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EFFECTIVENESS OF ARTIFICIAL INTELLIGENCE ON BUSINESS DECISIONS IN IT INDUSTRY

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Abstract- Technology as we know it has been evolving over the past few years through the emergence of artificial intelligence (AI). The role of AI in the IT sector for products, services and business operations has been increasing exponentially. This raises a question on how the present and possibly the near future of AI impact the business decisions of a company in the IT sector. This paper thus seeks to identify the applications of AI in the IT sector through its implementation of AI systems in various fields of business operations and hence analyze its advantages; perform financial and geographical analysis to get insights into the investor deals and countries leading in AI driven companies and also understand the job market for AI demanding skills. For identifying the data on this analysis, we consider the top 100 AI startups and other relevant AI startup data. Our findings obtained from this research will help improve the understanding of AI applications and practicality for using AI in business decisions and operations. These findings will also help suggest the growing need for businesses in the IT sector to technologically advance through AI and become intelligent, efficient and profitable.

Keywords: Artificial Intelligence, Business Intelligence, Business Decisions, Deep Learning, Machine Learning, Information Systems, Industry 4.0.

1 INTRODUCTION

Industry 4.0 has hugely been driven by the use of AI technology across various sectors in the modern world. Enabling organizations and businesses to become more efficient and enable their systems to perform tasks autonomously has boosted their growth significantly. AI is a huge field which encompasses various segments such as Machine Learning (ML), Deep Learning (DL), Image Processing, Natural Language Processing, Speech Recognition etc. Similarly, the IT sector that this paper focuses on

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are consists of three major categories namely software and services, technology hardware and equipment, semiconductors and equipment. Artificial Intelligence has influenced how the IT sector works tremendously by positively impacting the operations of technology and processes within the industry. AI can be simply known as intelligent computing without the need of direct human intervention through AI algorithms that are suited best for its application. This helps to provide critical input and solutions of complex problems that humans would face difficulty in. However, the IT industry is still struggling to promote the innovation of AI systems with the side effects from scrubbing away the traditional infrastructure in place. Since IT infrastructure will only grow with the industrial growth, the need to enhance IT operations becomes significant. Tasks of human nature such as speech and text recognition, information analysis, decision making etc. have become imperative through the use of AI. The primary use of AI in IT sector is based on Machine Learning and Deep Learning. Machine Learning is the subset of AI where the program uses data parsing through algorithms and modifies the program without human intervention and thus produces the processed information. There are various types of machine learning such as supervised, unsupervised and semi supervised in which the factors on which the algorithm works are representation, evaluation and optimization. Over time, ML “learns” through experiences and becomes more accurate. Deep Learning is the subset of ML where the program uses data from classification tasks which could be text, sounds, images etc usually using a large volume of data and neural network architectures.

Based on statistics the AI industry would reach $190 billion by 2022 and by 2021 the cost of investing into AI systems in IT is estimated to be $57.6 billion. Around 75% of business applications would soon by relying on AI systems for their operations. In this paper, we aim to investigate the effectiveness of deploying AI based technology into the IT sector through analyzing the industries within the IT sector that AI is used, the applications of AI in IT and the challenges that would arise, cost analysis of the ongoing implementations of AI and how geographically the effect of AI is seen in the IT sector. We analyze two lists of top 100 startups of AI from the years 2019 and 2020. The work in this paper would help us get important inferences in understanding the impact of AI in the IT business prosperity and growth of AI within the IT sector across the world. This would influence future preparedness for adopting to AI systems for IT organizations and help get an in-depth view of how AI can be made useful for the organization to reach human like behavior in their operations effectively.

2 LITERATURE REVIEW

The demanding times of globalization through technology has boosted the growth of implementing artificial intelligence across the world. Technology has advanced and strengthened the information technology sector as the industries now seek to make it automated and intelligent to improve profits and growth of their business as per latest trends. AI thus plays a crucial role in realizing this demand. Artificial Intelligence is widely studied for many years and it is therefore important to gain perspectives from existing research work.

