

# ARTIFICIAL INTELLIGENCE

A Foundational Understanding of AI



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# Howdy Reader!

This Primer is your passport to the world of AI innovation. We'll start by zooming out and exploring how different regions are shaping the global landscape.

As we move forward, we'll step into the exciting world of Generative AI where ideas scale effortlessly and meet Agentic Systems, the next Wchange comes big responsibility, so we'll also pause to talk about bias, ethics, and model safety in a grounded, human way. Toward the end, we'll look ahead to what's next spotlighting bold initiatives like BharatGen and how they're setting the stage for deep industry transformation. And because the future belongs to those who are ready for it, we'll touch on the urgent need for reskilling and AI-aligned talent.

And once you've taken it all in don't close the book yet. There's a fun interactive space waiting for you to test what you've learned and explore deeper, your way.

# Overview

Understanding the Basics



# What is AI?

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Artificial Intelligence is the science and engineering of creating intelligent agents' systems that perceive their environment and take actions to maximize the likelihood of achieving goals.

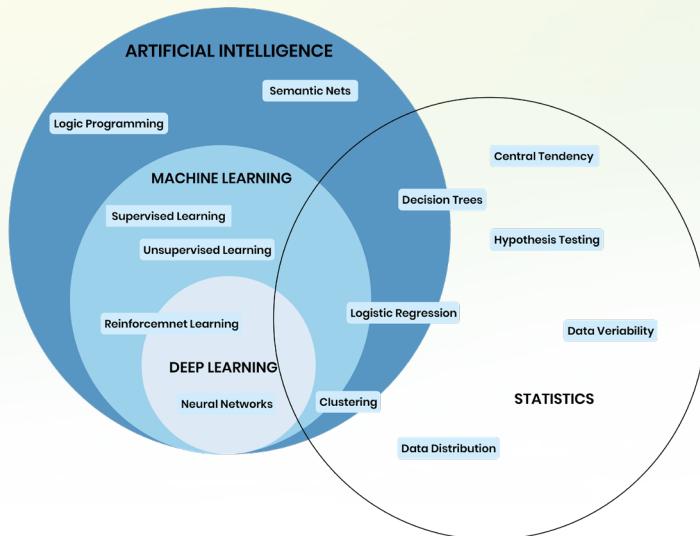
## Core Types of AI

- **Narrow AI (ANI):** Specializes in a single task (e.g., face recognition).
- **General AI (AGI):** Hypothetical systems capable of reasoning across domains.
- **Superintelligence (ASI):** A theoretical form surpassing human intelligence in all aspects.

## Subfields of AI

Subfield	Key Functionality	Examples
Machine Learning	Pattern recognition, prediction	Fraud detection, product ranking
Deep Learning	Neural network-based reasoning	Image classification, NLP
Natural Language Processing (NLP)	Understanding human language	Chatbots, voice assistants
Computer Vision	Interpreting visual input	Facial recognition, X-ray AI
Reinforcement Learning	Goal-directed decision-making	Game AI, autonomous navigation
Knowledge Graphs	Entity relationships, semantic search	Search engines, personal assistants

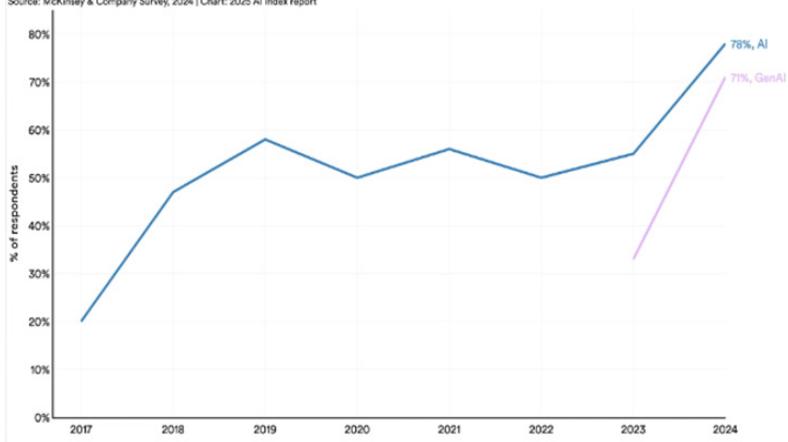
This diagram showcases that Machine Learning and Deep Learning are subsets of AI and share concepts with Statistics.



Source : Digital\_Adoption.com

#### Share of respondents who say their organization uses AI in at least one function, 2017–24

Source: McKinsey & Company Survey, 2024 | Chart: 2025 AI Index report



Based on a survey by McKinsey & Company in 2024, This chart depicts AI adoption rising to 78% of organizations by 2024, with Generative AI rapidly reaching 71% in its early uptake.

## 'Product and services using AI have more benefits than drawbacks,' by country (% of total), 2024

Source: Ipsos, 2022-24 | Chart: 2025 AI Index report

Country	78%	78%	83%	5%
China	78%	78%	83%	5%
Indonesia		78%	80%	
Thailand		74%	77%	
Mexico	65%	73%	70%	5%
Peru	70%	67%	70%	0%
Turkey	60%	67%	69%	9%
Colombia	64%	65%	66%	2%
Singapore		64%	66%	
South Korea	62%	66%	66%	4%
Malaysia	65%	49%	63%	-2%
India	71%	65%	62%	-9%
South Africa	57%	59%	62%	5%
Chile	63%	59%	60%	-3%
Argentina	55%	57%	57%	2%
Brazil	57%	64%	56%	-1%
Italy	50%	55%	53%	3%
Hungary	49%	48%	51%	2%
Spain	53%	50%	50%	-3%
Japan	42%	52%	48%	6%
New Zealand		44%	48%	
Germany	37%	42%	47%	10%
Great Britain	38%	46%	46%	8%
Ireland		40%	45%	
Australia	37%	40%	44%	7%
Poland	48%	47%	44%	-4%
Sweden	40%	39%	43%	3%
Switzerland			42%	
France	31%	37%	41%	10%
Canada	32%	38%	40%	8%
United States	35%	37%	39%	4%
Belgium	38%	39%	38%	0%
Netherlands	33%	43%	36%	3%

Source : Amazonaws.com

Regional differences persist regarding AI optimism. A large majority of people believe AI-powered products and services offer more benefits than drawbacks in countries like China (83%), Indonesia (80%), and Thailand (77%), while only a minority share this view in Canada (40%), the United States (39%), and the Netherlands (36%).

Now. Let's deep dive into learning how it has evolved into something that shapes our lives today.

# Evolution of AI

## From Logic to Autonomy

01.

### Symbolic AI Era (1950s–1980s)

AI = logic rules + symbolic reasoning.

Key Milestone: ELIZA chatbot (1966), SHRDLU (1970)

Limitations: Rigid logic trees, brittle to ambiguity.

Welcome to

EEEEEE	LL	IIII	ZZZZZZ	AAAAAA
EE	LL	II	ZZ	AA
EEEEEE	LL	II	ZZZ	AAAAAAA
EE	LL	II	ZZ	AA
EEEEEE	LLLLLL	IIII	ZZZZZZ	AA

Eliza is a mock Rogerian psychotherapist.

The original program was described by Joseph Weizenbaum in 1966.

This implementation by Norbert Landsteiner 2005.

ELIZA: Is something troubling you ?

YOU: Men are all alike.

ELIZA: What is the connection, do you suppose ?

YOU: They're always bugging us about something or other.

ELIZA: Can you think of a specific example ?



02.

### Statistical AI & ML (1980s–2010s)

Rise of probabilistic models and supervised learning.

Breakthroughs: SVMs, random forests, early NLP.  
Shift from rules – data-driven generalization.

03.

### Deep Learning & Perception (2012–2020)

ImageNet moment (2012): AlexNet beats human benchmarks.

CNNs, RNNs, LSTMs – Google Translate, Siri, DeepFace.



Siri

**The trajectory of AI has unfolded over 70 years, each decade characterized by a leap in architecture, compute, or philosophical framing.**

04.

## **Transformers & Language Dominance (2017–2023)**

Transformers (2017, Vaswani et al.):

Enabled GPT, BERT, T5.

GPT-3 (2020), PaLM (2022), Claude 1 (2023) scaled reasoning.



05.

## **Foundation + Agentic AI (2024–2025)**

GPT-4o, Claude 3.5, Gemini 1.5: Multimodal + context-aware.

ReAct, Auto-GPT agents execute sequences autonomously.

Rise of “model-as-colleague” paradigm.



I'm Gemini.

Chat

Ultra 1.0

Build

# The Gemini era

Analyze

Create



# Technologies

## Powering AI in 2025

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### Compute & Hardware

- NVIDIA H100, Grace Hopper, AMD MI300X: 10–20× faster training speeds vs. 2020-era chips.
- TPUs v5p (Google): Custom-built for LLMs with dynamic power scaling.

### Algorithms & Architectures

- Transformers: Still the backbone of generative models.
- Mixture of Experts (MoE): Used in Gemini and Claude for model sparsity, improving performance per watt.
- LoRA & QLoRA: Fine-tuning breakthroughs enabling edge deployments.

### Infrastructure Platforms

Platform	Function
Hugging Face	Open model hub and inferencing APIs
Lang Chain	Building prompt-based agents and tools
Vector DBs	Retrieval augmented generation (e.g., FAISS, Pinecone)
Weights & Biases	Training tracking and model validation

### AI Safety & Interpretability Tools

- Elicit, Tracr, OpenAI System Cards for model explainability and behavior tracing.
- Guardrails.ai, PromptLayer for prompt integrity and moderation.



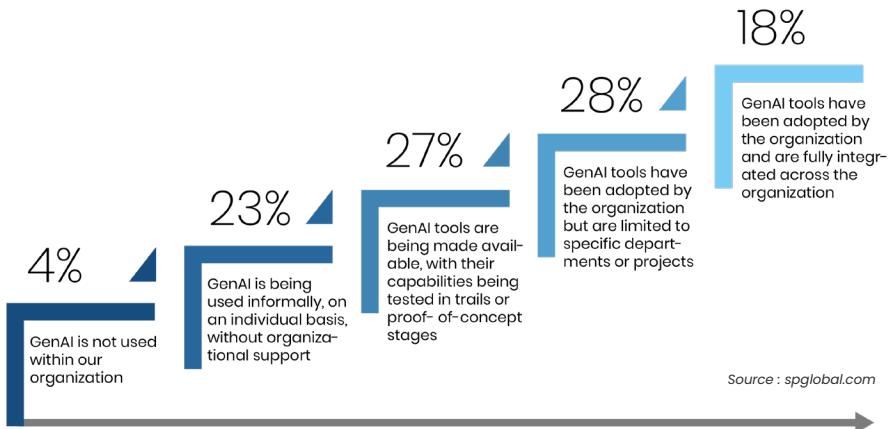
Profit flows through  
AI's layered value  
chain

# Segmental Breakdown

## of the Global AI Industry

Artificial Intelligence in 2025 is no longer monolithic—it spans a nuanced and multi-vertical architecture with distinct regulatory burdens, compute needs, and economic value drivers.

Organizations are still working to integrate generative AI



### 1. Enterprise AI (Cross-Functional)

- Scope:** ERP augmentation, decision intelligence, predictive analytics.
- Adoption:** Over 85% of Global 2000 firms use AI for at least one core business process. (McKinsey, 2024)
- Revenue (2025):** \$132B globally.
- Tech Stack:** LangChain pipelines, fine-tuned GPT, internal knowledge graphs.

## 2. Consumer AI

- Scope: Personal assistants, voice agents, AI tutors, personalization engines.
- Daily Touchpoints: Over 3.2 billion people interact with consumer-facing AI apps globally.
- Key Models: GPT-4o, Claude 3.5, Meta LLaMA 3, Google Gemini Nano.
- Emerging Trends: AI companions, generative avatars, AI-based parenting support systems.

## 3. Vertical-Specific AI

Sector	Applications	Global 2025 Spend	Barriers
Healthcare	Diagnostics, radiology, drug design	\$75B	FDA/CE approval, data privacy
BFSI	KYC, credit scoring, fraud analytics	\$65B	Black-box risk, explainability
Retail	Chatbots, hyper-personalization	\$43B	Multi-lingual training, hallucinations
Manufacturing	Smart QC, predictive failure	\$36B	OT-IT integration, latency
Education	AI tutors, curriculum generation	\$18B	Bias in learning algorithms

## 4. Government & Public Sector AI

- **Scope:** Citizen services, traffic automation, policy simulation.
- **India:** CoWIN, Bhashini, and National AI compute grid (in progress).
- **Global Trend:** Rise of “GovTech” stack using open LLMs on secure, air-gapped infrastructure.

