Opportunities and Challenges of Applying Artificial Intelligence in the Financial Sectors and Startups during the Coronavirus Outbreak

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ARTICLE INFO	ABSTRACT
Received: 06 July 2022 *Reviewed: 17 July 2022* *Revised: 18 August 2022* *Accept: 31 August 2022* ***Keywords:** Artificial Intelligence, Finance, Deep Learning, Soft computing, Big data, Machine Learning.*	**Purpose**: The main goal of this article is the comprehensive study of the applications of artificial intelligence in financial sectors in addition to startups and its impacts on such cases along with Covid19. **Methodology:** we have tried to study the applications of artificial intelligence in different areas especially financial fields such as accounting, auditing, management, capital market, banking etc. On the other hand, we have studied the impacts of artificial intelligence on startups during Covid-19 too. **Findings:** The results showed that AI can be a powerful tool in financial fields such as investment advice, asset allocation, fraud detection, portfolio management and etc. and startups such as increasing production and productivity, time management, data management and analysis and etc. during the Covid-19 outbreaks and it can decrease the harmful effects of Coronavirus. Thus, timely actions can be taken. **Originality/Value:** The main contribution of this paper is a comprehensive and specialized look at the discussion of the applications of artificial intelligence in the field of finance as well as startups during Covid19. We have tried to consider subjects and contents which cover most of the papers.

1. Introduction

Artificial Intelligence (AI) has been around us about 70 years but its possibilities have significantly risen in today's world and each time, we can see new capabilities and applications of AI which has made our works easier than before [1, 2]. Undoubtedly, the hardest challenge faced by many researchers, investors and managers in the field of finance is uncertainty. This uncertainty introduces an inescapable risk factor which has been in financial theories for a long time [3]. In financial fields, we often encounter a huge amount of data (which often is called Big Data) for decision-making such as stock market (trade in stock exchange), banking sector (lending to customers), investment (portfolio optimization) and etc. So, it could be hard and complicated for decision-making and it should be time-consuming due to the existence of different variables and parameters [4]. AI can improve and overcome these problems. On the other hand, it can optimize and boost your solutions and save your time because it can consider different parameters and doing complicated tasks. There are a lot of definition about AI, but one of the definitions which is common is that "AI is the simulation of human intelligence processes by computer systems". These processes include learning (the acquisition of information and rules for using the information), reasoning (using the rules to reach approximate or definite conclusions) and self-correction. In addition, AI can be as the science and engineering of making machines intelligent, especially intelligent computer programs. Therefore, AI can be characterized as a series of systems, methods, and technologies that display intelligent behavior by analyzing their environments and taking actions with some degree of autonomy toward achieving pre-specified outcomes [5].

Financial experts strongly believe that AI can be used in financial management and controlling as 90% of respondents identified finance as a potential area to adopt AI. Operations (60%) and logistics (50%) are also strong candidates to take advantage of AI. Naturally, the background of the respondents can drive their responses but we can already see that finance professionals believe in AI's capabilities in their domain [6, 7]. In this paper, financial fields cover areas such as accounting, auditing, capital market, banking, insurance in addition to startups. AI has a lot of subfields and subsets. So, people might confuse or make a mistake and misuse the words interchangeably or incorrect. So, it is better to know the concepts of some words such as machine learning (ML), artificial neural network (ANN), expert system (ES), deep learning (DL) and etc. We have covered these words in part (3) which is about AI architecture.

In this paper, we want to study the impacts of Covid-19 on financial fields and startups. On the other hand, survey the role of AI in reducing the negative consequences of Covid-19 in financial fields and startups simultaneously. For this purpose, we have introduced different branches of AI and the applications of each one in financial fields and startups. The problem is that there is an equality in distribution of vaccines. Some countries do not have enough access to Covid-19 vaccines while some others have used 3rd or 4th doses. Poor countries who are in Africa such as Nigeria and Ghana are faced with financial shortage. To gather, AI and startups can decrease these inequalities. As a solution, AI can use to optimize solutions. On the other hand, startups as a reference can improve the mechanism.

In this article, we have taken a look at startups, which are companies that pursue new goals with new tools or create a new solution for past problems. Like AI concept, startups have different definitions; startup companies are newly born companies which struggle with existence. These entities are mostly formed based on brilliant ideas and grow to succeed. These phenomena are mentioned in the literature of management, organization, and entrepreneurship theories. However, a clear picture of these entities is not available [8]. The general objective of AI is to make machines such as computers think and act

as human or do things which require intelligence when done by humans [9] and recognizing startups and make familiar with their potential gains and profits and their effects on global economy. The main and most significant contribution of the research paper is addressing a hybrid issue and combination of AI, finance and startups during Covid-19 pandemic.

The last part is related to the impacts of Covid-19 on financial fields and startups and the role of AI in decreasing these impacts. Covid-19 has definitely had a negative impact on the financial sectors and startups such as cash flow, company's value and etc. on the other hand, they can use AI to decrease these negative impacts and facilitate the realization and achievement of goals.

The structure of the paper is as the following: The 1st part is introduction, some information about what is AI and what do we mean by financial sector and startups. The 2nd section is AI background and overview, or literature review. The next part is about AI architecture and its sub-branches. Part 4th is about the applications of AI in finance and startups. Next part is including pros and cons of AI. Section six is about statistics and reports on using AI in different countries and its effect in economic such as GDP growth and etc. Finally, there is conclusion and remarks and further recommendation. Finally, references and usable resources.

2. Overview and Background

In this part, we have tried to take a look at the history and evolution of AI from 1940's until today. On the other hand, we have reviewed some researches and papers about using AI in different area such as financial management, accounting, auditing, banking and etc.

During 20th century, AI can be explained and can has a brief history such as below [10]:

1923: Karen Kapek's play named "Rossum's University Robots (RUR)" opens in London, first use of the world "robot" in English.

1945: Isaac Asimov, alumni at Columbia University, invented the term Robotics.

1950: Turning Test for evaluation of intelligence was introduced by Alan Turning. Claude Shannon published detailed Analysis of chess playing as a search.

1956: John McCarthy coined the term Artificial Intelligence.

1958: John McCarthy invents LISP programming language for AI.

1964: Danny Bobrow's thesis at MIT showed that computers can understand natural language well enough to solve algebra world problems correctly.

1979: The first computer controlled autonomous vehicle; Stanford Cart was built.

1984: Dennett discusses the frame problem and how it relates to the difficulties arising from attempting to give robots common sense.

1990: Major advances in all area of AI:

- *Significant demonstration in Machine Learning (ML)*
- *Case-based reasoning*
- *Multi-agent planning*
- *Scheduling*
- *Data-mining, web crawler*

- *Natural Language understanding and translation*
- *Vision, virtual reality*
- *Games*

1997: The deep blue chess program beats the world chess champion, Gerry Kasparov

2000: Interactive robot pets become commercially available. MIT displays a robot with a face name-Kismet that expresses emotions.

Table (1) shows the evolution of AI in different periods.

