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Story so far...

December 2020

India's largest platform for AI and Analytics aspirants & professionals

3AI
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- **From 3AI President's Desk**: Read what **Sameer Dhanrajani** has to share about the genesis that led to 3AI and how 3AI is reimagining AI & Analytics ecosystem in India
- **3AI - India's largest platform for AI and Analytics aspirants & Professionals - First-year Reflections**: A pullback of our first-year journey at 3AI, retrospectively, it's been an exhilarating ride of conceptualizing and creating India's Largest AI & Analytics platform
- **2020 - Year of Innovating through Artificial intelligence and Analytics**: AI has undoubtedly played an enormous role in 2020 in all sorts of ways. Here are the salient AI topical developments and emerging themes in 2020.
- **The journey from digital ambition to transformation**: Bridgei2i CEO and Co-Founder, **Prithvijit Roy** share his thoughts on systematic adoption of AI at an industrial scale
- **AI in R&D: Impact of AI and Exponential Technologies on Drug Discovery**: **Divesh Singla** present insights on how AI and cognitive technologies are impacting the drug discovery part of the life sciences R&D value chain

India's largest platform for AI and Analytics aspirants & professionals

Message from 3AI President

"Purpose, not Platitude has driven 3AI to become India's largest platform for AI & Analytics aspirants and professionals"

Sameer Dhanrajani
President, 3AI

www.linkedin.com/in/sameerdhanrajani/

Amidst the pandemic led chaos that prevailed over the last 10 months, most of us have experienced anxiety, despair & gloom and classified the situation as a one-time vagary of our lives. Now, In the continuum of topical developments. We are witnessing hope, optimism, and a pugnacious approach to stay afloat despite the downturn. To put this into an analogy, for working professionals and students aspiring to become professionals … this is how the crest & trough of the professional life operate until we hang up the boots. Over the last 10 years, the Technology industry has gone through a massive transformation with exponential technologies warranting new-age skills and competencies for professionals to stay relevant.

India's burgeoning Technology industry is currently pegged at USD 190 Bn growing at a CAGR of 6-8% employing 4.4 million professionals across IT & Consulting firms, GCC's, pure-play & boutique providers & startups. Amongst the exponential technologies mix, AI & Analytics continues to remain the preferred & sought-after profession for existing technology professionals and aspiring students in Technology & Business schools. With 0.5 million AI & Analytics professionals & 1,50,000 existing job roles, AI & Analytics continues to cruise along with the fastest growth rates amongst the suite of new-age technologies and enterprises are looking at AI & Analytics as a trojan horse for accomplishing Transformation & innovation at scale.

Whilst, India's resource pool with 34.8 Mn student enrolment is massive coupled with 50K academic institutions in India: 799 universities, 12,923 standalone institutes, 39,485 colleges; our overall industry employability ratio stands abysmally low at 18%. With AI & Analytics emerging as the first career choice amongst students, do they KNOW what it takes to get deployed in AI & Analytics industry? On the other side of the spectrum, organizations are facing the gargantuan challenge of reskilling the existing workforce and onboarding new professionals. Take a look at these numbers: According to recent reports, 65% of the technology professionals are struggling to upgrade their skills, 1.5 Mn existing professionals will be reskilled predominantly in AI & Analytics, By 2023; AI & Analytics will generate demand of additional 0.3 Million professionals however AI & Analytics selection ratio 1:25 is amongst the LOWEST in exponential technologies space.

AI & Analytics Industry has turned out to be the most sought after and fastest-growing segment in the business and technology space and the trend is likely to continue for the foreseeable time horizon with AI adoption acceleration within enterprises

Message from 3AI President

As more professionals work from home because of the ongoing pandemic, the need for mentor-led, career-focused partnership in the AI & Analytics industry is exactly what today's career-changers and job-seekers need. 251+ defined career pathways in AI & Analytics industry, 1:25 interview selection ratio, and inadequate knowledge about the requisite skills, competencies, and role expectations to succeed; AI & Analytics industry is a joyride as well comes with speed bumps! The current transition to remote work has significantly impacted career growth and development prospect for many students and working professionals. From leaders to job seekers, there is a pressing need to rethink how growth and development are perceived in the AI & Analytics side. Personalized mentoring programs can fill the major gaps in the current job market and help professionals working in and aspiring to scale and grow in their career goals.

We at 3AI believe that not every student and professional could distinguish between teaching and mentoring. Mentoring and teaching are equally important but when it comes to professional learning and career development, the process matters. So, should they go for a teacher, a mentor, or both? The majority of the aspirants and professionals prefer to get access to a mentor in the AI & Analytics industry. A whopping set of students & mentors think access to a seasoned AI & Analytics mentor can profoundly boost their career success and trajectory and one of the best ways to transition to a position in a new industry is with the help of a mentor. Having access to an experienced mentor in AI & Analytics helps students and professionals identify and bridge their skill gaps and expedite knowledge acquisition to achieve their career goals. This was the genesis that triggered the formation of 3AI.

