.

3.3.1 PURPOSE

we study the business opportunity evaluation from the data-driven perspective of entrepreneurship, and ask: How could the entrepreneur analyze imperfect market information in order to evaluate the business opportunity.

SYSTEM REQUIREMENTS

SYSTEM REQUIREMENT SPECIFICATIONS

HARDWARE REQUIREMENTS:

- **System** : Pentium IV 2.4 GHz.
- **Hard Disk** : 40 GB.
- **Floppy Drive** : 1.44 Mb.
- **Monitor** : 14’ Colour Monitor.
- **Mouse** : Optical Mouse.
- **Ram** : 512 Mb.

SOFTWARE REQUIREMENTS:

- **Operating system** : Windows 7 Ultimate.
- **Coding Language** : Python.
- **Front-End** : Python.
- **Designing** : Html, css, javascript.
- **Data Base** : MySQL.

SYSTEM DESIGN

SYSTEM DESIGN

A. POMDP Model:

We let Zt denote the state of the market at period t. The Markov chainZ = {Zt ; t = 0, 1, . . . , } is a hidden process with the transition matrix Qt (a, b,Ut) = P(Zt+1 = b |Zt = a, Ut) (1) over a state space F = {a, b, c, . . . , s}.1 Ut = (u1t , u2t , . .,umt) denotes the portfolio forminvestments at period t, where ukt (≥ 0) represents the allocated investment amount for investment k.2 Ut influences the transition states because Qt depends on the investments of the portfolio. The states of the market are not observable; thus, the entrepreneur's portfolio of m investments generate random net returns Rt (s) = _R1t (s), R2 t (s), . . . , Rm t (s)_ (2) when the hidden state of the market is s at period t. The entrepreneur has a total cash of Xt at the beginning of period t. We follow the stochastic evolution of the capital processzX = {Xt ; t = 0, 1, 2, . . . , } with a cash dynamics equation: Xt+1(Ut) = R _t (s)Ut , _ denotes the transpose operator. While Z is a hidden process, the entrepreneur can obtain imperfect information about the state of the market with an observable process Y = {Yt ; t = 0, 1, 2, . . .} over a state space E = {i, j, . . . , z}, where Yt is the information available at period t. The observable process Y is not necessarily a Markov chain and the states of the market Z are dependent on previous observations ofY.We develop a probabilistic information measure, referred to as the emission matrix E, that represents the probabilistic relationship between the true market state and the observation of external market factors. In particular, the probabilistic evolution of Y depends on the state of Z at period t and is independent of all previous states of Z and Y. The emission matrix at period t, Et, is

B. Sufficient Statistics:

The entrepreneur relies on information from past periods in our multiperiod model. In particular, since energy regulations are shaping over time, the entrepreneur may need to invest in multiple periods. A new observation at period t will increase the dimension of the information vector with a new observation Yt , therefore, the probabilistic structure of the information flow increases the dimension of the problem with each period. To monitor the increasing dimension, we utilize sufficient statistics, a common approach used under these circumstances, that represents the probabilistic structure of the information flow.

Let $\overline{Y}_t = [Y_0, Y_1, Y_2, \ldots, Y_t]$ and $\overline{Z}_t = [Z_0, Z_1, Z_2, \ldots, Z_t]$ denote the cumulative observed information and past history about the states of the market until period t,

C. DP Model:

In our model, the entrepreneur maximizes the expected returns at a terminal time T by selecting the investment portfolio. To develop the entrepreneur's dynamic problem formally, we let $g_t(\pi, x, u)$ denote the returns gained from an investment portfolio u constrained by available cash funds x in period t and optimal portfolios u^* from t + 1 to T. Also, the probability of the information flow in the market (i.e., sufficient statistics) is denoted by π. Then we define the optimal expected returns at period t from choosing the investment portfolio u as

FEASIBILITY STUDY:

Feasibility study:

The feasibility of the project is analyzed in this phase and business proposal is put forth with a very general plan for the project and some cost estimates. During system analysis the feasibility study of the proposed system is to be carried out. This is to ensure that the proposed system is not a burden to the company. For feasibility analysis, some understanding of the major requirements for the system is essential.

Three key considerations involved in the feasibility analysis are.

- ECONOMICAL FEASIBILITY
- TECHNICAL FEASIBILITY
- SOCIAL FEASIBILITY

ECONOMICAL FEASIBILITY:

This study is carried out to check the economic impact that the system will have on the organization. The amount of fund that the company can pour into the research and development of the system is limited. The expenditures must be justified. Thus the developed system as well within the budget and this was achieved because most of the technologies used are freely available. Only the customized products had to be purchased.

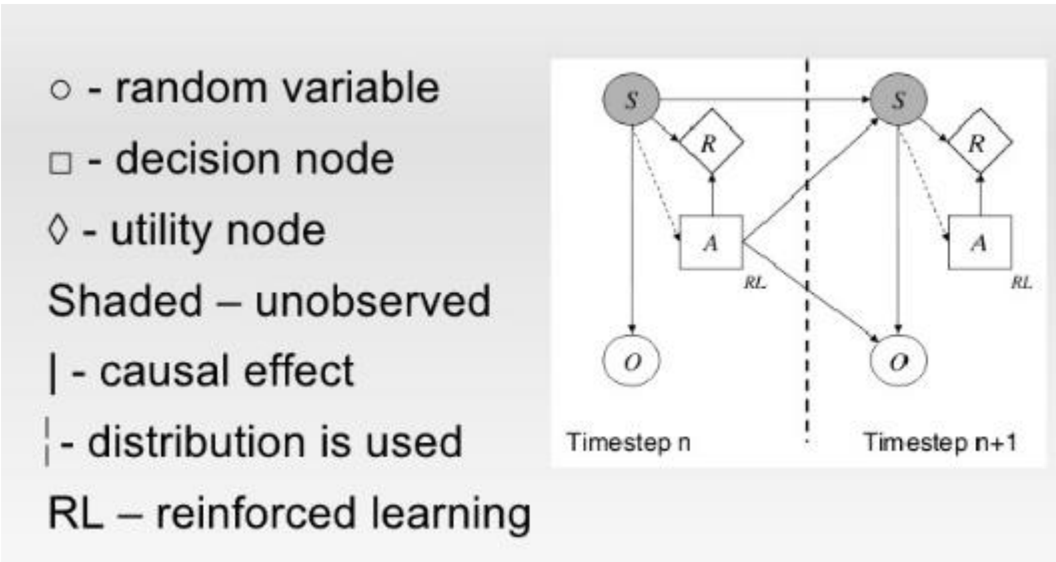
TECHNICAL FEASIBILITY:

This study is carried out to check the technical feasibility, that is, the technical requirements of the system. Any system developed must not have a high demand on the available technical resources. This will lead to high demands on the available technical resources. This will lead to high demands being placed on the client. The developed system must have a modest requirement, as only minimal or null changes are required for implementing this system.

SOCIAL FEASIBILITY:

The aspect of study is to check the level of acceptance of the system by the user. This includes the process of training the user to use the system efficiently. The user must not feel threatened by the system, instead must accept it as a necessity. The level of acceptance by the users solely depends on the methods that are employed to educate the user about the system and to make him familiar with it. His level of confidence must be raised so that he is also able to make some constructive criticism, which is welcomed, as he is the final user of the system.

SYSTEM ARCHITECTURE:



Consider an entrepreneur who is evaluating a business opportunity for a market in a multiperiod setting. The state of the market whether the market has a positive or negative outlook for the entrepreneur’s opportunity depends on a variety of external market factors such as economic, governmental, social, and regulatory that may not be directly observable and may change over time. Furthermore, the entrepreneur's risk preference and operational shortages of one or more of 4Rs (i.e., internal constraints) influence the entrepreneur's ability to observe the state of the market and take control over market changes.

To exemplify the impact of an external factor on opportunity assessment, we offer a simulated example of an entrepreneurial venture in a developing industry (e.g., clean energy). The entrepreneur may not have established know-how of external market regulations and lobbying practices for the technology (i.e., shortage of external regulations). Although the new venture's investors may provide some policy and regulatory assistance, the regulations for an emerging technology may be transient, which is likely to result in a hidden market. Therefore, he or she might not be able to fully evaluate the true economic outlook positive or negative without understanding the regulatory conditions, particularly among the rapidly changing laws surrounding energy. Information about the state of regulations and policy is needed to evaluate the valuation of the market for the clean energy innovation through hiring legal services, lobbying practices and active participation in discussions about pending regulations.

