

Dr. Alan Turing (1912-1954), A Founding Visionary in The Evolution of Modern Artificial Intelligence: A Scientometric Analysis

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ABSTRACT

Aim: Alan Mathison Turing, widely known as Alan Turing, was a British mathematician, logician, and computer scientist, recognized as one of the founding fathers of modern Artificial Intelligence (AI). Even after seven decades since his death, his contributions to AI continue to shape various aspects of our daily lives, raising concerns about their impact on the future. This study provides an analysis of Turing's 74 contributions, of which 43 were published during his active and productive life (from 1935 to 1954) and 31 were posthumous publications (from 1956 to 2020). **Background:** Today's AI is having huge impact on modern society and Alan Turing is one of its founders. This episode begins with him through a bibliometric study and endeavor to draw a scientific portrait of this fame of computer scientist. **Methodology:** Bibliographical and biographical data of Alan Turing were collected from Google Scholar (GS), Research Gate (RG), bibliography and some classic documents containing publications of Alan Turing. Collected data has been analyzed using standard bibliometric methods for generating scientific portrait. **Results:** Turing's first paper was published in 1935 when he was just 24 years old. The highest number of his publications i.e. five papers appeared in 1951 when he was 36. Throughout his career, he collaborated with 23 co-authors on 74 publications. However, the majority of his work, 61 contributions, was non-collaborative, with only 13 being collaborative in nature. His active life spanned only 43 years, and during this time, he published the greatest number of papers i.e. 24 within the decade of 1945-1954 while 19 papers were published in the preceding decade (1935-1944). His most frequent collaborator was M. H. A. Newman, with whom he co-authored three publications. The majority of Turing's publications (14, or 32.56%) were journal articles during his active life. Of his posthumous publications, 12 (38.71%) were in the form of composite books. His most frequent journals for publication included Journal of Symbolic Logic (5 papers), Cryptologia (3 papers), and Annals of Mathematics (2 papers). Finally, the study examines the validity of Bradford's law, and the overall DC value calculated to be 0.16. **Conclusion:** Alan's intellectual journey, though it lasted only 43 years, was filled with groundbreaking publications, many of which are still relevant today. It is a high time to quantitatively assess the contributions of this scientist and this is an important and original work.

Keywords: Scientometric study, Alan Mathison Turing, Alan Turing, British mathematician and logician, Computer scientist, Computer science, Artificial Intelligence (AI), Cognitive science, Father of Artificial Intelligence, Father of Modern AI.

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INTRODUCTION

Humans are intelligent beings, constantly making new discoveries that shape the world or civilization. One of the greatest inventions is the computer, which has transformed communication, writing, and problem-solving. This led to the rise of computer science, a field that drives innovation and career opportunities

globally. Today, computers play an essential role in nearly every aspect of life, making tasks easier *yet also* introducing new challenges. The rapid development of computer technology poses challenges, particularly for older generations struggling to keep pace. One of the most significant advancements is Artificial Intelligence (AI), which mimics human intelligence and can be used for both beneficial and harmful purposes, depending on human intent. AI has integrated into nearly every aspect of life, automating tasks traditionally performed by humans. Alan Turing, one of the greatest minds of the 20th century, played a key role in the development of computers and AI. Its origins date back to Alan Turing, whose groundbreaking work in the



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1930s laid the foundation for modern computing. His theories, developed in 1935 (at the age of 23), shaped the modern digital world, earning him the title "Father of Artificial Intelligence" or "Artificial Intelligence Pioneer". His work set the stage for AI's widespread influence today. While AI offers many benefits, it also raises concerns. As AI continues to evolve, we must decide whether it will be a helpful tool or a dangerous force in our lives. The future will determine whether AI is ultimately a blessing or a challenge. The episode opens with a focus on Alan Mathison Turing, popularly known as Alan Turing, shedding light on his remarkable life and defining the significant moments of his legacy.

Artificial Intelligence (AI)

Alan Turing, a pioneering mathematician and computer scientist who laid its theoretical groundwork in his 1950 paper *Computing Machinery and Intelligence*. A few years later, between 1955 and 1956, Stanford professor John McCarthy officially coined the term *artificial intelligence*, defining it as "the science and engineering of making intelligent machines." Initially, AI systems were designed to follow programmed instructions, enabling them to play games like chess. AI systems have advanced significantly, with the ability to learn, analyze and adapt, mimicking aspects of human cognition (Manning, 2020; Vedantu.com, 2023). AI is broadly defined as "the intelligence of machines or software, as opposed to human or animal intelligence" (Wikipedia, 2023). It encompasses a wide range of technologies designed to perform tasks requiring human-like intelligence, including visual recognition, logical reasoning, speech processing, decision-making, and language translation-once considered exclusively human abilities (Nextech3D.ai, 2023; Winston, 1992). Various scientists (chronologically) have defined AI as follows (Koushik, 2023; Copeland, 2000; Kurzweil, 1990); (Luger and Stubblefield, 1993). Some of those are: AI is (a) "the science and engineering of making intelligent machines, especially intelligent computer programs" (McCarthy, 2007); (b) "the study of how to make computers do things which, at the moment, people do better" (Rich & Knight, 2007); (c) "the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent being"(Copeland, 2023). Artificial Intelligence is inspired by the human brain, using neural networks-interconnected artificial neurons-to replicate biological neural processes. These networks are designed to mimic the structural organization and neural activity of the human brain (Ajakaye, 2021). Artificial Intelligence (AI) is the field of computer science that focuses on developing intelligent computer systems, or systems that display the features we associate with intelligence in human behaviour, such as language comprehension, learning, reasoning, problem solving, etc. (Rancho Labs, 2021).

Artificial Intelligence is a neural network, which is a network of artificial neurons or nodes that mimics the human biological processes of neurons.

Intelligent Systems (IS)

To develop an effective Intelligent System (IS), four key system types are necessary, as highlighted by Koushik (2023):

Some systems are designed to *think like humans*, mimicking human cognitive processes.

Others are built to *act like humans*, simulating human behavior.

Certain systems are focused on *thinking rationally*, following logical principles.

Lastly, some systems are designed to *act rationally*, ensuring optimal decision-making.

Goal of AI

Artificial Intelligence (AI) is the study of developing computers capable of performing tasks intelligently, drawing from human cognitive behavior. AI aims to replicate (i) the functions of the human brain (*what it does*-Cognitive Science) and (ii) its ideal logical and rational processes (*what it should do*) (Koushik, 2023). According to Winston (1992), AI can be viewed from two key perspectives: (i) *Technological view*-emphasizing AI's practical implementation and advancements; (ii) *Scientific view*-focusing on understanding and modeling intelligence.

Foundations of AI

Artificial Intelligence is inherently interdisciplinary, drawing upon various fields such as Mathematics, Neuroscience, Engineering, and Linguistics (Koushik, 2023). It integrates concepts from: *Engineering* (Computer Science, Electrical Engineering, and Control Theory); Mathematics (Statistics, Logic, and Algorithms); Neuroscience and *Medicine* (Brain function and cognitive modeling); Linguistics (Natural language processing and human communication); *Psychology and Cognitive Science* (Human cognition and learning models); *Philosophy* (Ethics and the nature of intelligence) (Patterson, 2005; Koushik, 2023).

Sub-fields of AI

The major subfields of AI, as discussed by Rancho Labs (2021), Burke and Akhta (2023), and Ajakaye (2021), include: Machine Learning-Enabling systems to improve through experience; Deep Learning-A subset of Machine Learning focused on multi-layer neural networks; Neural Networks-Algorithms inspired by the brain's structure and functions; Natural Language Processing-Facilitating interaction between computers and human language; Pattern Recognition-Identifying patterns in data; Cognitive Computing-Simulating human thought processes; Computer Vision-Allowing machines to interpret and make decisions from visual data; Robotics-Designing and building robots to perform tasks autonomously; Chatbots & Expert Systems-Automating conversations and decision-making; Data Mining & Data Science-Extracting meaningful insights

from large datasets; AI Tools & Web Agents-Providing resources for building and utilizing AI systems.

Practical Fields of AI

Artificial Intelligence has widespread applications across diverse fields, with transformative potential in (Koushik, 2023; Nextech3D.ai, 2023; Javatpoint.com, 2011-2021); Robotics and Engineering-Automating processes and enhancing machine capabilities; Business and Manufacturing-Optimizing operations and improving productivity; Medicine and Healthcare-Revolutionizing diagnostics, treatment plans, and patient care; Education including Library Science and services-Enhancing learning methods and information organization; Natural and Social Sciences-Facilitating complex data analysis and pattern recognition; Automotive and Transportation-Innovating autonomous vehicles and traffic management; Finance, Marketing, and E-marketing-Automating financial processes and improving customer outreach; Entertainment, Gaming, and Social Media-Enriching user experience and engagement; Data Security-Safeguarding data against cyber threats, etc. AI also enhances services like fraud detection, object identification, information retrieval, and multilingual translation.

Importance of AI

AI is crucial in today's world, offering a range of benefits such as (Fernandes, 2023; Nextech3D.ai, 2023 Rancho Labs, 2021):

Equipping individuals with *in-demand technical skills* and insights into emerging technologies.

Promoting awareness of *ethical challenges* associated with AI development.

Enhancing *problem-solving capabilities and decision-making abilities* through advanced data analysis.

Improving *safety and security* measures (e.g., facial recognition and AI-powered drones).

Enabling *personalized experiences* for users (e.g., product recommendations on platforms like Amazon and Flipkart).

Optimizing efficiency and productivity across complex tasks and industries

As AI continues to evolve, understanding its core principles will be crucial for staying competitive in the job market and succeeding in industries such as healthcare, education, marketing, and entertainment (Nextech3D.ai, 2023).

Future of AI

The importance of Artificial Intelligence (AI) continues to grow in today's world, with its profound impact on various industries and societal aspects (Fernandes, 2023). As AI evolves, its potential applications will be vast and transformative in the

digital age. According to the International Data Corporation (IDC) report, global spending on AI is projected to reach \$154 billion in 2023, reflecting a 26.9% increase over 2022. This is expected to rise further, surpassing \$300 billion by 2026 (Shirer, 2023). Some of the most significant areas for AI advancements in the future include: Significant progress in Machine Learning; Expanded AI applications in healthcare, particularly for cancer diagnosis and mental health detection; Creation of cutting-edge 3D Visualization; Growth of AI in Education; Developments in Natural Language Processing; Automation of Manufacturing processes; Introduction of Autonomous Vehicles; Improvements in Event Management. AI will also help increase operational efficiency in both public and private sectors. Governments are planning to utilize AI to improve public services and address climate change challenges. In addition, AI's integration into industries such as transportation and hazardous work environments (e.g., mining and firefighting) will enhance safety and reduce accidents. AI is here to work in tandem with us, enhancing human capability and efficiency (Formica.ai blog, 2023).