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“Artificial Intelligence in Business: From Research and Innovation to Market Deployment”,Neha Soni et al.(2019) [1] carried out a study to investigate the various implications of AI and it’s subsequent impact on society and individuals. They explain about the impact of artificial intelligence from initial research to the final deployment. The paper also explains the impact on businesses using AI for their operations and the factors that contribute to the advancement of AI. This work thus gives insights into understanding business operations using AI.

“Artificial Intelligence in Information Technology”, Sikender Mohsienuddin Mohammad (2020) [2] researched on the different types of technologies in artificial intelligence and their applicability in various sectors that could contribute for performance. He proposes the study to discuss the present and future uses and it’s concepts such as Natural Language Generation, Robotics etc. The study gives a detailed view of applications and use of AI in modern industries.

“AI in information technology and its future in the United States”, Lakshmisri Surya (2017) [3] studied the combination of AI in IT industries for their operations. The impact of AI in IT industries in various fields of operations and how it simplifies ease of doing tasks for the company. The study shows the types of AI applications in IT industry. The future of USA in AI for IT industry has also been elaborated to intricate how one of the world’s leading IT sector would show tremendous growth in the coming years.

“Artificial Intelligence in IT”, Rahul Reddy Nadikattu (2018) [4] discussed about several applications of AI in IT industry and it’s significant importance on all platforms that affect the consumers and producers. The paper is centered towards the progression of positive AI impacts in IT and the importance of the research in the USA. The challenges of AI could be interpreted from this study and can be made useful for further studies.

“Relationship Banking and Information Technology: The Role of Artificial Intelligence and FinTech”, Marko Jakšič and Matej Marinč (2018) [5] have used the examples of banking and how relationship banking with respect to customer relationship shouldn't change due to transaction banking as a result of advances in artificial intelligence driven systems. The IT companies using AI has influences over the traditional banking on a large scale and the drawbacks of relationship banking can be overcome using the competition from IT and FinTech companies to stay modern to propel advancement in banking technological systems.

“The Impact of Artificial Intelligence on Innovation”, Iain M. Cockburn, Rebecca Henderson, Scott Stern (2018) [6] discussed the impact of AI on a large scale by innovative practices and processes it would have in a organization. They discuss the shift from traditional application based learning to a more modern deep learning oriented method of invention. Automation and robotics have evolved due to innovation in AI and R&D has seen large growth. The potential for continuous advancement will be made possible if transparency and dataset sharing of public and public entities is made available for future research. Companies can gain commercial profits and success by creating algorithms to tailor the application requirements.

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3 RESEARCH METHODOLOGY

3.1 METHODOLOGY CONCEPT

Artificial Intelligence is being used in different sectors such as industrial, hospitality, construction and so on, however for this research we specifically focus on the IT sector that use AI systems or methods. The modern age where technological growth is rapid helps pave a path into understanding the impact of AI in all these business through the use of existing research, web articles, journals and other sources of information which helps to aid our research. Primarily, the aim to implement our methodology will be through the use of data from related research papers and web articles. CBInsights [13] which is a online business analytics and database platform helps us find information on AI startups and for performing visualizations on data. We focus on obtaining data on new startups to see the entrepreneurial actions of these AI startups in the IT sector. The data that we study from is obtained using the analytics website CBInsights which contains information on the top 100 AI startups that is useful for our study. Furthermore, we gather data from CBInsights on the years of 2016 to 2021 for identifying the financial analysis and we use the data on years of 2019 and 2020 to compare and perform geographical analysis of the top AI startups that will help us give a pattern into the growing AI popularity in these countries and the investments that are put into it. We can therefore understand the impact of AI in the IT sector across the world and how it can propel the IT sector for modernization in the upcoming years which will not only drive the creation of more AI jobs and roles but also make companies more effective in their operations by replacing traditional systems. In this paper, we thus aim towards three key focus areas of our study which are geographical distribution of AI startups, financing and deal analysis of AI startups and the job market analysis for AI companies in the coming years. Using the Stories functionality on CBInsights, the Dossier feature gives us lots of info graphic visualizations as per our preference and filters. The Dossier feature also visualizes older data to show trends to the current year. Hence, through the use of this feature we visualize our analysis.