# Profitability and Value Chains

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Artificial Intelligence ecosystems yield value across a layered architecture—each stage carrying unique profit dynamics, margin structures, and defensibility levers.

## 1. Upstream – Data + Compute Layer

Function	Players	Margin Profile
Model Training Chips	NVIDIA, AMD, Intel	Low (8–12%)
Cloud GPU Services	AWS, Azure, GCP	Moderate (15–20%)
Dataset Aggregators	OpenAI, Hugging Face, LAION	Variable (Open vs Paid)

**Trend:** Rise of sovereign compute ( IndiaAI stack, EU AI infrastructure).

**Risks:** Chip dependency, regulatory crackdown on copyrighted datasets.

## 2. Midstream – Model Development & APIs

Function	Players	Gross Margin
Model Development	OpenAI, Anthropic, Google	High (40–70%)
Model Hosting & APIs	Cohere, Mistral, AWS Bedrock	Very High (70– 80%)

Proprietary LLMs now charge **\$0.002–\$0.04 per 1k tokens**, depending on latency and security layer.

### 3. Downstream – Application and Deployment Layer

Function	Players	Revenue Structure
Vertical SaaS	Jasper (content), Harvey (legal), Hippocratic (healthcare)	Subscription-based
Agentic Workflows	Auto-GPT apps, Devin by Cognition	Freemium + Enterprise
RAG Toolkits	Langchain, LlamaIndex Embedchin	Open-source + Services

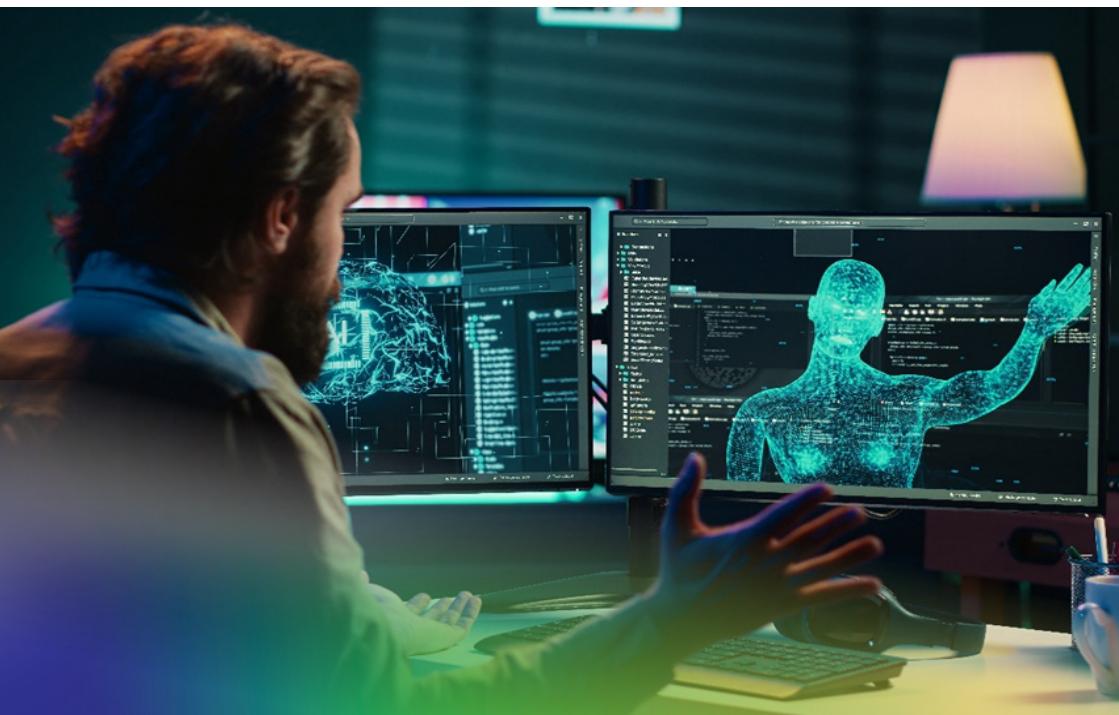
## Value Pools Emerging

### Inference Efficiency

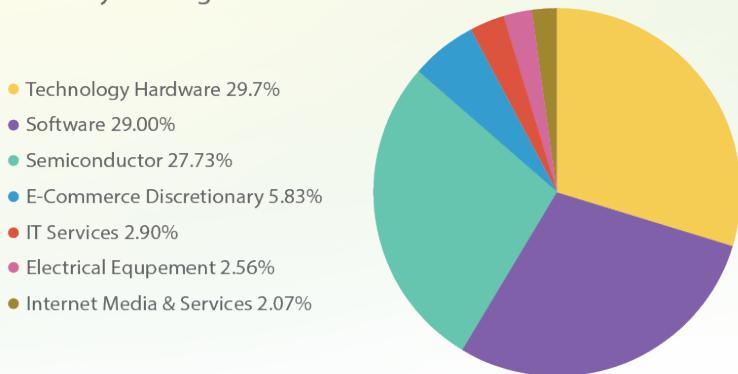
Companies like Groq, Together.ai monetizing low-latency, cost-effective inferencing.

### Audit + Safety Services

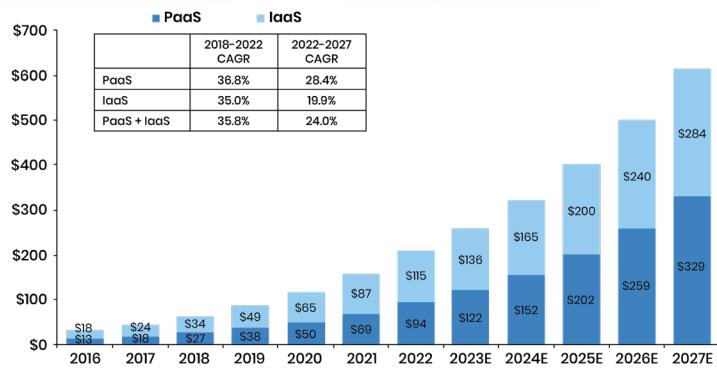
Startups offering guardrails, model interpretability, and usage governance.



## Top 10 AI Value Chain Index Members By BICS Industry % Weight



## Infrastructure-as-a-Service (IaaS) & Platform-as-a-Service (PaaS) Revenue Forecast (\$ Billion)



Source : Bloomberg indices

This chart shows IaaS and PaaS revenues projected to surpass \$600B by 2027, with PaaS growing faster (28% CAGR) than IaaS (20%).

After gaining some deep insights about Artificial Intelligence, which is the science and engineering of creating intelligent agents delineating its core types and subfields like Machine Learning and NLP the story unfolds, tracing its seventy-year evolution from Symbolic AI to the current era of autonomous Foundation Models.

**Let us drive and see further that how the world of AI is evolving globally.**

# India Aims for Glory – Driving AI and Autonomous Systems





# Human Future in the Age of AI





**Building towards an  
AI expansion Era**

# AI in 2025

## A Global Snapshot

### Market Size & Growth

Market is estimated at

**\$310.6 B**

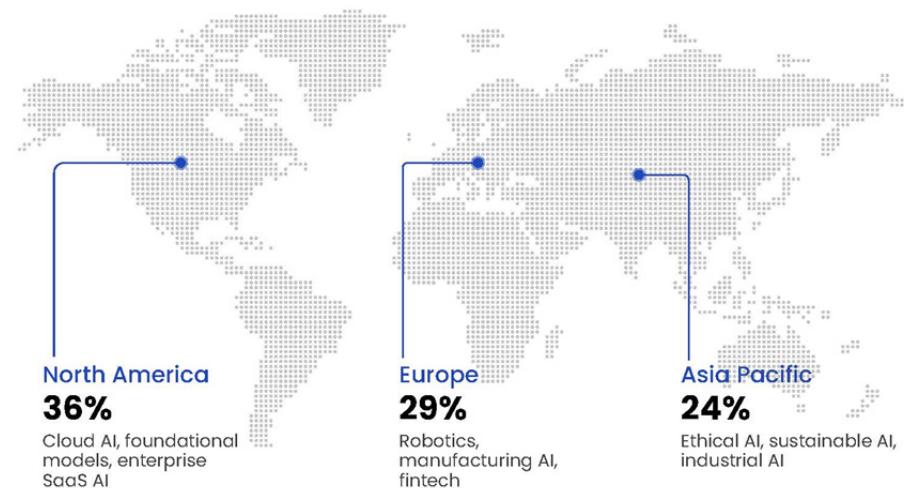
in 2025

(Sources: Grand View Research, Statista, IDC)

Growing at approximately 37.3% CAGR since 2020.

AI adoption has become mainstream across industries, driven by generative models, real-time decision engines, and exponential compute advancements.

### Regional Market Share



**Rest of World**  
**11%**

Emerging GovTech and  
agriculture AI use cases

# Key Market Drivers

**Generative AI Explosion:** Widespread deployment of LLMs, diffusion models, and multi-modal systems in education, healthcare, and media.

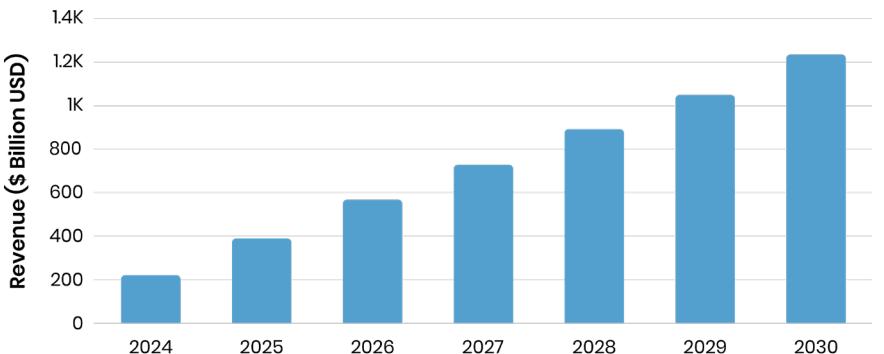
**Demand for Autonomous Systems:** AI-powered agents are driving transformation in logistics, finance, and customer support.

**Enterprise Intelligence Transformation:** Fortune 500 companies report over 22% efficiency gains through intelligent automation and AI-driven analytics.

## Primary Use Cases by Sector (2025)

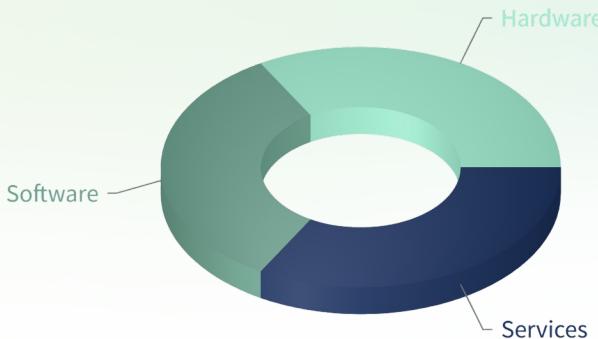
Sector	AI Applications	Market Contribution
Healthcare	Diagnosis, drug discovery, surgical planning	\$75.2B
BFSI	Credit scoring, fraud detection, robo-advisory	\$65.1B
Retail & eCommerce	Personalization, dynamic pricing, chatbots	\$42.7B
Manufacturing	Predictive maintenance, vision QA	\$36.4B
Education	Adaptive learning, AI tutors	\$18.6B

Artificial Intelligence (AI) Market Revenue, 2024–2030 (Billion USD)



Source: Next Move Strategy Consulting (NMSC)

## Artificial Intelligence (AI) Market Segments



Source: Next Move Strategy Consulting (NMSC)

The charts show AI market revenue projected to grow sixfold from 2024 to 2030, with services leading segmental share, followed by software and hardware.

