

# Market Evinced Disposition of Research and Innovation by Artificial Intelligence Manifested Business

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**Abstract-** It is quite evident and providential that the materialization of innumerable intelligent services and products is emerging day by day. The commercial approach followed by their obtainability and socioeconomic influence, considerably inflates a query regarding the existing inception of Artificial Intelligence that whether it is just any sort of promotion based publicity or it is indeed an adepted tool to transform and transmute the entire world. This paper is solely based on examination of extensive scopes and assortments on the entanglement of Artificial Intelligence. It also investigates into deep exploration of both beneficial as well as constructive and obstructive or fatalistic prospects of AI in various spheres mainly communities, governments, individuals any many other sectors. This paper scrutinizes the comprehensive consequences which is the result of AI after several examinations from innovation followed by research and to deployment of the innovation and discourses various authoritative academic procurements along with innovations followed by achievements in the domain of Artificial Intelligence; their influence on abundant entrepreneurial ventures that are prevailing and persuading around the global environment. Furthermore, this paper bestows in examination of investigating and evaluating factors that are usually accountable for advancements of Artificial Intelligence across various spheres. Considering the inspection of entrepreneurial ventures towards AI, a couple of lists of topmost Artificial Intelligence based startups are contemplated. The conjecture and hypothesizing derived from research work will fetch an improved and enhanced understanding of diversified and abundant innovations leading to various results acquired on Artificial Intelligence in the field of business, corporate and society. Thus it will furthermore provide more concise and coherent concern based on understanding of how Artificial Intelligence can metaphorise abundant business principles along with operations, and finally progress the economy globally.

**Keywords:-** Artificial Intelligence, Business, Entrepreneurial ventures, startups.

## I. INTRODUCTION

To standardize our living in an ameliorated way, innovation has been an instrumental part to function as the foremost engine in our society throughout the chronicle. Nevertheless,

the mode of operation or procedure through which the innovation is carried out can be exceedingly convulsive as in most cases the prevailing technologies may turn out to be obsolete or disused. Emerging and developing technologies like data science, cloud computing, big data, artificial intelligence (AI), blockchain and internet of things (IoT) and big data can fabricate the entire world by producing various conquerors or unbounded or detached categories of exertions across the world. Though these technologies are older about a couple and half decades [1] but they did not turn up to be feasible for practical commercial applications. Since last few years there has been a drastic change in the prevailing situation which led to the advancements in each every field of employees and the factors which constitute the further extension enhances in increasing the transparency by sharing codes and involving software that are open source. Presently the enormous use of these emerging technologies starting from healthcare, finance, gaming, environment, security, agriculture etc. are continuously shaping our lives, by a progressive change through human lifestyle which comprise of the sustainability through which human beings enliven themselves. These transpiring technologies can further lead to grow hyper- automation prior to hyper- connectivity and further escort to the inception of Industry 4.0 or commonly Fourth Industrial Revolution. [2]-[5] Predominantly, the significant advancement and progression of Artificial Intelligence is the core of all upgraded performance that escalates the power of innovation of various technologies and eventually leading to expansion of Industry 4.0. Through enormous literature surveys and reviews, it is quite evident that the technology of Artificial Intelligence offers latest openings which can fetch a progression in all round economic development system and can coerce a momentous business transformation [2], [4], [5]-[9]. Considering the business level the advantages of Artificial Intelligence pertains to many things like improving the design of a product followed by quicker analysis by proper visualization and diligent insights. There are many more benefits that usually refer to business modeling, financial data followed by many. These various