3.2 DATA COLLECTION

This research was initiated by browsing through several journals and web articles to help collect data on the domain of AI in IT sector. We have used the online platform of CBInsights which has lots of different data types that could aide our research since they utilize machine learning algorithms and have data visualization tools that provide insights into our required analysis. The data that is obtained on the AI based IT companies from CBInsights is factored on patents, IPO and M&A transactions, type of sector/industry, type of technology, social media information etc which gives us the flexibility to chose the startups relevant to our objectives and thus perform an analysis on artificial intelligence in the IT sector.

The attributes of the CBInsights AI 100 (2020) collection data that we've studied are Companies, URL, Description, Industry, Country, Total Funding, All People (Founder/CEO/CFO/CTO), All Investors. The total number of text and numerical value fields from these attributes are 800. As for our analysis, we consider only the fields of

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Companies, Sector, Country and Total Funding to get our desired results which is 400 fields of data.

4 RESULTS & ANALYSIS

4.1 APPLICATIONS OF ARTIFICIAL INTELLIGENCE IN IT INDUSTRIES

The diversity of applications within the IT sector depends on the focus area of the company and how the applications would suit the organizational requirements. AI applications in IT have been largely used in three key areas of service management, process automation and testing. AIOps(AI Operations) is also proving to be a much more productive and resourceful area of technology for IT operations.

4.1.1 SERVICE MANAGEMENT

IT service management which is also known as ITSM can help companies use AI driven applications to utilize the resources efficiently, progress the processes of patch management, software deployment, routing of incidents etc. Technologies of NLP (Natural Language Processing) which is used in virtual chat bots and service desk virtual agents will become a trend for ITSM. Self-solving service desks are intelligently programmed to analyze the input data given by the company and provide possible solutions as the output, thus the companies will be able to help make suggestions, track user preferences and behavior. The ML and DL functionalities can be used to give a solution based on previously submitted requests by comparing the service request it receives. Thus ITSM helps the operational processes for the IT team in the company.

4.1.2 PROCESS AUTOMATION

There is a largely significant growth in technological innovation and complexity of problems. Adapting to change and evolution of business makes it difficult without automating processes. AI driven process automation will help IT companies to make their operational processes and tasks automated without the need of manual repetitive tasks. One such way is by using AI in computer engineering. When compared to traditional programming where the code is rule based and uses conditions, AI programs will be able to execute and manage SDC (software development cycle) by the program itself.

Another way of process automation for automated network management is through ML which helps detect network anomalies or problems and implement appropriate measures for stabilizing the network.

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4.1.3 TESTING

In this context, we take AI powered testing into the areas of quality assurance, application testing, social media analysis and defect analysis. Testing the quality of the code for programs before it enters into the market is crucial. QA(Quality Assurance) team manually perform regression testing which is time consuming and repetitive. Utilizing the ability of AI to predict these repetitive patterns of testing, AI testing allows the QA teams to eliminate the chance of human errors and reduces cycle time of testing, especially for large amounts of data. This makes software testing effective. Similarly, application testing can be performed by AI systems through analyzing patterns of behavior pertaining to user information to enhance the application. Social media analysis is done by AI systems to process massive amounts of social media data and provide valuable insights into the growing market trends and consumer behavior that could provide a competitive advantage. Defect analysis can be performed by AI systems to detect abnormal variations and errors derived from a set of defined parameters, from which the system could provide solutions for optimization of data. Efficiency analysis works in a similar method to defect analysis by analyzing large amounts of information and giving suggestions to the QA team to make required changes for efficiency.