At 3AI, with our robust mentorship programs in AI & Analytics space, we provide a definite impact on filling the opportunity gap that keeps professionals from advancing within organizations or while changing jobs. Secondly, there is great potential in every professional looking to upskill – they just need to be directed and guided in the right manner. Whilst content and certification are just the tip of the iceberg and can help a student or professional grow only to a certain extent whereas guided and personalized mentoring by seasoned AI & Analytics leaders can be highly effective by applying that knowledge in the job spheres. To have career augmentation, good mentoring is of utmost importance, it is also one of the strongest areas which people misunderstand as plain counseling. A mentor can facilitate and expedite your success in your career and beyond...

The concept of mentoring has always been in existence, however, students' & professionals' understanding of mentorship in the AI & Analytics space is still unclear. Most students and professionals do not see expected growth in their career as they miss out on one or several aspects as AI & Analytics segment is fast-changing and ever-evolving and therein with 3AI's seasoned mentor can really alter and expedite one's career journey.

3AI has embarked upon to fill this gap by not only focusing on the 1:1 mentoring by seasoned and proven AI & Analytics industry leaders but also getting members where they want to be, by providing them effective career guidance about roles, expectations, and pathways. AI & Analytics has become a broad and exhaustive segment and incisive advice from mentors can go a long way in shaping up the careers of students and professionals.

Message from 3AI President

Also, with vast access to curated articles, thought leadership papers, proven industry use cases, weekly leadership webinars, immersive podcasts on the platform, 3AI knowledge insights provide the broadest spectrum of learning to 3AI members. Our two bespoke curated conclaves: Spectre & Technology Never Dies brought together 50+ AI & Analytics industry leaders & CXO's and were a testament to providing topical exposure to our members on the developments, applications, and opportunities in the AI & Analytics space.

With 150 + AI & Analytics thought leaders & mentors, 3000 + students & working professionals as members, 1000 + mentorship sessions, 1500 + posted job opportunities, 500 + articles, 300 + industry use cases, 18+ special interest groups, 25 + academic institutions on the platform, we believe the journey at 3AI has just begun…..

Sincere and earnest thanks to all our thought leaders & mentors, 3AI members, 3AI operations, marketing, content, outreach, technology teams, academic partners, patrons, academic faculty, startups, industry stakeholders for your unflinching support, efforts, and inputs.

3AI is on a mission to redefine career orientation and accelerate advancement for students and working professionals in AI & Analytics space. Watch out for an exhilarating set of interventions and high octane action in 2021!

"The key to realizing a dream is to focus not on success but significance, and then even the small steps and little victories along your path will take on greater meaning."

India's largest platform for AI and Analytics aspirants & professionals


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First Year Reflections
Journey of creating
India's largest platform for AI and
Analytics aspirants & professionals
ACA 589A

Undoubtedly, 2020 has been a challenge for all of us. But despite the turbulence, stalemate, and ambiguity; the year provided an unprecedented opportunity to reimagine, innovate, and transform. Unfathomable opportunities became a reality.

Amidst these difficult and challenging times in 2020, 3AI was conceptualized. A rumination exercise undertaken by four members has now turned into a phenomenon. At the heart of this phenomenon is an ecosystem creation on 3AI platform of 3000+ active members and 150+ Industry top AI & Analytics leaders as Thought Leaders and Mentors engaging through an array of interventions deployed for contextual learning thus creating opportunities for career augmentation & enhancement for students & working professionals.

A pullback of our first-year journey at 3AI, retrospectively, it's been an exhilarating ride of conceptualizing India's Largest Platform for AI and Analytics Aspirants and Professionals. 3AI platform is enabling the leaders to engage with students and working professionals for competency augmentation and career enhancement opportunities In the process, we have broken few cliched barriers and created a new niche and differentiated positioning in AI & Analytics.

Here are salient highlights of our year one performance:

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February 2020

3AI Launched on Feb 11 2020, at CII AI Summit & Expo Event

01.

150+ Thought Leaders and Mentors

Industry's top AI & Analytics leaders, experts, and practitioners onboarded as 3AI Thought Leaders and Mentors

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02.

3000+ active members

Partnered with universities and institutions to onboard their students as members of 3AI in addition to working professional members

03.

25+ University and Academic Institutions Partnerships

Partnered with leading academic institutions across the country while offering them customized interventions to plug the gap in the contextual knowledge around AI & Analytics skill building

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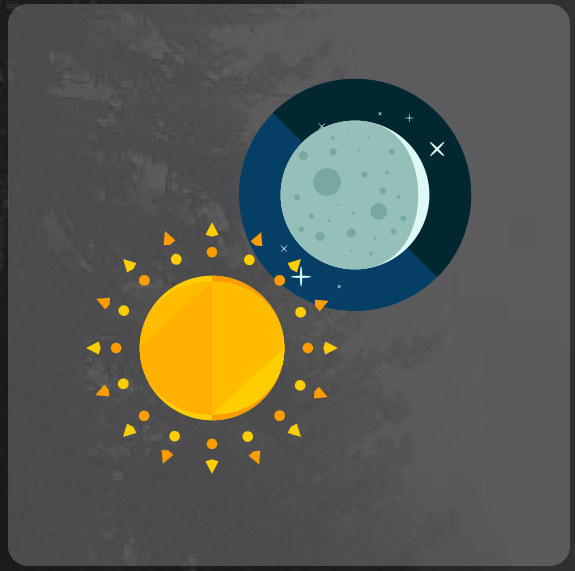
04.