usefulness henceforth are awaited to initiate modern and enhanced level of service which are usually concerned with increasing the level of profit and cost structures. [5], [8], [9]. This paper solely deals with the progressive magnification of economics, Neo-Schumpeterian Economics, exists as a foundation model to fetch a proper analytical result as well as serving a perfect examination of Artificial Intelligence in business [10]. Basically there are three types of driving exertions or forces that pertain to Neo-Schumpeterian Economics are mainly entrepreneurship, innovation as well as knowledge. In discrete, this paper manipulates these driving exertions to investigate the upliftment of the algorithms which uses Artificial Intelligence subsequently exploration of entrepreneurial actions, investigation of any deployment in a commercial manner, scrutinize the investors and seek for any action across the global market. Considering any entrepreneurial activity and its investigation towards Artificial Intelligence, among top Artificial Intelligence startups, two are considered. Comparative analysis is not at all possible as this methodology was not implemented previously. The inventive insights of this paper can be summarized as: (i) Executed data analysis proves that Artificial Intelligence is not any sort of advertisement or hype related to any sort of promotion. (ii) The factors which are recognized results in the exponential widening of Artificial Intelligence. (iii) Identifying various sort of achievements in the field of academics which further helps in advancing the products which are intelligent as well as commercially available. (iv) Exploring the strong locations geographically of Artificial Intelligence. (v) Determining the top industries of Artificial Intelligence as well as recent trends which takes place in investment of Artificial Intelligence. The conclusions and hypothesizing obtained from the research fetches a better comprehension on the impact as well the innovations of Artificial Intelligence in our society. It also gives us a concise apprehending on how the power of Artificial Intelligence can transform the entire society starting from several business operations, global economy, research and development. This work can be categorized in the following way: (i) Circumstances corresponding to products, algorithm as well as datasets. (ii) Focusing on collection of various data and fostering on the objectives of research. (iii) Analysis of Market globally.

## II. CIRCUMSTANCES CORRESPONDING TO PRODUCTS, ALGORITHMS AND DATASETS

The term Artificial Intelligence [14] was originated by a professor emeritus of Computer Science of Stanford University, John McCarthy as a field at 1956. He also organized renowned Dartmouth Conference in Dartmouth College at Hanover and initiated Artificial Intelligence as field. Coles and Firschein [15] in the year of 1973 advanced one list that comprised twenty-one suppositious products which may be the outcome from the advancements of Artificial Intelligence by 1990s. Some products predicted by them that are existing in reality are listed in fig(i). This table will impact a deep perception about the advancements of Artificial Intelligence for latest 48 years. The expeditions of Artificial Intelligence were not at all smooth. Despite being

undergone with several hindrances, Artificial Intelligence has reverted back into prominence due to the emergence of 'Deep learning' along with neural networks which has many hidden layers. The development of Artificial Intelligence counts to two major factors: the hardware accelerators (Tensor processing Units (TPUs) and Graphics Processing Units(GPUs)) along with the availability of big data. [16]-[18]

Sl No.	Products Postulated	Abilities Proposed (Firschein 1973)	Today's Reality
1.	Automatic Diagnostics	"A system which is capable of automated medical detection on the basis of querying a patient by examining biological tests etc."	Qualcomm Tricorder is used, Meditronic IQ Cognitive Application for measuring blood glucose.
2.	Deep Blue, AlphaGo	"System for automatic determination of identity of a person by recognizing the voice, face fingerprints etc."	NuData Security, Apple Face ID and MasterCard Identity Check.
3.	Industrial Robots	"An autonomous Industrial robot which is capable of inspecting products and assembly in automated factory, using both manipulative and visual skills."	FANUC Intelligent Robots, Mitsubishi Robots.
4.	Automatic Language translators	"Language translating instrument capable of high quality translation of text from one foreign language to another."	Bing Microsoft translator, Google translator.
5.	Robotic chauffeur	"Robots are made capable of several operations on city streets and standard country highways using various visual sensors"	Volvo X, MercedesBenz E-Class, Google Waymo

Fig(i): With Today's reality and the definition of AI, it was predicted in 1973[15]

## III. OBJECTIVES OF RESEARCH AND COLLECTING DATA

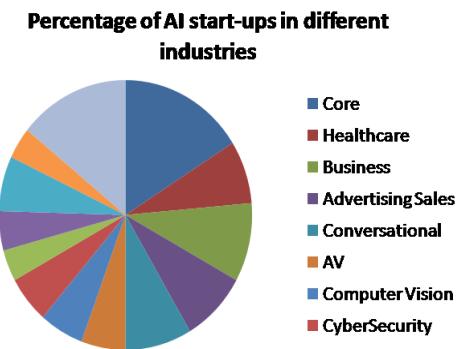
Contemporarily in this immediate world, this age has been feasibly manifested to be the significant as well as the stimulating phase of the human history. In this particular spell the growth and enhancement of these emerging technical innovations by the use of technology are so rapid that they are taking place at a rate of blinking of eyes. Few of the innovations that relate technology to develop technical thoughts mainly relate the applications of robots that are working in various fields like industry as well as automatic cars followed by automatic health superintending of patients through variety of methods and devices like smart watches etc. Appraising our calendar years, 2016 was one of the most staggering years if the studies relating to