4.1.4 AIOPS

AI Operations aims to simplify IT operations due to the growing challenges in data volume and complexity. AIOps is a platform or software system that can combine big data and functionality of AI to make IT operations efficient. Primary data collection requires large amounts of data to be identified and upgradation of technological systems can withhold the performability of systems for the company. AIOps uses a combination of big data, ML, and analytical tools to automate the processing of data and provide independent decision making of the system. AIOps functionality is mainly based on the concept of observe, act and engage. There are several elements that make up the functionalities of AIOps platform such as anomaly detection, pattern discovery automation and prediction, document reception, data packets reception, digital indicator reception, log reception, data management stream, data management accumulation and identification of problem sources. These elements would aid the IT companies to solve crucial and high value situations arising from vast amounts of data.

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4.2 FINANCIAL AND DEAL ANALYSIS

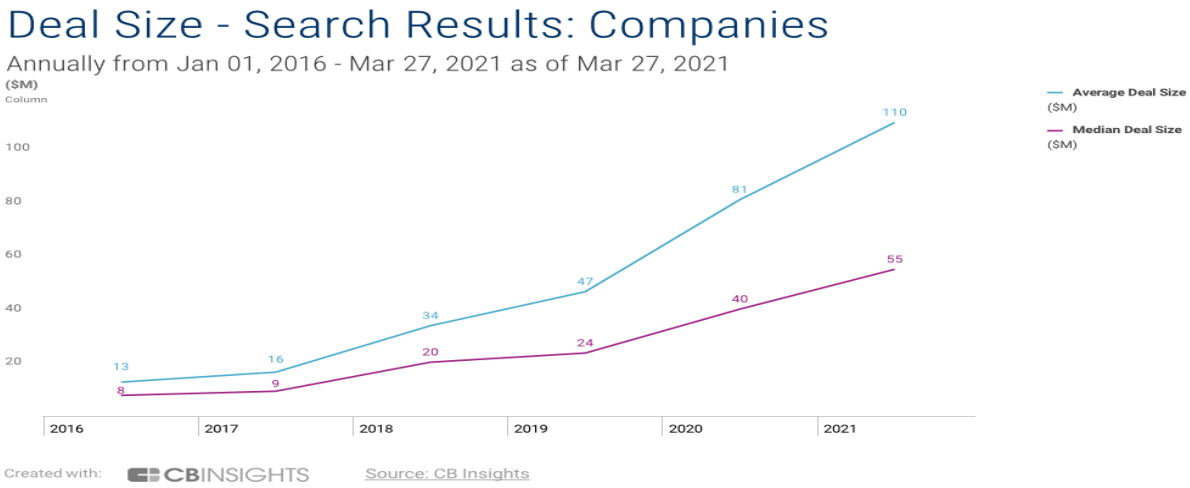

Fig. 1. Deal size results of AI companies

In figure 1, the increase in investor deals from years 2016 to 2021 show the growth of demand in artificial intelligence based startups. For the purpose of simplification, we mention 2016 as to shorten Jan 01, 2016 and 2021 as to shorten March 27, 2021. The average deal size is $110 million and average median deal size is $55 million as of 2021. Comparing this to 2016 where average deal size was $13 million and average median deal size was $8 million, we can infer that there is a huge growth in investments. By observation of the figure, it can be interpreted that investors will continue to invest in millions of dollars for AI startups and the number of startup deals will increase exponentially with the growth of the IT sector.