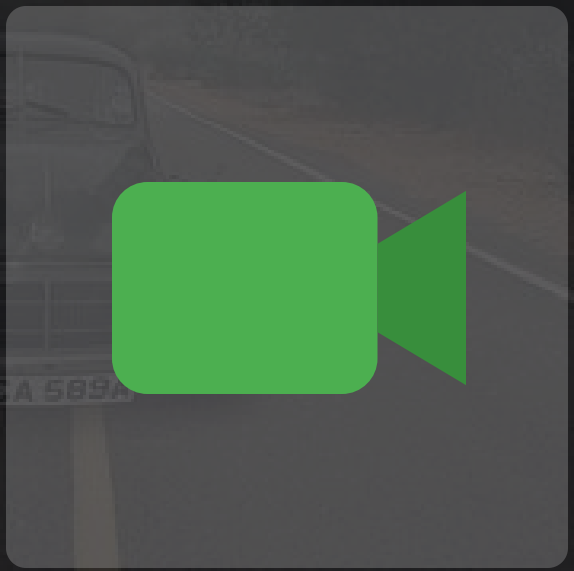
1000+ Mentorship sessions completed

The 3AI Mentorus provided members an opportunity to interact with the Top Industry AI & Analytics Leaders in a group setting and on a 1:1 basis. Further, apart from building and upskilling knowledge and skills, the program also offers the members, career guidance sessions, the landscape of AI & analytics roles and job expectations, personalized career roadmap exercise, and enabling members to build relationships along with expanding their networks.

05.

36+ Weekly Webinars and Fireside chat sessions completed

Members participated in Webinars, Seminars & Conferences and got an opportunity to build their knowledge base, gain deep expertise in their respective industry segments & functions, Got inspired by meeting leaders and learn from their experiences, get access to contextualized learning opportunities, insights on career progression and exchanging ideas and viewpoints from industry experts.



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06.

300+ Industry Case Studies and 500+ Articles

The research library provides the members with an exhaustive and vast array of topical AI & Analytics blogs, videos, articles, and newsletters. It helps in building contextualized learning by providing information about deep technology and domain areas leveraged by AI & Analytics. It's a treasure trove for members looking to enrich their learning quotient. India's first and largest repository of Industry Case Studies

07.

50+ Podcasts Episodes released

In partnership with Masters Decoded, 3AI brings a series of podcasts with industry leaders as guest speakers, who are successful in a different walk of life. Through these podcasts, we intend to decode and map out their careers and journeys with the hope that we all gain our learning

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08.

1500+ Job and Internship Opportunities

Leveraging our partnership with "Quess Corp" and "Monster.com", and a wide network of Thought Leaders, Mentors, Ambassadors, and Members, 3AI provides a segway of bridging the demand-supply gap in the AI& Analytics market opportunities. Our members get exclusive assistance of curated question bank, internship opportunities, mock interview sessions, and & placement opportunities with AI pure-play players, GCCs, startups & IT firms

09.

Special Interest Groups Launched

The program includes access to Special Interest Groups for 3AI members to connect with fellow AI practitioners, enthusiasts and learners to share best practices, discuss current issues and augment learning by sharing content, coding challenges, information on latest skills and practices & ideas.

10.

"3AI Pinnacle Awards 2020" across 5 categories

3AI Pinnacle Awards acknowledged and celebrates the prowess and contribution of AI & Analytics students, professionals, academic institutions, leaders in driving significant outcomes and augment the efforts of positioning India as a premier destination for AI & Analytics that online courses are easier to concentrate in because they are not distracted by other classroom activity.

Click to view award winners
https://www.3ai.in/pinnacle-spectre/

11.

"3AI Pinnacle Spectre Summit 2020"

3AI Pinnacle Spectre Summit & Awards 2020 brought together the top of the line AI & Analytics leaders discussing the topical developments, best practices & emerging opportunities in the AI & Analytics arena. The fast-paced, riveting, and engaging Summit was held in the virtual mode blended with a keynote address, panel discussions, fireside chats, valedictory address, and award announcements all packed in gripping three hours of showtime.

Click to view videos from 3AI Spectre
https://www.3ai.in/pinnacle-spectre/

12.