Table 1. History of AI [11]

Period	Explanation
1943 to 1955	Gestation of AI: first theorizing of brain-based computational models, conceptualization of Turning test
1956	Birth of AI: AI is established as a separate field of computer science
1952 to 1969	Early year of AI: the first AI software programs were developed and tested against existing approaches to solving problems
1966 to 1973	A dose of reality: original predictions for AI were realized as unachievable. Limited progress was made.
1969 to 1979	Knowledge-based systems: progress was made by including domain knowledge with AI systems
1980 to present	AI industry emerges: progress was made by including domain knowledge with AI systems
1986 to present	Rise of interest in artificial neural network
1995 to present	Data mining: growth of interest in and capacity for data mining
1997 to present	Intelligent agent: AI approach based on individual; autonomous agents emerge
2001 to present	Availability of large data sets

In each period, researchers could add some capabilities to AI and could discover the new applications. We can show the history of AI in other ways such as Table (2) with related and expert phrases:

Table 2. AI history [12]

Period	Subject
Early 1940's	Invention of modern computer
Early 1950's	Computational statistics
Mid 1950's	Machine learning (ML)
1956	Birth of artificial intelligence (AI)
Mid 1960's	Natural language processing (NLP)
Late 1960's	Computer vision
Late 1970's	Robotics
1990-2000's	Data mining/ data science
Early 2010's	Deep learning (DL)

As can be seen, in each phase, AI has progressed and being more completed than previous and done different and variety tasks such as graphical tasks, reasoning base task, decision making and etc. Table (3) is about some researches about AI in different financial fields along with authors, years of publication, methodology and results.

Table 3. Literature review [4]

Author(s) (year)	Objectives	Findings	Recommendations
Wall, L. D. (2018) [13]	History of artificial intelligence with some big strengths and weaknesses and some aspects in which AI influences the future of the political and financial systems.	The rapid development and use of AI technologies will change the financial services sector and many industries in the real economy. In the extent that this potential is realized, the financial behaviour and prudential supervisors will have significant consequences for AI.	The rapid development and use of AI technologies would change the financial services sector and many real economy sectors. If this ability understand, AI may suffer significant implications for financial conduct and prudential supervisors.
Xing, F. Z., et al. (2018) [14]	Clarify the scope of NLFF analysis through the organization and arrangement of related work methods and applications. The survey will also increase the knowledge of NLFF's progress and potential points and engage in discussions in various disciplines.	The estimation of the growth rate for each cycle creates an expectation of inflation, if the valuation of an asset remains static. Regardless of the changing market pattern, the average growth rate is always positive.	
Lin, T. C. (2019) [15]	An analysis of the threats and drawbacks such as how technological knowledge and uncertainty can affect regulation, economy and culture and discourage it from being carried out.	The rise and growth in financial and other artificial intelligence would definitely be one of the most important legal, business and social innovations of the years to come. The early developments provided insights into the immense capabilities of financial artificial intelligence and the opportunity.	The rise and development in financial and other artificial intelligence will undoubtedly be one of the biggest legal, economic and social advances of the coming years. The early advances gave insight into the enormous potential and ability of financial artificial intelligence.
Buchanan, B. G. (2019) [16]	Search for current AI literature on research, practice and regulation	The financial services industry is still in the early stages of artificial intelligence. Throughout banking, AI has become more omnipresent and there are more problems, including political, cultural, economic and social hurdles.	There is still artificial intelligence in the early stages of financial services industry. AI is more omnipresent in banking and challenges, including financial, technological, economic and social hurdles, are that.
Chan, C., et al. (2019) [17]	In three areas of financial services: asset management, banking and insurance, this paper is a joint effort on the benefits and cons of AI applications.	The use of AI in financial services has many advantages. It can increase efficiency and productivity by automating; minimize psychological or emotional errors; and improve the quality and conciseness of management knowledge by identifying patterns and/or longer-term developments, which cannot be easily identified using traditional monitoring techniques.	There are many drawbacks to the use of AI in financial services. It can improve efficiency and output by dynamically detecting anomalies and/or long-term changes that cannot be easily identified through conventional tracking methods, mitigating psychological or emotional mistakes. It can also improve quality and conciseness of management information.

3. Artificial Intelligence Structure

Artificial Intelligence tries to work based on the function of mind. So, it works based on training and learning. AI is based on three basics: 1. learning 2. reasoning 3. realizing [18]. AI is divided to different classes and they are different due to these above three basics. there is a class of AI which are including four parts: 1. reactive machines 2. limited memory 3. theory of mind 4. self-awareness [19]. There is another class of AI which is based on capabilities: 1. narrow 2. general 3. super [20]. The first and second classes are called type1 and type2 AI respectively. Totally, AI has three main sub-branches which are: 1. machine learning (ML) 2. artificial neural network (ANN) 3. deep learning (DL). But

there are other branches which are called expert systems (ES) and fuzzy logic which have defined them in Table (4).

Table 4. AI components

Name	Definition
Machine learning (ML)	ML takes AI a step further in the way that algorithms are programmed to learn and improve without the need for human data input and programming.
Artificial neural network (ANN)	ANN is a system that consist of many simple processing elements operating in parallel which can achieve, store and use experimental knowledge.
Deep learning (DL)	DL is the next generation of ML that introduces multiple layers of learning from massive datasets. DL decisions and data classifications are refined at each layer to produce accurate insight.
Expert systems (ES)	ES is a computer-based system that uses knowledge and facts and apply an appropriate reasoning technique (inferencing) to solve problems in a given field (domain) that normally require the service of human experts.
Fuzzy logic	It has been extended to handle the concept of partial truth, where the truth value may range between completely true and completely false. Furthermore, when linguistic variables are used, these degrees may be managed by specific functions.