Historical Events of AI

AI might seem a modern innovation in technology, but its roots can be traced back to ancient times. Greek mythology, for instance, contains early concepts resembling "artificial intelligence" (Vedantu.com, 2023).

The concept of Artificial Intelligence dates back thousands of years, originating from the philosophical debates on life and death. In ancient times, inventors created "automatons" (i.e. ideas of today's robot)-mechanical devices that mimicked human or animal actions. The term *automaton* comes from ancient Greek, meaning "acting of one's own will." One of the earliest references to an automaton dates back to 400 BCE, describing a *mechanical pigeon* built by a friend of the philosopher Plato. Centuries later, Leonardo da Vinci designed one of the most famous automatons around 1495. However, the groundwork for modern AI truly began in the early 1900s. During this period, the idea of artificial humans gained popularity, and scientists started conceptualizing an artificial brain. Some inventors even created early robot-like machines. These early robots, often steam-powered, could perform basic movements, make facial expressions, and even walk (Formica.ai blog, 2023; Tableau.com, 2024).

Basic Works of AI

Basic fundamental works for AI were found during following period (Formica.ai blog, 2023; Tableau.com, 2024), such as 1921: Czech playwright Karel Čapek released a science fiction play "*Rossum's Universal Robots*." It introduced the idea of "artificial people". He named such people "robots", first coined by him.; 1929: Japanese professor Makoto Nishimura made the first Japanese robot, named '*Gakutensoku*'; 1943: It was the time of *evolution of artificial neurons*; 1949: Computer scientist Edmund

Table 1:Year, age-wise distribution of papers of Alan Turing.

Year	SAP	MAP	Position in byline of authors		Publications		TAP	CAP	AA (1912)	PPA (FPY-1935)	CoA	DC
			1 st	2 nd	MA	CA						
			Auth.	Auth.								
Active (A)												
1935	2				2		2	2	24	1		0.00
1936	2				2		2	4	25	2		0.00
1937	3				3		3	7	26	3		0.00
1938	3				3		3	10	27	4		0.00
1939	1				1		1	11	28	5		0.00
1940	1				1		1	12	29	6		0.00
1941	2	1	1		2	1	3	15	30	7	3	0.33
1942	2	1		1	2	1	3	18	31	8	1	0.33
1943	1				1		1	19	32	9		0.00
1944									33	10		0.00
1945	1				1		1	20	34	11		0.00
1946	1				1		1	21	35	12		0.00
1947	2				2		2	23	36	13		0.00
1948	3				3		3	26	37	14		0.00
1949	1				1		1	27	38	15		0.00
1950	4				4		4	31	39	16		0.00
1951	5				5		5	36	40	17		0.00
1952	1	2	1	1	2	1	3	39	41	18	6	0.67
1953	2				2		2	41	42	19		0.00
1954	2				2		2	43	43	20		0.00
Total (A)	39	4	2	2	40	3	43					0.09
Posthumous (P)												
1956	1				1		1	44	45	22		0.00
1957									46	23		0.00
1958	1				1		1	45	47	24		0.00
1959	1				1		1	46	48	25		0.00
1960									49	26		0.00
1961									50	27		0.00
1962									51	28		0.00
1963									52	29		0.00
1964									53	30		0.00
1965									54	31		0.00
1966									55	32		0.00
1967									56	33		0.00
1968									57	34		0.00
1969									58	35		0.00
1970									59	36		0.00

1971									60	37		0.00
1972	1				1		1	47	61	38		0.00
1973									62	39		0.00
1974									63	40		0.00
1975									64	41		0.00
1976									65	42		0.00
1977									66	43		0.00
1978									67	44		0.00
1979									68	45		0.00
1980									69	46		0.00
1981									70	47		0.00
1982									71	48		0.00
1983									72	49		0.00
1984	1				1		1	48	73	50		0.00
1985									74	51		0.00
1986		2	2		2		2	49	75	52	4	1.00
1987									76	53		0.00
1988	1				1		1	50	77	54		0.00
1989									78	55		0.00
1990									79	56		0.00
1991	1				1		1	51	80	57		0.00
1992									81	58		0.00
1993									82	59		0.00
1994									83	60		0.00
1995		1	1		1		1	52	84	61	1	1.00
1996	1				1		1	53	85	62		0.00
1997									86	63		0.00
1998									87	64		0.00
1999	1				1		1	54	88	65		0.00
2000									89	66		0.00
2001	1				1		1	55	90	67		0.00
2002									91	68		0.00
2003	1				1		1	56	92	69		0.00
2004	2	2	2		4		4	60	93	70	5	0.50
2005	1	1	1		2		2	62	94	71	UK	0.50
2006	1	1	1		2		2	64	95	72	1	0.50
2007									96	73		0.00
2008									97	74		0.00
2009									98	75		0.00
2010									99	76		0.00
2011									100	77		0.00
2012		1	1		1		1	66	101	78	1	1.00
2013	2	1		1	2	1	3	69	102	79	1	0.33
2014	1				1		1	70	103	80		0.00

2015									104	81		0.00
2016	2				2		2	72	105	82		0.00
2017									106	83		0.00
2018									107	84		0.00
2019									108	85		0.00
2020	2				2		2	74	109	86		0.00
Total (P)	22	9		1	30	1	31					0.26
Grand Total (A+P)	61	13	10	3	70	4	74				23	0.16

UK=unknown.

Callis Berkley published the book “*Giant Brains, or Machines that Think*” like human brains.

Birth of AI: 1950-1956

Interest in AI really came during 1950-1956. Basically, AI was born in 1950 to Alan Turing. The term “artificial intelligence” was coined by John McCarthy in 1955 and since then it came into popular use. From laboratory to our society, AI reached during the following years (Tableau.com, 2024; Formica.ai blog, 2023; Javatpoint.com, 2011-2021); 1950: *Alan Turing, computer scientist*, published “*Computer Machinery and Intelligence*” which proposed a test of machine (computer) intelligence. It is popularly known as ‘*The Turning Test*’ or *turning machine*. He proposed a *test for machine intelligent*; 1952: A computer scientist named *Arthur Samuel* developed a program to play checkers, which is the first to ever learn the game independently; 1955: *John McCarthy* held a conference at Dartmouth on “*artificial Intelligence*” (AI). This term was first coined by him in this year. Since then, AI was born. It should be noted that *Alan Turing, and John McCarthy* are to be considered as founding father of “artificial intelligence”.

AI Maturation: 1957-1979

This is the period of rapid growth and time of AI for becoming a mainstream idea. During this time, the first ‘*anthropomorphic robot*’ was made in Japan. It is the first example of an autonomous vehicle. However, it was also a time of struggle for AI research, as the U.S. government showed little interest in continuing to fund for AI research (Formica.ai blog, 2023; Javatpoint.com, 2011-2021; Tableau.com, 2024): 1958: John McCarthy created ‘*List Processing (LISP)*’, the first programming language for AI. It is still in popular use. MIT AI Laboratory was built; 1959: Arthur Samuel coined the term “*machine learning*” when doing a speech about teaching machines to play chess better than the humans who programmed them; 1961: The first industrial robot ‘*Unimate*’ in AI history started working at General Motors in New Jersey; 1961: James L. Adams built *The Standford Cart* in 1961, the first examples of an autonomous vehicle; 1965: Edward Feigenbaum and Joshua Lederberg created the first “expert system” which was a form of AI programmed to replicate the thinking and decision-making abilities of human experts; 1966: Joseph Weizenbaum created

the first “chatbot”, the first Natural Language Processing (NLP) computer programme to converse with humans; 1966: The Robot ‘*Shakey*’ was accepted as world’s first electronic person; 1968: Soviet mathematician Alexey Ivakhnenko published “*Group Method of Data Handling*” in the journal “*Avtomatika*,” which proposed a new approach to AI that is now, “*Deep Learning*”; 1972: First Intelligence Robot “*WABOT-1*” was introduced; 1979: *The Standford Cart* created by James L. Adams in 1961 successfully navigated a room full of chairs without human interference; 1979: *The American Association of Artificial Intelligence* which is now known as the *Association for the Advancement of Artificial Intelligence (AAAI)* was founded.

AI Spring: 1980-1987

The field of Artificial Intelligence (AI) is currently experiencing an era of rapid advancement and growing interest. This momentum has been fueled by both groundbreaking research breakthroughs and increased government funding aimed at supporting researchers. One of the key areas of progress has been in *Deep Learning* techniques, which have enabled machines to recognize patterns and make predictions with incredible accuracy. Additionally, the rise of *Expert Systems* has allowed computers to learn from their experiences, adapt to new information, and make independent decisions-marking a significant leap in AI’s capabilities. This ongoing evolution of AI promises to transform industries and societies in ways we are only beginning to fully understand (Formica.ai blog, 2023; Javatpoint.com, 2011-2021; Tableau.com, 2024). 1980: First conference of the AAAI was held at Stanford; 1980: The first commercial expert system XCON (expert configurer) came into market; 1981: The Japanese government allocated \$850 million money to the Fifth Generation Computer project for AI research; 1984: The AAAI warns of an incoming “AI Winter” where funding and interest were less and so research significantly was more difficult; 1985: An autonomous drawing program “AARON” is demonstrated at the AAAI conference; 1986: Ernst Dickmann and his team at Bundeswehr University of Munich built and demonstrated first driverless “robot car”. It could drive up to 55 mph on roads without any obstacles or human drivers.

AI Winter: 1987-1993

AI Winter refers to a quiet period for AI research and development. The term winter is used to describe doormat periods when customer, public, and private interest in AI decline. In other words, there was no more interest for research funding by the private investors and the government. Both halted their funding due to high cost and apparently low return. There were some other problems warned in the machine market and expert systems, and a slowdown in the deployment of expert

systems and hence AI Winter came (Tableau.com, 2024) : 1987: The market for LISP-based hardware collapsed due to cheaper and more accessible competitors like IBM and Apple; 1988: A computer programmer, Rollo Carpenter introduced the Chabot “Jabberwacky”, which was suitable for conversation to humans.