The entrepreneur in our model gathers information about the market by allocating her/his total funds X across a portfolio of minvestments in f independent external market factors over Tperiods. To maximize potential returns of a business opportunity, a resource-constrained entrepreneur could invest small amounts of his/her resources, while minimizing risk exposure For example, prior to Turkey's passage of a renewable energy law in 2005, most clean energy entrepreneurs made relatively marginal investments to reflect the market's appetite for solar. The level of information, as denoted by ν j k $\in$ [0, 1], about the market factor j $\in$ {1, . . . , f} depends on investment k $\in$ {1, . . . , m}, whose return provides information about factor j. Subsequently, the investment returns form the state values of an observable process as characterized by the observed market factors.

In our example above, a specific investment that is associated with the external factor of energy regulations might help the entrepreneur to gain information about how regulations and possible future policies might influence the technological opportunity's economic value. In this way, the investment reveals partial information about the state of the market. Furthermore, the entrepreneur gains no information (NI) related to a factor unless she/he specifically invests in a source associated with that factor, but may obtain similar information about the market from other factors. Hence, the objective of the entrepreneur is to choose an investment portfolio U that provides information about the state of the market and maximizes returns gained from the investment at a terminal time T. Regarding our formal model, we make the following three assumptions. First, the change in the valuation of investments is exogenous and independent of funds invested at the previous periods. Thus, the investment return is a random variable that depends solely on the given state of the market. Second, we do not allow for risk free borrowing to avoid unbounded solutions. The omission of risk-free borrowing also underlines the entrepreneurial decision making amidst shortages of resources, routines, and reputation with no immediate resource infusion. Finally, the entrepreneur does not experience any decrease in efficiency by investing in multiple investments.

UML Diagrams:

UML stands for Unified Modeling Language. UML is a standardized general-purpose modeling language in the field of object-oriented software engineering. The standard is managed, and was created by, the Object Management Group.

The goal is for UML to become a common language for creating models of object oriented computer software. In its current form UML is comprised of two major components: a Meta-model and a notation. In the future, some form of method or process may also be added to; or associated with, UML.

The Unified Modeling Language is a standard language for specifying, Visualization, Constructing and documenting the artifacts of software system, as well as for business modeling and other non-software systems.

The UML represents a collection of best engineering practices that have proven successful in the modeling of large and complex systems.

The UML is a very important part of developing objects oriented software and the software development process. The UML uses mostly graphical notations to express the design of software projects.

GOALS:

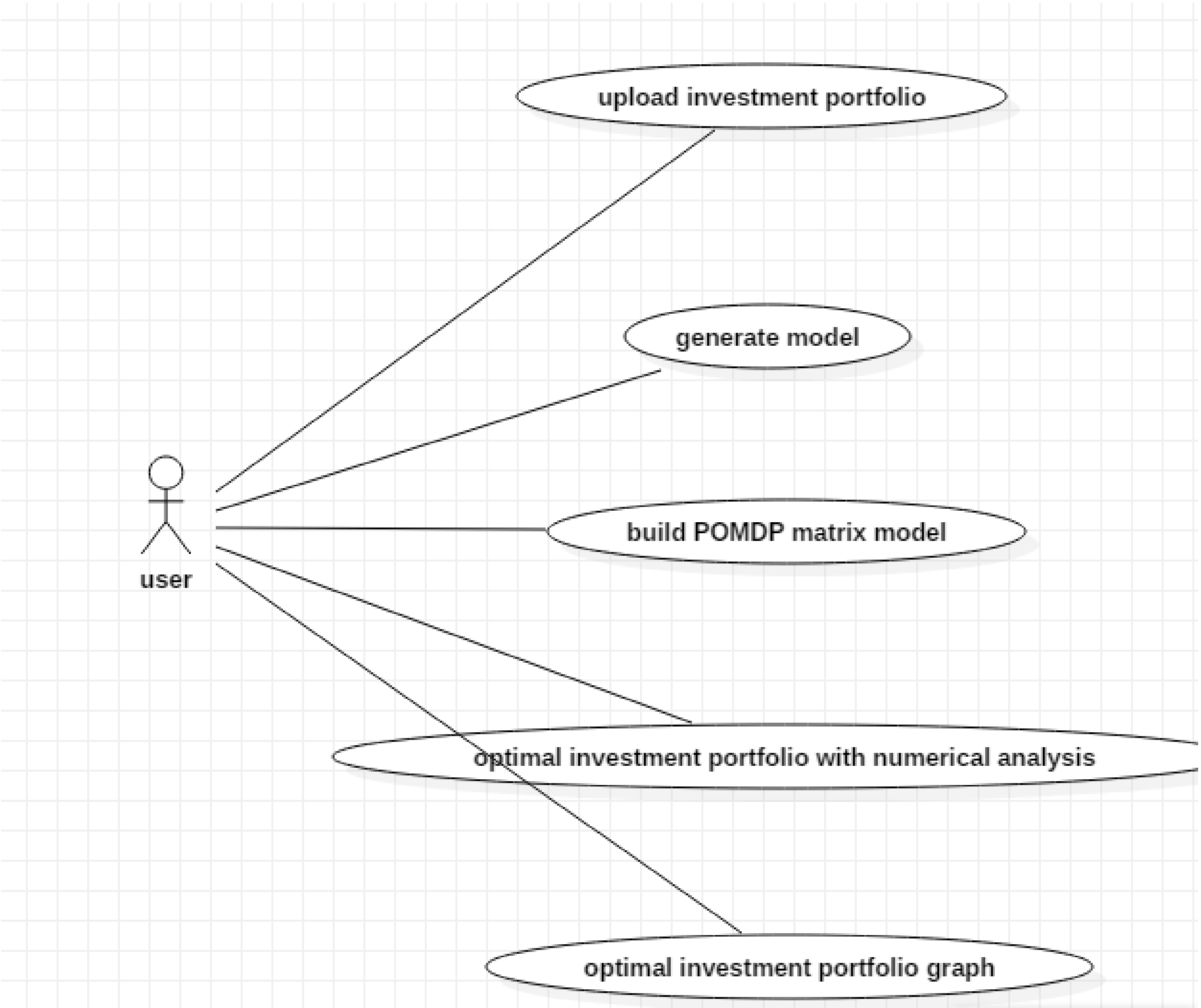
The Primary goals in the design of the UML are as follows:

1. Provide users a ready-to-use, expressive visual modeling Language so that they can develop and exchange meaningful models.
2. Provide extendibility and specialization mechanisms to extend the core concepts.
3. Be independent of particular programming languages and development process.
4. Provide a formal basis for understanding the modeling language.
5. Encourage the growth of OO tools market.

6. Support higher level development concepts such as collaborations, frameworks, patterns and components.
7. Integrate best practices.

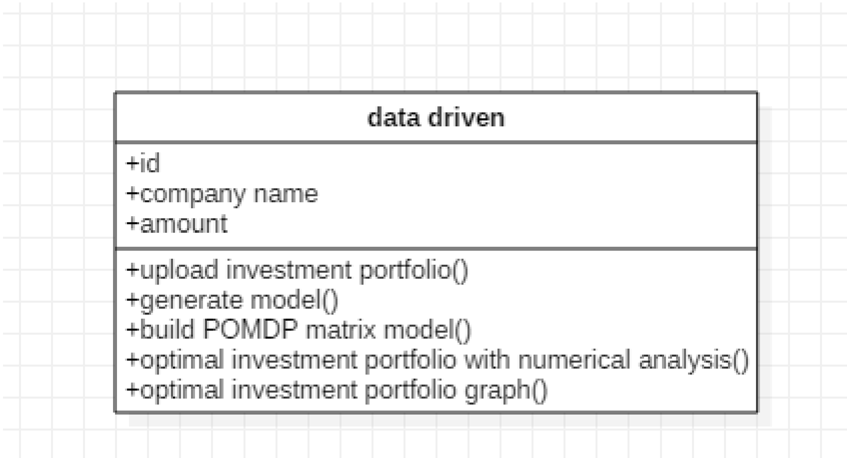
User use case:

A use case diagram in the Unified Modeling Language (UML) is a type of behavioral diagram defined by and created from a Use-case analysis. Its purpose is to present a graphical overview of the functionality provided by a system in terms of actors, their goals (represented as use cases), and any dependencies between those use cases. The main purpose of a use case diagram is to show what system functions are performed for which actor. Roles of the actors in the system can be depicted.