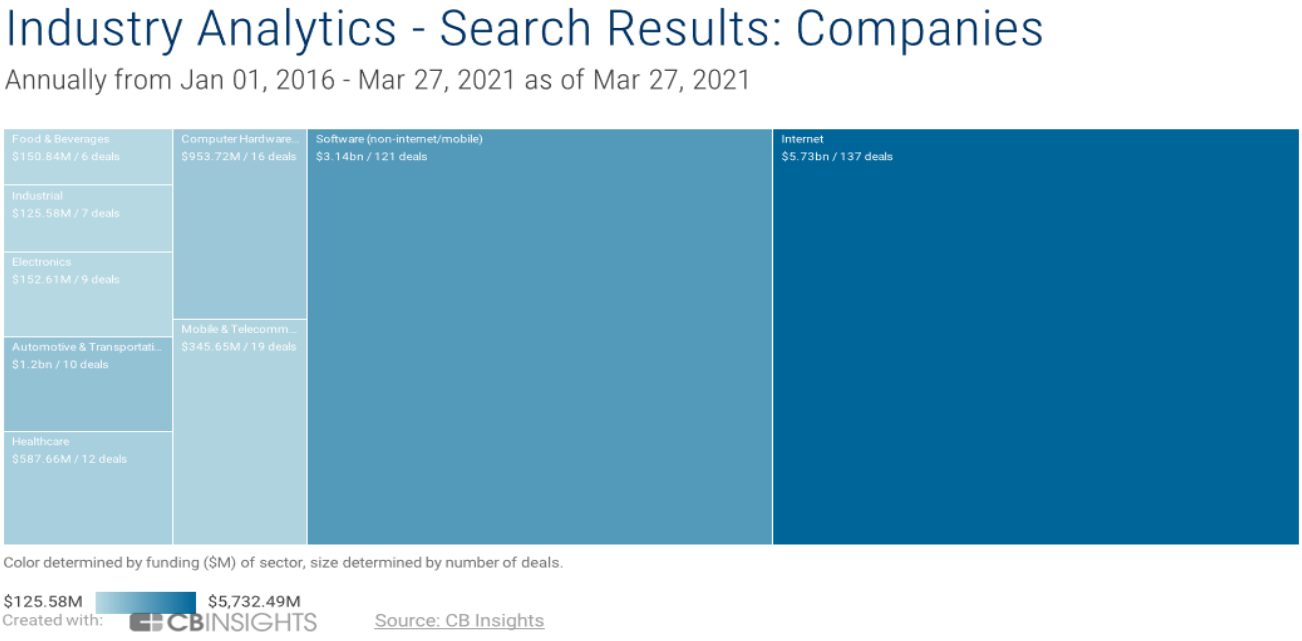

Fig. 2. Industry analytics heat map for companies

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In figure 2, the figure shows the heat map of the total funding of deals for AI startups from years 2016 to 2021. The most heat or impact of deals is for AI startups that provide internet based services. The internet sector has a total of $5.73 billion from 137 deals for the AI startups. The least sought after for AI technology is in the Food and Beverages sector with $150.84 million from 6 deals. Core IT sector segments such as computer hardware and services, mobile and telecommunications, software, internet have higher number of deals compared to non IT sectors such as healthcare, food and beverage etc. Therefore, we can understand that IT sector highly demands AI services to make their products and operations intelligent which will help in the growth of the company.