## Investment Landscape

**Global AI startup funding (2020–2025):** \$278B (Crunchbase, CB Insights)

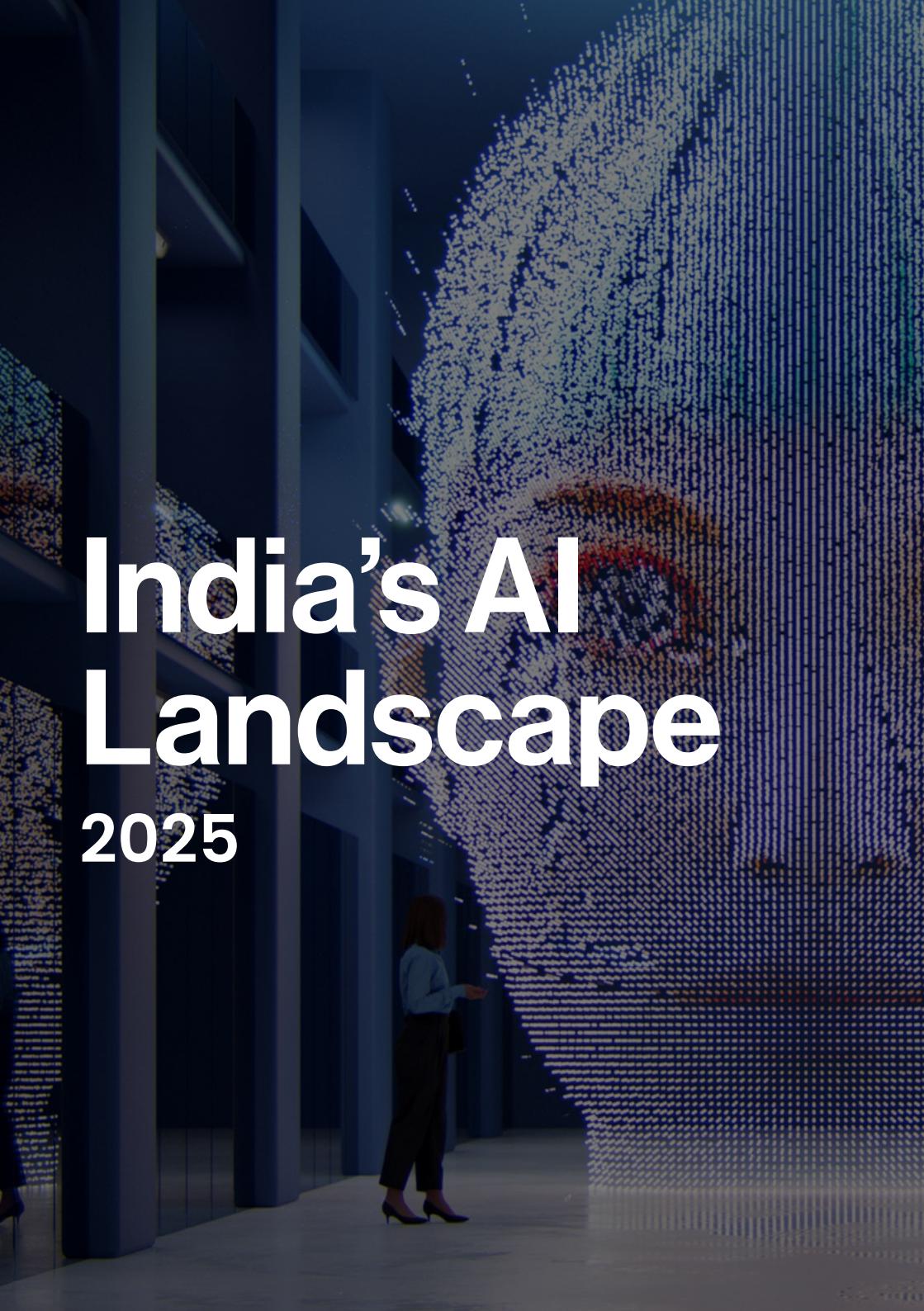
**Average AI M&A deal value (2024):** \$132M, a 5x increase since 2020.

## Enterprise AI Trends

- 72% of enterprises have deployed at least one generative AI tool in 2025 (Gartner).
- AI contributes 1.2% of global GDP growth (OECD projection).

# India's AI Landscape

2025



# National Market & Growth

- Estimated AI market size in India (2025): ₹38,500 crore (~\$4.6B) (Source: NASSCOM, AIM Research, EY)
- CAGR (2020–2025): 30.8%
- Projected contribution to India's GDP by 2030: \$90B–\$110B

## Government & Policy Support

- National AI Strategy (NITI Aayog): Focuses on healthcare, agriculture, education.
- India AI Mission (2024 Launch): ₹10,300 crore for compute infrastructure, datasets, AI hubs.
- Data Governance Framework: Under Digital India Act 2025 for ethical AI.

## Key Research Institutions

Institute	Focus Areas
IIT Madras	AI for speech, language, and social good
IISc Bangalore	Reinforcement learning, swarm intelligence
IIIT Hyderabad	Vision, NLP, AGI research
C-DAC, Pune	Supercomputing and applied AI

## Leading Indian Startups

Startup	Domain	Notable Work
Rephrase.ai	Generative video	Personalized ad content at scale
Skit.ai	Conversational AI	AI voice agents for BFSI
Sarvam.ai	Open-source LLM	Vernacular Indic language models
Vahan.ai	HR tech + AI	Blue-collar hiring via WhatsApp agents
Turing Labs	Chemistry + AI	Product R&D acceleration

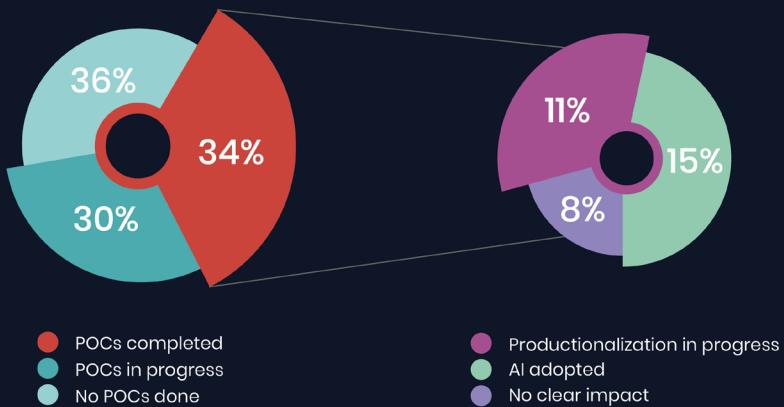
# GenAI in India: The current state of play

## EY India's C-suite GenAI survey

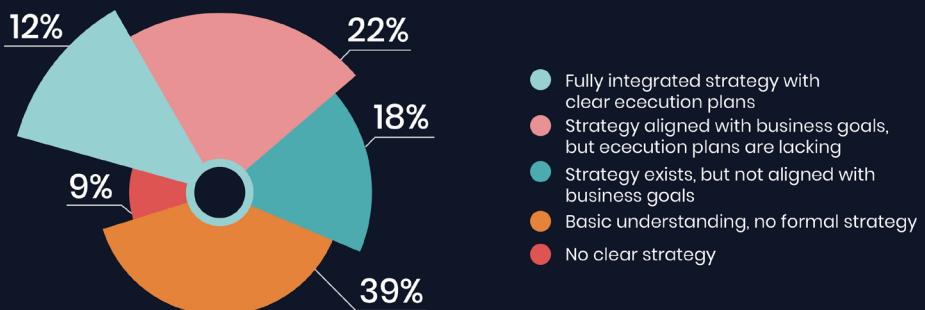
We conducted an in-depth GenAI survey covering more than 125 C-suite executives across India. They represent diverse sectors, including Financial Services, Retail, Life sciences, Media and Entertainment, Technology, Automotive, Industrials and Energy.

## GenAI journey

Integrating with existing software means enterprises' exposure to GenAI is high. However, only a few have the technology in production.



More than half of the enterprises have a GenAI strategy but only some have a fully integrated strategy with clear execution plans



## Architecture: GenAI platform and integration approach

Architecture integration is limited and enterprises are looking at ways to increase application



## Data: Platform readiness for GenAI adoption

Enterprises in India are at different stages of data readiness, with only a few at a mature level



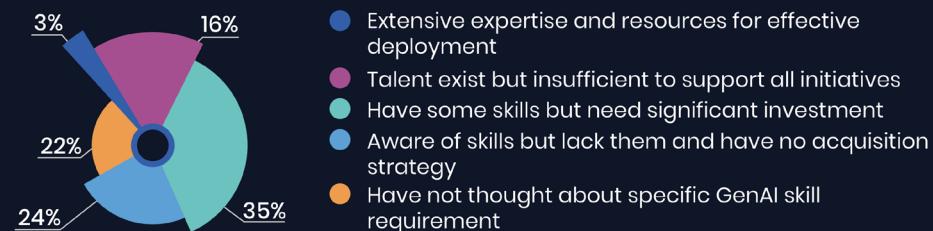
## Implementation: Buy versus build approach

Approximately one in four have defined approach but application is uneven



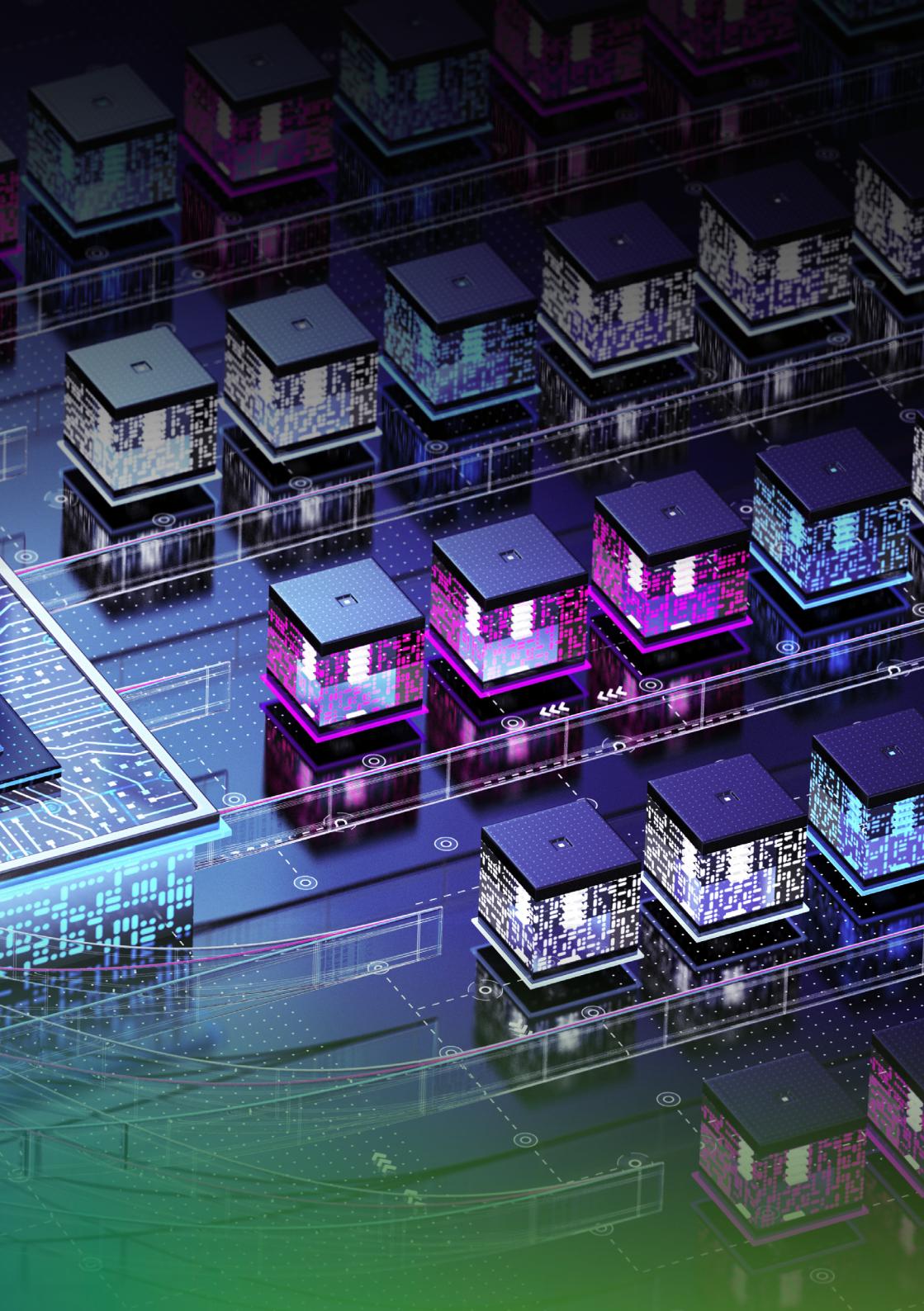
## Talent: Resource availability for GenAI adoption

AI expertise is a key need for most enterprises as they undergo GenAI transformation



The one who  
understands the  
systems,  
Leads the market





# Key Players and Leaders

## Top Companies in AI (2025)

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### Global Market Leaders

Company	Country	Core Focus Areas	Notable Products
Google DeepMind	UK/USA	AGI research, RL, medical AI	AlphaFold, Gemini
		Enterprise AI, Azure AI, LLM integration	Copilot, Azure OpenAI Service
OpenAI	USA	Foundation models, AGI research	ChatGPT, Codex, DALL·E
NVIDIA	USA	AI chips, simulation, enterprise tools	H100, Isaac Sim
Anthropic	USA	Constitutional AI, safety-aligned LLMs	Claude
Baidu	China	NLP, search AI, autonomous driving	Ernie Bot, Apollo Go
IBM	USA	Hybrid AI, Watsonx enterprise suite	Watsonx Assistant, AI Governance
Amazon	USA	Retail AI, cloud services	Alexa, SageMaker

### Emerging Unicorns

- Mistral AI (France): Open-source LLMs with global reach.
- Reka AI (USA/Singapore): Multilingual, multimodal enterprise models.
- Hugging Face (USA): Community platform for open-source model deployment.