AI Agents: 1993-2011

Despite the lack of funding during the AI Winter, the early 90s showed some significant progresses in AI research. This era also

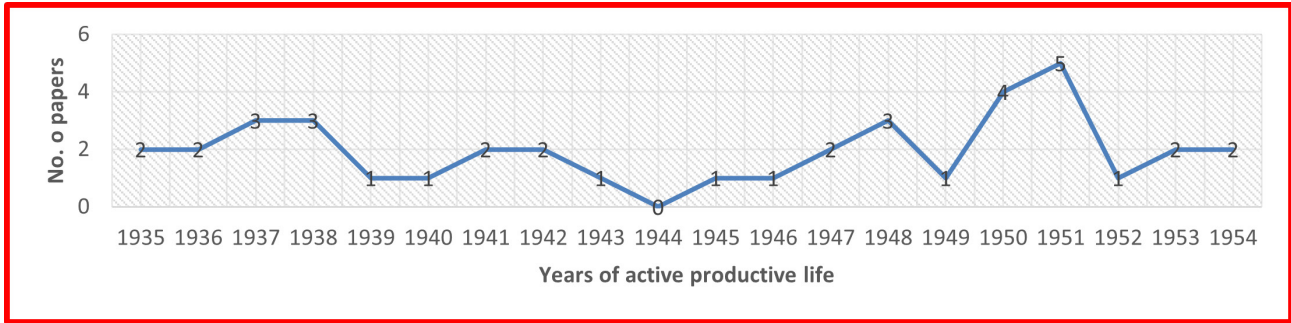


Figure 1: Paper production during productive active life.

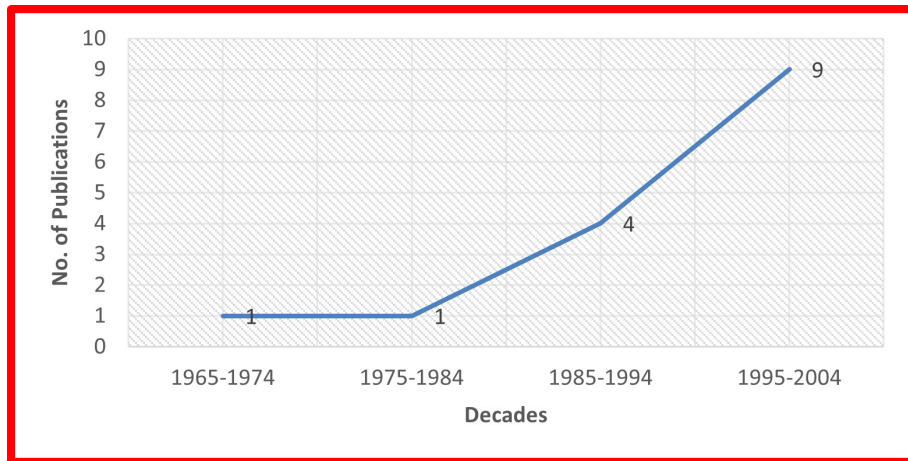


Figure 2: Paper publications after death.

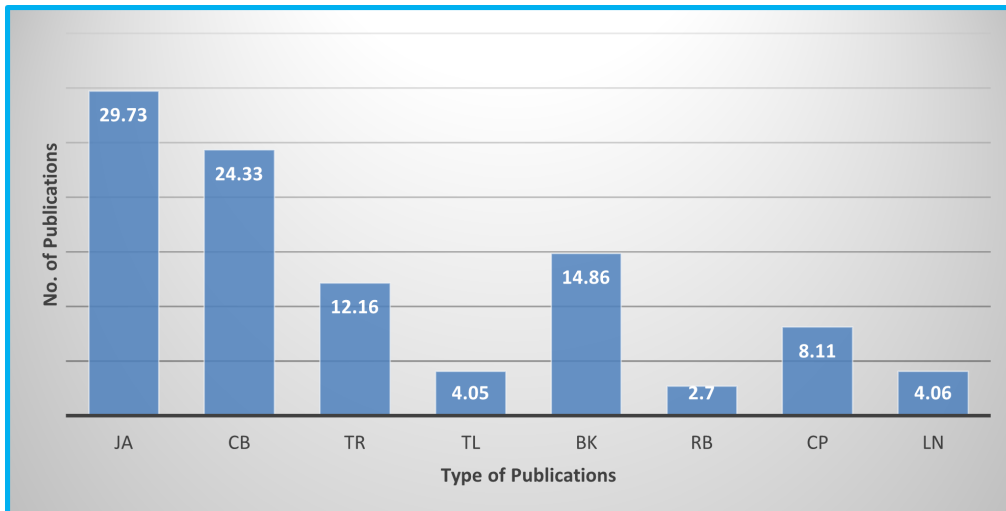


Figure 3: Forms of document wise publications.

Table 2: Authorship Pattern.

Authorship	Single	Two	Three	Four	<i>et al</i>	Total
Non-Collaborative	61					61
Collaborative		6	1	5	1	13
Total	61	6	1	5	1	74

Table 3: Decade wise productivity of Alan Turing.

Decades	Age (Years)	No. of Publications	Paper per year	%-age
Active life				
1935-1944	24-33	19	1.9	25.68
1945-1954	34-43	24	2.4	32.43
Posthumous				
1955-1964	***	3	0.3	4.05
1965-1974	***	1	0.1	1.35
1975-1984	***	1	0.1	1.35
1985-1994	***	4	0.4	5.41
1995-2004	***	9	0.9	12.16
2005-2014	***	9	0.9	12.16
2015-2024	***	4	0.4	5.41
Total		74		100

introduced AI into everyday life through innovations such as the first Roomba and the first speech recognition software on Windows computers. An upward movement in interest of AI was followed by a surge in funding for research for making more progress (Formica.ai blog, 2023; Javatpoint.com, 2011-2021; Tableau.com, 2024). 1997: Deep Blue chess computer developed by IBM. It was the first chess computer program to beat a world chess champion “Gary Kasparov”; 1997: Windows released a speech recognition software developed by Dragon Systems; 2000: Professor Cynthia Breazeal developed the first robot “Kismet” that could simulate human emotions with its face including eyes, eyebrows, ears, and a mouth; 2002: The first “AI in Home: Roomba” was released; 2003: NASA landed two rovers onto Mars (Spirit and Opportunity). Without human intervention they navigated the surface of the planet; 2006: Twitter, Facebook, and Netflix started utilizing AI as a part of their advertising and user experience (UX) algorithms; 2010: Microsoft launched the Xbox 360 Kinect, the first gaming hardware; 2011: IBM’s “Watson”, the robot could speak in natural spoken language; 2011: Apple released “Siri”, the first popular language-based assistant.

Artificial General Intelligence: 2012-present

The most recent developments in AI, was came during this period, and it is going on up to the present day. This time period also popularized Deep Learning and Big Data (Formica.ai blog, 2023; Javatpoint.com, 2011-2021; Sharma, 2024; Bergmann, 2024; Wikipedia, 2024); 2012: Two researchers from Google, Jeff Dean and Andrew Ng took training on a neural network; 2014:

Table 4: Rank of Alan Turing in the by line of authors.

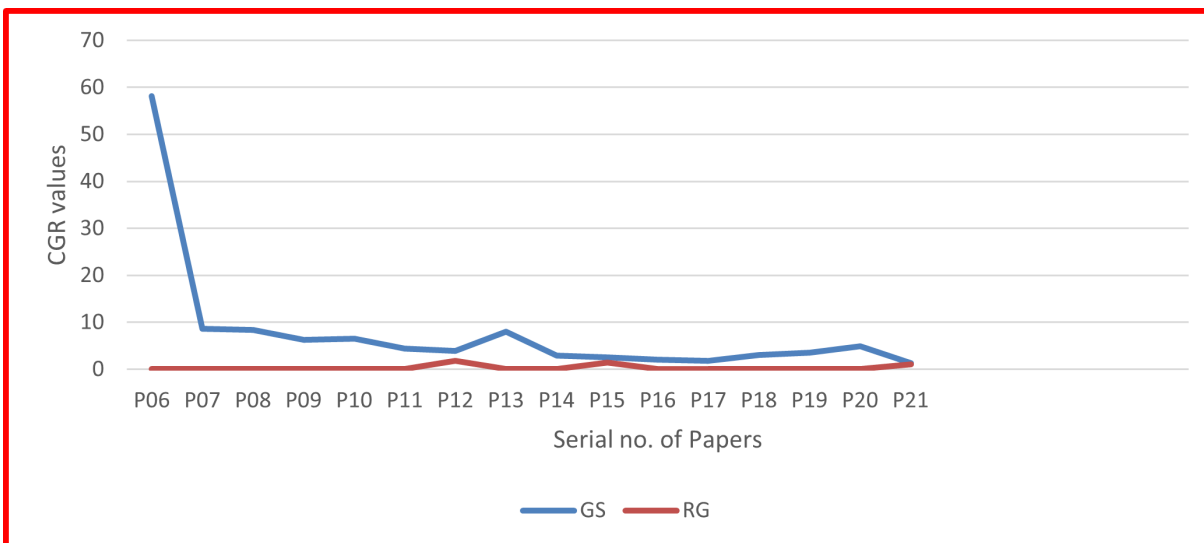
Publications	Status or position in the byline			
	1 st	2 nd	<i>et al</i>	Total
Two-authored	4	2		6
Three-authored	1			1
Four-authored	4	1		4
<i>et al</i>			1	1
Total	9	3	1	13

Note: Number of authors of one multi-authored (*et al*) could not be not ascertained.

Chatbot “Eugene Goostman” that won a Turing test; 2015: Elon Musk, Stephen Hawking, and Steve Wozniak and others protested with an open letter to the worlds’ government systems to ban the development of autonomous (Robot) weapons and use of it; 2015: Amazon Echo; 2016: Hanson Robotics created a humanoid robot “Sophia”, the first “robot citizen”. It was able to see and replicate emotions, as well as to communicate; 2016: Microsoft started Chatbot “Tay” on Twitter; 2017: Facebook programmed two AI chatbots to converse and learn how to negotiate; 2017: AlphaGo, a computer program developed by Google DeepMind; 2018: A Chinese tech group developed Alibaba’s language-processing AI; 2019: Google’s AlphaStar reached Grandmaster on the video game StarCraft 2; 2020: OpenAI started beta testing GPT-3, a model that uses Deep Learning to create code, poetry, and other such language and writing tasks; 2021: OpenAI developed DALL-E; 2022: Generative artificial intelligence (AI) exploded into the public consciousness (Bergmann, 2024); 2022: “ChatGPT”, based on a large language model (i.e. DALL. E 2) was developed by San Francisco-based OpenAI and launched (Wikipedia, 2024); 2023: Being able to chat with an AI. Apart, it began to take root in the Business world (Bergmann, 2024); 2024: Researchers and enterprises seek to establish how the evolutionary leap in technology can be most practically integrated into our everyday lives. In a world, year for services with ‘Big AI’ (Bergmann, 2024); 2024: Recently, India’s first AI teacher robot, “Iris”, based on generative AI, Created by Maker Labs was launched by Kerala’s KTCT Higher Secondary School, Thiruvananthapuram (Sharma, 2024); 2024: India’s first Helicopter Taxi (electric flying taxi) named “e 200” (eplane ai based) designed by a Bengalee Prof. Satya Chokraborty, the founder of ePlane Company, and Professor of Aerospace Engineering at the Indian Institute of Technology Madras (IIT Madras), India (Majumder, 2024).