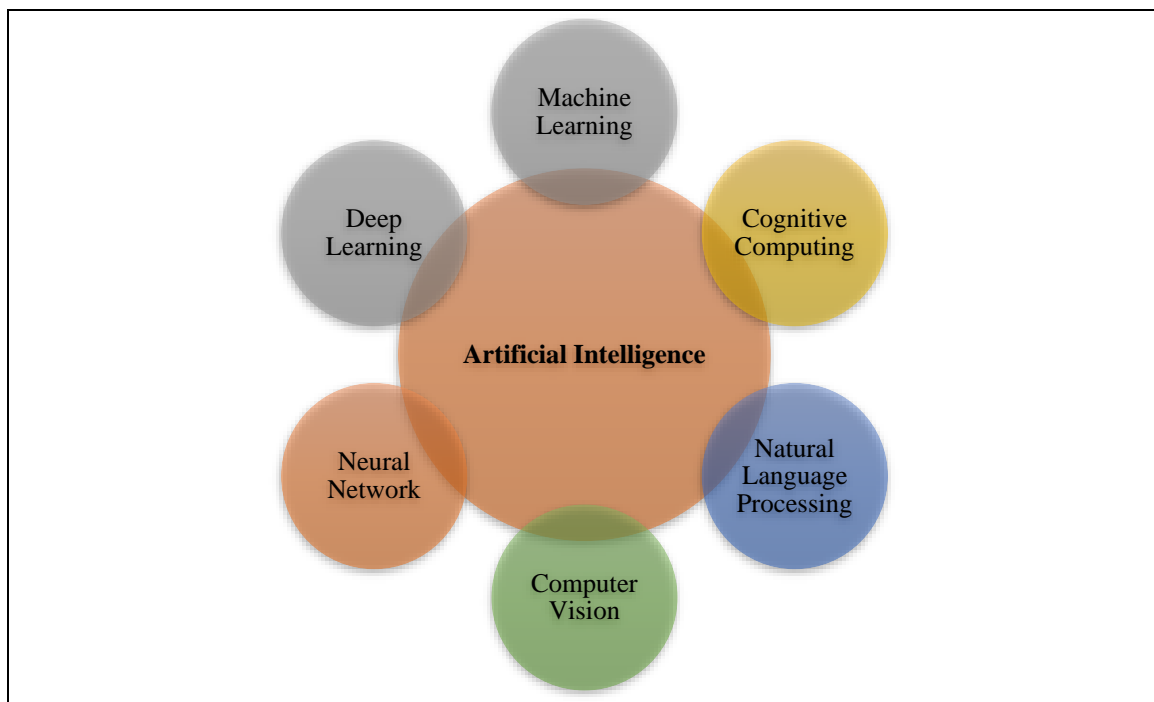There is a chart which is components of AI figuratively.

Fig. 1. AI components (*Source*: https://softwaretestinghelp.com)

For better understanding the relationship between categories and AI components, Figure (2) is depicted;
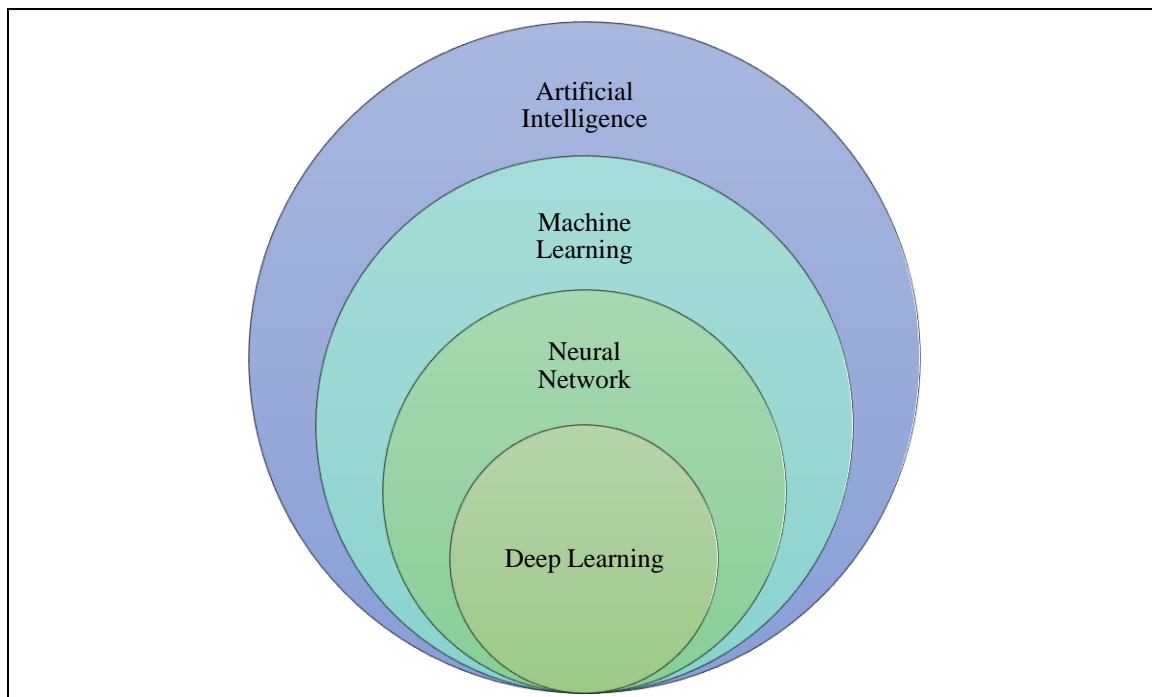
Fig. 2. AI subsets (*Source*: https://apmonitor.com)

3.1. Artificial intelligence applications in finance

Artificial Intelligence has different functions and applications in different fields. But, in this paper, we have focused on the study of AI in financial field.

City Bank is a sample about using expert systems in 1980s because of big data, in volume and speed. Every day, Reuters publishes 9000 pages' financial news and Wall Street creates five research documents every minute. By using AI, corporations can process data and do data mining. Some AI technologies which use in finance are natural language processing (NLP), data mining and text mining, semantic technology and machine learning (ML). IBM used AI to increase the speed of decision-making process and the power of financial statement analysis. In Table (5), we have taken a brief look at the applications of AI in financial sector:

Table 5. AI applications in finance

Row	Financial Sector	Applications
1	Auditing	- Measurement and management the probability of audit risk and audit ambiguity and evaluation of the materiality in auditing - AI can help auditors in analytical review process and going concern decisions - Fraud detection
2	Investment advice	It depends on annual income, capital, and individual risk taking and fuzzy logic can help
3	Assets allocation	Assets allocation to three parts such as savings, income investment and growth investment due to age and risk taking
4	Valuation	Evaluation the value of stocks, bonds and other assets. We should simulate due to human evaluation by Artificial Neural Network
5	Approval of credits	We can use ANN for giving loan to clients. For example, use client's information as input variable and real decisions as output variables. AI can be used to determine the credit limit.
6	Finished cost estimation	There are a lot of factors in determination of finished cost such as constant changes in the nature of technology, existence of direct material and labours and etc. So, the input data might be too much and we can use AI.
7	Forecasting	AI can be used in forecasting such as the prediction of stock price and trend, supply and demand and etc. This prediction is not affected by human behaviour and is unbiased and other interfering factors that affect in making decision is omitted.
8	Default risk prediction and limitation of loan	AI can be used in lending or non-lending loans to clients due to historical information such as defaults, age, job, criminal records and etc.
9	Portfolio management	Corporations and managers invest in different assets such as bond, stock, mortgage and fixed assets like real estates. They have different maturity dates and they should be tracked. On the other hand, economic and financial environment is fluctuating. So, we can use AI for management of our portfolios.
10	Fraud detection	AI can find and detection fraud in financial statement by using genetic algorithms and other AI optimization algorithms. They can memorize thousand frauds in different forms. AI can analyse user's behaviour and when the behaviour is different and not match with normal behaviour, it can predict the probability of fraud
11	visual identification and verification	It can use in lending and giving loans to clients virtually and finally accept or reject their documents. AI makes these services available, faster and more confident
12	Insurance recommendation	AI can be used in different fields of insurance such as job insurance, damage assessment after accidents and monitoring property condition. By replacing technology with human, it facilitates and accelerates insurance processes.
13	Algorithmic trading	Algorithmic trading has been used for a long time; today 70 % of the trade is made by algorithms - information on what and when to buy and sell - splitting market offers in optimal sizes in order to minimize the market impact - High-frequency trading (1/1000 second); optimization of time, market place, lot size; search of price discrepancies

In the following, we have discussed the applications of AI in most important financial fields which explained in table 5. We have tried to study the impacts of AI in finance. So, we need to investigate the results before and after applying AI along with its achievements and challenges.