deep learning, Artificial Intelligence and Machine Learning are considered. There are several questions and queries which arises like: Why AI is in every company? What are the factors which are leading to the exponential growth of AI? How the impact of AI is influencing the entire world with its prospects? Which country leads with the technology of AI?

These questions are intended to be answered and discussed throughout this paper. The research several procedures like scrutinizing several magazines of business including business newsletters, articles of conference proceedings, several forums which held in online, websites of stock market, magazines of Artificial Intelligence and many more to gather various statistics for examination. These various rejoinders will provide a coherent scope to act in future and plan accordingly for meeting various challenges that are upcoming. This will further guide in backing the transformations that will be accepted to ensure the exact incorporation of Artificial Intelligence in our society which mainly comprises business and lives of human beings.

#### IV. ANALYSIS OF MARKET GLOBALLY

As per our society the comprehension and understanding implies to be startups as the enhancers and innovation of economy. The analysis of these startups followed by their exploration would eventually fetch a better outcome in gaining relevant insights into the investigation of the impact of Artificial Intelligence to transform business. Top 100 startups which are based on Artificial Intelligence were made in two lists by taking the help considering CB Insights' Mosaic Algorithm [11]. Algorithm helps to identify startups by computing factors namely business model, financial historical analysis, quality of investor etc. The availability of the lists were done by investigating 1650 and more as well as 2000 and more global startups by taking help of Mosaic Algorithm. In the repose the paper deals with the startups which is based on Artificial Intelligence listing for 2017 as well as 2018 which can be cited as AI17 followed by AI18 respectively. A portion obtained from the following outcomes has been already presented in International conference named DIGITS 2018 [12]. That event was organized jointly by BIMT and University of Maryland. The expanded version of this manuscript was submitted to Journal Of Business Research, Elsevier for considering it as a journal research article [13].



Fig(ii) : Percentage of Artificial Intelligence based Start-ups in various industries in 2017 and 2018.

Fig (ii) exemplifies that on AI17, the attention was maximum in the core AI and consequently in AI18, cybersecurity got maximum benefit from the technology of Artificial Intelligence. This illustrated analysis covers the industrial sectors of top six startups in AI17 followed by AI18. All pre-eminent Artificial Intelligence startups are creating process oriented as well as technological innovations thus, generating more opportunities of business and efficiency gains in future. The industrial sectors mainly comprise of healthcare, cybersecurity, cross industry, enterprise AI and business Intelligence. Other processes in the industrial sectors which are responsible for various transformations in the industry includes image analysis, virtual nurses, robotic surgery as well as drug discovery.

PERCENTAGE of AI start-Ups in world

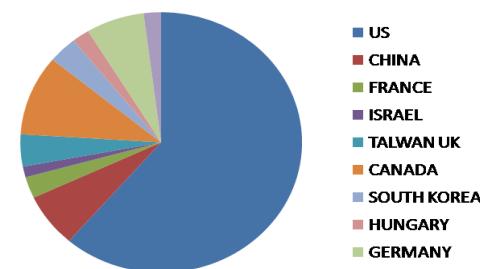


Fig (iii): Percentage of AI Startups in world

In this section of fig (iii) important insights of AI17 followed by AI18 are examined from their geographical distribution. The analysis of data resulted in massive progressive results. The United States of America is leading the revolution of Artificial Intelligence with its headquarters of around 3/4th of total startups. The majority of the startups are located in California, commonly known as heart of AI.