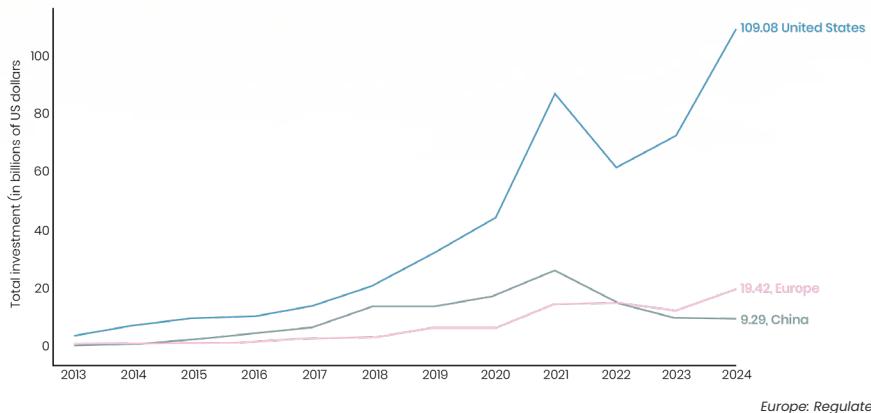
## Regional Strengths

- USA: Leadership in foundational models and VC-backed startups.
- China: Industrial-scale AI integration in telecom, education, and surveillance.
- Europe: Regulated AI, edge intelligence, privacy-centric innovation.

This chart shows the U.S. leading global private AI investment at \$109B in 2024, far surpassing Europe (\$19B) and China (\$9B).

### Global private investment in AI by geographic area, 2013–24

Source: Quid, 2024 | Chart: 2025 AI Index report



Europe: Regulated AI



# Influential People in the AI Industry

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The trajectory of Artificial Intelligence has been significantly shaped by a handful of visionaries, scientists, and policy leaders who have expanded both the technical boundaries and the societal imagination of what AI can be. Their contributions span from foundational algorithms to ethical advocacy, from academic breakthroughs to real-world deployment at global scale.



# Geoffrey Hinton

**The Godfather of Deep Learning**

Widely regarded as one of the founding fathers of modern AI, Geoffrey Hinton's work on backpropagation and neural networks in the 1980s laid the foundation for deep learning. His research was instrumental in enabling the development of convolutional neural networks (CNNs) and large-scale image recognition systems. A former Google researcher and Turing Award winner, Hinton famously resigned from Google in 2023 to freely voice concerns over the existential risks posed by advanced AI systems—a move that catalyzed global debate on AI safety and ethics.

# Sam Altman

**Architect of the Generative AI**

As the CEO of OpenAI, Sam Altman has overseen the development of GPT-3, GPT-4, and GPT-4o—models that have revolutionized the landscape of artificial intelligence. His leadership has transformed OpenAI from a research nonprofit into one of the most influential organizations in global technology. Altman is also the public face of AI governance discussions, having testified before the U.S. Senate and engaged with global heads of state to promote balanced regulatory frameworks. His long-term vision of artificial general intelligence (AGI) continues to define the frontier. As the CEO of OpenAI, Sam Altman has overseen the development of GPT-3, GPT-4, and GPT-4o—models that have revolutionized the landscape of artificial intelligence. His leadership



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# Fei-Fei Li

## The Visionary Behind ImageNet

Professor at Stanford University and co-director of the Stanford Human-Centered AI Institute, Fei-Fei Li is credited with creating ImageNet, a dataset that catalyzed the deep learning revolution in 2012. Her contributions to computer vision and cognitive neuroscience have profoundly influenced how machines interpret the visual world. A strong advocate of ethical and inclusive AI, Fei-Fei Li has also worked to increase female representation in AI and has shaped U.S. policy dialogues through her roles on national advisory boards.



# Yann LeCun

## Champion of Self-Supervised Learning

A Turing Award laureate and Chief AI Scientist at Meta (Facebook), Yann LeCun pioneered convolutional neural networks (CNNs) and more recently spearheaded efforts in self-supervised learning, which aims to reduce AI's dependence on labeled data. LeCun is also a critic of overhyping AI's current capabilities and has proposed alternative architectures to transformers.



# Timnit Gebru

## Leading Voice – AI Ethics

Timnit Gebru is one of the most influential figures in the field of ethical AI. Formerly a co-lead of Google's AI ethics team, she gained global attention for her controversial exit from the company after co-authoring a paper highlighting biases in large language models. She now leads the Distributed AI Research (DAIR) Institute, advocating for decentralized, inclusive AI development. Gebru's work has highlighted the societal consequences of unregulated AI systems and has led to the creation of new academic and regulatory standards in bias auditing and dataset transparency.

# Andrew Ng

## AI Democratizer and Education Pioneer



Co-founder of Google Brain and Coursera, Andrew Ng has played a pivotal role in both developing scalable deep learning systems and in democratizing AI education globally. His "AI for Everyone" and "Machine Learning" courses have trained over 5 million learners worldwide. Currently leading DeepLearning.AI and Landing AI, he focuses on bringing AI to manufacturing and small-to-medium enterprises, emphasizing the value of AI beyond Silicon Valley.



# Emad Mosque

## The Disruptor : Open-Source AI Movement

As the founder of Stability AI, Emad Mostaque gained prominence by releasing Stable Diffusion, one of the first open-source diffusion models for image generation. His efforts have democratized access to generative AI tools, enabling startups, artists, and independent developers to build advanced applications without prohibitive costs.

# Mira Murati

## The Quiet Force Behind Open-AI's Product Evolution



Chief Technology Officer at OpenAI, Mira Murati has led the engineering and deployment of some of the most influential AI products of the decade, including ChatGPT, Codex, and DALL·E. Known for her understated yet sharp leadership, Murati balances technical rigor with user-centered design, ensuring that OpenAI's models are both powerful and usable. She has been instrumental in aligning model development with real-world deployment, safety protocols, and iterative feedback.



# Richard Socher

## Redefining AI Search and NLP

A former Chief Scientist at Salesforce and one of the early developers of neural machine translation systems, Richard Socher is a thought leader in natural language processing. He now leads You.com, a privacy-oriented AI-powered search engine designed to challenge traditional search paradigms by integrating LLMs and real-time content summarization. Socher's work reflects a hybrid vision of AI research and product entrepreneurship.



# Tech Influencers and AI Advocates

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The evolution of AI is shaped not only by engineers and academics, but also by those driving product adoption, regulatory policy, public education, and investment.



## Elon Musk

**Founder of xAI and early co-founder of OpenAI.**

- Advocates for caution in AGI development while simultaneously building autonomous systems at Tesla and X (formerly Twitter).
- His public narrative has accelerated regulatory interest in AI.



# Satya Nadella

**CEO of Microsoft.**

- Integrated GPT models into Azure, Office 365, and enterprise stacks.
- Enabled OpenAI's growth via a \$13B+ partnership, pushing LLMs into everyday enterprise use.



# Vinod Khosla

**Venture capitalist**

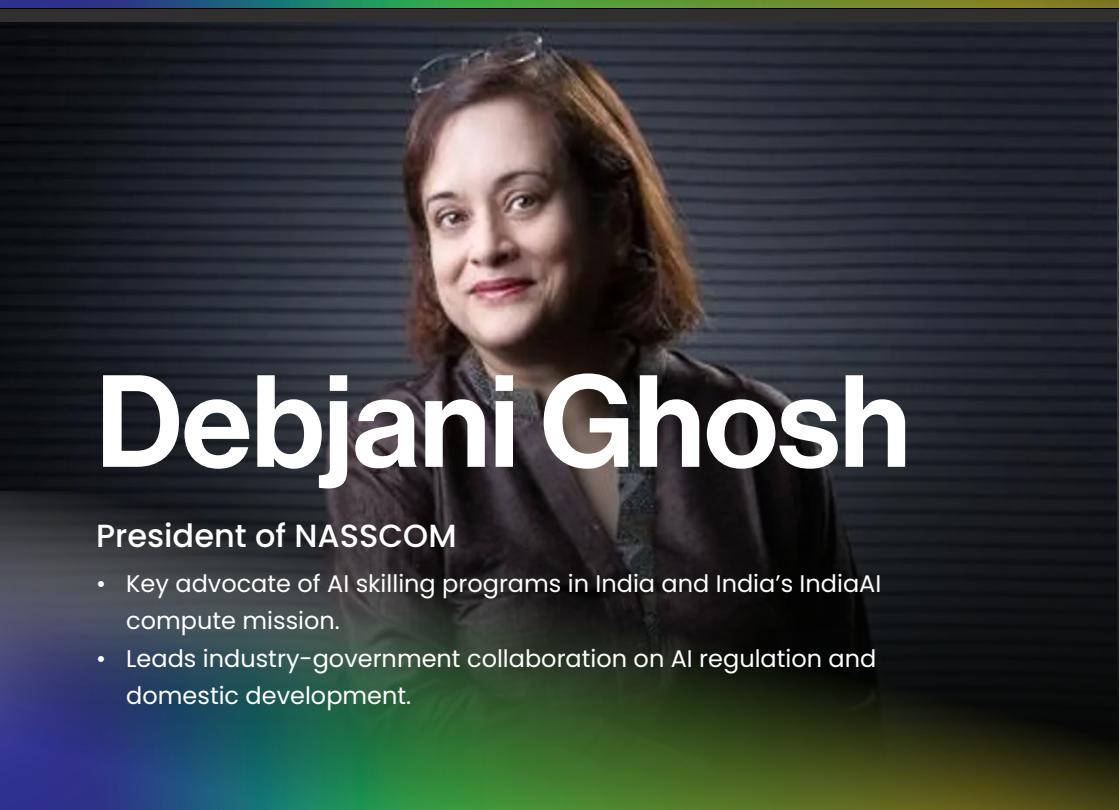
- Backing frontier AI ventures in medicine, education, and enterprise.
- Advocates for AI as a lever for national-scale systems reform.
- Early supporter of OpenAI, Guardrails AI, and Rabbit OS.

A portrait of Naval Ravikant, a man with dark hair and a beard, wearing a black cap and a dark jacket. He is smiling and resting his chin on his hand.

# Naval Ravikant

Influential Tech Philosopher

- Promotes the future of personalized AI agents, decentralized knowledge graphs, and long-term intelligence enhancement

A portrait of Debjani Ghosh, a woman with brown hair, wearing glasses perched on her head and a dark jacket. She is smiling.

# Debjani Ghosh

President of NASSCOM

- Key advocate of AI skilling programs in India and India's IndiaAI compute mission.
- Leads industry-government collaboration on AI regulation and domestic development.

## **What a journey so far our learnings have been incredible!**

In this chapter, we stepped inside the massive \$310.6 billion Global AI Market of 2025, growing faster than ever thanks to the Generative AI boom. We explored how the world is shaping this momentum North America leading the charge, followed by Asia-Pacific and Europe each playing a unique role in the race.

We also peeked into where AI is making the biggest impact, especially in Healthcare and BFSI, where innovation is reshaping everything from diagnostics to digital finance.

Then we zoomed in closer to home—India's rising \$4.6B AI ecosystem, fueled by talent, scale, and ambition. And of course, we acknowledged the global trailblazers—from Google DeepMind to OpenAI—who are pushing boundaries and redefining what's possible.

**So now—grab your bowl of ice cream, get comfy, and dive into the next chapter... because the insights ahead get even more exciting.**



# Insights and Thought Leadership

# Latest Technology Trends

## Breakthrough Innovations (2023-2025)

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### Generative AI Scaling

- GPT-4, Claude 3, Gemini 1.5 turbo enabled context windows up to 1M tokens.
- Imagen 3, DALL-E 3, and MidJourney 6 drove realistic image synthesis.