Table 5: Time span of authorship pattern.

No. of authors	One	Two	Three	Four	<i>et al</i>
No. of papers	61	6	1	5	1
Time span	1935-2020	1942-2013	2004-2004	1941-2004	2005-2005
Time span in Year	86	72	1	64	1

**Figure 4:** CGR of Alan Turing's publications.

The Role of Artificial Intelligence in Libraries

Artificial Intelligence (AI) is becoming an essential technology in modern libraries and information service centers. AI's applications in libraries encompass various innovative solutions, including expert systems for reference services, robotic book readers and shelf-reading systems, and immersive learning technologies like virtual reality. While some may fear that AI could replace librarians, it is more likely to enhance their work and improve service delivery rather than eliminate jobs. AI technologies in libraries include speech recognition, natural language processing, self-driving systems, machine learning, deep learning, and robotics (Omame and Alex-Nmecha, 2020). AI in libraries offers numerous benefits for both library staff and patrons, enhancing knowledge delivery and access to services. The integration of AI in library systems impacts cataloging, indexing, reference services, technical services, shelf reading, and collection development, among others (Asemi and Asemi, 2018). Since its formal establishment as a field in the 1950s, AI's use in libraries began in the 1990s (Ajakaye, 2021). Examples of use of AI in library operations (Ajakaye, 2021; Al-Aamri and Osman, 2022; Subaveerapandiyana and Gozali, 2024; Kumar and Yadav, 2023) are: (i) RFID for Library Resource Management (ii) Robot-based Teaching; (iii) AI-powered Automated Shelving Systems; (iv) Improvement of Search Capabilities and User Experience; (v) Cataloging, Indexing, and Classification; (vi) AI in Circulation and OPAC Systems; (vii) AI Tools for Reference Services; (viii) AI in Collection Development; (ix) Pattern Recognition for User

Identification; (x) Boosting Library Organizational Efficiency, etc. AI is not just a tool for automating library functions; it serves as an enhancement for library professionals, enabling them to deliver better, more efficient services. By integrating AI, libraries can improve their operational efficiency, resource management, and user experience, ensuring their services remain relevant and accessible in the digital age.

Artificial intelligence can help with easy retrieval of library materials in the OPAC at the circulation area. NLP can assist in retrieving relevant information from catalogues, databases, indexes and help to reduce language barriers. Users can state their information requirements during the information retrieval process in their natural language, making the search and retrieval process easier and more fruitful. This enables users to state complex retrieval language

SHORT BIOGRAPHY

Early Life of Alan Turing

Alan Mathison Turing, widely known as Alan Turing, was born on June 23, 1912, in Paddington, Maida Vale, London, to Julius Mathison Turing and Ethel Sara Turing (née Stoney). His father, a British civil servant in the Indian Civil Service (ICS) under the British Raj, was stationed in Chatrapur, located in what was then the Madras Presidency, now part of Odisha, India (Copeland, 2024; Wikipedia, 2024). Turing's father hailed from a Scottish family of merchants and had an impressive lineage-his paternal grandfather was a general in the Bengal Army. His mother, Ethel

Sara Turing, was the daughter of Edward Waller Stoney, the chief engineer of the Madras Railways. Alan's parents married on October 1, 1907, at Bartholomew's Church in Dublin, Ireland. Before Alan's birth, his parents lived in India, but they later moved back to London, where Alan was born. The family initially lived at Boston Lodge in Maida Vale, which is now marked with a blue plaque as a point of historical interest. They later resided at the Colonnade Hotel in London. Alan had an elder brother, John Ferrier Turing. The family's move to London was primarily motivated by their desire to raise their children in England. While Turing's parents eventually purchased a house in Guildford in 1927, where Alan would spend his school holidays, the location is also noted with a blue plaque (Wikipedia, 2024; Hodges, 1995).

A Childhood Shaped by Distance and Loss

During Turing's early childhood, his father frequently traveled between the United Kingdom and India due to his work. When Alan was about one year old, his mother rejoined her husband in India, leaving her two sons with family friends-an elderly retired Army couple-in England (O'Connor & Robertson, 2023; Wikipedia, 2024). A significant and peculiar incident occurred in the 1940s during World War II. In an effort to safeguard his savings from the German raids, Turing purchased two silver bars, each weighing 90 kg and valued at £250. He concealed the bars in a wooded area near Bletchley Park, but tragically, he later forgot the exact location of their hiding place, resulting in a notable personal loss (Wikipedia, 2024a).

Table 6: Research team of Alan Turing

Rank	PAT	Collaborators	FPY	LPY	YT	Paper/Year	Rank
1	3	M. H. A Newman	1942	1952	11	0.27	I
2	2	Hugh Alexander	1941	2004	64	0.03	II
3	2	Stuart Milner-Barry	1941	2004	64	0.03	II
4	2	Gordon Welchman	1941	2004	64	0.03	II
5	2	Michael Woodger	1986	1986	1	2.00	II
6	1	Richard Braithwaile	1952	1952	1	1.00	III
7	1	Geoffrey Jefferson	1952	1952	1	1.00	III
8	1	B E Carpenter	1986	1986	1	1.00	III
9	1	R W Doran	1986	1986	1	1.00	III
10	1	Jean-Yves Girard	1995	1995	1	1.00	III
11	1	Emil Post	2004	2004	1	1.00	III
12	1	Donald W Davis	2004	2004	1	1.00	III
13	1	Parabola	2006	2006	1	1.00	III
14	1	D. Bayley	2012	2012	1	1.00	III
15	1	S Skewes	2013	2013	1	1.00	III

PAT=Paper with Turing, FPY=First publication Year, LPY=Last publication year, YT=Year Taken.

Table 7: Percentage of type publications between Active life and Posthumous.

Types of Publications	Active Life (A)	%-age	Posthumous(P)	%-age	Total (A+P)	%-age
Journal Article (JA)	14	32.56	8	25.81	22	29.73
Composite Book (CB)	6	13.95	12	38.71	18	24.33
Technical Report (TR)	7	16.28	2	6.45	9	12.16
Technical Letter (TL)	1	2.33	2	6.45	3	4.05
Books (BK)	4	9.3	7	22.58	11	14.86
Radio Broadcasting (RB)	2	4.65			2	2.7
Conference Proceedings (CP)	6	13.95			6	8.11
Lecture Notes (LN)	3	6.98			3	4.06
Total	43	100	31	100	74	100
%-age	58.11		41.89		100	

A Complex Personal Life

In 1941, Turing became engaged to Joan Clarke, a fellow mathematician and cryptanalyst. However, their engagement ended when Turing confessed to her that he was homosexual, a revelation that Joan did not accept, which ultimately led to the dissolution of their relationship (Wikipedia, 2024a).

Certification and Education

School Life of Alan Turing

Alan Turing's early education was marked by a mixture of brilliance and challenges. He first attended a private school but was removed after a few months due to inadequate facilities (O'Connor & Robertson, 2023). He was then enrolled at St Michael's, a primary school located at 20 Charles Road, St Leonards-on-Sea, where he spent his childhood years from the age of six to nine. The headmistress of the school quickly recognized his exceptional abilities. On one hand, Turing was clever and hardworking; on the other, he was a naturally gifted child with a deep intellectual curiosity. Between 1922 and 1926, Turing attended Hazelhurst Preparatory School, an independent school in Frant, Sussex (now East Sussex). At Hazelhurst, Turing performed at a high standard, achieving a mix of average to good marks. Despite this, he was often more focused on pursuing his own ideas. His interest in chess began here, and he joined the debating society. Turing also sat for his Common Entrance Examination in 1926, which marked the end of his preparatory school education (O'Connor and Robertson, 2023). At the age of 13, Turing moved on to Sherborne School, an independent boarding school in Sherborne, Dorset. During this time, Britain was facing the General Strike, but Turing remained undeterred. He would cycle 60 miles (97 km) from his home to school, a testament to his determination. Turing was also an accomplished athlete, with abilities approaching Olympic standards. Turing excelled in mathematics and science at Sherborne. However, he struggled with English and was often criticized for his handwriting. Despite these challenges, his talent for mathematics stood out. Turing often came up with his own methods for solving problems, which sometimes conflicted with conventional teaching. Some teachers were not impressed with his unorthodox answers, but Turing's talent could not be ignored. He won almost every mathematics prize available at Sherborne. In 1927, Turing demonstrated remarkable ability by solving advanced problems without having formally studied elementary calculus. By 1928, at the age of 16, he managed to deduce Albert Einstein's critique of Newton's laws of motion from a text that didn't explicitly mention it (Wikipedia, 2024a). Turing's love for chemistry also began during his school years. He carried out experiments based on his own ideas, which sometimes did not align with the curriculum, much to the displeasure of his teachers. Despite the challenges he faced, Turing's headmaster once remarked, "If he is to stay at Public School, he must aim at becoming educated. If he is to

be solely a Scientific Specialist, he is wasting his time at a Public School." It was clear that Turing did not fit the conventional mold of a public-school student, yet his mother ensured that he received a public-school education (Wikipedia, 2024; O'Connor and Robertson, 2023). At Sherborne, Turing dove deep into mathematics and advanced scientific theories. Unbeknownst to many of his teachers, he was teaching himself Einstein's papers on relativity and reading about quantum mechanics through Eddington's *The Nature of the Physical World* (O'Connor and Robertson, 2023). One of the most significant relationships in Turing's early years was his friendship with Christopher Morcom, a fellow student at Sherborne. The two shared a passion for scientific discovery and worked together on various ideas. Morcom was someone Turing could confide in, and their friendship served as a source of inspiration for Turing's future work. However, Turing was deeply affected by Morcom's death in February 1930, caused by complications from tuberculosis. The loss of his close friend left Turing heartbroken and profoundly impacted his emotional and intellectual journey (Wikipedia, 2024a; O'Connor and Robertson, 2023).

