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Editorial

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Seventy years of AI: from a Dartmouth dream to a partner in scientific discovery

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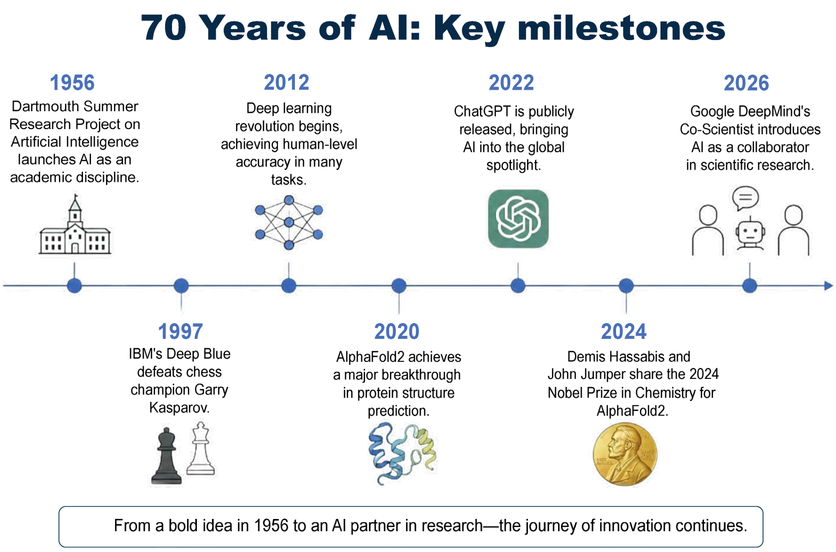
The 70th anniversary of the 1956 Dartmouth Summer Research Project offers an occasion to celebrate artificial intelligence's extraordinary trajectory from a bold hypothesis about machine simulation of intelligence to a transformative force reshaping science, medicine, and environmental stewardship. This editorial traces key technological milestones across seven decades, from early symbolic reasoning to today's agentic systems capable of autonomously generating hypotheses and accelerating discovery. It then examines promising future directions, with particular emphasis on AI's rapidly expanding role in scientific research from protein structure prediction to AI co-scientists that collaborate with researchers in real time. Far from a source of apprehension, AI stands as one of the most powerful tools ever devised for expanding the frontiers of human knowledge, provided we guide its development with wisdom, responsibility, and a steadfast commitment to human flourishing.

Keywords: Artificial intelligence, Dartmouth Conference, Scientific discovery, AlphaFold, Agentic AI

Graphical abstract



Introduction: Dartmouth Summer Workshop

Seventy years ago this summer, a small group of mathematicians and scientists gathered on the campus of Dartmouth College in Hanover, New Hampshire, for a two-month workshop that would forever change the course of human history. The Dartmouth Summer Research Project on Artificial Intelligence, organized by John McCarthy, Marvin Minsky, Nathaniel Rochester, and Claude Shannon, formally launched artificial intelligence as an academic discipline and gave the

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field its name. In their visionary proposal, they speculated that "every aspect of learning or any other feature of intelligence can in principle be so precisely described that a machine can be made to simulate it" [1]. That summer, Newell and Simon demonstrated the first AI program, i.e., the Logic Theorist, marking the beginning of a journey that has since reshaped every domain of human endeavor.

What the Dartmouth pioneers could not have imagined was the sheer scale and scope of the revolution they had set in motion. From the early days of symbolic reasoning through the "AI Winters" of the 1970s and 1980s, followed by the resurgence around 2012 and the public release of transformative models such as ChatGPT in early 2022, AI has emerged from the laboratory to become a defining force of the twenty-first century. The anniversary is being marked with a yearlong series of events designed to reflect on that legacy and to shape what comes next[2]. The flagship gathering, "The Dartmouth Conference, Revisited," will connect AI's founding vision to a future-facing mandate for responsible innovation, reminding us that the central challenge has shifted from "Can machines think?" to "How do humans think, create, make ethical decisions, and lead alongside machines?" [2].