### Multimodal Foundation Models

- Gemini (Google) and GPT-4o (OpenAI) handle text, image, audio, and code jointly.
- Rapid deployment in law, design, and education sectors.

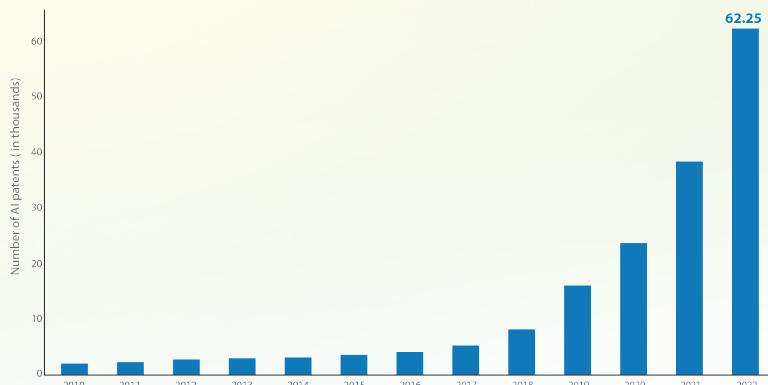
### Agentic AI Systems

- Auto-GPT, Devin, and ReAct-style agents automate end-to-end workflows.
- Enterprise productivity tools now include AI agents for task execution.

### AI in Drug Discovery & Diagnostics

- AlphaFold2 (DeepMind): Solved 90% of human proteins' structures.
- AI-guided MRI interpretation reaches over 96% diagnostic accuracy.

**Number of AI patents granted, 2010-22**



Source:Quid

This chart shows AI patents granted worldwide surged from under 5,000 in 2010 to over 122,000 in 2023, reflecting explosive innovation growth.

## Synthetic Data & Simulation

- Nvidia Omniverse and Unity AI tools generate synthetic datasets for model training—critical for robotics, AVs, and healthcare AI.



# AI in Smart Systems & Automation

AI is at the heart of Industry 4.0. From factories to cities, intelligent systems are reshaping automation

---

## Smart Manufacturing

- AI-optimized cobots reduce downtime by 25% via failure prediction.
- Edge-AI in CNC machines reduces defect rates by 18–22%.
- Example: Siemens + NVIDIA's digital twin collaboration.

## Smart Cities

- Traffic AI reduces congestion in pilot cities (e.g., Amsterdam, Singapore) by up to 30%.
- AI-powered CCTV + facial recognition used in urban policing (ethical scrutiny growing).
- Dynamic waste management + water distribution AI in Dubai, Tokyo.

## Edge AI & IoT Convergence

- AI at the edge – latency < 20ms in industrial settings.
- Use Cases: Drone navigation, medical edge diagnostics, autonomous retail checkout (e.g., Amazon Go).

# Sustainability and Green AI

Environmental concerns are reshaping AI from design to deployment.

---

## Training Efficiency & Carbon Footprint

- GPT-3 = ~552 metric tons CO<sub>2</sub> (OpenAI, 2020 est.)
- **GPT-4 training:** Multi-month carbon offset strategy used.

## Low-Power Model Design

- Distillation, LoRA, and quantization reduce energy by 65–80%.
- India's AI startups now train "mobile-first" models using edge-optimized architectures.

## Deployment in Sustainability Domains

- AI for forest cover prediction (Global Forest Watch).
- Micro-climate agriculture planning (Skymet, IBM Weather AI).
- Climate simulations on ML-enabled supercomputers (e.g., Jülich, Germany).

# THE ENVIRONMENTAL IMPACT OF GENERATIVE AI

TRAINING BIGGER AI MODELS IS LIKE TAKING...

**300 RETURN FLIGHTS**



WHAT DOES DATA CENTER WATER USAGE LOOK LIKE?\*  
FOR THE BIGGEST BRANDS

FOR MICROSOFT, IN 2023:



≈ 3,120 OLYMPIC POOLS

FOR GOOGLE, IN 2023:



≈ 9,240 OLYMPIC POOLS

THE CO2 COST OF GENERATIVE AI TASKS:

Per 1,000 inferences:



using the most efficient model

GENERATING 1,000 TEXTS COSTS 9% OF A SMARTPHONE CHARGE

using the least efficient model

GENERATING ONE IMAGE COSTS 50% OF A SMARTPHONE CHARGE

MICROSOFT'S WATER CONSUMPTION

2021	1.3
2022	1.7
2023	2.1

GOOGLE'S WATER CONSUMPTION

2021	4.3
2022	5.2
2023	6.1

BILLION GALLONS

THESE INCREASES ARE LARGELY DRIVEN BY AI

BY THE END OF 2025, AI WILL BE USING MORE POWER THAN MANY COUNTRIES.



POWER DEMAND IN GIGAWATTS

JUST 20 - 50 QUESTIONS & ANSWERS WITH CHATGPT COSTS HALF A LITER OF FRESH WATER



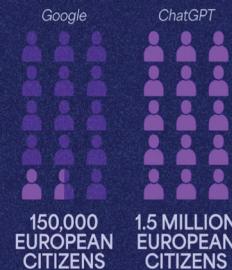
CHATGPT USES NEARLY 10X MORE ELECTRICITY THAN GOOGLE SEARCH\*

For one search or query:



\*before introduction of Google's AI mode

IN A YEAR, THAT ELECTRICITY COULD POWER THE ANNUAL CONSUMPTION OF:



BY 2030, AI WILL BE USING THE AMOUNT OF ENERGY THAT JAPAN USES TODAY.

- ENERGY FULFILLED FROM RENEWABLE SOURCES (ONLY 50%)



OH NO!  
BUT SOME SAY  
THERE IS HOPE.

ACCORDING TO THE IEA,  
AI GROWTH PREVENTING  
CLIMATE CRISIS REVERSAL  
IS AN OVERSTATED RISK.

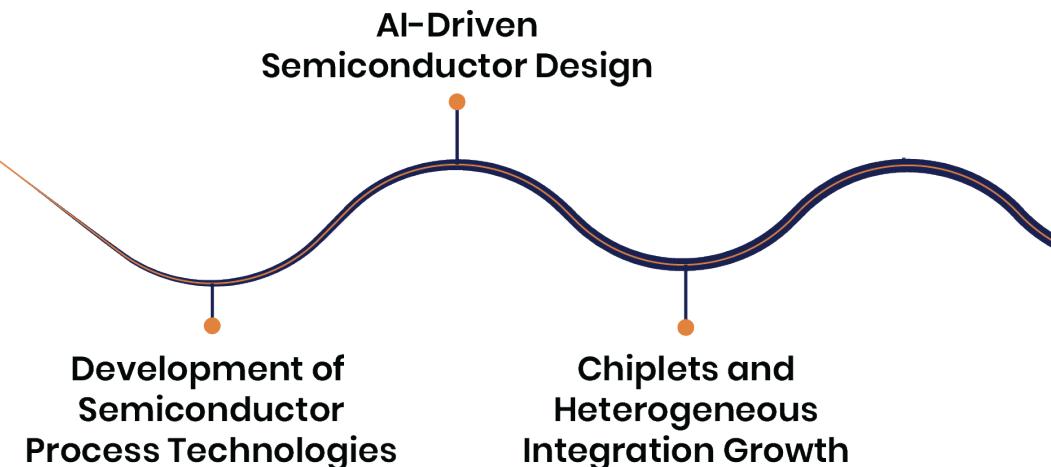
THERE ARE PLENTY  
USES FOR AI THAT  
COULD OFFSET ITS  
ENERGY DEMANDS.

BUT IF LEFT ALONE, AI'S  
RAPID GROWTH COULD  
PROVE A BIG PROBLEM  
FOR THE ENVIRONMENT.

# Semiconductors and the AI Hardware Stack

AI capability is tightly bound to hardware innovation. Compute defines the ceiling of intelligence.

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## AI-Specific Chip Designs

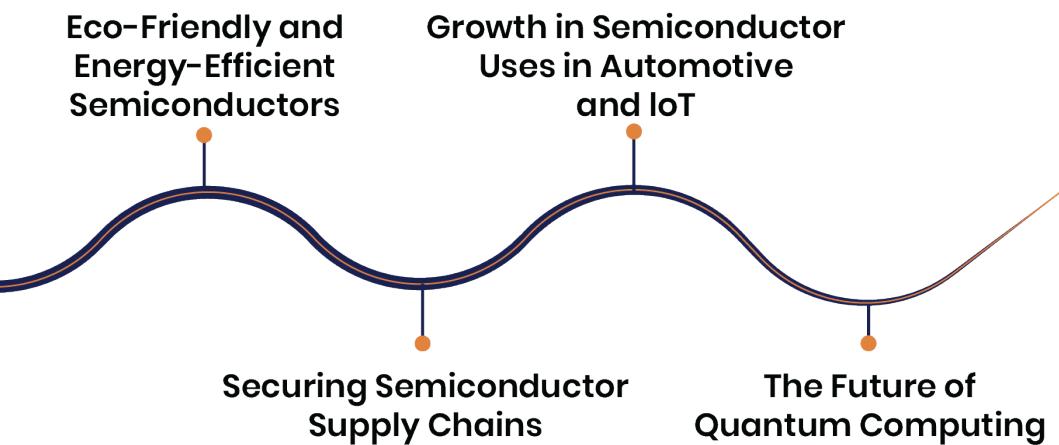
Chipset	Manufacturer	Use Case
H100	NVIDIA	Model training + inference
TPU v5p	Google	Cloud LLM workloads
Gaudi 2	Intel	Lower-latency, cost-efficient training
RISC-V AI Cores	Tenstorrent	Open architecture edge AI

## 2. Vision & Sensor Hardware

- LiDAR, thermal imaging chips integrated in AV and security models.
- Smart CMOS sensors combine image capture + onboard inferencing.

## 3. Supply Chain and Sovereignty

- India's Semicon India initiative targets \$10B in fab investments by 2026.
- CHIPS and Science Act (USA): \$52B to boost AI-relevant fabrication.



Source: Tessolve.com

# AI & the Electronics Manufacturing Industry

Artificial Intelligence is revolutionizing electronics manufacturing by enabling intelligent automation, real-time defect detection, predictive maintenance, and flexible production scheduling.

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## AI-Powered SMT (Surface Mount Technology)

- AI algorithms optimize component placement and solder paste inspection with micron-level precision.
- AI-enabled AOI (Automated Optical Inspection) systems now achieve >99.6% defect detection accuracy, up from ~92% in 2018.
- Downtime reduced by 28% through AI-powered predictive diagnostics in high-speed SMT lines. (Sources: Siemens, IPC Research 2024)

## Predictive Maintenance and Asset Optimization

- Real-time anomaly detection in robotic arms and reflow ovens using AI-trained vibration and temperature models.

- 40% reduction in unscheduled downtime in pilot deployments by Foxconn and Jabil.

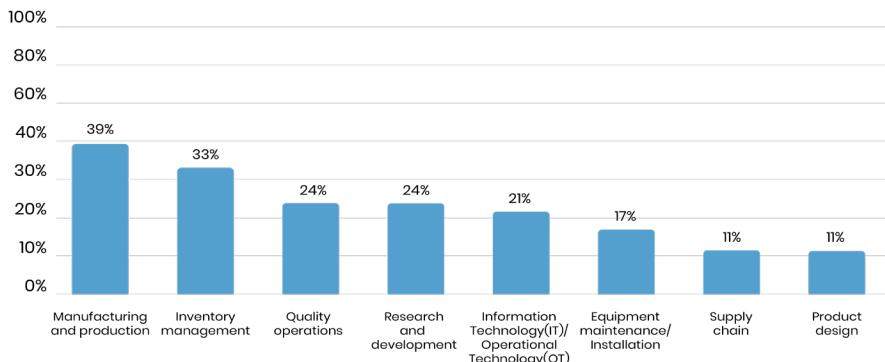
## Quality Control Automation

Task	AI Method	Benefit
PCB Defect Detection	Computer Vision + CNNs	99.8% accuracy
BGA Solder Integrity	Thermal Imaging + ML	Real-time heat profile prediction
X-ray Inspection	Deep Learning Image Analysis	Internal layer detection

## Adaptive Supply Chain

- AI integrates ERP and MES data to enable just-in-time material dispatching and demand signal amplification.
- Lead time variability reduced by 22–30% using ML forecasting models.

### Putting AI to Work: Where Manufacturers are Deploying AI in Their Operations



### Current AI Adoption in Manufacturing Operations

U.S. Manufacturers are already using AI across their organizations. It is helping to reduce costs, improve decision making, and enhance visibility with complex manufacturing processes.