TECHNOLOGY NEVER DIES 007

Exponential Technologies++ Conclave

3AI Technology Never Dies 2020 Conclave

3AI's Technology Never Dies 2020 was the first-ever conclave covering 7 exponential technologies: AI, Blockchain, Cybersecurity, Cloud, IoT, RPA & AR/VR bringing together 25+ marquee leaders delivering pacy yet focused curated sessions with state-of-the-art discussions & narratives on the developments and possibilities of exponential technologies with coverage of adjacent human-machine creative disruption & future of work led innovation.

Click to view session videos from TND 2020
https://www.3ai.in/tnd2020/

13.

"Best Emerging Technology Enabler 2020" Award

ASSOCHAM, and apex industry association and Ministry of Skill Development and Entrepreneurship, Government of India felicitated 3AI with "Best Technology Enabler 2020" Award for its efforts in building a sustainable skill development ecosystem for Artificial Intelligence and Analytics in the country. Our co-founder, Divesh Singla received this award on behalf of 3AI

ASSOCHAM INDIA

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150+ Companies represented on the 3AI platform

- Microsoft
- Wells Fargo
- Accenture
- IQVIA
- Parexel
- PepsiCo
- NVIDIA
- Oracle
- Genpact
- Michelin
- Aditya Birla Group
- Bridgei2i Analytics
- LatentView Analytics
- Citibank
- AIQRATE
- AT&T
- Bajaj Allianz
- MetLife
- Rolls-Royce
- Axtria
- Philips
- WNS Global Services
- AB-InBev
- Automation Anywhere
- IBM Watson
- United health group
- MothersonSumi
- Quess Corp
- Hike Messenger
- Baker Hughes
- Course5i
- Eli Lilly
- Novartis
- HSBC
- JP Morgan
- TNQ Ingage
- Boston Consulting Group
- KPMG
- Airtel
- Ripple Links
- Cisco Systems
- Amazon
- Cognizant
- Beam Suntory
- Telstra
- Amex
- United airways
- Toyota Financial Services
- IBM
- Wockhardt
- Synopsys
- Ernst & Young
- Symphony AI
- BresMed
- Fractal
- Spiceworks
- Landmark Group
- Wiley
- Ramboll
- Euromonitor
- Mahindra & Mahindra
- HCL Tech
- State Street Corp
- TEG Analytics
- Novo Nordisk
- Astra Zeneca
- Google
- AboluteData
- Apple
- Citrix
- Atos
- Axa Group
- Adani Wilmar Group
- Swiggy
- Dunzo
- Flipkart
- IDFC
- Capgemini
- Reliance Jio
- Yes Bank
- DBS Bank

...and many more

India's largest platform for AI and Analytics aspirants & professionals

2020 - A year of innovating through artificial intelligence

Artificial intelligence is coming out with what we define as sophisticated computer technology that is becoming widely used to understand and improve business and customer experiences. We are all witnessing a staggering growth of AI technology with so many additional benefits for people while also changing the way we live and work.

The possibilities of AI are innumerable and beyond the scope of our imagination. AI is becoming the bedrock of the era of connected mobility, automation, and Industry 4.0, powering everything from analytics, decision-making, hospitality, logistics, to healthcare, insurance, retail, technology, manufacturing, and many more. Over the past decade, artificial intelligence has become more and more integrated into these industries. However, AI has undoubtedly performed an infinite position in 2020 in all kinds of how. 2020 had some noteworthy advancements in AI & Analytics.

Listed are some primary developments and rising themes seen in artificial intelligence throughout 2020.

2020 - A year of innovating through artificial intelligence

Prediction of AI-based protein structure

Deepmind, the AI technology company that is part of Google parent Alphabet, has achieved a significant breakthrough in AI-based protein structure prediction. This means that AI can correctly figure out, to very high accuracy, the structure of proteins in just days that is crucial to figuring out how diseases can be best treated, DeepMind's technological leap could make accurately predicting these folds a much less time and resource-consuming process, which could dramatically change the pace at which our understanding of diseases and therapeutics progresses. This could come in handy to address major global threats including future potential pandemics like the COVID-19 crisis we're currently enduring, by predicting viral protein structures to high accuracy early in the appearance of big problems like working out how best to break down ecologically dangerous material like toxic waste.

An autoregressive natural-language-processing neural network GPT-3

Generative Pre-trained Transformer 3 (GPT-3) received the most attention of any development this year. In an average year, a text-generating tool probably wouldn't rank as one of the most exciting new A.I. developments. But 2020 hasn't been an average year, and GPT-3 isn't an average text-generating tool. Generative Pre-trained Transformer 3 (GPT-3) is an autoregressive language model for creating human-like text with deep learning technologies and can generate impressively accurate text matching the style and content of the initial few lines — even down to making up fabricated quotes.