Key technological milestones: seven decades of progress

The seventy-year history of AI reveals a consistent pattern: every major breakthrough has emerged from the collision of ideas, cross-disciplinary collaboration, and relentless human ingenuity. In 1997, IBM's Deep Blue defeated world chess champion Garry Kasparov, demonstrating that brute computational force combined with sophisticated algorithms could surpass human performance in narrow domains. In 2012, the deep learning revolution began, culminating in systems capable of recognizing images, understanding speech, and translating languages with human-level accuracy. The advent of transformer architectures and large language models has since pushed the boundaries of what machines can understand and generate.

Perhaps the most dramatic demonstration of AI's scientific potential came with DeepMind's AlphaFold. On October 9, 2024, Demis Hassabis and John Jumper were jointly awarded the Nobel Prize in Chemistry for developing AlphaFold2, an AI model that can predict the three-dimensional structure of a protein from its amino acid sequence with near-experimental accuracy in a matter of minutes—a task that traditionally took around a year of experimental work[3]. AlphaFold2 has already predicted the structure of almost all 200 million proteins that researchers have thus far identified, and its code was released open access, enabling more than two million users in 190 countries to accelerate their own research[4]. The 2020 Critical Assessment of Protein Structure Prediction (CASP) competition, where AlphaFold2 performed so well that the judges concluded it had solved the 50-year-old challenge of protein structure prediction, marked a turning point in computational biology. This achievement has revolutionized fields from molecular biology to medicine, enabling researchers to understand disease mechanisms and develop new therapeutics at unprecedented speed.

Beyond structure prediction, AI has demonstrated remarkable capabilities in drug discovery. In a study published in Science Translational Medicine, researchers developed a deep learning model to identify antibiotics effective against *Neisseria gonorrhoeae*, a pathogen with increasing resistance to all recommended antibiotics[5]. The model virtually screened approximately 6 million compounds, identifying 213 for experimental validation, of which 83 (39%) inhibited bacterial growth. Two compounds with structures dissimilar to existing antibiotics maintained potency against multidrug-resistant strains and showed early promise in human tissue models and animal studies. This work establishes deep learning-enabled discovery as a powerful tool to address the growing crisis of antimicrobial resistance[5].

AI in science: a new partner for discovery

For this journal, the most exciting frontier lies in AI's transformative role as an active collaborator in the research process. In May 2026, Google DeepMind published its Co-Scientist research in Nature, introducing a multi-agent AI system built with Gemini that iteratively generates, debates, and evolves novel hypotheses for complex scientific problems[6]. The system comprises specialized agents working in concert: a Generation agent proposes initial focus areas and novel hypotheses grounded in scientific literature; a Reflection agent acts as a "virtual peer reviewer," critically evaluating hypotheses for correctness, quality, and novelty; a Ranking agent orchestrates an "idea tournament" to prioritize the most promising paths; and an Evolution agent continuously refines and combines top-ranked hypotheses. This structured approach, described by the researchers as a "structured scientific thinking engine", enables Co-Scientist to engage in the rigorous cycle of ideation, critique, and refinement that characterizes breakthrough science[6].

Co-Scientist is already being applied to challenges ranging from antimicrobial resistance and plant immunity to liver fibrosis. Specifically, it helped identify new drug-repurposing candidates and synergistic combination therapies for acute myeloid leukemia that were validated through in vitro experiments, and it successfully discovered candidate drugs for liver fibrosis while explaining the genetic mechanisms of antimicrobial resistance[6]. Independently, FutureHouse has developed Robin, a multi-agent system built using OpenAI o4-mini and Anthropic Claude 3.7, capable of fully automating both hypothesis generation and data analysis for experimental biology[6,7]. Robin has already identified promising therapeutic candidates for dry age-related macular degeneration—the major cause of blindness in the developed world—by proposing a novel strategy and confirming in vitro efficacy for compounds never previously considered for this indication[6,7]. Both systems can generate hypotheses, propose experiments, interpret results, and refine ideas based on new data, representing a fundamental shift in how science is conducted with human scientists remaining in control while AI accelerates every stage of the research cycle[6,7].