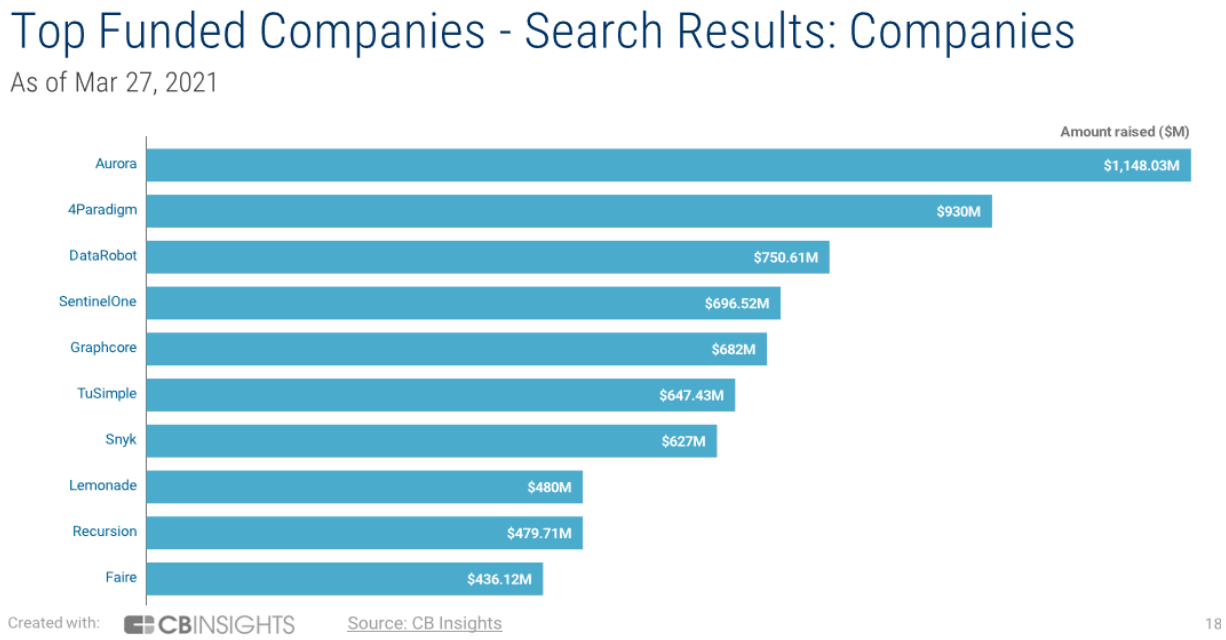

Fig. 3. Top funded AI companies

In figure 3, we analyze the currently top funded AI startups from 2021. US based Aurora is a startup specializing in AI based automated car self driving software and hardware has the highest funding of $1,148 million dollars. The reason of such high funding is because of the boom in self driving and technologically intelligent cars. Aurora provides a platform known as Aurora Platform which integrates the software and hardware along with data services to completely operate vehicles autonomously. Uber, Hyundai, Toyota and other major players in the automotive market are working with Aurora to integrate these systems in their vehicles.