College Life of Alan Turing

Despite the challenges Turing faced during his school years, he successfully entered *King's College*, University of Cambridge, in 1931 to study mathematics. He began his undergraduate studies in the prestigious Mathematical Tripos course, which he completed between February 1931 and November 1934. Turing's exceptional abilities were recognized when he was awarded first-class honours in mathematics upon graduation, although this achievement did not come without difficulty. Turing's academic journey at Cambridge started with some setbacks. In 1929, he sat for the scholarship examinations but was not awarded a scholarship. Dissatisfied with his performance, he retook the exams the following year and this time was successful in securing a scholarship. This determination to improve is a key aspect of Turing's character. In 1933, Turing read *Russell's Introduction to Mathematical Philosophy* and, at around the same time, began studying von Neumann's 1932 text on quantum mechanics. His interest in quantum mechanics and mathematical logic would continue throughout his career. The following year, in December 1933, Turing presented a paper on "Mathematics and Logic" to the *Moral Science Club* at Cambridge, marking the beginning of his deep engagement with mathematical logic. Turing graduated with a *B.A.* in 1934, having achieved first-class honours in mathematics. His time at Cambridge laid the foundation for his later groundbreaking work. In the spring of 1935, Turing attended an advanced course on the foundations of mathematics, focusing particularly on the concept of algorithms, taught by Max Newman. It was here that Turing's interest in algorithms and computation began to take shape, leading him to further explore these ideas in his later work (O'Connor and Robertson, 2023; Hodges, 1995).

Table 8: Communication channels and their forms.

Rank	Communication Channels	TP	%-age	Cumulative-%	YFP	YLP	Country
First Zone (34.01%)							
Group A	Journal Articles						
01	Journal of Symbolic Logic	5	6.78	6.78	1937	1948	USA
02	Cryptologia	3	4.08	10.86	2001	2012	UK
03	Annals of Mathematics	2	2.90	13.79	1938	1950	USA
04	Science News (Penguin Books)	1	1.35	15.11	1954	1954	UK
05	Rutherford Journal	1	1.35		2005	2005	New Zealand
06	Quarterly Journal of Mechanics and Applied Mathematics	1	1.35		1948	1948	UK
07	Philosophical transactions of the Royal Society of London Series B, Biological sciences, B	1	1.35		1952	1952	UK
08	Parabola	1	1.35		2006	2006	USA
09	Minds and Machines: Journal for Artificial Intelligence, Philosophy, and Cognitive science.	1	1.35		1958	1958	Switzerland
10	MIND: A Quarterly Review of Psychology and Philosophy	1	1.35		1950	1950	UK
11	Journal of the London Mathematical Society	1	1.35		1935	1935	UK
12	Composition Mathematica	1	1.35		1938	1938	UK
13	American J. of Math	1	1.35	27.26	1936	1936	USA
Group B	Books						
14	Alan Turing's Manual for the Ferranti Mk. I. University_of_Manchester	1	1.35	28.61	1951	1951	UK
15	Alan Turing's Systems of Logic: The Princeton Thesis. Princeton University	1	1.35		2014	2014	USA
16	Alphabet handwriting practice workbook for kids: Workbook for kids and teenagers kinder garden and primary school Activity: trace letters and numbers	1	1.35		2020	2020	USA
17	Connectionism, Concepts, and Folk Psychology: The Legacy of Alan Turing, Volume 2, Oxford University Press.	1	1.35		1996	1996	UK
18	How computer databases work: Overcoming the Black Box mentality. 156 pages.	1	1.35	34.01	2020	2020	***
Second Zone (32.87%)							
19	La machine de Turing. French ed. Published by SEUIL (10 May 1995) (translated book)	1	1.35		1995	1995	Paris
20	Logbuch (Internet Organizer und Passwortbuch (Red Hot Data)): Red Hot Data Passwortbuch - Das Buch zur Verwaltung von Zugangsdaten und Passworten [German]	1	1.35		2016	2016	Germany

21	Machines and Thought: The Legacy of Alan Turing, Volume I, Oxford University Press.	1	1.35		1999	1999	UK
22	On the Gaussian error function: fellowship dissertation	1	1.35		1935	1935	UK
23	Programmers' handbook for Manchester electronic computer. Mark I. University of Manchester	1	1.35		1950	1950	UK
24	Programmers' handbook for Manchester electronic computer. Mark II. University of Manchester	1	1.35		1951	1951	UK
25	Puede pensar una maquina? [Spanish],Createspace	1	1.35		2016	2016	***
26	Systems of logic based on ordinals: a dissertation.	1	1.35		1938	1938	UK
27	The Automatic Computing Engine: Papers, MIT Press (MA)	1	1.35	46.06	1986	1986	UK
Group C	Composite Books						
28	The Essential Turing: Seminal Writings in Computing, Logic, Philosophy, Artificial life: Plus, The Secret of Enigma, edited by Copeland, B Jack (ed)	8	10.84	57.00	1941	1986	UK
29	Alun Turing: his Works and Impact/ S Barry Cooper & Jan Van Jeeuwen, Amsterdam: Elsevier.	3	4.08	61.08	2013	2013	Netherland
30	The Turing Test: Verbal Behavior as the Hallmark of Intelligence, Cambridge, MA: The MIT Press.	2	2.90		1950	1952	UK
31	Anonymous	2	2.90	66.88	1951	1984	
Third Zone (33.12%)							
32	The World of Mathematics	1	1.35	68.23	1956	1956	USA
33	Introduction to Computational Biology: An Evolutionary Approach-Springer.	1	1.35		2006	2006	Germany
34	In Ferris and Fadiman (eds), pages 492{??}. Foreword by Clifton Fadiman. (Title of the book not Identified)	1	1.35		1991	1991	***
35	Faster than thought. A symposium on digital computing machines, London: Pitman Publishing	1	1.35		1953	1953	UK
36	Computer Chess Compendium. Springer, New York, NY. ONLINE publications: Levy, D. (eds)	1	1.35		1988	1988	USA
37	Alan M. Turing, Intelligence Service. Schriften hrsg. von, 2. Brinkmann & Bose	1	1.35	74.98	1947	1947	Germany
Group D	Conference Proceedings						
38	Proceedings of the London Mathematical Society.	5	6.79	81.77	1936	1953	UK
39	EDSACI Naugural Conference (In Report of a Conference on High Speed Automatic Calculating Machines)	1	1.35		1949	1949	UK

Group E	Lecture Notes						
40	Compte-rendu de lecture (channel not identified)	1	1.35		1954	154	***
41	<i>Turing Archive at King's College</i>	1	1.35		1951	1951	UK
42	Turing Digital Archives.	1	1.35		1947	1947	UK
Group F	Radio Broadcasting						
43	Radio broadcast, BBC Third Programme	1	1.35		1951	1951	UK
44	Broadcast discussion, BBC Third Programme	1	1.35	89.87	1952	1952	UK
Group G	Technical Report						
45	Report, National Physical Laboratory, Teddington	4	4.53	94.40	1945	1972	UK
46	Report, GCHQ, Cheltenham	2	2.90	97.30	1941	1941	UK
47	Report, The (British) National Archives	1	1.35		1942	1942	UK
48	Report, Turing's treatise on Enigma [the Prof's book]	1	1.35	100.00	1940	1940	UK
Total		74	100.00				

University Life of Alan Turing

Alan Turing entered the University of Cambridge in 1931, where he pursued a degree in mathematics. After graduating from Sherborne in 1934, Turing's academic excellence was further recognized when he was elected a *Fellow of King's College, Cambridge* in the same year. This prestigious honor was granted in recognition of his groundbreaking research in *probability theory*. Turing's dissertation, titled "On the Gaussian Error Function," made fundamental contributions to probability theory, notably establishing results related to the *central limit theorem*. Although the central limit theorem had been recently discovered, Turing independently arrived at the same conclusion, unaware of prior work in this area. In 1936, Turing was awarded the *Smith's Prize*, a notable distinction for his work, and began his master's course at Cambridge, completing his *M.A.* in 1937. That same year, he published his first academic paper, a concise one-page article titled "*Equivalence of Left and Right Almost Periodicity*," which appeared in the *Journal of the London Mathematical Society*. Turing's academic career reached a turning point in 1936 with the publication of his seminal paper "*On Computable Numbers, with an Application to the Entscheidungsproblem*". This paper was crucial in the development of the theory of computation. Alonzo Church, an American mathematical logician, had independently arrived at similar conclusions and recommended Turing's paper for publication. However, Turing's approach to the *Entscheidungsproblem* (the decision problem) was distinctly different from Church's. Turing's work laid the foundation for what would later become the field of computer science, with profound implications for computational theory and the

development of modern computing. Turing's early academic achievements at Cambridge, particularly his work in probability theory and logic, set the stage for his later groundbreaking contributions to mathematics and computer science. His 1936 paper, "*On Computable Numbers*", was published in the *Proceedings of the London Mathematical Society* in two parts, on November 30 and December 23, and was later included in the *Journal of Mathematics* (Wikipedia, 2024a).

Research and Discovery

After his groundbreaking work at Cambridge, Alan Turing moved to *Princeton University*, where he worked under the guidance of Alonzo Church from September 1936 to July 1938. During this time, Turing was elected as a *Jane Eliza Procter Visiting Fellow*. During this period, Turing began working toward a *Ph.D. in Mathematical Logic* under Church's supervision, and in June 1938, he successfully completed his doctorate. His thesis, "*Systems of Logic Based on Ordinals*", delved into ordinal logic and the concept of relative computing, with the final work being published in 1939 (O'Connor & Robertson, 2023; Wikipedia, 2024). Turing's thesis laid the foundation for what would later be referred to as the *Church-Turing Thesis*. This thesis posited that everything computable by humans could also be computed by a universal Turing machine. Turing's pivotal paper "*On Computable Numbers, with an Application to the Entscheidungsproblem*" introduced the concept of the Turing machine, which became central to the theoretical framework of computation (O'Connor & Robertson, 2023). Church later acknowledged the superiority of Turing's formulation, highlighting the clarity with which Turing's concept of computability by machine captured the essence of

what was previously an abstract idea. In recognition of Turing's monumental impact on the field, Wigderson (2019) remarked, "Turing's 1936 paper was most influential. Indeed, it is easily the most influential math paper in history. ... Turing gave birth to the discipline of computer science and ignited the computer revolution, which radically transformed society. Turing's model of computation (quickly named a Turing machine) became one of the greatest intellectual inventions ever" (Wigderson, 2019). In simple terms, it may be said that Turing's model of computation, known as the Turing machine, became one of the greatest intellectual inventions ever, igniting the computer revolution and shaping modern society.