Complementing these hypothesis-generation tools, Google DeepMind also introduced Empirical Research Assistance (ERA), an AI system that creates expert-level scientific software to maximize a quality metric[8]. The cycle of scientific discovery is frequently bottlenecked by the slow, manual creation of software for computational experiments, and ERA addresses this critical constraint by automating the coding process. Together, Co-Scientist and ERA provide a comprehensive AI toolkit for the modern scientist, which generates ideas, designs experiments, and writes the code needed to execute them[8].

Future directions: the age of agentic AI

As we look toward the next seventy years, the trajectory is clear. Gartner predicts that by the end of 2026, 40% of enterprise applications will embed task-specific AI agents, up from under 5% a year earlier[9]. Estimates of the agentic AI market's current size cluster around $10 billion, with most analysts projecting compound annual growth above 40% for the rest of the decade. In a "best-case" scenario, Gartner predicts agentic AI could drive 30% of all enterprise application software sales by 2035, up from just 2% in 2025[9]. Once workloads are empirically ranked by value, enterprises can deploy agentic optimization frameworks where AI agents select the most cost-effective compute instances, structure data, and deliver critical reports on demand. AI is no longer merely an assistive tool; it has acquired the attributes of a digital colleague capable of autonomous reasoning and action.

In manufacturing and design, the convergence of digital twins and AI agents is reshaping product development. By 2028, an estimated 65% of the world's top 1,000 manufacturing enterprises will integrate agents with design and simulation tools for continuous validation of design changes. AI agents are increasingly capable of automatically clicking buttons, filling forms, and switching between software applications, performing the routine tasks that once consumed countless hours of human labor. These developments point toward a future in which AI systems will collaborate with humans not as passive tools but as proactive partners, augmenting creativity and accelerating innovation across every sector.

Environmental stewardship through AI

Concerns about AI's environmental footprint are legitimate and must be addressed. Yet AI is also proving to be a powerful ally in environmental protection. The UN Environment Programme is using AI, through its Methane Alert and Response System (MARS), to turn satellite observations into methane mitigation action in the oil and gas sector[10]. Since becoming fully operational in 2024, MARS has contributed to more than 40 methane mitigation actions worldwide. With more than 30 satellites generating vast amounts of data on methane emissions, humans struggle to process this information at scale; AI dramatically speeds this process up, enabling analysts to process 12 to 15 times more data while maintaining scientific rigor[10]. AI-assisted workflows identified 80–85% of confirmed methane detections before expert review, helping to mitigate sources estimated to have emitted 1.2 million tonnes of methane[11]. These mitigation efforts have delivered a climate benefit comparable to removing the annual emissions of almost 24 million gasoline-powered passenger cars[10]. During eleven months of operational deployment, the system processed more than 25,000 hyperspectral products, facilitating the verification of 2,851 distinct methane leaks, which resulted in 834 stakeholder notifications[11]. Crucially, the methane-monitoring models were specifically designed to be lightweight and energy-efficient, requiring only modest computing resources while delivering substantial gains in monitoring capacity[10]. As Martin Krause, Director of UNEP's Climate Change Division, observed: "The real lesson from this work is that AI can help convert the explosion of environmental data into practical action" [10]. The system is currently expanding to additional sectors beyond oil and gas, including coal and waste.

A future of responsible partnership

The Dartmouth anniversary is not only a time to celebrate past achievements but also an opportunity to reaffirm the principles that should guide AI's future. Dartmouth President Sian Leah Beilock, a cognitive scientist, has articulated this vision: "Our legacy carries a responsibility to anchor innovation in human judgment, to ask hard questions about the role of new tools in teaching and research, and to lead higher education in defining how this technology advances knowledge with integrity and purpose" [2]. Faculty across disciplines are using AI not to bypass student thinking but to sharpen it, making reasoning visible, testing assumptions, and pushing ideas into new territory[2]. The same spirit can and should infuse scientific research, where AI serves as a collaborator that enhances, rather than replaces, human curiosity and ethical discernment.