- *AI in auditing*

Audit firms try to test and apply the power of ML in audits. One of them is Argus which is used by Deloitte. Argus is a ML tool that has different capabilities. For example, it can read different documents such as lease contracts, sale contracts and etc. it can identify and interpreting the key feature of documents. It can review entire data and population for anomalies. Then it can make decision. It can distinguish the appropriate and inappropriate contracts and improving both speed and quality of the auditing. Another application of AI in auditing is controlling entries. It can cause finding entries which are questionable and they have unauthorized sources.

Another uses of AI in auditing is improving internal auditing. AI can improve by using different algorithms and can handle a huge amount of data. For example, we can use Fuzzy logic in audit opinion because fuzzy logic can consider conditions which are not binary and contains different broad and frontiers such as unqualified, adverse, modified audit opinion or etc. [21].

Before applying AI: Spending too much time doing facile, tedious and time-consuming tasks will be one of the topics and problems that often cause various and troublesome mistakes in this area.

After Applying AI: Misallocate of time to time-consuming, trivial tasks and eliminating heavy physical processes, such as data collection that has been done manually for decades, is one of the developments in artificial intelligence in this field.

Achievements: Forecasting, analyzing and statistical classification of information, collecting financial statements, operating methods and organizational structures, reviewing a large number of contracts in a much shorter period of time can be important achievements of artificial intelligence in this field.

Challenges: Understanding customers' business and its potential risks, determining compliance with established standards, gathering evidence, applying professional doubt and uncertainty, making more judgments about processing, interpreting and transmitting data to customers to provide guaranteed services are limitations that it is beyond the scope of artificial intelligence.

- *AI in investment advise*

By digitalization and accessing smart phones, we can apply AI easily. AI provides wealth management facility and customer can access to financial health, make investment and setting goals and plans for long-term periods.

Financial institutions can use ML to create opportunities and improving their relationships to customers. There are different AI tools such as robot-advisors, text bots and etc. which are facilitating the financial operations and reducing costs. Customers can make a balance between their risk and return. AI and ML can help them because they can work with big data and recognizing the pattern and prepare them as an output along with different shapes, tables and interpretation [22].

Before applying AI: Financial constraints and lack of proper knowledge and recognition of the market may lead to emotional decisions, by reducing access to the required funds, it can hinder the optimal decision-making in the field of investment and lead to the missing of investment opportunities. As well as retained losses.

After applying AI: The effort of artificial intelligence in the financial market is to automate and analyze the trading process as much as possible, as well as facilitating the process of market analysis, purchase, sale and capital allocation for a system or even a huge database of systems.

Achievements:

1. Speeding up the analysis in the machine compared to human analysis

2. Automation and accurate process for transactions and eliminate human error

3. Applying analytics to making profit from market trends

4. Predict the upcoming trend using the analysis of past data

5. Market monitoring and rapid analysis

6. Obtain trading strategy from market algorithm

Challenges: Currently still important functions such as investigation of evidence in the capital market for unknown assets such as stocks, cryptocurrencies, credit discovery, etc. is done by humans and is not the responsibility of artificial intelligence!

- *AI in portfolio management*

Financial institutions and advisor can use advanced AI algorithms to help their customers and managing portfolios in terms of tax efficiency, rebalancing, risk and return. AI can be used in data mining. It can recognize the patterns and making decisions in the future. ML can distinguish the real patterns from noises and provide a meaningful inference, more efficient and faster. Chabot can ask a few questions to find out a person's interests and goals. So, they can give some tips based on these goals and saving consumers money.

AI and ML can do parallel tasks. For example, they can get data from different markets such as house, automobile, stock market and etc. and analyzing based on risk and return automatically [23].

Before applying AI: Failure to discover new solutions and also failure to discover new solutions from old methods, strategic mistakes, exorbitant costs to receive advice from experts in this field, etc. all derived of the lack of artificial intelligence in the field of portfolio management.

After applying AI: The combination of artificial intelligence and the existence of a planned system with this field of activity causes portfolio management services to be more automated and help to make a profit in the market.

Achievements: The features that the user offers to the machine according to its specifications determine the level of risk-taking or risk-aversion of the user, and depending on this situation, certain shares are offered to the user.

Challenges: Due to the complex nature of artificial intelligence and computing technologies, you have to tolerate higher costs for their ongoing maintenance.

- *AI in forecasting*

By using different algorithms, AI can be applicable in different financial predictions such as stock market, credit rating, volatility, interest rate, inflation and etc. AI can store a long historical data and finding the patterns. It can be trained and improves its predictive power. For example, by training ANN,

tuning parameters, using advanced algorithms, we can optimize the output and obtaining the ideal solution.

Banks and financial institutions can use ML or ANN as a method to customer's credit rating. They need to use different data such as the amount of capital, total assets, sales, liabilities and etc. as input variables. Then by training the network, they can diagnose the right customers who are appropriate and suitable for loan. This can decrease the bank risk. On the other hand, it can beneficial for economic because lending to right people can increase production, the rate of employment and the growth rate of GDP as well [24].

Before applying AI: Regardless of the time you have to devote to your research, even with a great deal of knowledge and performance, or even examine the rate of inflation, interest rates, market fluctuations, etc. there will be the possibility of mistakes that will sometimes costly.

After applying AI: Considering the personal information that AI receives from you, carefully processing this information and combining it with similar and coded items will give you the best and most efficient and possible way according to the previously provided feature.

Achievements: Computational tools of artificial intelligence are able to replace it with human intelligence in performing tasks. So, at different times according to the information they receive from you provide the conditions to perform specific tasks.

Challenges: Due to any problems related to computing software, it may also cause problems such as hacking, missing information, etc. which you often need to back up your data and information.

- *Algorithmic trading*

There are three reasons which causes using AI in algorithmic trading:

1. Collecting and analyzing a huge amount of data without any human intervention.

2. ML creates a situation which computers can conduct faster and more accurate financial analyses than human.

3. Real time trading, high speed transactions and complex data structure are some qualifications which AI and ML can handle these traits efficiently.

The most precious material in stock price forecasting is data. ML can recognize the structured and unstructured data by training to make worthy predictions based on that data [25].

Before applying AI: Due to the increasing degree of difficulty of the problems as well as the high volume of information in this field, research will be a little confusing, tedious, too much consuming and of course costly because doing all this work is beyond the responsibility of one person. So, as a result of doing complicated and several tasks, it can lead to making some mistakes.