Professional Career

Alan Turing's professional career began in code-breaking. During his time at Princeton, Turing had already explored the idea of constructing a computer. His expertise soon caught the attention of the Government Code and Cypher School, which invited him to join their ranks. In 1938, shortly after returning to the UK from the United States, Turing began working with the organization, focusing on breaking the German Enigma codes. When Britain declared war on Germany in 1939, Turing immediately moved to work full-time at the wartime headquarters at *Bletchley Park*, located in Buckinghamshire. The work at Bletchley Park was classified under the Official Secrets Act and remained largely unknown to the public for many years. Between autumn 1939 and spring 1940, Turing, alongside fellow mathematician W. G. Welchman, designed a pioneering machine known as the *Bombe*, a device specifically created to decipher the German Enigma codes. For the rest of the war, the *Bombes* were crucial in providing the Allies with vast amounts of military intelligence. In 1942, Turing also developed a systematic method for breaking encrypted messages from the German *Tunny* cipher machine, which was more sophisticated than the Enigma. Turing's ingenuity in cracking codes and developing machines to assist in the process is believed to have saved the lives of countless military personnel during the war. In recognition of his extraordinary contributions, Turing was appointed an *Officer of the Most Excellent Order of the British Empire (OBE)* in 1945 for his role in code-breaking (Copeland, 2024; O'Connor and Robertson, 2023). Once the war concluded in 1945, Turing was recruited by the *National Physical Laboratory (NPL)* in London to work on creating an electronic computer. His design for the *Automatic Computing Engine (ACE)* was groundbreaking—it was the first comprehensive blueprint for an electronic, stored-program, all-purpose digital computer. It boasted significantly more memory capacity and speed than other early computers. However, delays at NPL hindered progress on the ACE project (Copeland, 2024). In 1948, Max Newman, a renowned English mathematician, became a professor at the University of Manchester and invited Turing to join the institution. Turing resigned from the NPL and took up a newly created readership in computing theory at Manchester. That same year, he was also appointed deputy director of the

Computing Machine Laboratory at the university. Turing's work at Manchester contributed significantly to the development of computers. He designed a novel input-output system using technology from Bletchley Park and developed a programming system. In addition, he authored the world's first programming manual. His system became integral to the *Ferranti Mark I*, the world's first commercially available electronic digital computer, which went into operation in 1951 (Copeland, 2024; O'Connor and Robertson, 2023). Turing's work in computing solidified his legacy as a pioneering computer designer.

Alan Turing and Artificial Intelligence

Alan Turing is often regarded as one of the founding figures of artificial intelligence (AI) and modern cognitive science. He was a pioneering advocate of the idea that the human brain could, to a significant extent, function as a digital computing machine (Copeland, 2024). In 1950, Turing published his influential paper "*Computing Machinery and Intelligence*" in the journal *Mind*. This work demonstrated his forward-thinking approach and addressed questions that would come to define the field of artificial intelligence. Among his groundbreaking contributions was the introduction of the "Turing Test," which he proposed as a measure for determining whether a machine could exhibit human-like intelligence. The Turing Test remains a key reference point in AI research today. In late 2022, with the rise of AI models like ChatGPT, discussions surrounding the Turing Test were reignited as people began to question whether its criteria had been met (Copeland, 2024; O'Connor and Robertson, 2023). Turing's recognition of the brain as a digital computing machine was just one of his many profound insights. In March 1951, he was elected a fellow of the Royal Society of London, a prestigious honor, largely due to his work on Turing machines in 1936. From that point onward, Turing became deeply involved in research that is now known as artificial life. By 1951, he was exploring how mathematical theory could be applied to biological organisms, particularly in understanding the development of form and pattern in living beings. He published "*The Chemical Basis of Morphogenesis*" in 1952, in which he outlined his groundbreaking ideas on the processes that generate anatomical structure in plants and animals. Turing used Manchester's Ferranti Mark I computer to model the chemical mechanisms that could explain how life forms take shape (Copeland, 2024; O'Connor and Robertson, 2023). Unfortunately, during this period of remarkable intellectual achievement, Turing's personal life took a tragic turn. In 1952, at the age of 39, he was convicted of homosexuality, which was illegal in Britain at the time. As a result, he was subjected to hormone "therapy" (oestrogen injections) as part of his sentence. This criminal conviction permanently barred him from working for Government Communications Headquarters (GCHQ), the British government's postwar code-breaking agency. Despite this setback, Turing continued to engage in a wide range of academic pursuits.

Table 9: Ranking of Publications by Number of citations received.

Rank	Titles of top cited paper	Communication channels (publication Year)	Total Citation (TC) received		Age (A) of papers as on 2024	Citation growth Rate=TC/A	
			GS	RG		GS	RG
01	Computing machinery and intelligence	MIND: A Quarterly Review of Psychology and Philosophy (original 1950)	22858	9916	30	761.93	330.53
02	The chemical basis of morphogenesis	Bulletin of Mathematical Biology (1950)	19659	4148	75	262.12	55.31
03	On computable numbers, with an application to the Entscheidungs problem	Proceedings of the London Mathematical Society (1936)	14346	4790	89	161.19	53.82
04	Systems of logic based on ordinals	Proceedings of the London Mathematical Society, Series 2 (1939)	1269		86	14.76	
05	Intelligent machinery	The Essential Turing (book) (1948), Oxford University Press.	1223		77	15.88	
06	Intelligent machinery, a heretical theory (c. 1951)	The Essential Turing (book) (2004), Oxford University Press.	1220		21	58.10	
07	On computable numbers, with an application to the Entscheidungs problem: A correction	Proceedings of the London Mathematical Society (1937)	761		88	8.65	
08	Rounding-off errors in matrix processes	The Quarterly Journal of Mechanics and Applied Mathematics (1948)	645		77	8.38	
09	Computability and λ -definability	The Journal of Symbolic Logic (1937)	549		88	6.24	
10	Checking a large routine	The early British computer conferences (1948)	502		77	6.52	
11	Can a machine think	The world of mathematics (1956)	306		69	4.43	
12	Digital computers applied to games	Faster than thought (Journal) (1953)	279	125	72	3.88	1.74
13	Lecture to the London Mathematical Society on 20 February 1947	MD Computing (Journal) (1995)	241		30	8.03	
14	Can automatic calculating machines be said to think?	The Essential Turing (Book) (1952)	213		73	2.92	
15	Solvable and unsolvable problems	Penguin Books (1954)	182	99	71	2.56	1.39
16	Can digital computers think	The Turing test: verbal behavior as the hallmark of intelligence (1951)	154		74	2.08	
17	Some calculations of the Riemann zeta-function	Proceedings of the London Mathematical Society (1953)	131		72	1.82	

18	Proposal for development in the mathematics division of an Automatic Computing Engine (ACE)	Carpenter, BE, Doran, RW (eds): Book (1986)	119		39	3.05	
19	La machine de Turing	Editions du seuil (1995)	107		30	3.57	
20	Lecture on the automatic computing engine (1947)	The Essential Turing (2004)	104		21	4.95	
21	The word problem in semi-groups with cancellation	Annals of Mathematics (1950)	101	79	75	1.35	1.05

In June 1954, Turing was found dead in his bed, having been poisoned by cyanide. The official cause of death was ruled as suicide. Turing's tragic end at the age of 42 marked the premature loss of one of the most brilliant minds of his time. As the 21st century unfolded, his unjust prosecution for being gay became infamous. In 2009, British Prime Minister Gordon Brown issued a formal apology on behalf of the government for Turing's "utterly unfair" treatment. Four years later, Queen Elizabeth II granted Turing a posthumous royal pardon (Copeland, 2024). Although Turing's life was cut short, the impact of his work on computer science, artificial intelligence, and the foundations of modern technology is immeasurable. His ideas continue to influence the field today and will undoubtedly shape its future. Had he lived longer, the world would likely have seen even more revolutionary changes in computer science. His untimely death remains a profound loss to the global scientific community.

AWARD AND ACHIEVEMENT

In 1936, Alan Turing was awarded the prestigious Smith's Prize, a recognition of his outstanding contributions to mathematics (Wikipedia, 2024a). Throughout his brief but brilliant career, Turing made groundbreaking discoveries that have had a lasting impact on the field of computing. His work laid the foundation for many of the technologies we use today, particularly in the realm of Artificial Intelligence (AI). The AI that Turing conceptualized decades ago is now deeply integrated into our daily lives, powering everything from virtual assistants to self-driving cars.

While Turing received many accolades during his career, his most significant achievement might be the legacy of his pioneering work in AI. Today, he is often regarded as the "Father of AI"-a title that reflects the immense influence his ideas continue to have on modern technology. This recognition, more than any formal award, underscores the lasting impact of his work on the world.

REVIEW OF LITERATURES

Numerous bibliometric studies have been conducted by librarians and information scientists, often focusing on prominent figures across various domains, including Nobel laureates, Indian Presidents, Reserve Bank of India Governors, environmental scientists, film actors, medical researchers, and authors (Rao,

2013). In India, leading scholars in bio-bibliometric studies are Kademami *et al.* (1994) who explored the works of Nobel laureate and eminent physicist Dr. C. V. Raman. Other significant studies include Koley and Sen (2006) on physiologist Prof. B. N. Koley, Srimurugan and Nattar (2008) on plant biologist Dr. K. Veluthambi, and Sangam and Savanur (2010) on Eugene Garfield, the pioneer of bibliometrics and scientometrics. Further contributions include Mondal *et al.* (2018), who analyzed the work of statistician Prof. P. C. Mahalanobis, and Dutta (2019), who examined the research of librarian and information scientist Prof. B. K. Sen. Bhattacharyya and Sahu (2020) studied Elinor Ostrom, the Nobel laureate in Economic Sciences, while Teli and Maity (2021) focused on physicist Stephen Hawking. More recently, Seidlingappa *et al.* (2023) conducted a bibliometric study on ecologist Prof. Madhav Gadgil, while Koley (2023, 2024) published works on Prof. Subhas Mukherjee, the creator of India's first IVF baby, and Prof. Dilip Mahalanabis, a pioneer of Oral Rehydration Solution (ORS). Behera and Meher (2024) examined the contributions of economist Dr. Raghuram Rajan. Koley and Sen (2024) introduced a novel bibliometric analysis on the filmography of actress Suchitra Sen. Despite this extensive body of research, a bibliometric analysis of Alan Turing, the father of modern artificial intelligence and a pioneering computer scientist, remains absent. This study aims to fill that gap, offering a scientometric assessment of Turing's research contributions and his lasting impact on the field of computing.

OBJECTIVES

The main objectives of the study are:

- To find out the year-wise distribution of research articles of Alan Turing.
- To measure of Collaboration co-efficient.
- To determine the position of Alan Turing.
- To calculate author productivity.
- To observe age wise publication pattern.
- To identify spectrum of his research.
- To find out peak period of productivity.

To observe rank-wise scattering of publications according to communication channels.

To count citation received and Citation Growth Rate.

To test Bradford's law for communication channels.