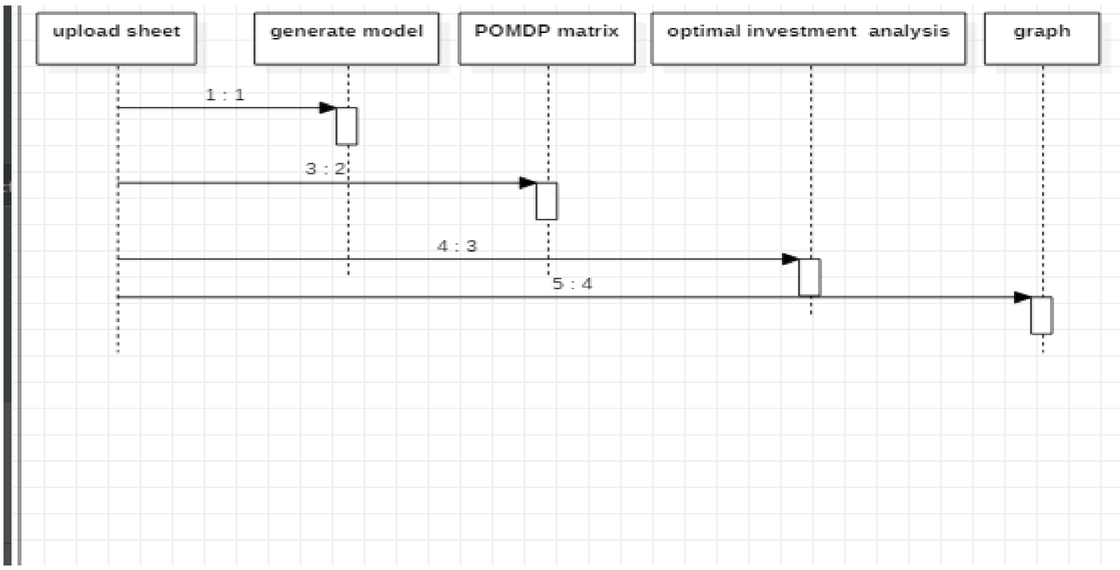
Class diagram:

In software engineering, a class diagram in the Unified Modeling Language (UML) is a type of static structure diagram that describes the structure of a system by showing the system's classes, their attributes, operations (or methods), and the relationships among the classes. It explains which class contains information.



Sequence:

A sequence diagram in Unified Modeling Language (UML) is a kind of interaction diagram that shows how processes operate with one another and in what order. It is a construct of a Message Sequence Chart. Sequence diagrams are sometimes called event diagrams, event scenarios, and timing diagrams.



State chart:

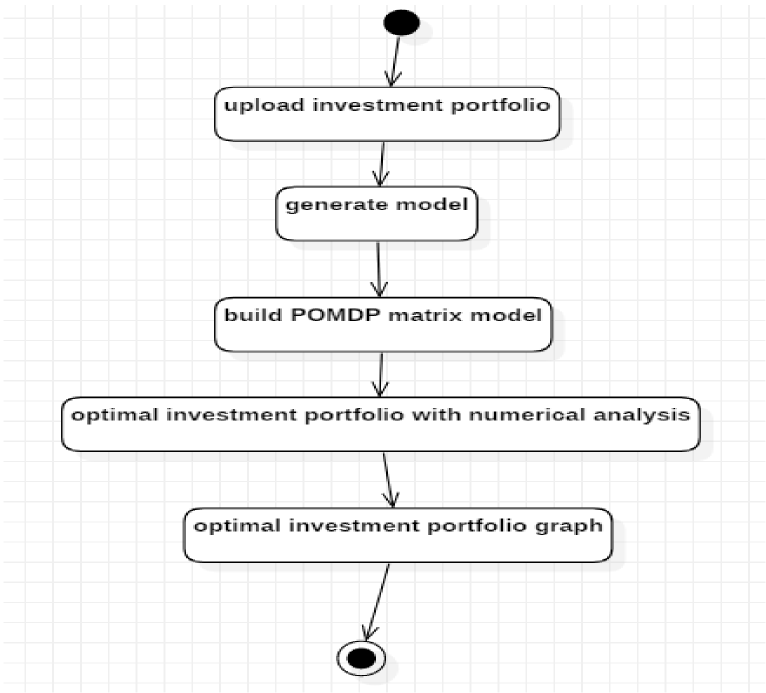
Statechart diagram is one of the five UML diagrams used to model the dynamic nature of a system. They define different states of an object during its lifetime and these states are changed by events. Statechart diagrams are useful to model the reactive systems. Reactive systems can be defined as a system that responds to external or internal events.

Statechart diagram describes the flow of control from one state to another state. States are defined as a condition in which an object exists and it changes when some event is triggered. The most important purpose of Statechart diagram is to model lifetime of an object from creation to termination.

Statechart diagrams are also used for forward and reverse engineering of a system. However, the main purpose is to model the reactive system.

Following are the main purposes of using Statechart diagrams −

- To model the dynamic aspect of a system.
- To model the life time of a reactive system.
- To describe different states of an object during its life time.
- Define a state machine to model the states of an object.



Activity Diagram:

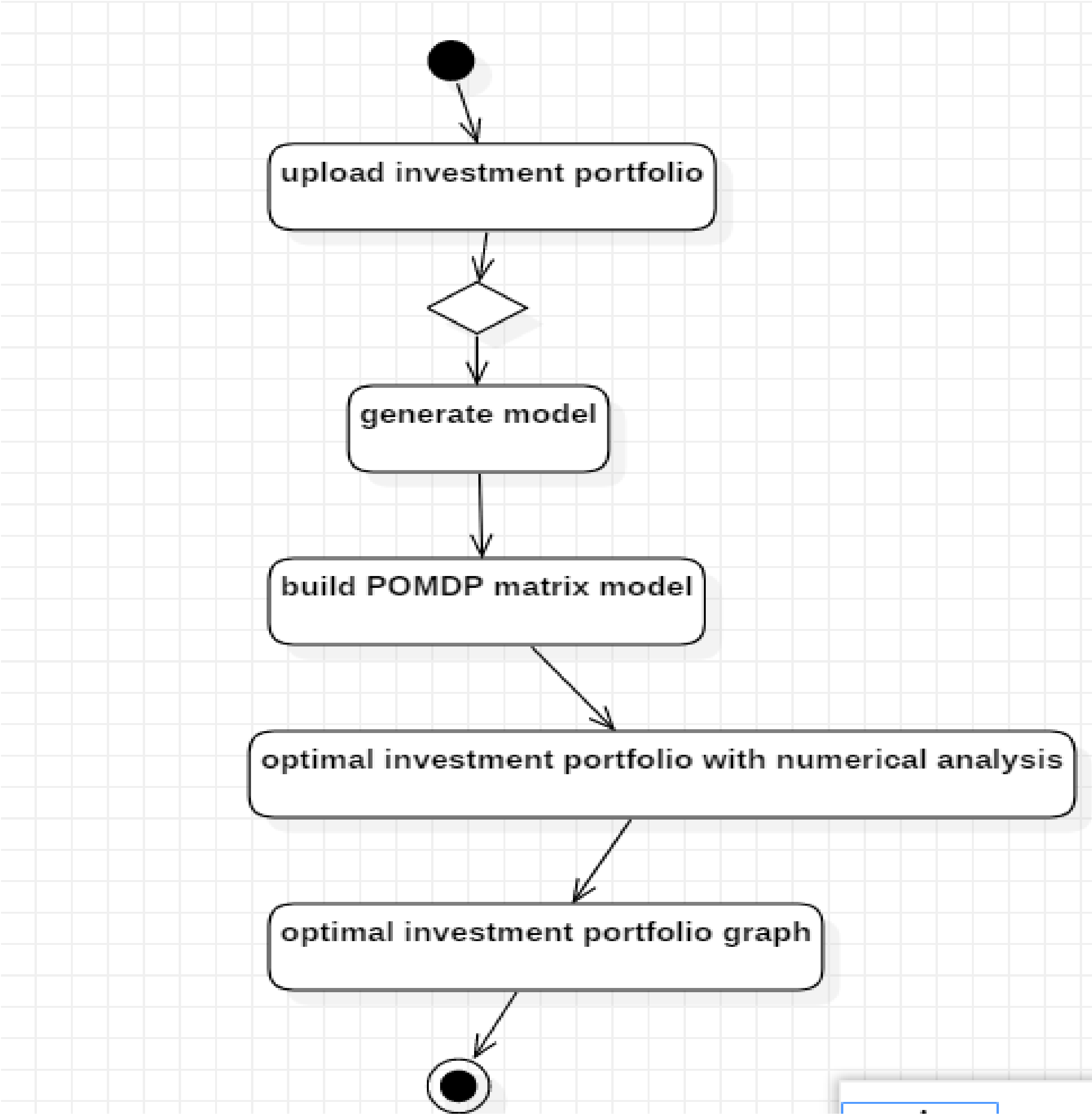
The basic purposes of activity diagrams is similar to other four diagrams. It captures the dynamic behavior of the system. Other four diagrams are used to show the message flow from one object to another but activity diagram is used to show message flow from one activity to another.