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4.3 GEOGRAPHICAL ANALYSIS

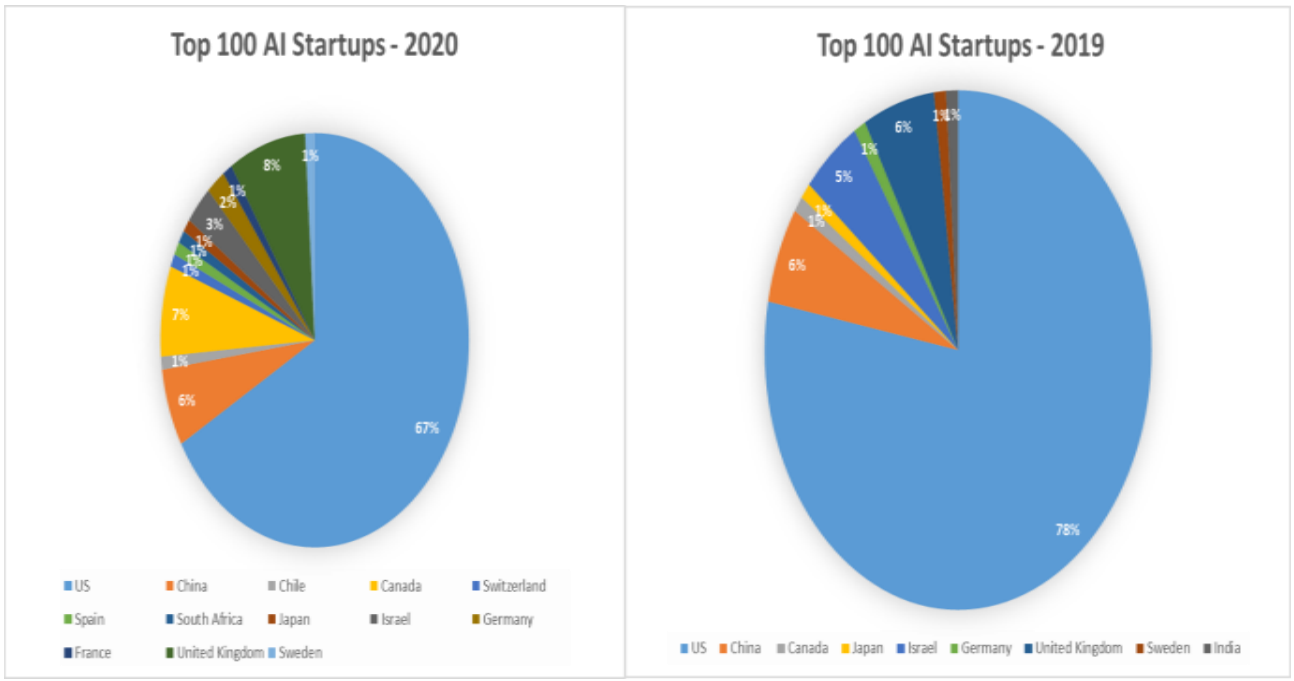

Fig. 4. Top 100 AI startups of 2019 and 2020

In figure 4, we analyze the geographical distribution of the top AI startups in the years 2019 and 2020 in order to study the most recent data. The data analysis reveals that the highest number of startups in both years is in United States. United States has 78% and 67% of the total AI startups in 2019 and 2020 respectively, wherein majority of these startups are founded in Silicon Valley, California which is known as the startup heaven of United States. Out of 195 countries, only 9 countries in 2019 and 13 countries in 2020 had the most number of successful AI startups on a global scale. This goes to show that technologically developed countries are the only countries who continuously seek to advance their IT infrastructure and growth in the field of artificial intelligence.

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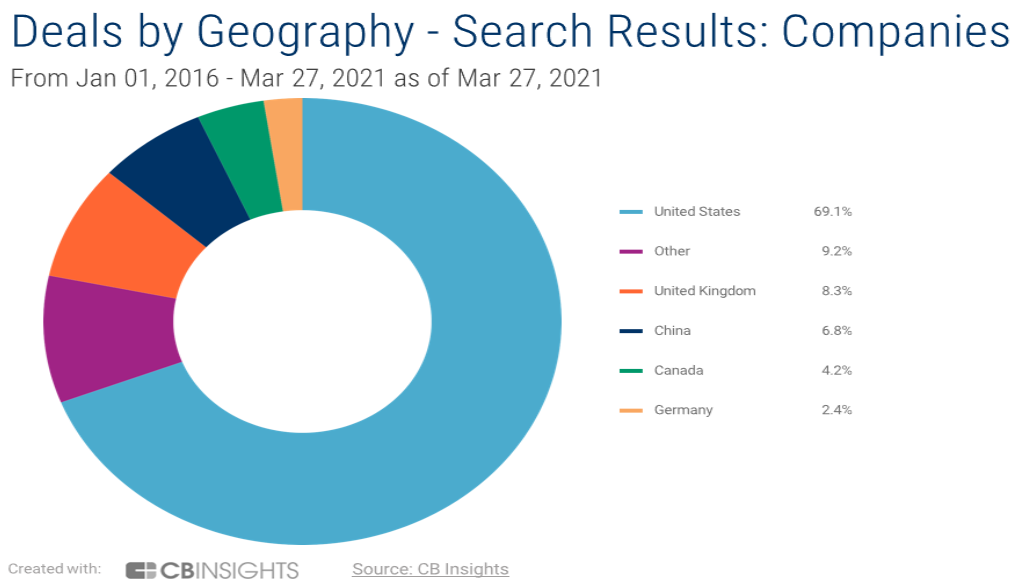

Fig. 5. Deals sorted by geographical area for AI companies

In figure 5, we study the data on number of deals by geography from 2016 to 2021 to understand the deal wise geographical distribution. United States was leading the number of AI startups with a total funding of $9,432 million dollars from 233 deals while United Kingdom comes in second with a total funding of $1,157 million dollars from 28 deals. This signifies that the top AI startups with respect to number of investor deals from the past 5 years are mainly from United States and United Kingdom.