After applying AI: Algorithms reduce the possibility of errors and mistakes and solving the most complex and difficult problems quickly with minimum mistake.

Achievements: Saving time, much less depreciation than humans, much faster and un-interrupted speed in collecting and solving information, etc. have been only a small part of the achievements of AI in the field of algorithm trading.

Challenges: Such machines also have many complexities. So, you may tolerate huge costs. On the other hand, the software must be constantly updated according to environmental changes and new needs.

- *Asset allocation*

There are different types of markets such as automobile market, precious metal, currency, stock market and etc. along with fundamental data. AI and ML can analyze data faster and more efficiently. They can decrease different risks such as operational risk, technology risk, model risk and etc. However, we need to declare that there are some skills which you need when you use AI systems. So, both expert knowledge and machine can be beneficial together [26].

Before applying AI: There are a lot of data in the market which whenever you are going to invest, you must enter with full knowledge and information. As a result, by spending a lot of time predicting and processing them, if we assume that they are done without any mistakes, it can be effective, but it often gives the opposite result due to evidence.

After applying AI: Artificial intelligence acts and thinks much faster than we think, and resolves monotonous methods that are very tedious, and achieving the considered results as well.

Achievements: The complete absence of emotion and excitement in machines increases their efficiency, because due to these features, they are able to make the best and most correct decisions including potential transactions in the shortest possible time as well as observation and analysis.

Challenges: Unlike humans, AI progress needs planning, and if they are not given a new plan, they will do the same repetitive and routine tasks. On the other hand, machines wear out over time.

- *Approval of credit*

AI and ML techniques can use different data such as income, liabilities, assets and etc. to predict the appropriate loan applicants. In the past, loan applicants received loans by filling out forms and answering a few questions. But by using ML and smart app, it is possible to identify the real applicants in the shortest possible time**.** AI can decrease costs. On the other hand, it can increase efficiency and productivity [27].

Before applying AI: Access to raw data, difficulties in combining and aggregating input data, use of approaches, features, appropriate choices and evaluation of results are some of the factors that need to be addressed.

After applying AI: Machine learning algorithms can be configured to process millions of customer data, including age, occupation, financial status, and so on.

Achievements: By combining data and prediction of future, it is possible to decide what kind of arguments are better to be considered. This helps a lot in the dynamic status of providing credit to users.

Challenges: Machines can only do things they have learned and only execute commands. Although artificial intelligence is used to design and build, their power does not match the power of the human's brain.

- *Fraud detection*

ML can use different approaches to find patterns across huge quantities of streaming transactions. So, it can be very helpful in fraud prevention and detection. They have some merits and benefits such as [28]:

1. Faster and efficient detections

2. Cost effective

3. More accuracy

4. Easily scalable

Before applying AI: Misrepresentation of financial information and intentional or unintentional misstatement of financial statements will involve a serious economic problem that must be avoided from both a practical and a financial perspective.

After applying AI: Fraud forecasting identifies cases that are historically related to the occurrence of fraud in the financial field. For example, there have been a number of case studies on discretionary accounting estimations that relate to management dividend reforms and are commonly associated with accounting fraud.

Achievements: Data mining, specialized systems, pattern recognition, machine learning, neural networks, new monitoring methods, etc. are achievements and techniques in AI which are used to fraud detection.

Challenges: There are still many variables that need to be identified in new fraud theories to give more predictive power to machines and therefore to experts. Continuous updating is also one of the orders that should be paid special attention to it.

- *Insurance recommendation*

By using AI, more customers at a higher volume and higher speed can be serviced. It can recommend and giving some advice and tips about insurance and saving insures money and creating happier customers [29].

Before applying AI: Generalized reality, data accuracy, unrestricted business, etc. are among the things we deal with on a daily basis, and due to the staggering costs of some medical services and various accidents, a person may be under a lot of pressures.

After applying AI: However, while AI provides opportunities for traditional insurers to modernize themselves, implementing AI is not straightforward. Traditional insurers could face challenges integrating AI into their existing technology due to issues such as data quality, privacy and infrastructure compatibility.

Achievements: Pricing, compensation and identification of violations, early fraud detection, tailored and cheaper insurance, faster claims processing, saving time and improvement in these areas have been among the basic achievements of artificial intelligence in the field of insurance.

Challenges: There are still many doubts about its capabilities in enhancing the experiences of insurance companies and their customers, such as privacy issues and, of course, job loss, which should be resolved with further investigation of these ambiguities.

3.2. Artificial intelligence pros & cons

At first, we take a look at pros and cons of AI in financial sector. Then, we talk about benefits and risks of AI in general.

3.2.1. AI pros in finance

AI technologies can provide companies with a wide range of benefits. For instance, artificial intelligence is efficient in handling large volumes of information [30]. As a result, we could soon have real-time dashboards available in the blink of an eye. In essence, computers will take over the manual work of analyzing data and creating meaningful reports. By using these insights and metrics, professionals will be much more efficient in budgeting and forecasting. They will have more time to build business relationships and to do advisory work as well.

Risk assessment through the use of advanced software is already showing promising results across industries, and finance is leading the way. Likewise, AI can be more efficient than humans when it comes to fraud detection and prevention [31]. On top of that, AI-based applications will eliminate bias from the metrics. Of course, we will have to say goodbye to human errors as well. After all, computer algorithms do not get tired or sleepy, no matter how many hours of overtime they put in a week.

Improved data quality will result in better efficiency, which is the end-goal of every group. Better graphics and informative charts will lead to better decisions, as simple as that. So, it seems that AI could bring lots of positive aspects to the world of finance. But is there more than meets the eye with AI tools and systems? Is AI the future of finance?

3.2.2. AI cons in finance

At the moment, most organizations cannot afford premium AI applications. The high-end technology is too expensive for the majority of fin-tech businesses out there, at least for now. Yet, we are on the verge of entering a new decade, and things could rapidly change. Nonetheless, many renowned experts have issued warnings about the dangerous nature of artificial intelligence. Of course, the primary axiom of these claims is that AI will make humans obsolete. Once computers develop their own intelligence, they will be unstoppable. Nonetheless, the situation out in the trenches shows that this is nothing more than a myth. No matter how complex the algorithms are, they cannot copy our common sense. In other words, human intuition remains an elusive ingredient that makes the difference between robots and the human race.

Also, a lack of regulatory scrutiny could present a problem in the upcoming period. Only by fine-tuning the legislation and improving infrastructure management can we hope to mitigate the risks of cybercrime. Misuse of data in the fin-tech business often results in colossal losses, and that is why the rise of AI needs to be accompanied by constant improvements in security procedures. The appearance of GDPR in the EU zone was a significant step forward when it comes to regulatory efforts, but the battle to reduce risks will never end.