#### V. DISCUSSION AND CONCLUSION

This work mainly accompanies the achievements of Artificial Intelligence that are prominent and the technological innovations that are influential in field of Artificial Intelligence. Around 48 years before, the proposed Artificial Intelligence products that were driven is having their commercial availability and henceforth proves that Artificial Intelligence is not any kind of hype and it solely has the ability to transform the entire business infrastructure thus by shaping the world economy. The explosive growth and progress of the systems that is based on Artificial Intelligence is deployed and abolished on the basis of a couple of factors: The fast processing units like the TPUs and GPUs as well as the big data. This work also portrays the broad sectors in deep learning namely speech recognition, computer vision analysis, analysis of text and playing games. DL algorithm is preferred for each of the deep learning areas and other several fruitful applications which eventually surpassed the accuracy of human level. Exploration of various lists containing dataset providers with the URLs is being procured by this work. Final outcomes of results are hence summarized in the form of table which aids in helping the industries and various researchers working in the domain of Artificial Intelligence.

The study of top Artificial Intelligence startups distinctly presents the impact of innovation and research at an advanced level in the globalized market. The examination also depicts that the wave of Artificial Intelligence and appetite for the growth of Artificial Intelligence has been exponential. The investments in the domain of Artificial Intelligence are predominantly progressing since last years and are expected to remain consistent in forthcoming days. This examination henceforth proves that Artificial Intelligence industries will enhance more productivities as well as create more scope of opportunities in future like cybersecurity, data analysis, cognitive technologies, core Artificial Intelligence etc and their prime advantages fosters sales maximization and many other prospects like faster business decisions, human error reduction, time and cost efficiency etc. Though the examination of this paper depicts that the technology of Artificial Intelligence is limited to only few areas in the entire world, thus creating a divide commonly "AI divide". This divide will further enhance the inequality in all phases like social, culture as well as economy further making a digital divide. Moreover, the Artificial Intelligence software is subjected to vulnerabilities and is software dominant. Many deep learning methods are a key for undergoing various real-time applications and eventually are the backbone of Artificial Intelligence. Some of the prime factors which evolved are transparency, path tracing, penetrability, explainable followed by identification of systemic failure modes are accepted at the time of software assessment. Sometimes cases exist where DL algorithm turned to be producing inconstant outcomes. Surpassing these issues, defiance such as bias, shortage of Artificial Intelligence talent, ethics are also crucial and need consciousness for commercial applications of applications of Artificial Intelligence.

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Fig(iv) and fig(v) represents the list of dataset providers along with their URLs followed by the API support and amount and type of data.

S.N	Dataset Provider	Free / Paid	API Support	URL	Number of datasets	Type of dataset
1	Reddit-top-2.5-million	Free	No	<a href="https://github.com/umbrae">https://github.com/umbrae</a>	Not Applicable	1000 Posts on from 2500 subscribers on reddit.
2	BuzzFeedNews	Free	Yes	<a href="https://github.com/BuzzFeedNews/everything">https://github.com/BuzzFeedNews/everything</a>	Not Applicable	Live News Headlines, News Articles, Standalone Datasets
3	Figure Eight	Both	No	<a href="https://www.figure-eight.com/data-for-everyone/">https://www.figure-eight.com/data-for-everyone/</a>	Not Applicable	Finance, Medical, Chatbots, Aerial Imagery, Autonomous Vehicles
4	data.world	Both	Yes	<a href="https://data.world/search?q=datasets">https://data.world/search?q=datasets</a>	5022	Agriculture, Geospatial, Country Codes, Ground Water Quality, Daily Weather, Ecosystem observation
5	Academic Torrents	Free	Yes	<a href="http://academictorrents.com/browse.php?cat=">http://academictorrents.com/browse.php?cat=</a>	392	News Articles, License Plates, Twitter Dataset.
6	AggData	Both	Yes	<a href="https://www.aggdata.com/data">https://www.aggdata.com/data</a>	4500	Arts and Entertainment, Clothing and Accessories, Computer and Electronics, Food and Dining
7	Datashop	Paid	Yes	<a href="https://www.datashop.biz/">https://www.datashop.biz/</a>	55	Car, Economy, Finance, Linguistics, Geography, Postcodes, Media
8	Gapminder	Free	Yes	<a href="https://www.gapminder.org/data">https://www.gapminder.org/data</a>	519	Employment