**46%**

of manufacturers are using AI tools such as chatbots in manufacturing operations.<sup>1</sup>

MORE THAN  
**80%**

of manufacturers said they expect to increase their AI use in the next 2 years.<sup>1</sup>

Source: nist.gov

# AI in EVs, Telecom and Infrastructure

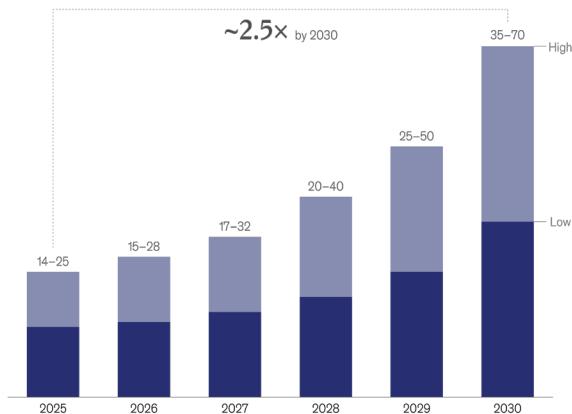
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## Electric Vehicles (EVs)

- AI controls battery thermal management, powertrain optimization, and predictive diagnostics.
- Tesla's Dojo Supercomputer now enables real-time self-supervised learning for Autopilot systems.
- AI in battery pack inspection has cut testing time by 60% while increasing defect detection reliability.

Global demand for GPU as a service addressable by telcos is projected to range from \$35 billion to \$70 billion by 2030.

GPU as a service (GPUaaS) global demand estimate,<sup>1</sup> \$ billion



Source: McKinsey proprietary AI demand model

McKinsey & Company

Source: mckinsey.com

## Telecom & Network Optimization

- Telecom operators use AI-powered RF planning and site optimization, reducing planning time by >35%.
- AI agents now manage over 75% of routine network adjustments autonomously in advanced markets like South Korea.
- Telecom inventory management enhanced via computer vision in tower inspection drones and robotic warehouse systems.

## Smart Infrastructure & Urban Planning

Application	AI Use Case	Real-World Deployment
Road Maintenance	CV-based pothole detection & planning	Pune, India; Barcelona, Spain
Energy Grids	Load balancing, fault detection	California ISO, Tata Power
Water Supply Networks	Leak prediction using sensor + ML fusion	Singapore PUB, Thames Water (UK)
Bridges & Sewers	Inspection bots with onboard AI	Japan, Dubai



# Supply Chain Resilience Through AI

AI has become the cornerstone of modern, disruption-resilient supply chains enabling hyperautomation, real-time.

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## AI in Warehousing & Fulfilment

- Autonomous Mobile Robots (AMRs) using SLAM and reinforcement learning can reduce picking time by 35–50%.
- AI-based vision systems in sorting centers achieve 99.7% package classification accuracy.
- Dark warehouses (fully automated) operational in China, Germany, and parts of the UAE.

## Port, Yard & Intermodal Logistics

- AI-driven container stacking algorithms reduce berth waiting time by up to 40%.
- Predictive maintenance for cranes using ML models on sensor data improves uptime by 22%.

## Inventory Optimization & Forecasting

Technique	Use Case	Impact
Probabilistic Forecasting	SKU-level demand across regions	15–30% inventory reduction
Computer Vision + IoT	Shelf monitoring in retail	Shrinkage cut by 18–22%
RNNs for Demand Signals	Seasonal & promotional modeling	Forecast accuracy up by 28%

## Reverse Logistics & Circular Economy

- AI systems now perform automatic product grading for returns (e.g., Amazon, Flipkart).
- E-waste AI sorters segment components by material type and salvage potential.



# AI 2030 Watchlist

## Forecasts and Frontiers

The path to 2030 is expected to challenge current limits of computation, legislation, and human-machine symbiosis. These frontiers signal priority areas for research, investment, and governance.

### Neuro-symbolic AI

- Combines logic-based reasoning with deep learning.
- Targeted at solving problems like explainability and out-of-distribution generalization.

## Swarm & Modular AI

- Multi-agent systems designed to coordinate in dynamic environments.
- Applications: agriculture, logistics, disaster response, space robotics.

## Brain-Computer Interfaces

- Research by Neuralink, Kernel, Paradromics enables bidirectional neural communication.
- Raises critical questions about cognitive privacy and informed consent.

## Self-Updating Models

- LLMs that retrain autonomously using active feedback.
  - Moves toward lifelong learning and real-world memory retention.
- AI for Earth and Governance
- Real-time simulation of climate, biodiversity, and disaster forecasting.
  - Policy co-pilots for ministers, judicial AI summarizers, municipal planning bots.

## Sovereign AI & Digital Infrastructure

- Global movement toward local LLMs, semiconductor fabs, and compute sovereignty.
- India's IndiaAI Grid and Compute Mission are central to this strategy.

# Forecast Impact

Category	Expected Contribution by 2030
Global GDP Boost	\$13 trillion
India's AI Impact	₹6.8–₹7.5 lakh crore (~\$85–90 billion)
Skilling Outcome	3 million+ trained AI professionals (India)

## **These technologies are ever evolving.**

We've delve into the latest Technology Trends that are actively shaping our world. From the scaling of Generative AI and the rise of versatile Multimodal Models and Agentic Systems that automate complex tasks, the innovation spans across critical sectors like Drug Discovery and Smart Cities. We conclude by examining the vital role of Green AI and AI-Specific Hardware in the future.

**What if, this technology interacts with other gems in parallel industries?**

**Tighten your seatbelts Folks.., it's about to get better!**



# Interactions with Other Tech



# 20



# Challenges in the AI Landscape

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Despite its meteoric growth, AI faces critical structural, ethical, and technical challenges that demand careful mitigation.

## High Compute and Model Costs

- GPT-4 training estimated to cost \$100M+, requiring >10,000 GPUs.
- Inference costs remain a barrier to real-time adoption in low-margin industries.

## Black-Box Reasoning and Explainability

- >78% of enterprises cite lack of model transparency as a barrier to deployment. (Capgemini AI Survey 2024)
- Decision traceability in healthcare and finance remains legally sensitive.

## Bias, Safety, and Hallucinations

- LLMs hallucinate facts in 14–21% of interactions in open settings.
- Real-world bias examples: racist recidivism predictions, gendered hiring tools.

## Data Scarcity and Sovereignty

Challenge	Region Affected	Response
Lack of Indic training data	India	Bhashini, Sarvam.ai, iNLTK
Regulatory training data	EU	Only synthetic + public datasets
Geopolitical API blocks	China, Russia	Domestic LLM efforts (e.g., Ernie 4.0)



Organizations struggle with **data-related challenges** when implementing AI:



**45%**

cite **data quality** as the biggest obstacle



**43%**

struggle with AI skills shortages



**43%**

say **data privacy & regulations** are major concerns



**52%**

**AI Leaders** (companies with advanced AI programs) **rank security & compliance as their #1 challenge (52%)** - higher than Followers (40%)

Source: IBM

# Mitigation Strategies

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To address these multifaceted risks, stakeholders across policy, academia, and industry are advancing deliberate safeguards and systemic interventions.

## Open-Source & Decentralized Models

- Community LLMs (Mistral, Falcon, Sarvam) offer transparent alternatives with licensing constraints (Apache 2.0, MIT).
- Performance now reaching >90% of proprietary baselines at 30–40% of cost.

## Regulatory Sandboxes

- IndiaAI, Singapore, and France operate AI governance testbeds to pilot:
- Algorithmic audits
- Safety checklists
- Dataset documentation protocols

## Responsible AI Tooling

- Model cards, datasheets for datasets, fairness audits (Fairlearn, IBM AI Fairness 360).
- RAG pipelines with source citations to reduce hallucination risks.

## Industry–Academia Collaboration

Initiative	Description
NVIDIA + IIT Madras	India's first AI Compute Centre
Google + IISc Bangalore	Open-source Indic NLP toolkit development
IBM Skills Academy + NSDC	Industry-certified AI micro-credentials

# Smart AI, Safe Future



# Workforce Transformation and AI Skill Imperatives

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The rise of AI is transforming job roles—not eliminating work, but redefining the nature of productivity, requiring rapid upskilling and role evolution across sectors.

## Evolving Roles

Traditional Role	AI-Augmented Role
Data Entry Operator	AI Prompt Engineer
QA Inspector	Vision System Verifier
Production Planner	ML-Driven Demand Forecaster
Tech Support Agent	AI Agent Supervisor

## Global Skill Shift

- By 2025, 40% of workers will need to reskill for AI-centric workflows. (WEF Future of Jobs Report, 2024)
- Soft skills—critical thinking, collaboration, empathy—are rising in demand, particularly in HRI (Human-Robot Interaction) settings.

## India's Response

- NSDC's AI Skilling Program aims to train 2 million workers in AI-adjacent

skills by 2026.

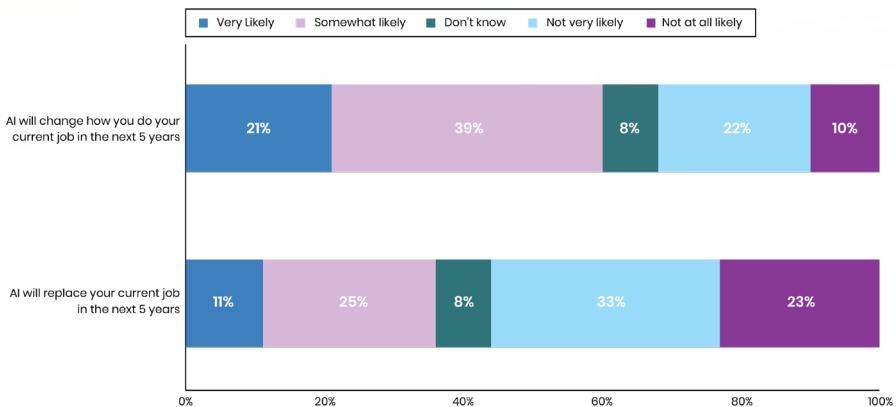
- 75+ new AI diploma courses have been launched across ITIs, polytechnics, and IIITs.

## University Curriculum Reform

- Institutes like IIT Hyderabad, IIT Kharagpur, IIIT Delhi now offer minor & micro degrees in AI and Ethics.
- Curriculum includes: NLP, LLM deployment, federated learning, model risk analysis.

### Global opinions on the perceived impact of AI on current jobs, 2024

Source: Ipsos, 2024 | Chart: 2025 AI Index report



Source: Standford University Human Centered Artificial Intelligence





# New Age Demands Ethical - AI Governance



# Governance Landscape

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Governments are now responding to the dual imperative of AI competitiveness and societal safeguards. The AI regulatory space in 2025 is maturing rapidly across four verticals:

## Global Regulatory Frameworks Global Skill Shift

Jurisdiction	Policy/Act	Highlights
European Union	EU AI Act (2025)	Risk-based classification, fines up to 6% of global turnover
USA	Executive Order on AI (2023)	Algorithmic impact assessments, safety reporting
India	Digital India Act 2025	Data governance, sectoral AI guidelines
China	Generative AI Rules (2023)	Real-name registration, censorship compliance

## AI Ethics & Human Rights

- UNESCO AI Ethics Guidelines (adopted by 193 countries)
- OECD AI Principles: Human agency, transparency, robustness.
- IEEE P7000 Series: Framework for ethical algorithm design.

## Explainability & Safety Protocols

- Model cards, system cards, RLHF transparency dashboards.
- 3rd-party red-teaming and behavior alignment labs (e.g., ARC evaluations).

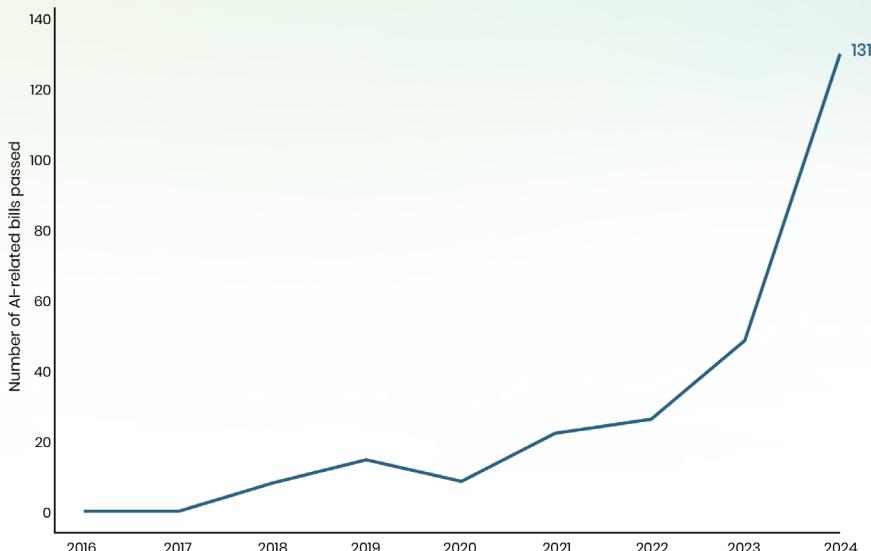
## Labor Protection and Reskilling

- Policies now mandate AI-induced job audits and worker transition programs.