The black box of AI comes with ethical and economic risks, so teams need to be ready to face the challenges and prevent malicious use of emerging applications and tools. In other words, it is essential to think three steps ahead.
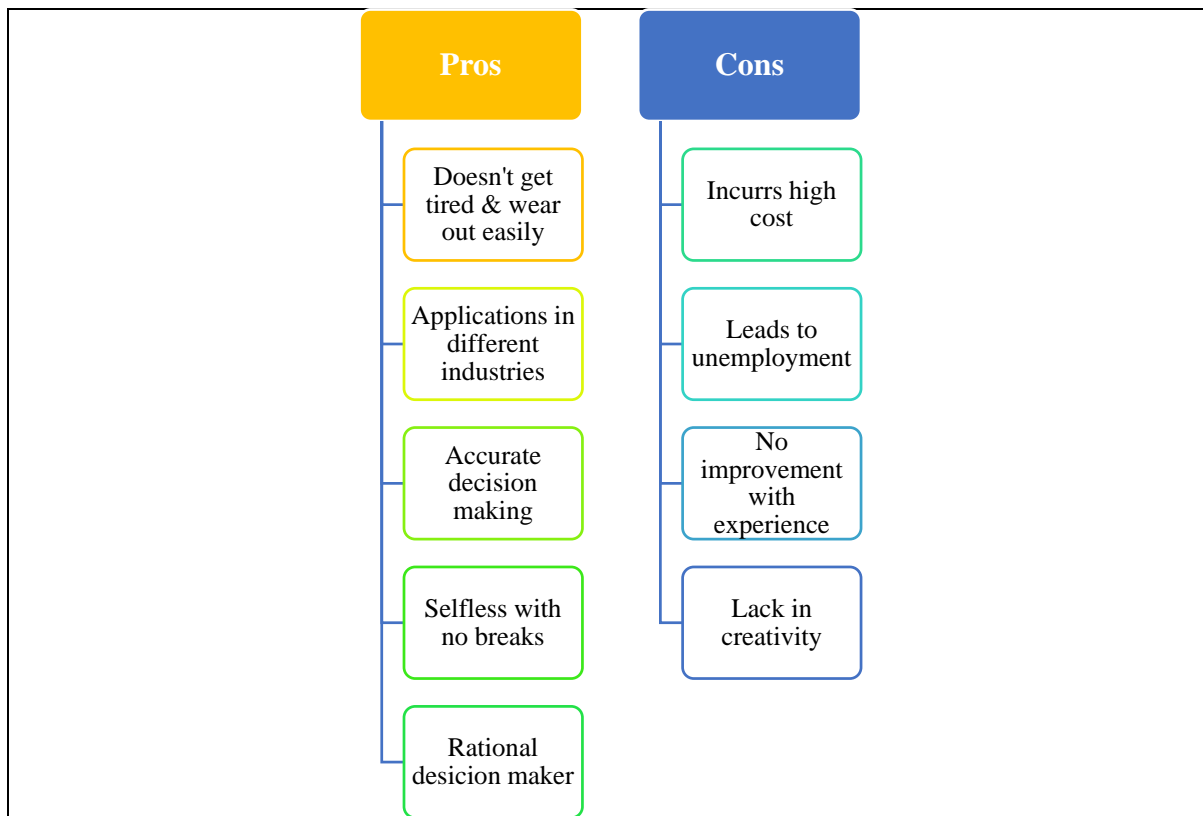
Fig. 3. Pros & Cons of AI in general (*Source*: DataFlair)

3.3. Artificial intelligence and startups

Over the years and during times, human have studied and researched shortcomings throughout their lives and they were looking for the answer to this question: "how to do things to save time and money?"

With the advent of this question, many ideas surrounded the minds of researchers. Perhaps the issue of technology lies in the origin of this principle. Due to weaknesses in previous business models, they sought new business models and methods to compensate for previous shortcomings with better results and more productivity.

3.3.1. Definition of startup

Based on the management literature, we consider any start-up activities (from hypothesis and idea design to implementation and productivity) to be a startup. Summary, startup can be considered as an emerging business and a little beyond the idea, which is being developed executively and for its members, the consistency improvement, going concern, and creation of a new situation is important and is a concern. Therefore, its structure covers not only technology but also all aspects of business. But there is another common definition of a startup and it is as follows:

A startup is a young company founded by one or more entrepreneurs to develop a unique product or service and bring it to market.

3.3.2. Startup history

From the conceptual viewpoint, startups originated from human birth and when they felt the need, even before the formation of civilization and society. Over time, this concept found universal meaning and strengthened the first collective ideas. However, the use of the term startup began with the launch of Silicon Valley technology companies and it still remains strong and years later, people like Bill Gates (Microsoft), Elon Musk (New Tesla technologies), and Steve Jobs (Apple) pioneered the field with the products they offered.

3.3.3. Tasks and functions of startups

Additional explanation of this section in relation to the tasks of startups, requires separation from the economic point of view, etc. In 2020, due to the Corona-virus pandemic, some startups failed such as travel startups and some grew and matured like virtual structured startups.

According to the World Economic Forum, the world startup economy in 2019 is estimated at about three billion dollars and is three to four times larger than average.

The functions of startups are described in Table (6):

Table 6. Startup functions [32]

No	Subjects	Explanation
1	Reduce the gap between men and women, old and young	All of the people can launch their businesses with a little research and exploration.
2	Replacing technology with dependence on natural resources	Optimal use of natural resources based on knowledge.
3	Creating specific management principles	Anyone can create an innovation that people can benefit from, even in the most disadvantaged areas and get the most benefit.
4	Help improve the economy	According to the World Economic Forum, the world startup economy in 2019 is estimated at about three billion dollars and is three to four times larger than average.
5	Create competition for entrepreneurs	Startups create competition in people and also create creativity, initiative and more inspiration to create new ideas.
6	Increase cash flow	Most technology-based companies outsource their tasks to startups, which helps increase startup cash flow.
7	Creating jobs	In each country, startups produce the most jobs than regular companies. As a result, they solve the problems of many developing countries.
8	Creating wealth	By using the products of startups, people increase their living standards and the economy of startups and the economic situation.
9	Improving the standard of living	Startups with their innovations have improved the living standards of the people so that people in the farthest corners can benefit from their products.
10	Increasing GDP	Due to the high income of startups and increasing living standards, economic development can be achieved
11	Invest in products and services that people need	As a result of not meeting some of the needs of the people, entrepreneurs created new jobs that economists call opportunity entrepreneurs.
12	Address environmental challenges	Fighting climate changes, reduce greenhouse gas emissions, avoid wasting natural resources are subjects that are in the direction of sustainable development and economic development.

3.3.4. The applications of AI startups

Today, artificial intelligence has many different applications in businesses and it has created more opportunities for them to succeed. Some of its applications are illustrated in Table (7).