Artificial Intelligence in practice for COVID-19

The COVID-19 pandemic has provided a driver for change, altering how we work and interact with remote working and reduction of human interaction at the center of global initiatives to try to reduce the spread of the virus. During this time Healthcare records in most countries have moved from paper-based records and notes to digital media with the help of The electronic health record (EHR) that allows the capture of large quantities of data across patient groups and Artificial Intelligence, in collaboration with Chest X-rays, helped in diagnosing the ground-glass opacities in the lungs, which is a classic feature of the COVID-19 disease. During this time we have seen an increase in the use of AI chatbots to handle patient queries regarding appointment queries. We also saw developments in the contact-based app to trace COVID-19 patients working on Bluetooth For instance, in India, the government ruled out a similar strategy by developing the Aarogya Setu app. Apart from using the Aarogya Setu app, for contact tracing, many states in India have exercised AI to identify people who are mask violators with the help of AI cameras.

2020 - A year of innovating through artificial intelligence

COVID-19 Increased Enterprise Interest in RPA

The pandemic and ensuing recession increased interest in RPA for many enterprises. 90% of large organizations globally will have adopted RPA in some form by 2022 as they look to digitally empower critical business processes through resilience and scalability while recalibrating human labor and manual effort. The key driver for RPA projects is their ability to improve process quality, speed, and productivity, each of which is increasingly important as organizations try to meet the demands of cost reduction during COVID-19.

Automatic Detection and Prevention

We have already seen the use of drones in several jurisdictions to monitor whether social distancing guidelines are being followed. More advanced applications are on the horizon – such as drones with the capability of detecting COVID symptoms such as high temperature in individuals within a crowd. These systems use computer vision technology to analyze data captured by cameras on the drones and inform authorities or local administrators of statistics and probabilities around the spread of the virus. Another related growth area will be the use of facial recognition technology, also powered by computer vision algorithms. Somewhat more controversial as it focuses on the identification of individuals, rather than patterns among groups of people, facial recognition has been used by police to detect lockdown and quarantine-avoiders, as well as to track the movements of individuals displaying symptoms within crowds.

SaaS BI

The pandemic has shown that remote working is becoming a norm, especially for companies that don't rely on daily human contact to perform their regular tasks. Many businesses have turned to SaaS BI in order to gain more flexibility and access the data on the cloud, from any device. Since the shift from traditional settings to remote business opportunities enable people to access their analytics with the help of SaaS, and pushed the market, again, in the center stage of business management and development. SaaS is becoming a best friend to remote and disparate teams that need solutions that will help them to optimize their business processes and ensure there are no bottlenecks by working remotely. A well-developed business intelligence technology can help companies in many ways, and ensure sustainable growth, which we certainly need in these uncertain times.

2020 - A year of innovating through artificial intelligence

Generative model

Generative AI- widely known as the creative side of AI – is a collective term for machine learning algorithms capable of producing, understanding, and enhancing content. Here content refers to images, video, audio, and text. What makes these models suited for content creation applications for media and entertainment businesses - their sheer ability to generate content conditionally from a variety of domains. Industry leaders like Netflix and Prime Video are creating almost all their content in 4K, setting the norms of quality.

AI in Retail

AI in retail is taking center stage for enterprises. In a digital era where consumers are constantly seeking personalized products and services, artificial intelligence solutions in retail are helping retailers align their offerings with the expectations of their customers. The disruptive impact of artificial intelligence in retail is seen across the value chain and is emerging as a powerful tool for retail brands to gain a strategic advantage over their competition. For instance, companies like MallIQ an in-store analytics vendor aims to increase foot traffic and sales of retail brands with targeted actions.

Deepfakes

There's no denying that 2020 has been a strange year for blurring the edges of reality in all sorts of weird ways. Deepfakes aren't an invention of 2020, but they have seen some significant developments this year. In July, researchers from the Center for Advanced Virtuality at the Massachusetts Institute of Technology put together a compellingly high-budget deep fake video depicting President Richard Nixon giving an alternate address about the moon landings, which was written in the Apollo mission went wrong. Along with more convincing visual deepfakes, researchers have also created some astonishingly accurate audio deepfakes.

The journey from digital ambition to transformation

Contributed by

Prithvijit Roy

The journey from digital ambition to transformation

Prithvijit Roy
Founder & CEO
Bridgei2i

www.linkedin.com/in/prithvijitroy/

We are in a world where brands compete almost exclusively on customer experience, and much of it is digitally-led. Technology is at the core of this - mobile, cloud, IoT, robotics, blockchain are rapidly disrupting the landscape. Digital enterprises of the future are looking to make the most of these technologies to modernize core systems/processes and digitize their operations. The recent pandemic has only accelerated the urgency.

Today 90% of the data generated by digital business models remain unused. Digital models become incredibly powerful when you can learn from the data and take intelligent actions. This is how AI drives the reimagination of businesses to power contextualized customer experiences and intelligent operations.
Though AI and Digital are undoubted priorities for CXOs, most enterprises are still in the early stages of AI industrialization. To quote a frustrated client, enterprises have more pilots than Lufthansa. But fewer than 1 in 10 businesses are ready to take AI into production.