Activity is a particular operation of the system. Activity diagrams are not only used for visualizing the dynamic nature of a system, but they are also used to construct the executable system by using forward and reverse engineering techniques. The only missing thing in the activity diagram is the message part.

It does not show any message flow from one activity to another. Activity diagram is sometimes considered as the flowchart. Although the diagrams look like a flowchart, they are not. It shows different flows such as parallel, branched, concurrent, and single.

The purpose of an activity diagram can be described as −

- Draw the activity flow of a system.
- Describe the sequence from one activity to another.
- Describe the parallel, branched and concurrent flow of the system
- Describe the parallel, branched and concurrent flow of the system


upload investment portfolio
generate model
build POMDP matrix model
optimal investment portfolio with numerical analysis
optimal investment portfolio graph

IMPLEMENTATION

IMPLEMENTATION

1) Data Driven: Here Data-Driven means analyzing past market data to take decision
2) Entrepreneur: Any organization who are investing money in stock market
3) Imperfect Information: As stock market always have either positive and negative states and predicting its current state is bit difficult so it will called as Imperfect Information.
4) Business Opportunity Evaluation: evaluating current portfolio can give best opportunity to earn more money.
5) POMDP model : In this paper author is analyzing past entrepreneur investment portfolio (all companies in which entrepreneur already invest money) using POMDP (Partial Observed Markov Decision Model) model. POMDP model will be initialize with states (Low, High, Medium) called Z values and this Z matrix will be filled with all past invested amount values. By applying Emission Matrix (Markov Model) using Numerical values we can predict optimized portfolio which can helps us in better understanding next company in which organization can invest money.

To implement this project i downloaded portfolio of one organization from internet and by applying POMDP model we can get optimized information of a company in which entrepreneur can invest amount. This application will give High Investment, Low and Medium Investment companies.

Dataset i kept inside portfolio folder inside project folder and below are some values from dataset

date,GOOG,AAPL,FB,BABA,AMZN,GE,AMD,WMT,BAC,GM,T,UAA,SHLD,XOM,RRC,BBY,MA,PFE,JPM,SBUX
1989-12-29,,0.117203,,,,0.352438,3.9375,3.48607,1.752478,,2.365775,,,1.766756,,0.166287,,0.110818,1.827968,
1990-01-02,,0.123853,,,,0.364733,4.125,3.660858,1.766686,,2.398184,,,1.766756,,0.173216,,0.113209,1.835617,

In above dataset all decimal values are the invested amount and GOOG is the stock name of google and AAPL is for apple and AMZN is for amazon. Similarly u can get rest companies name by giving its short name

SAMPLE CODE

SAMPLE CODE

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
from tkinter import messagebox
from tkinter import *
from tkinter.filedialog import askopenfilename
from tkinter import simpledialog
import tkinter
from tkinter import filedialog
import os
from sklearn.model_selection import train_test_split
from sklearn import metrics
from sklearn.metrics import accuracy_score
from sklearn.neural_network import MLPClassifier
import socket
from sklearn import svm

root = tkinter.Tk()

root.title("Decentralize Fog Processing")
root.geometry("1200x700")

global filename
global control_loop
global X_vector
global y_vector
global input
global X_test
global y_test

def upload():
    global filename
    filename =
filedialog.askopenfilename(initialdir="ProcessVariables")
    pathlabel.config(text=filename)



def buildInputVector():
    global X_vector
    global y_vector
    global input
    global X_test
    global y_test
    input = pd.read_csv(filename)
    input = input.fillna(0)
    y = input['class']
```

```
    X = input.drop(['class'], axis = 1)
    X_vector, X_test, y_vector, y_test = train_test_split(X, 
y, test_size=0.1, random_state=0)
    text.delete('1.0', END)
    text.insert(END,"Input Variables Length : 
"+str(len(input))+"\n")
    print(X_vector)


def stateVector():
    global control_loop
    control_loop = svm.SVC(C=2.0,gamma='scale',kernel = 'rbf', 
random_state = 2)
    #MLPClassifier(solver='lbfgs', alpha=1e-
5,hidden_layer_sizes=(5, 2), random_state=0)
    control_loop.fit(X_vector, y_vector)
    y_pred = control_loop.predict(X_test)
    text.insert(END,"close loop vector generated\n")

def runServer():
    headers = 
'A_feed,D_feed,E_feed,A_C,Reactor_feed_rate,Reactor_pressure,R
eactor_level,Reactor_temperature,Separator_temperature,Separat
or_level,Separator_pressure,Separator_underflow,Stripper_level
,Stripper_pressure,Stripper_underflow,Stripper_temperature,Str
ipper_steam_flow,Recycle_flow,Purge_rate,Compressor_work,React
or_water_temperature,Separator_water_temperature,Component_A,C
omponent_B,Component_C,Component_D,Component_E,Component_F,Com
ponent_A,Component_B,Component_C,Component_D,Component_E,Compo
nent_F,Component_G,Component_H,Component_D,Component_E,Compone
nt_F,Component_G,Component_H,D_feed_flow,A_feed_flow,E_feed_fl
ow,A_C_feed_flow,Compressor_recycle_valve,Purge 
valve,Separator_pot_liquid_flow,Stripper_liquid_product_flow,S
tripper_steam_valve,Reactor_cooling_water_flow,Condenser_cooli
ng_water_flow'
    host = socket.gethostname()
    port = 5000
    server_socket = socket.socket()
    server_socket.bind((host, port))
    while True:
        server_socket.listen(2)
        conn, address = server_socket.accept()
        data = conn.recv(1024).decode()
        f = open("test.txt", "w")
        f.write(headers+"\n"+str(data))
        f.close()
        text.insert(END,"from connected user: " + 
str(data)+"\n")
        test = pd.read_csv('test.txt')
        test = test.fillna(0)
        predict = control_loop.predict(test)
```

```
        data = str(predict[0])
        text.insert(END,"Monitoring Value " + str(data)+"\n")
        root.update_idletasks()
        conn.send(data.encode())
        conn.close()


font = ('times', 18, 'bold')
title = Label(root, text='Data-Driven Design of Fog Computing
aided Process Monitoring System for Large-Scale Industrial
Processes')
title.config(bg='wheat', fg='red')
title.config(font=font)
title.config(height=3, width=80)
title.place(x=5,y=5)

font1 = ('times', 14, 'bold')

upload = Button(root, text="Upload Input Variables",
command=upload)
upload.place(x=50,y=100)
upload.config(font=font1)

pathlabel = Label(root)
pathlabel.config(bg='blue', fg='white')
pathlabel.config(font=font1)
pathlabel.place(x=300,y=100)

preprocessButton = Button(root, text="Build Input Vector",
command=buildInputVector)
preprocessButton.place(x=50,y=150)
preprocessButton.config(font=font1)

treeButton = Button(root, text="Generate Vector",
command=stateVector)
treeButton.place(x=50,y=200)
treeButton.config(font=font1)

serverButton = Button(root, text="Start Monitoring Fog Node",
command=runServer)
serverButton.place(x=50,y=250)
serverButton.config(font=font1)

font1 = ('times', 12, 'bold')
text=Text(root,height=28,width=80)
scroll=Scrollbar(text)
text.configure(yscrollcommand=scroll.set)
text.place(x=500,y=150)
text.config(font=font1)