METHODOLOGY AND SOURCE OF MATERIALS

Alan Turing's publications were collected from Google Scholar (GS), Research Gate (RG), bibliography (Hodges, n.d.), and some classic documents containing publications of Alan Turing compiled and edited by Furbank (1992-2001), Copeland (2004) and Beebe (2023). In addition, other data has been accumulated from different offline and online resources. A compiled list of 74 publications of Alan Turing was prepared published during his active working life (1935-1954) and original writings of the scientist (not published by him during active life) have been published posthumously. Only those papers that have been published during his active life and first published after his death have been considered for this study. There are so many publications indexed in Google Scholar or Google which are either on or about the scientist and related topics written by others or his publications collectively appeared in an editorial document. Many, out of them, main or added access heading or searching approaches has been prepared under Alan Turing or Alan Mathison Turing. In reality, he was or is not original author of such publications. Besides, his many papers still are publishing as reprint. For this study, all these publications have not counted for making list of his publications. The collected data were transferred into MS-excel and Words and tabulated keeping in view the objectives of this study. Finally, entire data was analyzed to generate scientometric indicators.

DATA ANALYSIS AND DISCUSSION

Publications of Alan Turing

Table 1 enumerates year, age production of papers of Alan during into two categories, active life 1935-1954, and posthumous period 1956-2020. He has 61 papers as first author and 13 multi-authored which have published in collaboration with 23 co-authors. His 39 papers were published when he was alive, and remaining 22 papers after deaths during 1956-2020. Out of collaborative papers, he has 10 papers to his credit as first author, and 3 papers as second author according to authorship rank list. Over all he has played vital role as main author in 70 papers and as co-author in 4 papers only. This indicates the trend of sole research. When he was 24 years old, his first paper was seen light of day in the sky of publication world. His actual active life was spanned very short time that is 20 years only. He died at the age of 43 and his untimely demise was a great loss in the field of today's AI research. Figure 1 has graphically represented paper productions during active life (1912-1954).

Authorship Distribution

As per authorship pattern in Table 2, it is observed that Alan produced 13 collaborative papers, out of which, 6 two-authored, 1 three-authored, five four-authored papers in his credit, and one paper under *et al* where number of authors could not be ascertained.

Decade wise Publication Distribution

Alan spent only two decades during his active productive life and produced outstanding 43 papers (more than 58%) which made him staller in the field of computer science, especially which is called "pioneer of today's Artificial Intelligence (AI)". His research discoveries were so importance that still today are getting priority in the field of groundbreaking discoveries in AI, and even after his death his knowledge is strongly linked to the activities of modern study in computer science. Table 3 shows decade wise publications and Figure 2 shows Posthumous-decade wise papers have published.

Status byline of Authors

Table 4 shows Alan's status in the byline of authors in collaborative papers. Out of 13, he occupies first position in nine papers, and second position in three papers. In case of one multi-authored paper (*et al.*), his position could not be ascertained.

Authorship Pattern

Table 5 shows authorship pattern and span of authorship. It appears that Turing has only 13 collaborative papers to his credit. Sixty-one papers were contributed without collaboration. Among collaborative papers, 6 are two-authored, 5 are four-authored. One each is three-authored and in the category "*et al*" for which actual authorship pattern could not be identified. Collaboration has resulted maximum two-authored papers i.e. 6 with the maximum time span of 72 years. Five four-authored papers were published in a time span of 64 years of his active life and beyond it. Besides one three-authored paper was published in a time of one year. Sixty one (61) single authored papers could publish during his active life and after death.

Leading Collaborators

Table 6 depicts research team of Alan. It reveals that the scientist has worked with 15 collaborators in his productive career and generated the highest number of papers i.e. 3 in collaboration with M. H. A Newman, during the period 1942-1952 within 11 years. Other closed collaborators were Hugh Alexander, Stuart Milner-Barry, Gordon Welchman and Michael Woodger who have produced 2 papers each. Second ranked first three collaborators each took time span of 64 year in production of 2 papers. Its reason is that many of Alan's papers have been published after his death. A group of ten collaborators has one publication each.

Forms of Publications

Table 7 represents type of publication during active life and posthumous. Out of 74, his 43 publication (58.11%) saw light of the day in his active career whereas 31 publications (41.86%) published posthumously. Majority of publications i.e. 14 (32.56%) are journal articles in active productive life, and 12 (38.71%) are composite books or chapters. Following these, numerically, his publications in active life belong to technical reports (7, 16.28%), composite books (6, 13.95%), conference proceedings (6, 13.95%), books (4, 9.3%), lecture notes (3, 6.98%), etc. Besides, the writings that are published after death are in order- journal articles (8, 25.81%), books (7, 22.58%), etc. In all, maximum numbers of publications are journal articles (22, 29.73%) followed by chapters in composite books (18, 24.33%), books (11, 14.86%), technical reports (9, 12.16%), conference proceedings (6, 8.11%) and so on. Figure 3 draws a picture showing types of Alan's publications.

Channel-wise Publications

Table 8 reveals a rank list of publication channels wherein Turing publications have been published between 1935 and 2020. He has used 48 types of forms of documents embodying information or knowledges. Out of, 13 are journals and majority of his publications i.e. 5 (6.78%) were published in Journal of Symbolic Logic followed by 3 (4.08%) in Cryptologia, 2 (2.9%) in Annals of Mathematics, etc. A category of 10 journals wherein one paper each has been published. Maximum number of his chapter papers i.e. 8 (10.84%) were found in a famous editorial book "*The Essential Turing: Seminal Writings in Computing, Logic, Philosophy, Artificial life: Plus, The Secret of Enigma, edited by Copeland, B Jack*". Following it, his 5 (6.79%) papers were published in popular composite books "*Alan Turing: his Works and Impact / S Barry Cooper and Jan Van Jeeuwen (Eds.), Amsterdam: Elsevier*" (N3), and "*The Turing Test: Verbal Behavior as the Hallmark of Intelligence, Cambridge, MA: The MIT Press*" (N2) and so on. In addition, his 5 important writings have found in "*Proceedings of the London Mathematical Society, UK*", and 4 (4.53%) technical reports of his research work were appeared as valuable reports in, "*Report, National Physical Laboratory, Teddington, UK*", and like. Most of his publications published from UK. His publications emanated from USA, Germany, New Zealand, Switzerland, Paris, etc.

Validation of Bradford's Law

According to the Bradford Law, three zones, divisions of total communication channels, should have nearly 33% publications in each zone. From Table 8, it is observed that in the first zone, 25 (34.01%) publications have been published in first 18 channels. The second zone contains 13 channels with 32.87 or 33% approximately and the third zone covers 25 (33.12%) publications in 17 channels. Therefore, the data set of communication channels validates Bradford's Law.

Citation Received (cited by) and Citation Growth Rate (CGR)

Table 9 shows citation growth rate according to the use by other scholars around world. A ranking list of Highly cited top 21 Alan's papers have been prepared from Google Scholar (GS) and ResearchGate (RG) including name of publication channels, year of publications, times of citation received, age of the publications and calculated value of CGR. It is observed that the article "Computing machinery and intelligence" topped in the rank with 22858 citations in GS and 9916 in RG. Its CGR accounted for highest values i.e. 761.93 in GS and 330.53 in RG followed by "The chemical basis of morphogenesis" with the CGR values 262.12 in RG and 55.32 in RG, "On computable numbers, with an application to the Entscheidungs problem" with the score of CGR value 161.19 in RG and 53.82 in RG and so on. Alan's publications are highly cited in GS than RG that is clearly visible on the drawing in Figure 4. Google scholar statistics outshines other database statistic.

Bibliometric Indicators

Bibliometric indicators of Alan are harvested on the basis of data available from Google Scholar. The number of citations received by Alan is 65652 in total. The value of h-index, i-10 index, g-index, e-index, a-index, R-index etc. is 45, 96, 256, 252, 1456.2, and 1225.99 respectively. The recency Index is 0.28; nearly 0.3 which means that around 30% of the total number of citations received by Alan was appended during last five year 2019-2023.

CONCLUSION

Alan Turing's contributions to mathematics, logic, and computer science have not only shaped the foundation of modern Artificial Intelligence (AI) but continue to influence contemporary technological advancements. His groundbreaking work on the concept of computation and the creation of the Turing Machine laid the groundwork for the digital age, fundamentally transforming how we understand machines and their capabilities. Despite his relatively short life, Turing's intellectual legacy remains immeasurable, with his work permeating diverse fields from cryptography to machine learning. The analysis of his publications reveals Turing's deep intellectual engagement throughout his life, with a focus on both individual and collaborative contributions. His active life, though spanning just 43 years, was marked by a series of highly impactful publications, many of which remain relevant today. The collaborative nature of some of his work highlights his ability to engage with the broader scientific community, while his solitary contributions underscore his capacity for independent thought. Posthumous publications further attest to the enduring significance of his ideas, as his work continued to inspire and guide generations of scholars and researchers. Turing's influence transcends his own time, offering a vision that continues to shape the trajectory of AI and computational theory. Ultimately, Alan

Turing's life and work exemplify the power of visionary thinking in shaping the future, and his contributions will undoubtedly continue to resonate as AI evolves in the coming decades. His role as a founding father of AI and his lasting impact on the field is an enduring testament to the importance of intellectual curiosity and perseverance in the pursuit of knowledge. It is important to note that John McCarthy, alongside Alan Turing, Marvin Minsky, Allen Newell, and Herbert A. Simon, is recognized as one of the "founding fathers" of artificial intelligence. McCarthy, Minsky, Nathaniel Rochester, and Claude E. Shannon were the pioneers who coined the term "artificial intelligence" in a proposal for the renowned Dartmouth Conference held in the summer of 1956. This landmark conference is widely regarded as the event that officially established AI as a distinct field of study (Wikipedia, 2023a).

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This work is respectfully dedicated to Dr. Alan Turing (1912-1954), a true pioneer-an unsung hero whose genius in computer science and artificial intelligence paved the way for the technological advancements that have shaped our world today.

CONFLICT OF INTEREST

The author declares that there is no conflict of interest.

ABBREVIATIONS

SAP: Single Authored Paper; **MAP:** Multi-authored Paper; **MA:** Main Author; **TAP:** Total Annual Paper; **CAP:** Cumulative Annual Paper; **AA:** Author's Age; **PPA:** Paper Productive Age; **FPY:** First Publication Year; **CA or CoA:** Co-authors; **DC:** Degree of Collaboration; **YFP:** Year of First Publication; **YLP:** Year of Last Publication; **YT:** Year Taken; **TP:** Total.