To harness the power of AI, enterprises need to follow a systematic approach, across the value chain. Starting from AI use-case-discovery, organizing data by applying data engineering principles, augmenting it with unstructured data leveraging technologies such as NLP and computer vision, and using machine learning to unearth patterns and anomalies in this vast and complex data. It is a deliberate journey to get to the point where enterprises have automated processes with AI-driven intelligent actions for alerting, personalizing, planning its resources and interacting with their suppliers and customers.

This systematic adoption will make AI real on an industrial scale.

AI in R&D

Impact of AI and Exponential Technologies on Drug Discovery

Contributed by

Divesh Singla

AI in R&D: Impact of AI and Exponential Technologies on Drug Discovery

Divesh Singla

Vice President, HEOR

Parexel

www.linkedin.com/in/diveshsingla/

Global healthcare spending is projected to reach by $8.7 trillion by 2020 from previously recorded $7 trillion in 2015. Critically evaluating the life sciences industry, the key factors that seem to be contributing to ever-increasing spend include

- **Growing population and greater demand for disease management**. The pressure of an increased overall population and an increasing number of the elderly population is continuing to add pressure on the healthcare system. Additionally, majority of healthcare spending share goes to chronic conditions such as diabetes, cardiovascular diseases, asthma, and not only acute care. Chronic diseases are on rising and are continuously adding demands to the health care system.
- **Another major driver is medical technology and treatments**. Medical technology has been providing critical break-through in increasing the quality of medical care but the same comes at a significant cost. New healthcare delivery technologies like better diagnostics machines, robotic surgery equipment often increase the healthcare costs, even as it lowers the per-unit cost of delivery
- **Increasing government regulations** and newer compliance mandates are also contributing to increasing in costs of healthcare
- **Prices of prescription drugs are increasing**. Patients and providers are generally unaware of drug and service costs, upfront. This contributes to an increase in upward spending. Other factors contributing to the increase in overall drug costs include increased prescriptions of drugs, price inflation, and an increasing shift towards high-cost treatments.

AI in R&D: Impact of AI and Exponential Technologies on Drug Discovery

THE CHANGING PHARMA AND LIFE SCIENCES LANDSCAPE

As per a recent market research report by The Business Research Company, in comparison to the overall healthcare market, the global pharmaceutical market was valued at $934.8 billion in 2017 and is estimated to touch $1.1 trillion in 2021, representing 5.8% growth. The increase in pharmaceutical market size is contributed by factors including disease prevalence, customer attitude, government policies, and supply-related factors.

The fourth industrial revolution has ushered an era of exponential transformation and change. Emerging technologies are creating a transformative opportunity for life sciences. Declining R&D productivity, changing commercial models, increased patient expectations, increasing regulatory complexities and the growth of personalized medicine are the way drugs have been discovered, developed, and made available to patients worldwide.

The discussions on Artificial Intelligence (AI) and cognitive technologies have been gaining significant momentum over the last few years – especially in the era when these life sciences companies are facing intense disruption from non-conventional competitors in form of small and large technology companies. For instance, Apple and Amazon have been rolling out advanced computing technologies. Both these companies are positioning themselves to enter the life sciences and healthcare markets, Apple through its Healthkit ecosystem, and Amazon through a recently discovered healthcare innovation arm called 1492. This disruption is forcing the conventional life sciences companies towards accelerated adoption of emerging technologies and the resultant transformation is driving a significant overall scientific innovation.

Poor data quality, multiple fragmented systems, resistance to change the attitude of the patients and providers have led to slow adoption of data and analytics by the life sciences industry. This is however at a cusp point in the adoption of big data analytics, advanced technology towards a more patient-centric and accountability model. Recruitment and retention of “fit-for-purpose” talent will allow appropriate access to specialist skills including advanced analytics and digital skill, thus determining the adoption of technologies by the life sciences industry. While most of the life sciences companies have cited as a risk-averse approach to regulation as a reason for this slow adoption of technology, investment by regulatory bodies like FDA and EMEA in new capabilities to manage data and technology regulations will continue fuel adoption of these technologies.

A recent discussion paper “Notes from the AI frontier: Applications and value of deep learning” from McKinsey Global Institute estimated a potential to create between $3.5 trillion and $5.8 trillion in value annually across nine business functions in 19 industries including a significant portion of that growth in the life sciences and healthcare industry. Additionally, Gartner recently estimated that the global AI business value could reach $1.2 trillion by 2018 and $3.9 trillion by 2022. There is a strong opportunity that AI-based technologies will boost pharmaceutical R&D productivity and help the industry to tackle some of the key cost and efficiency challenges. Large pharmaceutical and healthcare organizations are partnering with emerging startups to gain AI tools and expertise. As reported by Fortune Times in September 2017, Novartis chief executive, Vas Narasimhan, plans to partner with, or acquire, artificial intelligence and data analytics companies, to supplement Novartis’s strong but “scattered” data science capability.