root.mainloop()
```

INPUT & OUTPUT DESIGN

INPUT AND OUTPUT DESIGN

How Data-Driven Entrepreneur Analyzes Imperfect Information for Business Opportunity Evaluation

6) Data Driven: Here Data-Driven means analyzing past market data to take decision
7) Entrepreneur: Any organization who are investing money in stock market
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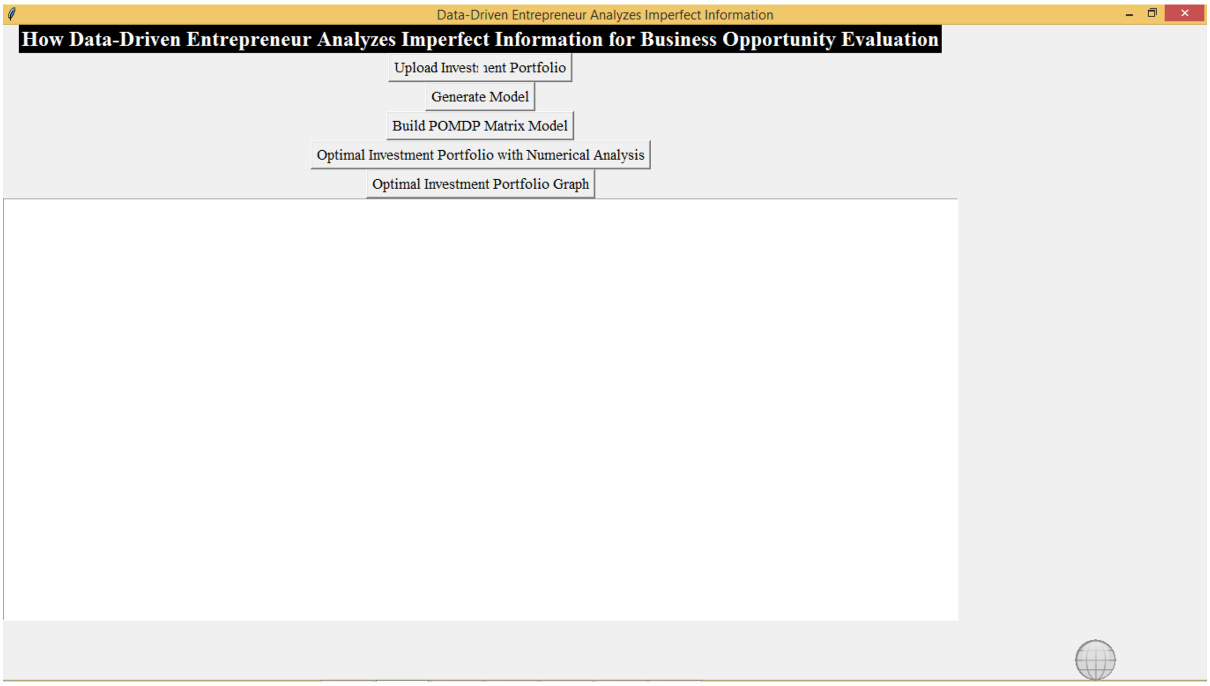
date,GOOG,AAPL,FB,BABA,AMZN,GE,AMD,WMT,BAC,GM,T,UAA,SHLD,XOM,RRC,BBY,MA,PFE,JPM,SBUX
1989-12-29,,0.117203,,,,0.352438,3.9375,3.48607,1.752478,,2.365775,,,1.766756,,0.166287,,0.110818,1.827968,1990-01-

02,,0.123853,,,,0.364733,4.125,3.660858,1.766686,,2.398184,,,1.766756,,0.173216,,0.113209,1.835617,

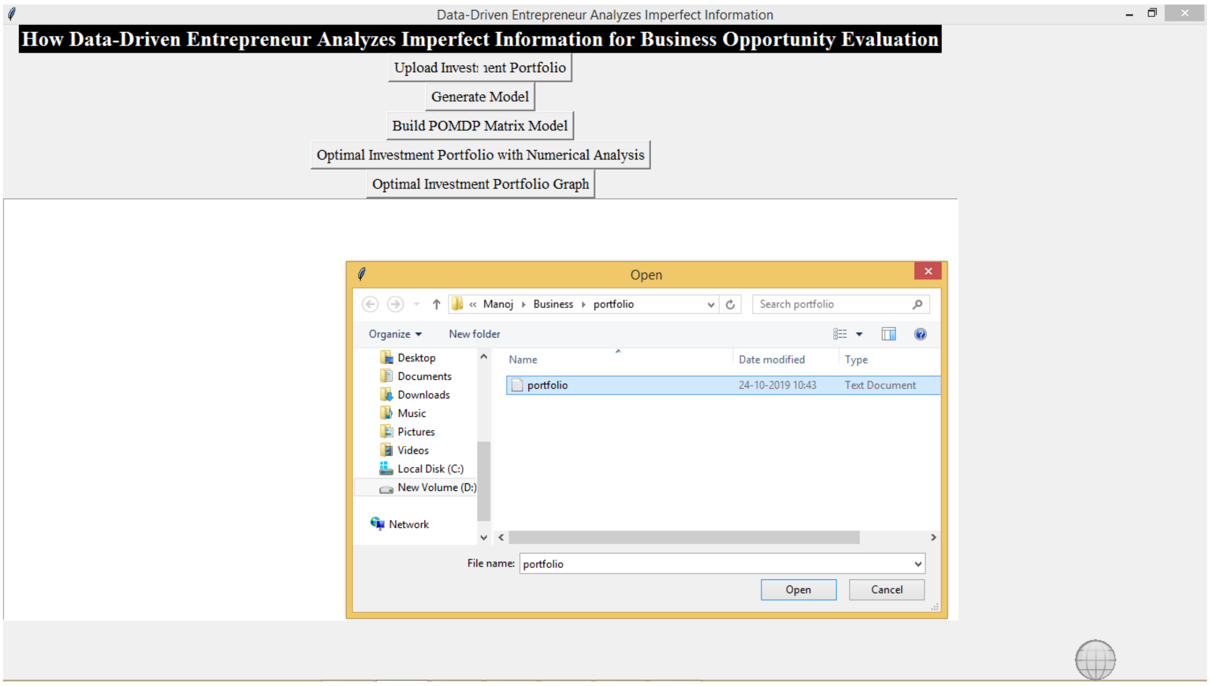
In above dataset all decimal values are the invested amount and GOOG is the stock name of google and AAPL is for apple and AMZN is for amazon. Similarly u can get rest companies name by giving its short name

Screen shots

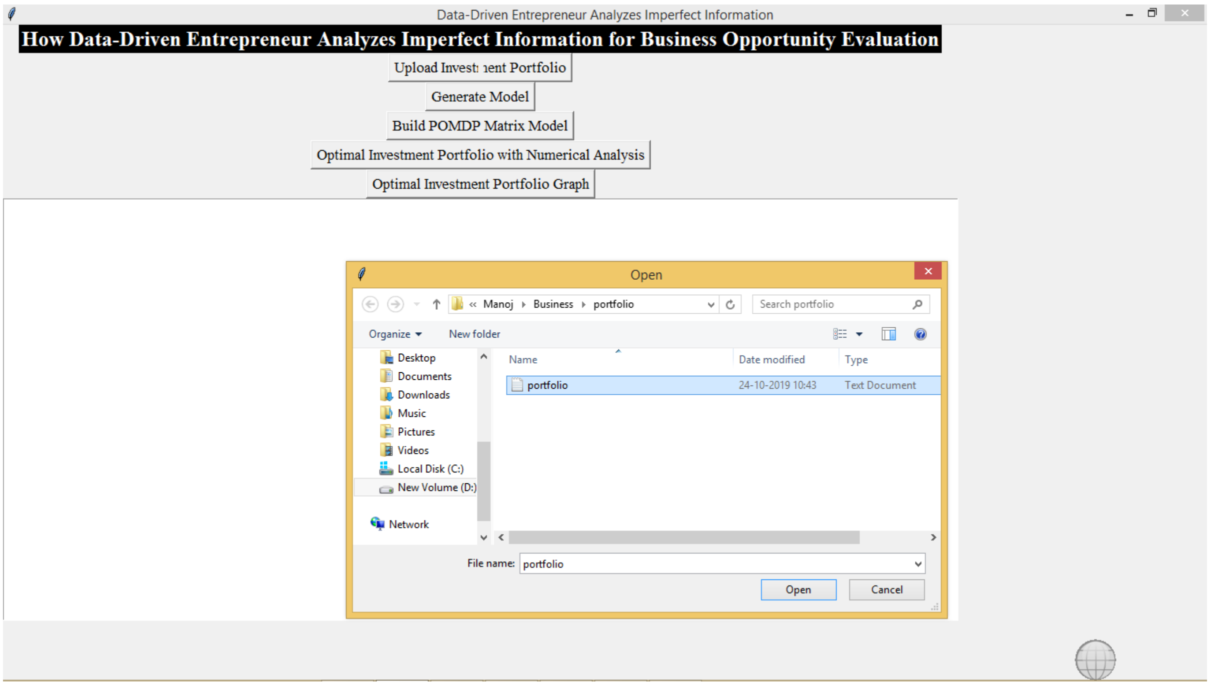
Double click on ‘run.bat’ file to get below screen

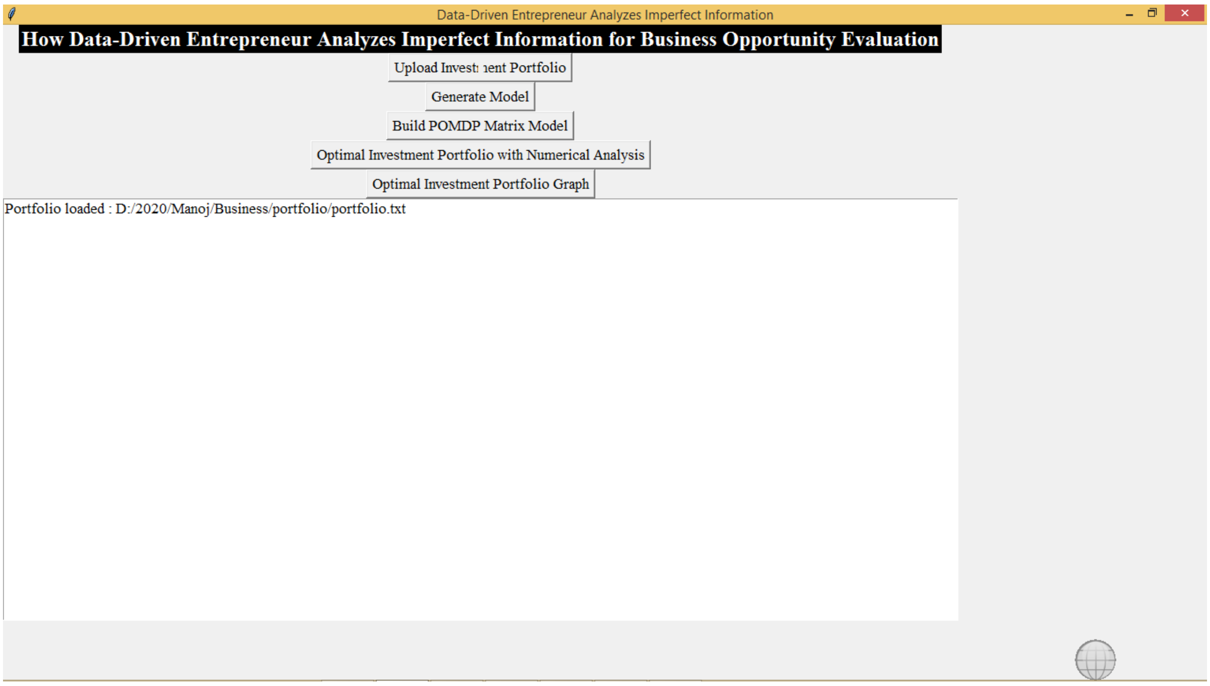


In above screen click on ‘Upload Investment Portfolio’ button to upload portfolio data

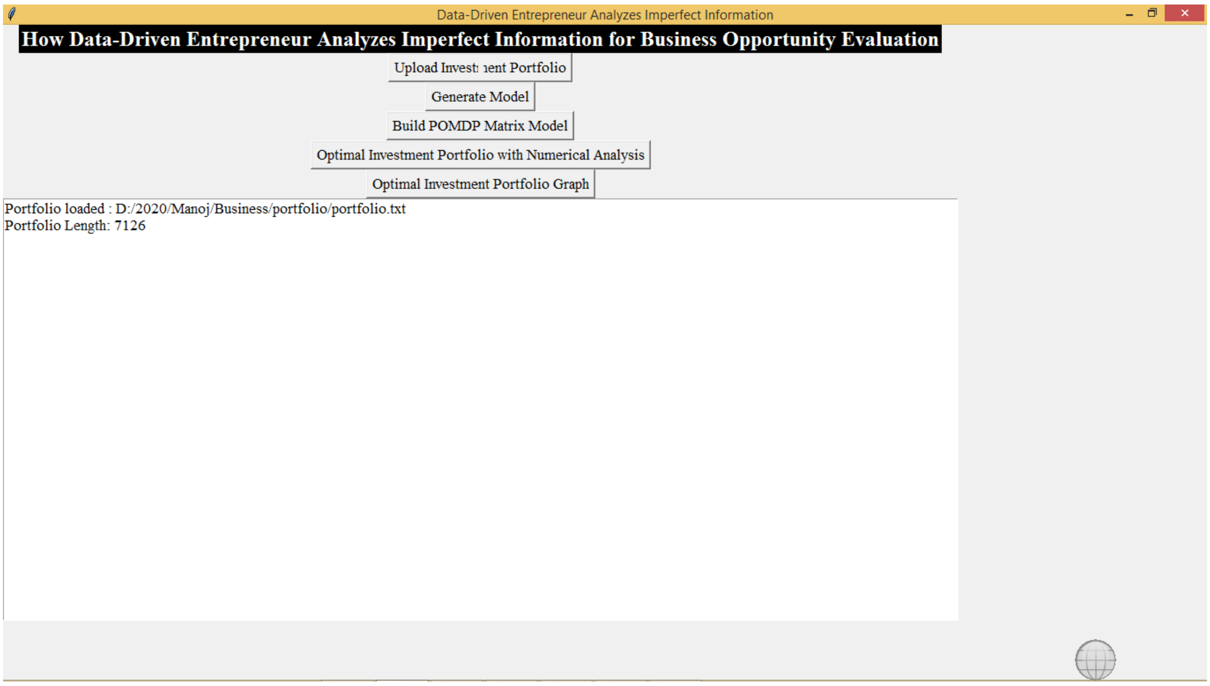


After uploading portfolio will get below screen

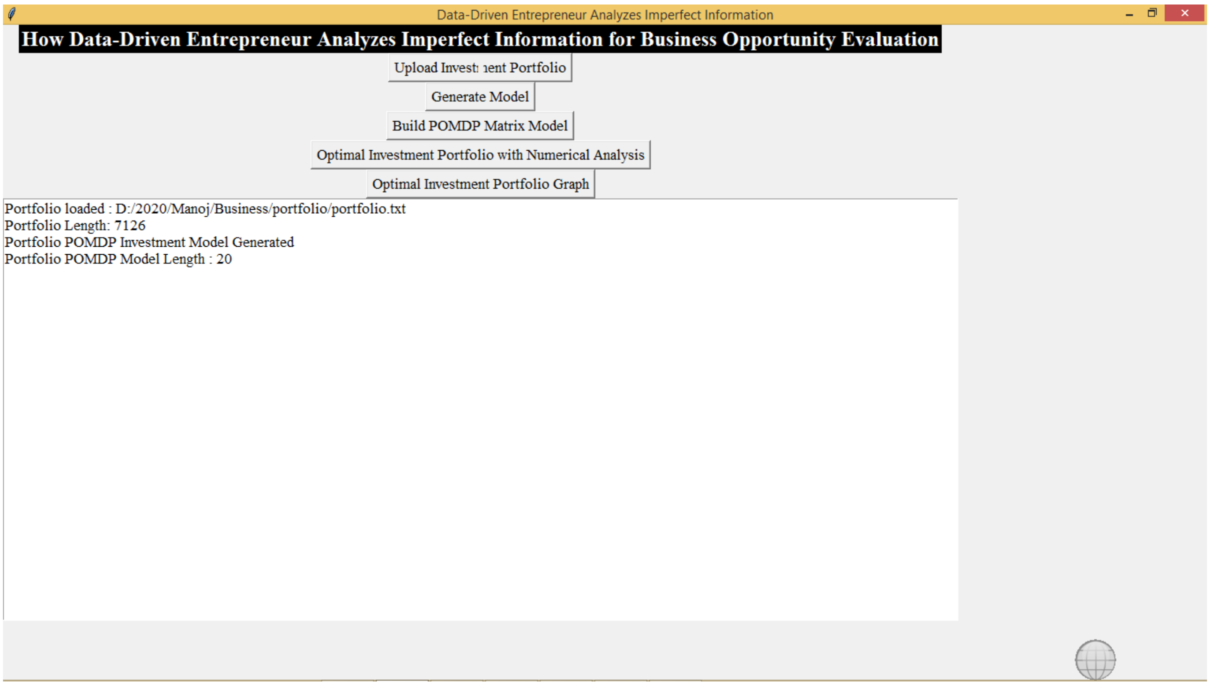




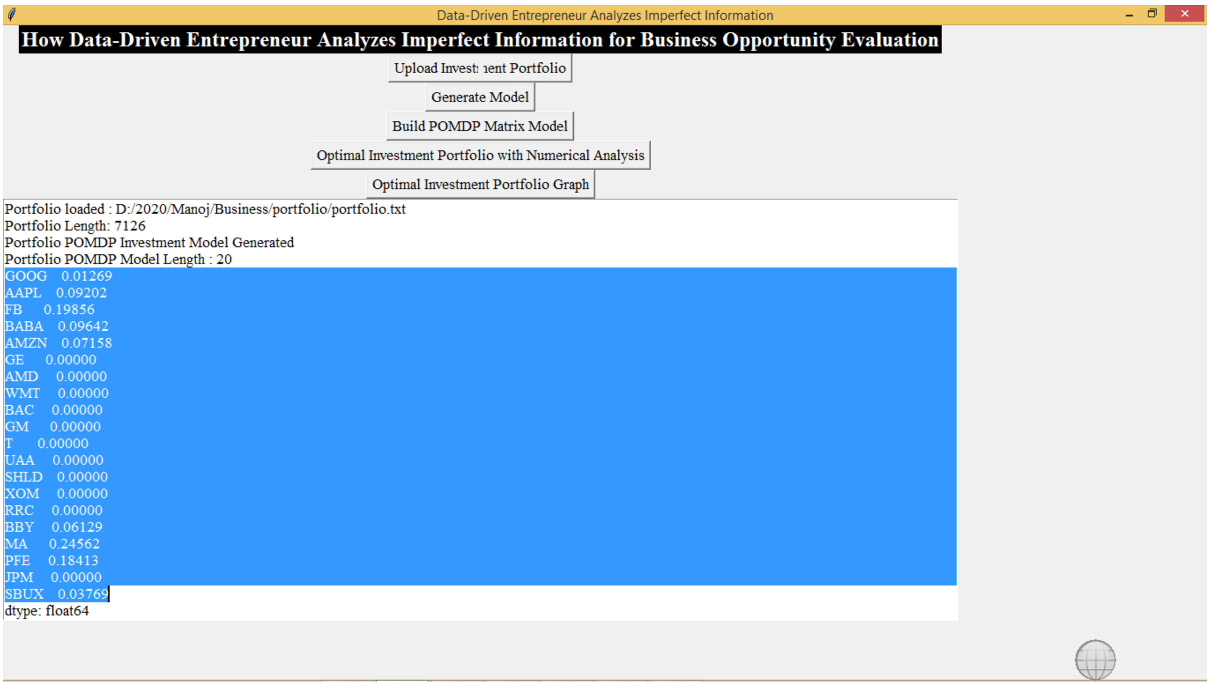
In above screen now click on 'Generate Model' button to create matrix with Z values from portfolio



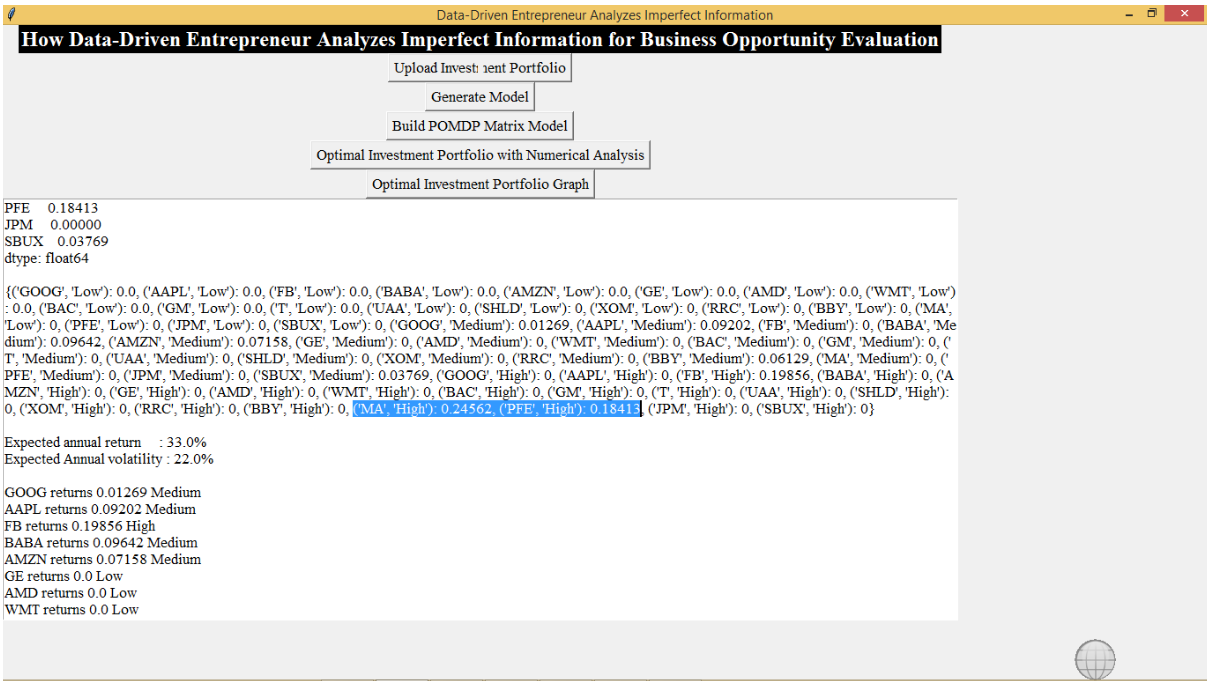
In above screen we can see portfolio contains total 7126 records which contains investment data. Now click on 'Build POMDP Model' button to build POMDP matrix model



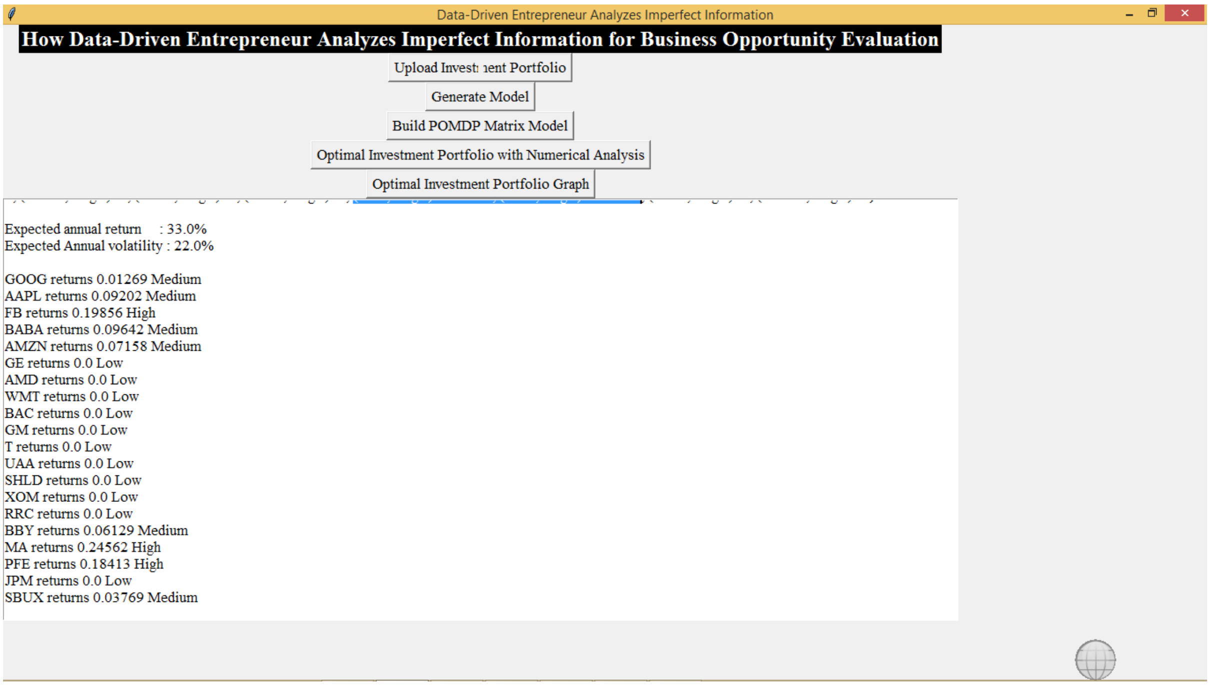
In above screen we can see total POMDP model tree length is 20 now click on 'Optimal Investment Portfolio With Numerical Analysis' to analyze model to get optimize portfolio



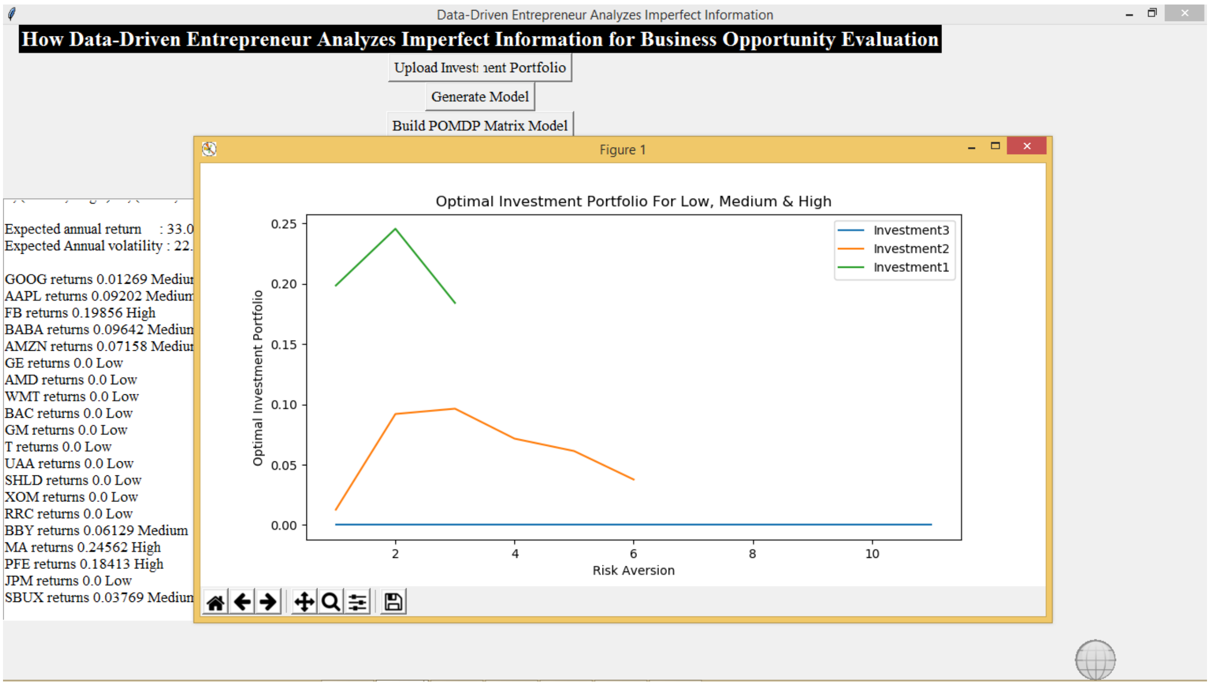
In above screen we can see some companies has given some returns and some returns 0% profit. Now see in below screen to see which company returns high, low and medium



In above screen in POMDP model we can see in selected text that MA and PFE company returns high profit and other returns low and medium profit. To clearly see return values see below screen. Scroll down output textarea to view all output



In above screen we can see total annual returns and the companies which returns high and low profit. From above screen users can easily understand which company returns high profit and in which they have to invest. Now click on ‘Optimal Investment Portfolio Graph’ button to get below graph



In above graph we are showing 3 investment records where investment1 showing high returns and investment3 showing 0 returns. In above graphs x-axis represents record no of each investment as Risk Aversion and y-axis represents returns on investment or optimized portfolio value.

From above screen shots by seeing high returns users can easily understand and invest in those companies which are returning high profits