REFERENCES

- Ajakaye, J. E. (2021) Chapter 6. Applications of artificial intelligence (AI) in libraries. In Handbook of research on emerging trends and technologies in librarianship (pp. 73–90). IGI Global.
- Al-Aamri, J. H., & Osman, N. E. (2022). The role of artificial intelligence abilities in library services. *International Arab Journal of Information Technology*, 19(3A), 566–572.
- Asemi, A., & Asemi, A. (2018). Artificial intelligence (AI) application in library systems in Iran: A taxonomy study. *Library Philosophy and Practice* (e-journal). <https://digitalcommons.unl.edu/libphilprac/1840/>.
- Beebe, N. H. (2023, November 21). A bibliography of publications of Alan Mathison. <https://www.math.utah.edu/~beebe/>
- Behera, M., & Meher, D. (2024). Scientometric portrait of Dr Raghuram Rajan: An economist and 23rd RBI governor. *Journal of Data Science, Informetrics, and Citation Studies*, 3(2), 206–215. <https://doi.org/10.5530/jcitation.3.2.21>
- Bergmann, D. (2024, February 9). The most important AI trends in 2024. <https://www.ibm.com/blog/artificial-intelligence-trends/>
- Bhattacharyya, P. K., & Sahu, N. B. (2020). Informetric portrait of Elinor Ostrom, the Nobel Laureate in the field of Economic Sciences. *Journal of Scientometric Research*, 9(2), 204–213.
- Copeland, B. (2004). *The essential Turing: Seminal writings in computing, logic, philosophy, artificial intelligence, and artificial life plus the secrets of enigma*. Oxford University Press (UK). https://www.thriftbooks.com/w/the-essential-turing-seminal-writings-in-computing-logic-philosophy-artificial-intelligence-and-artificial-life-plus-the-secrets-of-enigma_b-jack-copeland/423762/#edition=3048994&idq=47812156
- Copeland, B. (2024, February 12). Alan Turing: British mathematician and logician. *Encyclopaedia Britannica*. <https://www.britannica.com/biography/Alan-Turing>
- Copeland, B. J. (2023, December 18). Artificial Intelligence. <https://www.britannica.com/technology/artificial-intelligence/Alan-Turing-and-the-beginning-of-AI>. britannica.com
- Copeland, J. (2000, May). What is artificial intelligence? https://www.alanturing.net/turing_archive/pages/reference%20articles/what%20is%20ai.html. Retrieved from Alan. Turing.net.
- Dutta, B. (2019). Bibliometric Portrait of B K Sen: A Librarian, Information Scientist and scientometrician. *Malaysian Journal of Library and Information Science*, 24(1), 1–21.
- Fernandes, A. (2023, March 2). Why artificial intelligence is so important in today's world. [https://www.linkedin.com/pulse/why-artificial-intelligence-so-important-todays-world-fernandes-.](https://www.linkedin.com/pulse/why-artificial-intelligence-so-important-todays-world-fernandes-/) linkedin.com
- Formica.ai [Blog]. (2023, November 28). Brief history of artificial intelligence: A journey from yesterday to the future. <https://www.formica.ai/blog/brief-history-of-ai-artificial-intelligence>
- Furbank, P. (1992–2001). *Collected works of A. M. Turing* (Vol. 4 volumes). North-Holland. https://monoskop.org/Alan_Turing
- Hodges, A. (1995). Alan Turing: A short biography. UK. <https://www.turing.org.uk/publications/dnb.html>
- Hodges, A. (n.d.). The Alan Turing bibliography. UK. <https://www.turing.org.uk/sources/biblio.html>
- Javatpoint.com. (2011–2021). History of artificial intelligence. <https://www.javatpoint.com/history-of-artificial-intelligence>. javatpoint.com
- Kademami, B. et al. (1994). Scientometric portrait of Nobel Laureate Dr. C V Raman. *Indian Journal of Information, Library and Society*, 7 (3–4), 215–249.
- Koley, S. (2023, July–December). Biobibliometric portrait of Dr. Dilip Mahalanabis, Pioneer of Oral Rehydration Solution (ORS), the Life-saving Solution. *International Journal of Library and Information Science*, 15(2), 14–31.
- Koley, S. (2024). Medicimetric Portrait of Dr. Subhas Mukherjee, Late recognized Pioneer of Historic Creation of India's First and World's Second IVF Baby. *Journal of Data Science, Informetrics and Citation Studies*, 3(1), 42–57. <https://www.jcitation.org>
- Koley, S., & Sen, B. (2024, December). Filmometric or Biofilmometric study: Application of bibliometric laws in filmography. *Kelpro Bulletin*, 28(2), 73–91.
- Koley, S., & Sen, B. K. (2006, June). A Biobibliometric study of Prof. B N Koley, an eminent physiologist. *Annals of Library and Information Studies*, 53, 74–82.
- Koushik, S. (2023). *Artificial intelligence*. Cengage Learning India Pvt. Ltd.
- Kumar, A., & Yadav, N. (2023, November). Empowering library system with AI: A road map of AI in Indian academic libraries system. *International Journal for Research Trends and Innovation*, 8(10). https://www.researchgate.net/publication/375225647_Empowering_Library_System_with_AI_A_Roadmap_of_AI_in_Indian_Academic_Libraries_System.
- Kurzweil, R. (1990). *The age of intelligent machines*, by Raymond Kurzweil. MIT Press.
- Luger, G. F., & Stubblefield, W. A. (1993). *Artificial intelligence: Structures and strategies for complex problem solving*. The Benjamin/Cummings.
- Majumder, B. G. (2024, March 7). India's first flying taxi to take maiden flight in 7–8 months at double the cost of an Uber ride: IIT prof | Exclusive. *News*, 18. <https://www.news18.com/auto/indias-first-flying-taxi-to-take-maiden-flight-in-7-8-months-at-double-the-cost-of-an-uber-ride-iit-prof-exclusive-8806405.html>
- Manning, C. (2020, September). Artificial intelligence intelligence. <https://hai.stanford.edu/sites/default/files/2020-09/AI-Definitions-HAI.pdf>
- McCarthy, J. (2007, November 12). What is artificial intelligence? <https://www-formal.stanford.edu/jmc/whatsai.pdf>
- Mondal, D. et al. (2018). Scientific contribution of Professor Mahalanobis: A bio-bibliometric study. *Current Science*, 115(8), 1470–1476.
- Nextech. (2023, May 11). The importance of artificial intelligence in today's world. 3D.ai. <https://www.nextechar.com/blog/the-importance-of-artificial-intelligence-in-todays-world>. nextechar.com
- O'Connor, J. J., & Robertson, E. F. (2023, October). Alan Mathison Turing. <https://mathshistory.st-andrews.ac.uk/Biographies/Turing/>
- Omame, I. M., & Alex-Nmecha, J. C. (2020) Chapter 8. Artificial intelligence in libraries. In N. E. Osuigwe (pp. (Ed.),120–144). IGI Global. <https://doi.org/10.4018/978-1-7998-1116-9.ch008>
- Patterson, D. W. (2005). *Introduction to artificial intelligence and Sxpert Syetem*. PHI.
- Rancho Laboratories. (2021, July 14). 6 Major Sub-Fields of Artificial Intelligence. <https://rancholabs.medium.com/6-major-sub-fields-of-artificial-intelligence-77f6a5b28109>. rancholabs.medium.com
- Rao, I. K. (2013, October). Introduction to the special issue [scientometric]. *SRELS Journal of Information Management*, 50(5), 463–471.
- Rich, E., & Knight, K. (2007). *Artificial intelligence*. Tata McGraw-Hill.
- Sangam, S. L., & Savanur, K. (2010). Eugene Garfield: A scientometric portrait. *COLLNET Journal of Scientometrics and Information Management*, 4(1), 41–51. <https://doi.org/10.1080/09737766.2010.10700883>
- Seidlingappa, H. et al. (2023). Professor Madhav Gadgil: A bibliometric portrait. *Data Sci. Info. Citation Studies*, 2(3), 243–254. <https://doi.org/10.5530/jcitation.2.3.32>
- Sharma, S. (2024, March 7). Kerala school introduces IRIS: India's First AI teacher robot redefining education. <https://timesofindia.indiatimes.com/education/news/>

- kerala-school-introduces-iris-indias-first-ai-teacher-robot-redefining-education/articleshow/108292074.cms
- Shirer, M. (2023, March 7). Worldwide spending on AI-centric systems forecast to reach \$154 billion in 2023, according to IDC. <https://www.idc.com/getdoc.jsp?containerId=prUS50454123#>. Retrieved from IDC.
- Srimurugan, A., & Nattar, S. (2008, January–June). Dr. K. Veluthambi: A Bibliometric study. *Indian Journal of Information Science and Service*, 2(1), 23–30.
- Stevie, A. B., & Ammara, A. (2023, July–December). The shortcomings of artificial intelligence: A comprehensive study. *International Journal of Library and Information Science*, 15(2), 8–13. <https://doi.org/10.5897/IJLIS2023.1068>
- Subaveerapandian, A., & Gozali, A. A. (2024, January). AI in Indian libraries prospects and perceptions from library professionals. *Open Information Science*, 8(1). https://www.researchgate.net/publication/377658608_AI_in_Indian_Libraries_Prospect_and_Perceptions_from_Library_Professionals#:~:text=AI%20tools%20like%20smart%20shelving,on%20A. <https://doi.org/10.1515/opis-2022-0164>
- Tableau.com. (2024). What is the history of artificial intelligence (AI)? <https://www.tableau.com/data-insights/ai/history#:~:text=Birth>
- Teli, S., & Maity, A. (2021, June). A bio-bibliometric portrait of Stephen William Hawking. *IASLIC Bulletin*, 66(2) (pp. 122–128).
- Vedantu.com. (2023, December 22). Artificial intelligence essay. <https://www.vedantu.com/english/artificial-intelligence-essay.vedantu.com>
- Wigderson, A. (2019). *Mathematics and computation. A theory revolutionizing technology and science*. Princeton University Press. <https://www.math.ias.edu/files/Book-online-Aug0619.pdf>
- Wikipedia. (2024, March 20). ChatGPT. <https://en.wikipedia.org/wiki/ChatGPT#:~:text=>
- Wikipedia. (2024a, March 24). Alan Turing. https://en.wikipedia.org/wiki/Alan_Turing
- Wikipedia. (2023, December 16). Artificial Intelligence. https://en.wikipedia.org/wiki/Artificial_intelligence#Goals. wikipedia.org
- Wikipedia. (2023a, December 5). John McCarthy (computer scientist). [https://en.wikipedia.org/wiki/John_McCarthy_\(computer_scientist\)](https://en.wikipedia.org/wiki/John_McCarthy_(computer_scientist)). wikipedia.org
- Winston, P. H. (1992). *Artificial intelligence*. Pearson Education.

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