AI in R&D: Impact of AI and Exponential Technologies on Drug Discovery

Most of the early adopters of advanced analytics and emerging technologies within life sciences industry have successfully been able to build significant infrastructural and cultural frameworks for successful AI transformations, including

- establishing a solid business case for AI and its relationship with overall business strategy
- breaking down the silos in the data ecosystems and identifying high-value data for a competitive edge
- partnering externally to acquire expertise and plug the capability gaps
- creating seamless AI integration into workflow processes through newer business models thus resulting in optimization in human and machine interfaces
- adopting open, collaborative culture to deal with uncertainties, building trust in AI insights, and ensuring complementarity through constant reskilling and upskilling of the workforce
- building cross-functional and smart approaches to adhere to the regulatory requirement

Why the life sciences industry is in the need of scientific transformation and innovation, more than ever? What is driving this transformation and disruption of the life sciences industry which is experiencing unmatched changes due to emerging technologies like connected care, personalized medicine, wearable devices, artificial intelligence, Internet of Medical Things (IoMT), machine learning, blockchain and augmented reality?

Like many other industries, the key fundamental of the life sciences industry's business model is the generation of greater customer value through product innovation. This value generation further depends on a firm R&D productivity with consistent ROI which drives future revenues that can be reinvested back into R&D – which has been witnessing a steady decline over the last decade or so. Remember, as per estimates from Tufts Center for the Study of Drug Development, the average cost of developing a new drug at US$2.55 billion, with the process potentially taking more than 10 years

As a result, pharma organizations end up putting more and more efforts toward innovation (R&D) to just get diminishing incremental benefits and added value for patients, which results in diminishing overall return on investments. At the same time, R&D budgets at biopharma companies are usually proportional to revenues. When revenues contract, less money becomes available for investing back into R&D, leading to even smaller chances of improvement in the future.

Emerging technologies, including social media, mobile applications, robotic process automation, wearables, machine learning, artificial intelligence, analytics, blockchain, and virtual reality are transforming drug discovery and development. The application of these technologies along with Real World Data (RWE), has and will continue to enhance the clinical trial productivity by driving efficiencies, providing an enhanced experience to enrolled patients by increasing effectiveness of the interactions of these patients across various stakeholders, and increasing overall effectiveness of the drug development process with the generation of largescale data which, in turn, lead to deeper insights. Digital technologies have been significantly resulting in improvement of patient recruitment efficiencies and have been resulting in cost and effort reduction in this process.

AI in R&D: Impact of AI and Exponential Technologies on Drug Discovery

As per US FDA, there are five stages in the development of a new drug: discovery and development, preclinical research, clinical research, FDA review, and FDA post-market safety monitoring. Development of better biomarkers and diagnostics, identification of effective drug targets, and molecular design of new drugs—these are some of the areas where cognitive technologies are finding significant applications. For a lot of the pharmaceutical companies, the most important component of AI is machine learning. There are numerous case studies suggesting increasing interventions of AI and machine learning in drug discovery, especially in the identification and screening of potential drug candidates. Big pharmaceutical companies are getting into partnerships with small and large AI-driven companies in the quest of enhancing the predictability of drug targets, thus resulting reduction of cost and time to market. Drug discovery involves disease research and understanding, molecular compound testing to identify drug targets or repurpose currently available drugs.

DISEASE UNDERSTANDING

The drug discovery process is highly data-driven, including molecular structures, genome profiles, medical images, and biological information data. AI can use deep learning and machine learning techniques to collect this data from journals and research paper, assimilate, correlate this information with existing information and identify patterns in the data pools. AI can provide the hypothesis for drug discovery through review of scientific publications and making correlations.

- US based Pfizer adopted IBM Watson for its drug discovery cloud platform. This platform holds 25 million medline article abstracts and 1 million scientific articles in its immune-oncology (I/O) research. Human research is typically able to analyze only 200-300 articles per year while having AI based platforms do this will bring efficiencies in the process.
- London-based start-up firm BenevolentAI has used deep learning and Natural Language Processing for mining and analyzing large volumes of scientific data. Data sourced from multiple sources including journals, papers, patent documents, trials and patient medical records is used as input. The platform then returns inferred relationships between biological entities such as genes, symptoms, diseases, proteins, tissues, species and candidate drugs. The platform works like a search engine and can be used to create information grids of disease and genes associated with it. With this approach, AI can shorten the process and predict how the compounds can be more efficient in targeting diseases. For instance, BenevolentAI used AI technology to help identify a potential hypothesis for the treatment of ALS (also known as Motor Neurone Disease) in 2016

"AI can provide the hypothesis for drug discovery through review of scientific publications and making correlations and making correlations."

Identification of Drug Target

One of the most challenging aspects of the drug discovery process is the identification and selection of new drug targets or drug molecules. The complexity of this is driven by what is known as the ‘chemical space’, which is defined as the catalogs of all the potential pharmacologically active molecules. The vastness of this chemical space can be ascertained from the fact that there are believed to be 1060 molecules in comparison to 100 billion stars in a galaxy and 1 billion trillion stars in-universe.