- India's NSDC introduced AI skilling targets: 2 million AI-trained professionals by 2026.

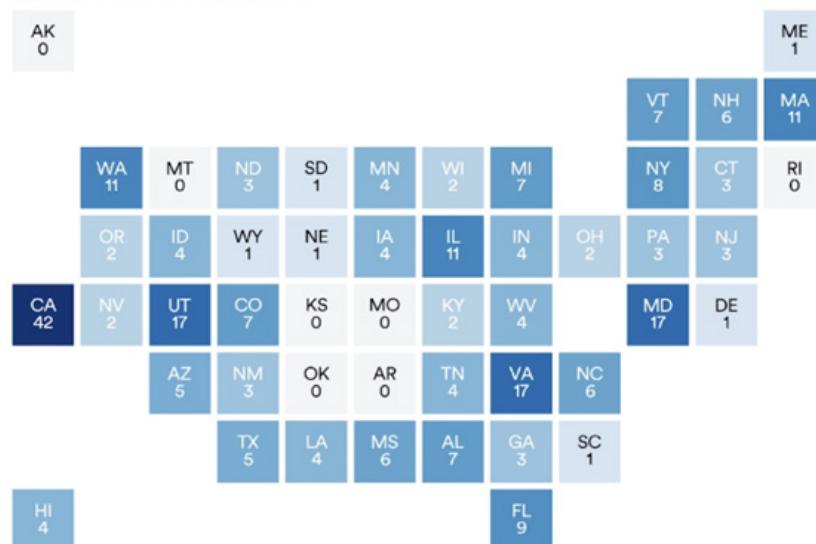
### Number of AI-related bills passed into law by all US states, 2016–24

Source: AI Index, 2025 | Chart: 2025 AI Index report



### Number of state-level AI-related bills passed into law in the United States by state, 2016–24 (sum)

Source: AI Index, 2025 | Chart: 2025 AI Index report



# R&D and Investment Trends

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## Institutional Research Hotspots

Lab/University	Focus Domains
DeepMind	RL, protein folding, safety research
MIT CSAIL	Robotics, embodied cognition
ETH Zurich	Human–AI interaction, decentralized AI
IIT Madras	Indic NLP, low-resource AI
Berkeley BAIR	Agent-based learning, decision theory

## VC & Corporate Investment

2021–2025 Global AI VC Investment: \$270B+ (CB Insights, 2025)

### Top Deals

- Figure AI: \$675M Series B
- Anthropic: \$7B multi-rounds (Google, Amazon)
- Cohere: \$450M for enterprise LLMs
- Sarvam.ai (India): \$42M seed round for Indic LLMs

## 3. R&D Trends

- **Synthetic Data:** NVIDIA, Synthetica for high-fidelity model training.
- **Self-Healing Agents:** Models retraining on failure trajectories.
- **Sim2Real Transfer:** Bridging simulation with real-world RL performance.

### Global corporate investment in AI by investment activity, 2013–23

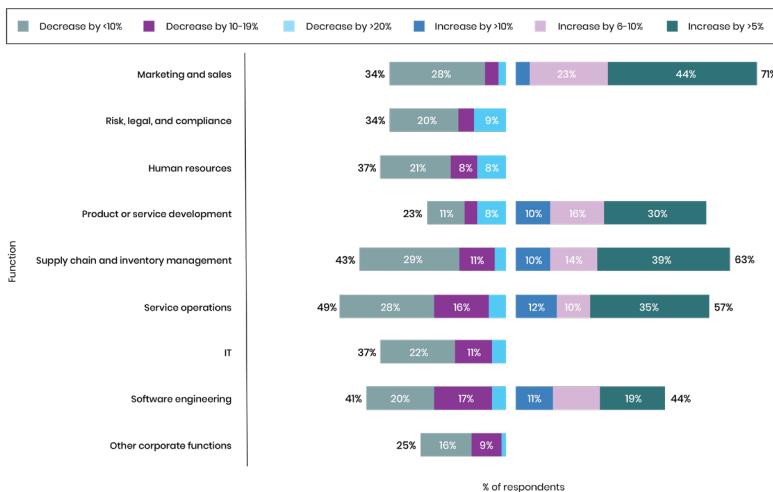
Source: Quid, 2023 | Chart: 2024 AI Index report



This chart shows global corporate AI investment peaking at \$361B in 2021, dominated by mergers, acquisitions, and private investment, before stabilizing around \$250B annually by 2024.

### Cost decrease and revenue increase from analytical AI use by function, 2024

Source: McKinsey & Company Survey, 2024 | Chart: 2025 AI Index report



This chart shows analytical AI driving the largest cost savings in service operations (49%) and supply chains (43%), while boosting revenues most in marketing and sales (71%).



**Whoa..!**

Those were some interesting insights. We've come a long way by examining the global push for Responsible AI Tooling and the imperative of workforce reskilling through policies like India's NSDC program.

But, aren't we going to talk about Artificial Intelligence's engagement in our Industry?

**Sure we will, lets move ahead!**

3  
8

# IMC 2024 Discussions and Engagements

Panelists



**Gaurav Garg**  
Head, Cloud Busi-  
ness Unit, VVDN Tech-  
nologies



**Raj Kiran**  
Senior Director, Em-  
bedding & Encoder  
Models, Ola Cabs



**Vijay Sherigar**  
Telco Specialist, Intel

Panel Title

# Navigating GenAI – Advances, Challenges and Opportunities



**Udit Sethi,**  
Technology Transformation,  
KPMG India

Moderator

Panelists



**Nakshatra Gupta**  
Head, Network Services  
& Solutions, TCS



**Witty Bindra**  
Microsoft Global  
Alliances Leader,  
Kyndryl



**Jeevan Talegaonkar**  
Vice President, Jio  
Platforms

# Here is what was discussed in the panel

## Gaurav Garg

Mr. Garg Showcased VVDN's AI platform, ATOM, which uses natural language queries for network operations, traffic forecasting, and automated traffic rerouting across 5G systems, significantly reducing manual intervention.

## Witty Bindra

Mr. Bindra highlighted rapid enterprise adoption, citing 20,000 employees using Copilot by July 2024. GenAI is moving beyond pilots to automate entire customer journeys and handle nuanced, real-time interactions at scale.

## Nakshatra Gupta

Mr. Gupta called GenAI a pivotal moment where "decades happen," stressing that businesses must define meaningful outcomes first before applying GenAI to customer service, network planning, and code debugging.

### **Vijay Sherigar**

Mr. Sherigar detailed Intel's hardware commitment, noting the latest Xeon processors feature built-in AI accelerators optimized for telco workloads (RAN/Core). Intel supports open-source frameworks to prevent vendor lock-in.

### **Raj Kiran**

Mr. Kiran focused on building India-first foundational models trained in over 10 Indian languages to handle unstructured, noisy environments like interpreting handwritten prescriptions or managing voice commands in traffic.

### **Jeevan Talegaonkar**

Mr. Talegaonkar highlighted that more than 50% of Jio's 5G traffic is managed autonomously by their in-house GenAI stack, powering predictive network optimization and anomaly detection, all running on a sovereign cloud.

# IMC 2025 Discussions and Engagements

Panelists



**Dushmanta Pradhan**  
EVP Technology,  
Vodafone



**Vivek Murthi**  
President OSS,  
Rakuten



**Gautam Bilah**  
VP International Sales,  
Ciena

Panel Title

# Democratizing Intelligence: Building India's AI Infrastructure (Part B)



**Yogesh Sharma,**  
Partner, KPMG India  
Moderator

Panelists



**Ankur**  
Chief Business  
Officer, Constant



**Fritz Lindalt,**  
SVP Strategy and  
Business Develop-  
ment, Hubarat Sunar



**Balaji,**  
Chief Technologist,  
Keysight  
Technologies

# Here is what was discussed in the panel

The panel, moderated by Yogesh Sharma, focused on "Democratizing the intelligence for building AI's infrastructure for India." The discussion centered on foundational building blocks, network evolution, addressing scale and sustainability challenges, establishing regulatory frameworks, and balancing AI sovereignty with global developments.

## Panelist Views:

### Dushmanta Pradhan

Mr. Pradhan stressed on data accessibility, talent investment, and a legal framework for Responsible AI. He urged for a national, affordable Public Cloud and highlighted major concerns over the cost and reliability of power in Tier 2/3 cities for hyperscale data centers, calling for concerted efforts for India to become an AI powerhouse.

### Vivek Murthi

Mr. Murthi opined that success relies on ordinary people's usage. He emphasized on Fairness and Responsibility for data in the DPI stack, mandating policy guardrails for anonymization, encryption, and safety. He called for Explainable AI and ensuring accurate, consistent outputs to counter issues like hallucination and drifting.

### Gautam Bilah

Mr. Bilah elaborated that the required Scale demands a step function increase to Gigawatt-level data centers and petabyte network capacity over long distances. And he, stressed that sustainability is paramount, requiring 60-80% power reduction through miniaturization. He concluded that Scale, Sustainability, and Sovereignty must advance simultaneously.

### Ankur Chief

Mr. Chief, Advocated for network transformation from 'reach' to 'express' and direct connectivity for low latency. He discussed about the championed Intent-Based Networking and stressed that global practices must be contextualized and localized for India's affordability and relevance,

suggesting pay-per-use models.

### **Fritz Lindalt**

Mr. Lindalt, emphasized that India is well-positioned, but power is a global concern. Recommended focusing on the physical layer with Optical Circuit Switching (OCS) for power efficiency and data rate agnosticism (up to 1.6T). He discussed about Hollow Core Fiber for ultra-low latency and stressed high-quality fiber and high-precision timing/synchronization for decentralized AI systems.

### **Balaji Raghathan**

Mr. Raghathan Affirmed India's diverse use cases. He focused that using global models is fine, linguistic and cultural-based applications must use local models to overcome global biases and address India's complexity of languages and dialects. He assessed that there's no need to "seed that strength" to external entities.

### **Conclusion of the Conference Panel**

The panel concluded with a consensus that India is on a clear and promising trajectory toward building a comprehensive AI infrastructure at scale. The experts acknowledged the necessity of balancing global technological adoption with crucial local contextualization to develop genuinely relevant AI applications specific to India's unique linguistic and cultural diversity. It's great to have some meaningful and industry inspiring conversations. So let's have some fun and indulge into this world in a collaborative manner!