The seventy-year journey from Dartmouth to today's AI co-scientists is a testament to human ingenuity and the relentless pursuit of knowledge. The pioneers of 1956 dared to imagine that machines could simulate intelligence. We now know that AI can do far more: it can accelerate the pace of scientific discovery, help us understand the fundamental building blocks of life, and contribute to the stewardship of our planet[12]. The challenge ahead is not to slow this progress, but to guide it wisely, ensuring that AI remains a partner in human flourishing, augmenting rather than replacing human judgment, and serving the common good. The next seventy years of AI promise to be even more transformative than the first. Let us embrace that future with optimism, rigor, and an unwavering commitment to the ethical and responsible development of this extraordinary technology.

Authors' contributions

The authors confirm their contributions to the paper as follows: Jing-Yu Lin: Writing – original draft, review & editing. Pei Hua: Writing – review & editing. Chang-Er Chen: Writing – review & editing. Guang-Guo Ying: Writing – original draft, review & editing. All authors reviewed the results and approved the final version of the manuscript.

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References

[1] McCarthy J, Minsky ML, Rochester N, Shannon CE. 1955. A proposal for the Dartmouth summer research project on artificial intelligence. *AI Magazine* 27(4):12–14

[2] Dartmouth College. 2026. Dartmouth, where AI began, celebrates a 70-year milestone and defines what's next. EurekAlert. https://www.eurekalert.org/news-releases/1118006

[3] Nobel Prize Outreach. 2024. The Nobel Prize in Chemistry 2024. https://www.nobelprize.org/prizes/chemistry/2024/press-release/

[4] Burki T. 2025. Nobel prizes honour AI pioneers and pioneering AI. *The Lancet Digital Health* 7(1):e11–e12

[5] Anahtar MN, Valeri JA, Modaresi SM, Krishnan A, Donghia NM, et al. 2026. Deep learning–enabled discovery of antibiotics effective against Neisseria gonorrhoeae. *Science Translational Medicine* 18(854):eads4699

[6] Gottweis J, Weng WH, Daryin A, Tu T, Sirkovic P, et al. 2026. Accelerating scientific discovery with Co-scientist. *Nature* 655(8122):487–496

[7] Ghareeb AE, Chang B, Mitchener L, Yiu A, Szostkiewicz CJ, et al. 2026. A multi-agent system for automating scientific discovery. *Nature* 655(8122):497–505

[8] Aygün E, Belyaeva A, Comanici G, Coram M, Cui H, et al. 2026. An AI system to help scientists write expert-level empirical software. *Nature* 654(8120):909–916

[9] STAMFORD, Conn. 2025. Gartner Predicts 40% of Enterprise Apps Will Feature Task-Specific AI Agents by 2026, Up from Less Than 5% in 2025. https://www.gartner.com/en/newsroom/press-releases/2025-08-26-gartner-predicts-40-percent-of-enterprise-apps-will-feature-task-specific-ai-agents-by-2026-up-from-less-than-5-percent-in-2025

[10] United Nations Environment Programme (UNEP). 2026. Spotlighting Opportunity: How artificial intelligence is accelerating methane action. Nairobi. https://wedocs.unep.org/handle/20.500.11822/49692

[11] Růžička V, Mateo-García G, Irakulis-Loitxate I, Johnson JE, Martín MMS, et al. 2026. Operational machine learning for remote spectroscopic detection of CH_4 point sources. arXiv. https://doi.org/10.48550/arXiv.2511.07719

[12] Zhao C. 2026. How will we know if AI is smart enough to do science? *Science* 391(6790):1090–1091