Table 7. Artificial intelligence applications in startups

No	Applications	Explanations
1	Improve customer service	For example, supports the preparation of customer invoices using the assistant and virtual services!
2	Increase production and productivity	Robots can be built to help manpower in difficult or trivial production line tasks.
3	Optimization	Refers to all coordination activities that are referred to the study, explore and assessment of basic needs and requirements in the field of business mechanism.
4	Avoiding interruptions and wasting time	It is really difficult to know how much time was spent on work or activity, and sometimes we run out of time with a series of activities that are difficult to calculate. Using software that calculates how time passes is critical.
5	Time management	For example, busy managers can give all their work plans to the system and the system or program in question provides that information and data in a daily calendar and in accordance with the schedule and management.
6	Performance and behaviour prediction	For example, you give your data to the system according to how you perform, and the system predicts your success and error rates and presents it to you as data.
7	Data management and analysis	Artificial intelligence brings you a deeper insight, which means you can use it to analyse all the details of your activities, assets and performance one by one.
8	Transparency and security	With the awareness of customers about the amount of information and data of a product, transparency also increases and with the awareness and feeling of customer security, demand also increases.

3.3.5. The effect of Covid19 on startups

It is impossible not to talk about Corona and its effects in current articles. So, in this part, our focus is more on the Corona impacts on startups. The world has gone through many days of pandemics, and still the end is not determined. With the continuous trend of these conditions, some businesses suffered from recession and others were able to save themselves to some extent and in others, we have witnessed their progress and growth.

The shift in citizenship style to online suggests that internet businesses were among those that were less likely to suffer or even benefit from the Corona outbreak. However, due to the negative effects of Covid-19, suppliers of some businesses couldn't provide a suitable platform to support some businesses. We proceed with a simple example in this regard;

Once citizens start quarantining, they will spend many hours at home. So, they will turn to online video sites, the main question being whether these sites will be able to fully support them as the number of user's increases. Is the infrastructure needed to provide their services such as bandwidth or content storage infrastructure, responsive to this increase in demand?

A study on the negative and positive impact on Corona on IT businesses shows that this epidemic has had the most negative impact on tourism startups and positive impact on online shopping ones.

Despite the extent of the disruption that pandemics have created for the world, many startups have discovered new and innovative ways to adapt; in fact, many of them have forced themselves to change their business strategy to ensure that they still maintain their capital to fund their projects.

While emerging startups including video calling apps that have revolutionized their growth and profitability, some other startups and jobs such as travel and aviation technologies will have more problems and they are also facing problems now. So, business founders and startups should expect to see more investment in high-tech startups and organizations that promise profitability in the new normal that is companies that offer clear solutions to modern challenges in the COVID19 era.

Some companies were able to be resilient to the advent and spread of the Corona, making not only losses but also profits. At the time when various industries and companies such as large airlines and construction companies are struggling to survive, the total operating income of the five major technology companies (Apple, Microsoft, Amazon, Google and Facebook) has reached 1.1 trillion$ and the profits of these companies have grown by an average of 24%.
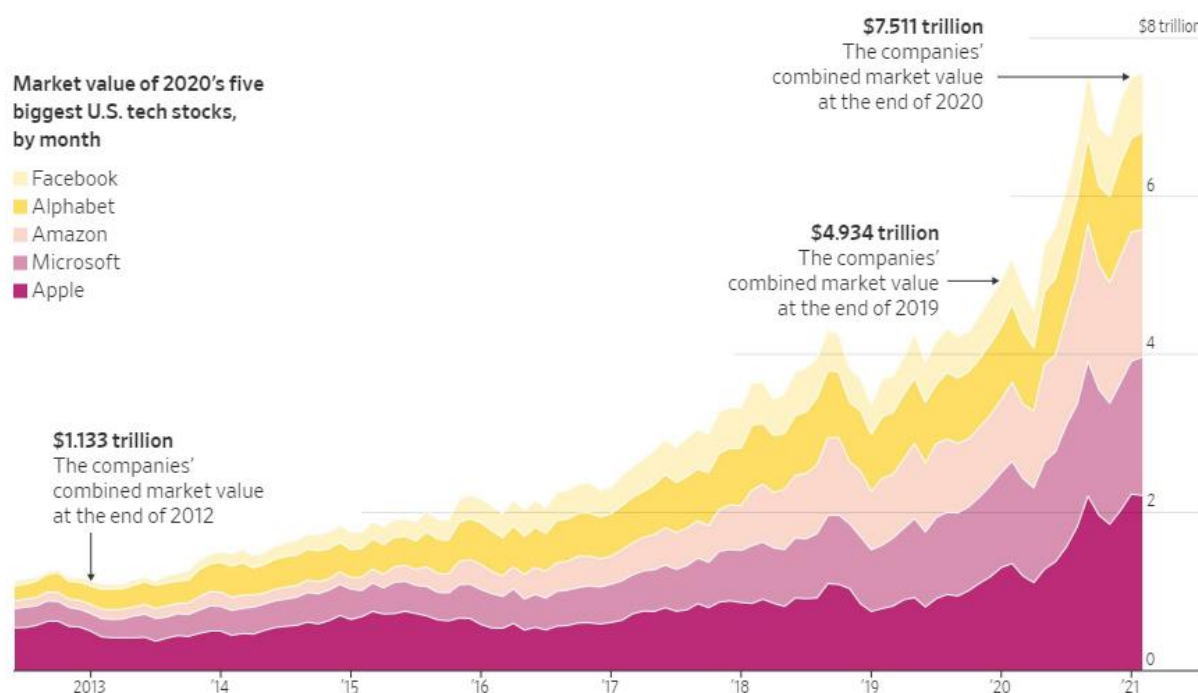

Fig. 4. Market value of 2020's five biggest U.S. tech shocks, by month *(Source*: How Big Tech Got Even Bigger – Wall Street Journal)

Over the past year, the market value of these companies has grown by a whopping 50% to an unimaginable 8trillion dollar.