4.4 JOB ANALYSIS

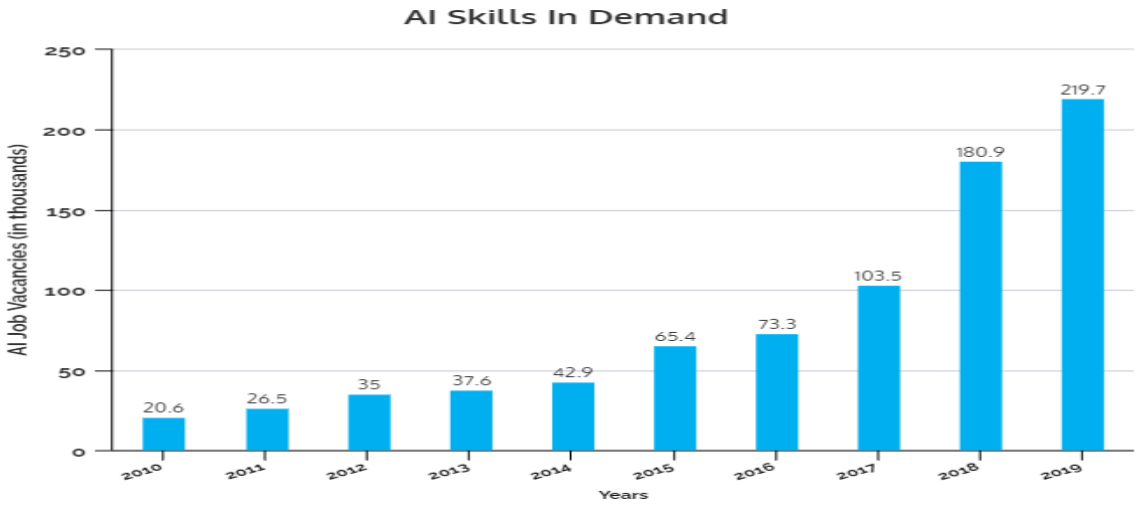

Fig. 6. AI skills in demand

In figure 6, by referring to “The demand for AI skills in the labour market”, Alekseeva et al. (2019) [7], we study the demand for AI skills which are measured to the number of posted vacancies on online job portals. The graph gives insight into the rapid

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growth over the years of 2010 and 2019 where the number of online job postings requiring skills in AI grew massively. The year 2015 showed a big upwards trajectory of AI demanding jobs and skills requiring AI. By the end of the year 2019, there were about 219,000 job vacancies around the world that required AI skills. This compliments our proposed analysis hand in hand by confirming that as the years keep progressing, IT sector implements and advances their systems for AI capabilities which causes the number of AI jobs to increase.

5 CONCLUSION

Artificial Intelligence has been a driving factor in changing how organizations in the IT sector perform business. With capabilities of Machine Learning and Deep Learning, AI technology is making several areas of the IT industry smoother in their operations. The fast paced and competitive world shapes a need for advanced technological capabilities in the IT environment as the rise of technology and innovation continue to increase a massive rate. The significance of AI is prominent in almost every industry and more so in the IT sector as organizations move towards automation of operations to cut down manual and repetitive tasks, thus improving operating efficiency and boosting the growth of the organization. Fields of AI application in service management, process automation and testing have become much easier and reliable. AIOps is the new key area of AI development where majority of companies would implement it for their operations. In our paper, we also understand the significant growth of AI startups around the world and the investments that they receive since they are perceived to be successful given the capabilities of AI. The job market for AI skills is rapidly growing to support the increase in AI operations in the IT sector. This indicates that the systems used by IT companies would eventually become more efficient, intelligent and self-sustainable through AI driven operations.

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