AI in R&D: Impact of AI and Exponential Technologies on Drug Discovery

Deep learning does have answers to this challenge in form of Generative Adversarial Networks (GANs). GANs are a neural network class of techniques, which intend to generate objects from a certain class. The architecture of GANs was first introduced by Ian Goodfellow in 2015, and since then it has achieved significant accuracy in the image, video, and text generation.12 GANs generation has two parts that compete with each other

1. The goal of the generator is to generate new objects that are supposed to pass for 'true' data points
2. The goal of the discriminator is to the difference between real data points and ones produced by the generator

- Atomwise, founded in 2012, uses its deep learning and deep convolutional neural network for bioactivity prediction in structure-based drug discovery through its platform AtomNet. It analyzes molecules to predict their potency, side effects, and toxicity, and as a part of this process, the platform screens 10 million small molecules daily. This technology is thus is focused on addressing the challenges related to the identification of silico small molecules for specific drug targets, and optimizing the same for potency and safety.14 Atomwise is partnering with large pharma companies as well as prominent research institutions, thus rapidly improving its AI-based models.
- Exscientia's AI platform screens compounds in animal models, using its deep-rooted knowledge for compound design and assessment—comparing the results of a newly designed compound with the anticipated performance and with other molecules.

"Machine learning algorithms can be used to repurpose drugs faster and at lower costs."

Drug Repositioning

Also, known as drug repositioning, this is a process in which already known drugs and compounds are used to treat new indications. The biggest advantage of drug repositioning is that these known compounds have less risk of failure, as they have already passed a series of tests. Machine learning algorithms can be used to repurpose drugs faster and at lower costs

- IBM Watson utilizes cognitive technologies to analyze unstructured data and explore the relationships between drug molecules and specific diseases
- The bioinformatics company NuMedii uses neural network-based algorithms on its Big Data pool and uses biological, clinical and pharmacological properties to explore drug candidates.

Precision/Personalized Medicine

The 'one-size-fits-all' approach to treatment and disease management no longer works. Instead of making the same medical decisions based on a few similar clinical features among patients, healthcare has shifted toward prevention, personalization. Precision or personalized medicine is an emerging approach for disease treatment, as well as prevention that takes into account the individual variability in genes, environment, and lifestyle for each person.

Developing new personalized treatments is like trying to work a huge, multidimensional puzzle with pieces that are constantly changing their shapes. Precision medicine initiatives not only provide scientists and healthcare practitioners with enablers to cure people but also empower patients to monitor and take a more active role in their own health management.

AI in R&D: Impact of AI and Exponential Technologies on Drug Discovery

AI helps build personalized models of drug compound combinations and explores the relationship between genome and microbiomes to determine comparative treatment response. These algorithms are also used to create artificial patient populations with properties of actual patient cohorts, using volume and ever-growing clinical data from EHR for insights for safe, effective, and cost-efficient personalized healthcare.

- Recursion Pharmaceuticals, an AI-driven biotechnology company, partnered with a large France-based global pharmaceutical company to test clinical-stage molecules for genetic disorders. Recursion's machine learning algorithm uses image analysis of individual cells, screens them across a library of genetic disease models, and derives new indications

"AI helps build personalized models of drug compounds combinations and explore relationship between genome and microbiomes to determine comparative treatment response."

Increasing interest and application of AI-enabled technologies will further shift the strategic focus of leading biopharmaceutical companies towards setting up sophisticated IT infrastructure and M&A activities to address the need for scarce and highly skilled data scientist talent.

AI activity for drug discovery has risen multifold since 2015, and based on the expanding interest in AI-enabled technologies, it is predicted that the next 1-2 years will witness enhanced interests in AI-based technologies and tools, and their scalable applications in drug discovery by pharma and biotech companies. It is evident that given this large potential but at the same time, a scarcity of required skills within the pharma and biotech companies, a growing number of AI technology companies will be pitching in and will be offering solutions for new use cases and more flexible commercial models. The big and mid-pharma companies will be launching more research initiatives in this space. This will lead to the outsourcing of high-end R&D activities, at least those in the area of AI, cloud, and Big Data

"The biggest challenge that AI-providers will face is finding ways to prove the value proposition for the pharma and biotech collaborators in more measurable ways."

The biggest challenge that AI-providers will face is finding ways to prove the value proposition for the pharma and biotech collaborators in more measurable ways. Despite a lot of skepticism in the last few years about whether AI-enabled technologies could deliver their promise of drug discovery efficiency, it is evident with every use case that there is an incredible potential of AI powering high throughput activities around disease research, drug target identification, molecular compound screening, drug design, and clinical prediction through computational tools.

With growing computational power through innovation, GPU-based AI accelerators, quantum computing, and AI-powered drug discovery is poised to increase. With an overwhelming amount of data available today in life sciences, coming in from advanced research, ever-increasing digitization

of healthcare, IoT, the time is ripe to harness this data and unlock the potential of AI and exponential technologies.


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