SYSTEM TESTING

SYSTEM TESTING

TEST CASES

The purpose of testing is to discover errors. Testing is the process of trying to discover every conceivable fault or weakness in a work product. It provides a way to check the functionality of components, sub assemblies, assemblies and/or a finished product It is the process of exercising software with the intent of ensuring that the

Software system meets its requirements and user expectations and does not fail in an unacceptable manner. There are various types of test. Each test type addresses a specific testing requirement.

TYPES OF TESTS

Unit testing

Unit testing involves the design of test cases that validate that the internal program logic is functioning properly, and that program inputs produce valid outputs. All decision branches and internal code flow should be validated. It is the testing of individual software units of the application .it is done after the completion of an individual unit before integration. This is a structural testing, that relies on knowledge of its construction and is invasive. Unit tests perform basic tests at component level and test a specific business process, application, and/or system configuration. Unit tests ensure that each unique path of a business process performs accurately to the documented specifications and contains clearly defined inputs and expected results.

Integration testing

Integration tests are designed to test integrated software components to determine if they actually run as one program. Testing is event driven and is more concerned with the basic outcome of screens or fields. Integration tests demonstrate that although the components were individually satisfaction, as shown by successfully unit testing, the combination of components is correct and consistent. Integration testing is specifically aimed at exposing the problems that arise from the combination of components.

Functional test

Functional tests provide systematic demonstrations that functions tested are available as specified by the business and technical requirements, system documentation, and user manuals.

Functional testing is centered on the following items:

Valid Input : identified classes of valid input must be accepted.

Invalid Input : identified classes of invalid input must be rejected.

Functions : identified functions must be exercised.

Output : identified classes of application outputs must be exercised.

Systems/Procedures: interfacing systems or procedures must be invoked.

Organization and preparation of functional tests is focused on requirements, key functions, or special test cases. In addition, systematic coverage pertaining to identify Business process flows; data fields, predefined processes, and successive processes must be considered for testing. Before functional testing is complete, additional tests are identified and the effective value of current tests is determined.

System Test