3.3.6. Challenges facing startups during Covid-19

Most of the companies especially startups were injured due to the appearance of the Covid-19 disease. So, the financial climate changed and companies should find the opportunities and threat to gain and avoiding loss. Because of dynamic nature of startups and adaptability qualification, some of them turned this threat into an opportunity and increased their profitability. However, the Covid-19 initially posed challenges for them, including the following:
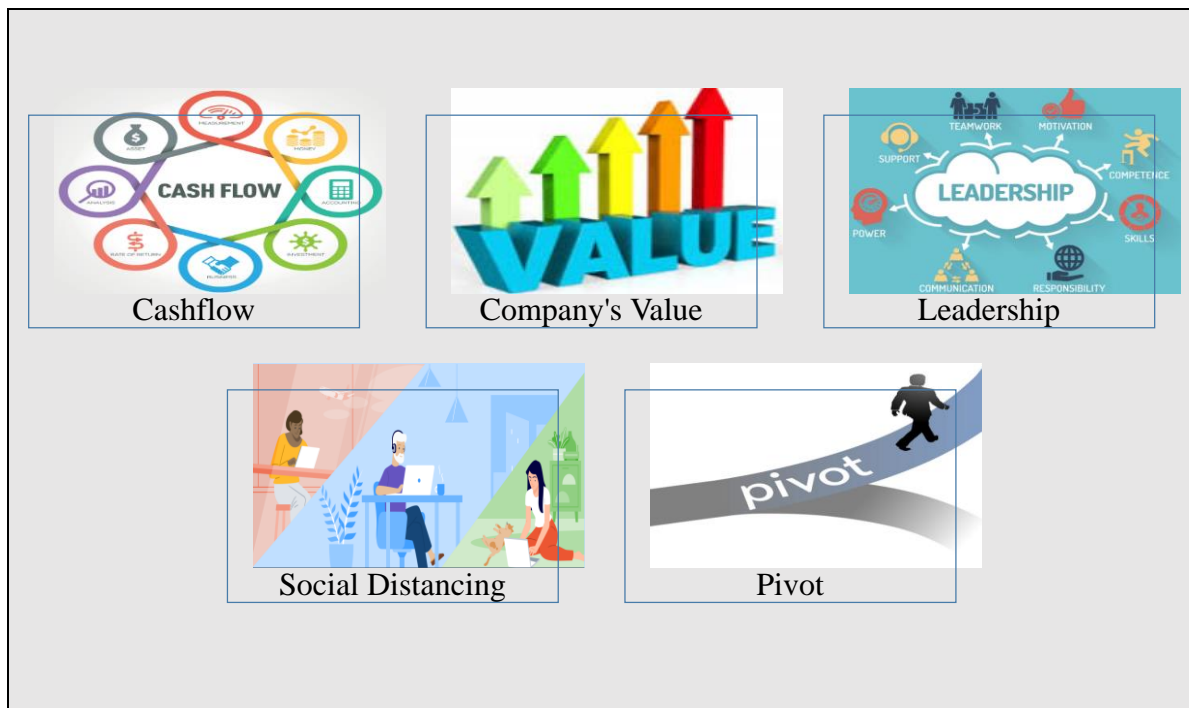
Fig. 5. Covid-19 challenges for startups (*source*: Founder's Guide Start up the Business of your Dreams)

1. **Cash flow**: companies have limited cash and it's important how to manage it during crisis. They should allocate some money for possible future crisis.

2. **Company's value**: demand shock means a sudden and unexpected hit causes rapidly changing valuation. Thus, when the stock market crashes, the business activity, the rate of employment, the rate of investment and totally, the value of companies are declined and attracting investors who are willing to invest in any businesses can be almost impossible.

3. **The leadership issue:** leading company in ambiguities and uncertain future is complicated. Being transparent and honest with employees and investors is the best choice.

4. **Social distancing:** running company remotely and coordinating people and controlling assigned tasks complicates the way your business functions.

5. **Pivot:** being flexible and dynamic environment means change the way you view your company is necessary during crisis like pandemics.

From above cases, we can conclude that your ability to maintain your calm and commanding demeanor during this difficult time is crucial to the survival of your company overall.

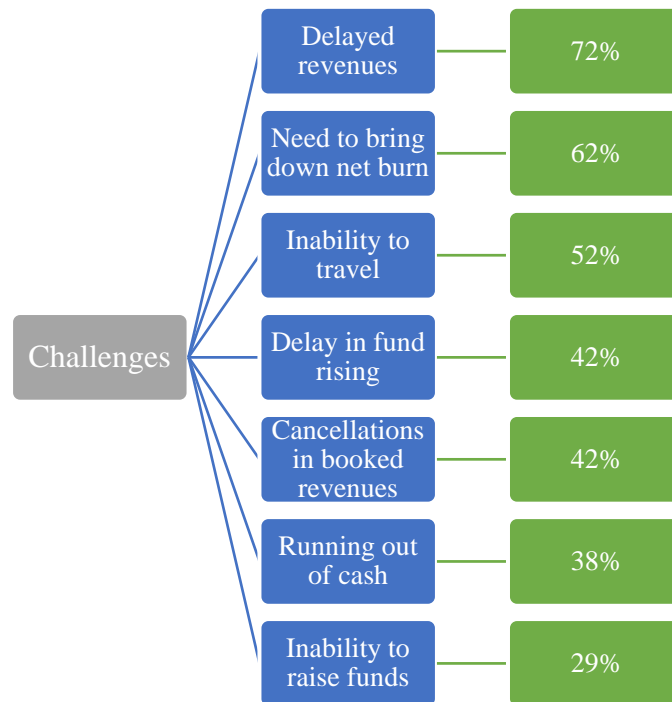The biggest challenges arising from Covid-19 is as below Figure:

Fig. 6. Challenges and the rate of impact (*Source*: SEA Founders)

As it is clear, the most challengeable and the least challengeable issues are delayed revenues and inability to raise funds which tied up to cash flow and money that we mentioned them in this part.

Finally, we have investigated how Covid-19 impacted the global startups scene:

Table 8. Change in revenue of selected startup sectors since the start of the pandemic* (*Source*: Startup Genome)

Activity	Percentage (%)
Block chain and crypto	-14
Gaming	-19
Social media and messaging	-22
AI & big data	-30
Agtech & new food	-39
Automotive	-43
Beauty & fashion	-59
Travel and tourism	-70

*Worldwide (between December 2019 and June 2020)

You can see that Blockchain and crypto, travel and tourism have been affected least and most respectively.

4. Main findings and results

The results show that AI can be use in different financial sectors such as auditing, investment, insurance, etc. while. AI has many advantages (speed up doing works, automating etc.) it can evolve many challenges. The results presented that AI startups can create more value and they can be effective or impactful in fight against to Covid-19. As a result, they need to access financial funds or capital for going concern.

5. Conclusions

The financial and banking industry is facing major changes in the future and new technologies have transformed the financial industry in an unimaginable way. Therefore, it is important to be prepared to keep up with these changes. Many financial industry activists have turned to new software and technologies because they offer many benefits, including better economic efficiency, time savings, less labor requirements, and more competition. This article discussed the applications of artificial intelligence in providing better customer service, user behavior, industry risk assessment, and identification. With the aim of automating the business activities of managers and business owners, artificial intelligence has started its activity in the industrial sector and has forced traditional businesses to use new financial innovations to compete with the global market.

In this paper, we have studied the role of artificial intelligence in financial sectors, startups during Covid-19 too. The results showed that AI can robust the performance of financial sectors and increasing the power of profitability in startups during Covid-19 infectious too.

For further and future researches, there are some recommendations:

- *AI based methods and different optimization algorithms like meta-heuristic algorithms such as Aquila optimization (AO) algorithm, Sparrow search optimization (SSO) algorithm and etc. can be used to prediction of profitability and un-profitability in startups and financial fields such as banking, insurance and etc. during Covid-19.*
- *AI based methods such as ANN, GA and etc. can be used to prediction of cryptocurrency markets and its volatilities. On the other hand, econometric models can be used to compare each other.*
- *Different optimization methods such as AI based, econometric and mathematical models can be used to predict the destructive economic effects of the Covid-19 and estimate losses for future years and comparing them based on predictive performance measurement indicators such as accuracy, precision, recall and sensitivity index and introduce the best method.*

Conflicts of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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