				/	rate, agricultural land, alcohol consumption rate, Life expectancy, children per women, Foreign Direct Investment, Flooddeaths, Government Health Spending.
9	StackExchange Data Explorer	Free	Yes	<a href="https://data.stackexchange.com/">https://data.stackexchange.com/</a>	Not applicable
10	IMDb	Free	Yes	<a href="https://www.imdb.com">https://www.imdb.com</a>	Not applicable

Fig (iv) : List of dataset providers along with their URLs followed by the API support and amount and type of data

## REFERENCES

- [1] Marston, Sean, et al. (2011) "Cloud computing—The business perspective." *Decision support systems* 51(1): 176-189.
- [2] Schwab, Klaus. (2017) "The Fourth Industrial Revolution, Crown Business." *New York*.
- [3] Bloem, Jaap, Menno Van Doorn, Sander Duivestein, David Excoffier, René Maas, and Erik Van Ommeren. (2014) "The fourth industrial revolution." *Things Tighten 8*.

[4] Klosters, Davos. (2016) "World Economic Forum Annual Meeting 2016 Mastering the Fourth Industrial Revolution." *World Economic Forum*. <http://www3.weforum.org/docs/Media/>. Accessed 7 October 2018.

[5] Park, Sang-Chul. (2017) "The Fourth Industrial Revolution and implications for innovative cluster policies." *AI & Society* 33(3): 433-445.

[6] Mazali, Tatiana. (2018) "From industry 4.0 to society 4.0, there and back." *AI & Society* 33(3): 405-411.

[7] Furman, Jason, and Robert Seamans. (2019) "AI and the Economy." *Innovation Policy and the Economy* 19(1): 161-191.

[8] Cockburn, Iain M., Rebecca Henderson, and Scott Stern. (2019) "The Impact of Artificial Intelligence on Innovation." *The Economics of Artificial Intelligence: An Agenda*. Pp: 115-152.

[9] Freddi, Daniela. (2018) "Digitalisation and employment in manufacturing." *AI & Society* 33(3): 393-403.

[10] Hanusch, Horst, and Andreas Pyka. (2006) "Principles of neo-Schumpeterian economics." *Cambridge Journal of Economics* 31(2): 275-289.

[11] CB Insights. Mosaic Algorithm. <https://www.cbinsights.com/company-mosaic>. Accessed on 11th October 2017.

[12] SoniNeha, Sharma EK, Singh Narotam, KapoorAmita (2018) "Impact of Artificial Intelligence on Business." *Digital Innovations, Transformation, and Society Conference 2018 (Digits 2018)*. pp:10.

[13] Soni, Neha, Sharma EK, Singh Narotam, KapoorAmita (2019). "Impact of Artificial Intelligence on Businesses: from Research, Innovation, Market Deployment to Future Shifts in Business Models." *arXivpreprint*:1905.0209..

[14] McCarthy, John, Minsky ML, Rochester N, Shannon CE (2006) "A proposal for the Dartmouth summer research project on artificial intelligence, august 31, 1955." *AI magazine* 27(4): 12-12.

[15] Firschein, Oscar, Fischler, M. A., Coles, L. S., & Tenenbaum, J. M. (1973) "Forecasting and assessing the impact of artificial intelligence on society." *IJCAI 5*:105-120.

[16] Goodfellow, Ian, YoshuaBengio, and Aaron Courville. (2016 ) "Deep learning" *MIT press*.

[17] Abadi, Martín, et al. (2016) "Tensorflow: A system for large-scale machine learning." *12th {USENIX} Symposium on Operating Systems Design and Implementation ({OSDI} 16)*.

[18] KapoorAmita (2019) "Hands-On Artificial Intelligence for IoT: Expert machine learning and deep learning techniques for developing smarter IoT systems." *Packt Publishing Ltd.*

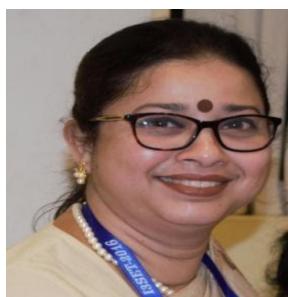
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