System testing ensures that the entire integrated software system meets requirements. It tests a configuration to ensure known and predictable results. An example of system testing is the configuration oriented system integration test. System testing is based on process descriptions and flows, emphasizing pre-driven process links and integration points.

White Box Testing

White Box Testing is a testing in which in which the software tester has knowledge of the inner workings, structure and language of the software, or at least its purpose. It is purpose. It is used to test areas that cannot be reached from a black box level.

Black Box Testing

Black Box Testing is testing the software without any knowledge of the inner workings, structure or language of the module being tested. Black box tests, as most other kinds of tests, must be written from a definitive source document, such as specification or requirements document, such as specification or requirements document. It is a testing in which the software under test is treated, as a black box .you cannot “see” into it. The test provides inputs and responds to outputs without considering how the software works.

Unit Testing:

Unit testing is usually conducted as part of a combined code and unit test phase of the software lifecycle, although it is not uncommon for coding and unit testing to be conducted as two distinct phases.

Test strategy and approach

Field testing will be performed manually and functional tests will be written in detail.

Test objectives

- All field entries must work properly.
- Pages must be activated from the identified link.
- The entry screen, messages and responses must not be delayed.

Features to be tested

- Verify that the entries are of the correct format
- No duplicate entries should be allowed
- All links should take the user to the correct page.

Integration Testing

Software integration testing is the incremental integration testing of two or more integrated software components on a single platform to produce failures caused by interface defects.

The task of the integration test is to check that components or software applications, e.g. components in a software system or – one step up – software applications at the company level – interact without error.

Test Results: All the test cases mentioned above passed successfully. No defects encountered.

Acceptance Testing

User Acceptance Testing is a critical phase of any project and requires significant participation by the end user. It also ensures that the system meets the functional requirements.

Test Results: All the test cases mentioned above passed successfully. No defects encountered.

TENETS REQUIREMENTS:

1. User

User:

Use case ID	**Virtual Mouse**
Use case Name	user
Description	Display home page of
Primary actor	User
Precondition	User must perform the specified actions
Post condition	Action Result
Frequency of Use case	Many times
Alternative use case	N/A
Use case Diagrams	
Attachments	N/A

CONCLUSION

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The entrepreneurial environment is characterized by high levels of uncertainty about the markets that entrepreneurs wish to enter. We develop a dynamic data analysis technique based on a POMDP model to answer our research question about how to analyze imperfect market data for business opportunity evaluation,

while accounting for the entrepreneur's individual risk preference and operational shortages. Specifically, we obtain a probabilistic information measure in the form of an emission matrix. That measure enables insights from an observable process related to external factors, which, in turn, helps assess the state of the hidden market. Owing to Markovian modulation of the POMDP model, the findings of our dynamic model are more realistic than standard static models. Whereas one can derive a closed-form solution for certain probabilistic measures using a POMDP, closed-form analytical expressions cannot be obtained for certain cases, such as situations where the investment dollar amount determines the level of information gain. Therefore, our algorithm numerically mimics the POMDP-based model.We offer insights from our numerical analysis in response to our research question on the impact of the entrepreneur's risk preference and operational shortages on the data-driven investment portfolio. Rather than pursuing the highest expected returns, an entrepreneur may choose perfect information, risk hedging, or market controlling investments, based on his/her cash level and risk preference, in order to maximize the venture's prospects.

Thus, the value of high expected returns or perfect information may be secondary to the availability of investments aimed at hedging risk and/or controlling the markets. For instance, in our numerical analysis, we show that when the shortage of regulations or the entrepreneur's risk aversion creates a higher risk exposure, he/she may be more successful making a risk-hedging investment decision to mitigate that exposure. This outcome of risk hedging may be somewhat counter-intuitive to previous findings, which argue that an entrepreneur is more likely to invest in activities that generate an FI and a path for opportunity change [30]. Akin to the data-driven perspective of entrepreneurship,
the data analysis tied to an investment strategy can lead to new or revised activities that further reduce uncertainty.

In particular, our research shows that the data-driven decision maker might be more successful by managing an investment portfolio specifically tailored to an observable Markovian market, and then analyzing real-time and imperfect data before making a decision. As such, the entrepreneur's creativity, fuelled by the availability of data and analytical models, can play a crucial role in mitigating market uncertainty. We next describe the theoretical and managerial implications of our study, as well as future research directions related to our modeling assumptions and limitations.

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