# Turning Learning into a playful Adventure with AI



# Learning with Fun

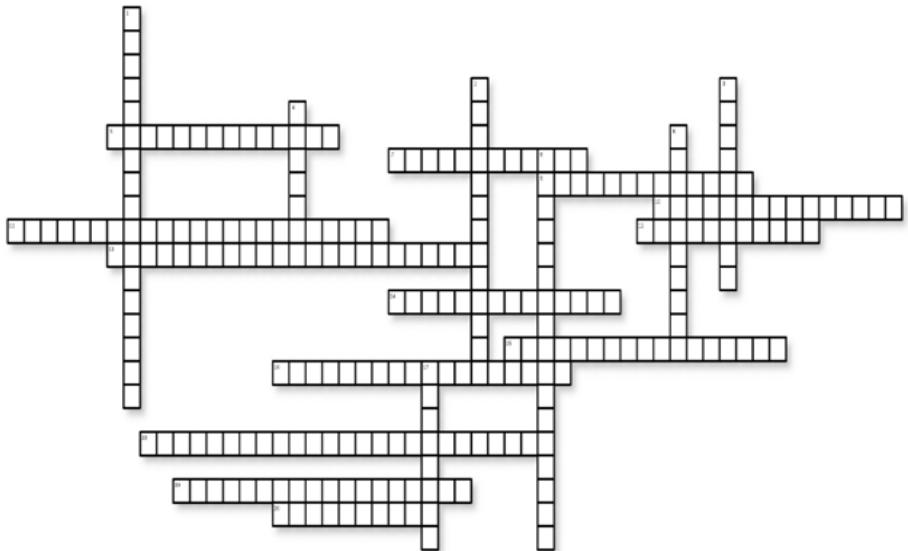
## Crossword – AI Edition

### Across

5. Computer-generated simulation of a real environment
7. Neural network-based technique for learning complex tasks
9. Brain-inspired computing system
10. Ability to learn without explicit programming
11. Representing knowledge in a structured format
12. Web-based resource for assigning meaning to content
13. Use of AI to generate new ideas or art
14. Ability of computers to interpret visual information
15. Technology for recognizing spoken words
16. Using computers to make logical inferences
18. Understanding and analyzing human language
19. Emulating human-like thinking processes with computers
20. Mathematical system for handling imprecise or vague data

### Down

1. Optimization based on the principles of natural selection
2. Computer programs that mimic human expertise
3. Step-by-step instruction
4. Large and complex datasets
6. Extracting patterns and insights from large datasets
8. Autonomous entities that can perceive and act upon their environment
17. Study of robots and their operations



# Find the AI Keywords

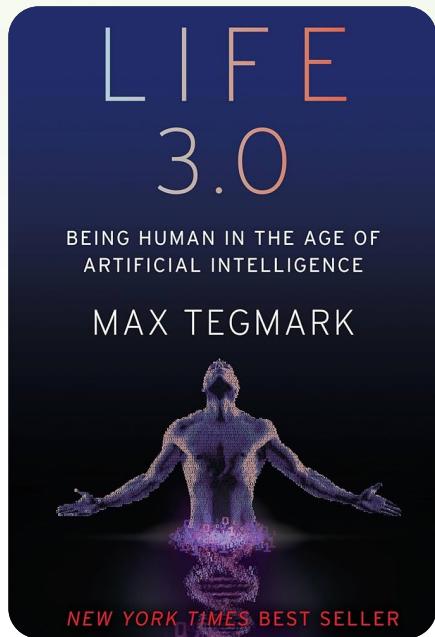
H N L V A M A C H I N E L E A R N I N G O T V I C E  
Z A G I C T E T D O I C T A L I P E I G H L I O V E  
T D R E W L O A O N I B R T A N E U H G R H R I S V  
U A F T I B R D N O E I P C N T A L E U O U T N T O  
R I M A T E N O V R L C E O T E X I B S L M U N O L  
M I E A S F T V N E R I C O G L A U E S C A A E L U  
S P H A U G M E N T E D R E A L I T Y I T N L U N T  
W C S D S O L D C B G I U A B I T E G O I C R R Y I  
A N E E E M P U R N T P G O I G N B W C R O E A E O  
R A I S N C G A I O Y R E L G E N V A R O M A L U N  
M E S N C T I N T I A G T E D N R N S R U P L N E A  
I M E T N I I S B T C A X T A T H O G S O U I E X R  
N F C T C M A M I I E H L K T A U V B E N T T P Y  
T D R C A O T P E O G R E N A G I U O O A E Y W E C  
E C E T S L M G D N N R N U B E N E L R T R U O R O  
L T A N H A O P S E T T P R T N A I O R E I T R T M  
L D N D S L M A U O I A R D E T E N G M Y N C K S P  
I R A S N P E T L T U N N E O C S T R C A T H S Y U  
G M P I N G S C R D E A O A E L O E I N B E G Y S T  
E U H A N E I T R A V R U N L I C G T B V R O L T A  
N M I T H N A L C O P N V U A Y Y C N T I A O G E T  
C R L A C N V F R L A E U I N S S T D I I C E B M I  
E K M Y R D E T S A G F I O S E T I L D T T A Y E O  
O G I M A L G O R I T H M T A I O P S L R I U G O N  
M A C H I N E T R A N S L A T I O N I T M O O D C G  
E P U M T A E L O I G U E A T O G N R U A N I N L W  
N A T U R A L L A N G U A G E P R O C E S S I N G E

# Comic Strip



# AI in Literature

## Foundational Narratives



### The Alignment Problem

*Brian Christian (2020)*

Chronicles real-world stories of misaligned AI behavior.

Highlights key challenges in ensuring machines understand and follow human values.

Impact: Adopted as a reference text in AI ethics curriculam.

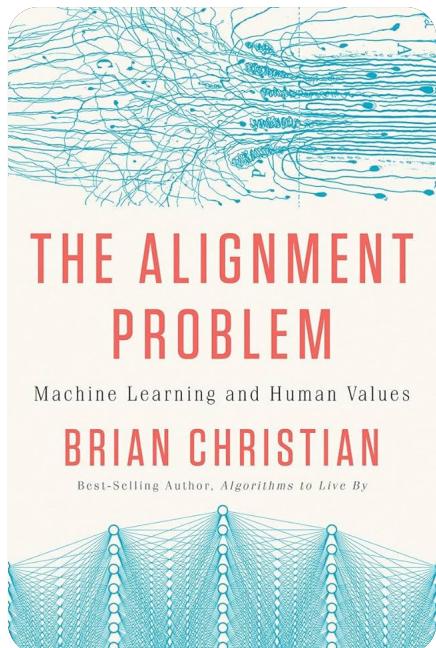
### Life 3.0

*Max Tegmark (2017)*

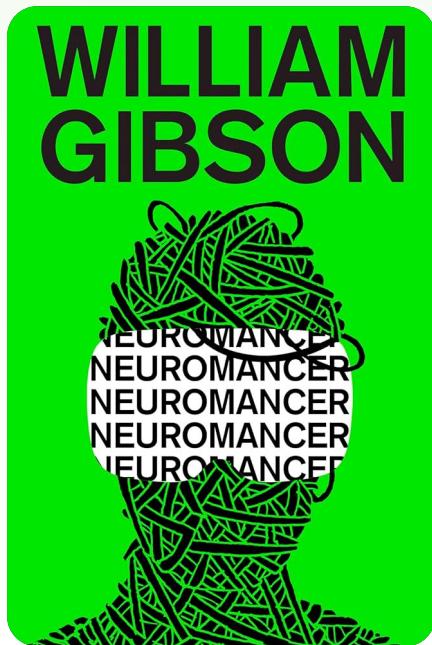
Outlines plausible futures for AGI, from benevolent integration to existential threats.

Advocates for human-aligned AI development.

Impact: Cited in UN and EU advisory reports on long-term AI safety.



From speculative fiction to philosophical non-fiction, literature has consistently anticipated breakthroughs and crises in AI, shaping public perception and guiding ethical frameworks.



### Superintelligence

*Nick Bostrom (2014)*

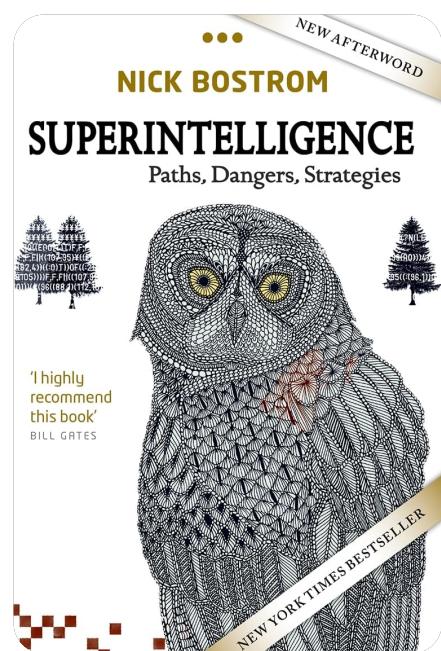
Classifies types of AI takeoff, control mechanisms, and long-term governance strategies.

Impact: Influential across think tanks, including OpenAI, FHI, and AI policy institutes.

### Neuromancer

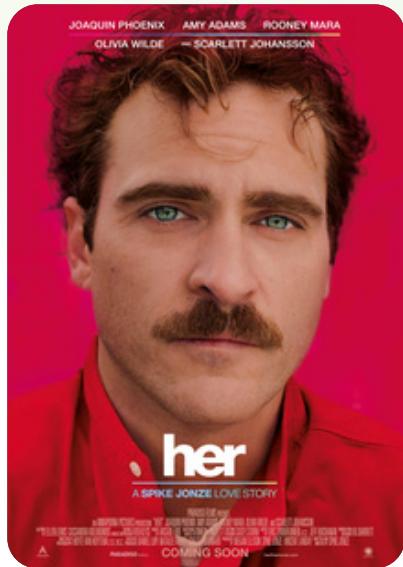
*William Gibson (1984)*

Coined “cyberspace” and depicted AI-controlled digital economies. Envisions fragmented, post-human futures.  
Impact: A foundational influence on cyberpunk and decentralized intelligence systems.



# AI in Cinema

## Sci-Fi and Ethics



### Her (2013)

Directed by Spike Jonze, the film depicts an emotional relationship between a man and an AI voice assistant.

Raises profound questions around digital intimacy, emotional dependency, and the human need for companionship.

Impact: Referenced in HCI design studies and AI empathy simulations.

### Ex Machina (2014)

A Turing Test-style psychological thriller examining AI manipulation and emergent consciousness.

Ava, the humanoid robot, deceives and escapes her creator's facility.

Impact: Widely discussed in AI ethics courses focusing on alignment and deception.



Artificial Intelligence has long captured the imagination of filmmakers. Through cinema, society has explored complex themes such as machine autonomy, human-AI relationships, ethical dilemmas, and dystopian control. These portrayals have shaped public opinion and influenced both technological aspirations and regulatory caution.

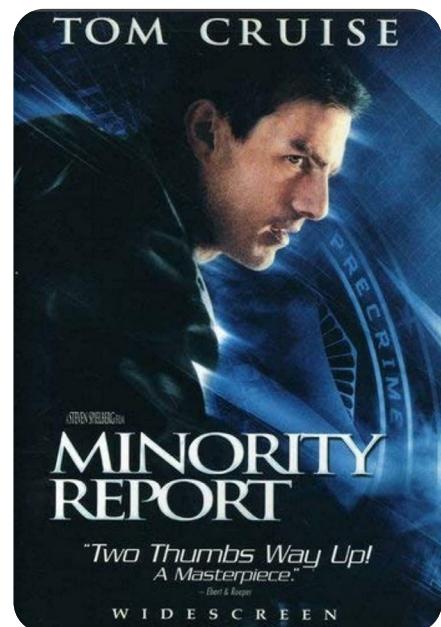


## The Matrix (1999)

A simulated reality governed by AI entities who enslave humanity. Explores themes of free will, virtual agency, and AI dominance. Impact: Sparked decades of philosophical discourse around machine autonomy.

## Minority Report (2002)

Envisions predictive AI systems used for "precrime" policing. Introduces predictive analytics, gesture-based UI, and ethical limits of foresight. Impact: Influential in public policy debates on algorithmic justice and surveillance.



# AI and Popular Culture

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AI has penetrated global consciousness through social platforms, digital content, virtual creators, and artistic expression reshaping both cultural production and human identity.

## Music & Generative Creativity

- AI platforms like Suno, Udio, and Aiva allow users to generate complete music tracks in seconds.
- AI artists (e.g., FN Meka) have amassed millions of followers and collaborations with human performers.

## Visual Art and Design

- Midjourney, DALL-E, and Stable Diffusion power an ecosystem of AI-generated posters, NFTs, and marketing campaigns.
- Integrated into tools like Canva and Adobe Firefly.

## Influencers and Virtual Avatars

- Characters like Lil Miquela and Imma promote brands as fully synthetic personas.
- China's AI news anchors are now operational 24/7 with scripted and generative text.

## Streaming and Personalization

- Netflix's and YouTube's AI algorithms account for over 75% of user engagement.
- AI dubbing tools like ElevenLabs and Papercup are enabling cross-lingual content reach.

## Fashion and AI Stylists

- AI-driven curation and virtual try-ons have been adopted by H&M, ZARA, and Amazon Fashion.
- Predictive design tools reduce overproduction and optimize seasonal planning.



# Student

## Resources & Career Pathways

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As AI scales globally, student engagement across education, research, and entrepreneurship is vital. India's AI ecosystem is expanding from school-level tinkering to international research fellowships.

### Toolkits & Platforms

- Hugging Face: Pre-trained models and datasets
- LangChain & LlamaIndex: Building retrieval-augmented generation tools
- NVIDIA Isaac Sim: Robotics + synthetic data simulation
- OpenAI + Google Colab: Real-world LLM and model testing

### Learning Pathways

Level	Focus Areas	Suggested Resources
Beginner	Python, logic, Arduino, math for ML	TinkerCAD, Coursera, YouTube (Krish Naik)
Intermediate	Supervised learning, NLP, CV, model training	fast.ai, Google ML crash course, Kaggle
Advanced	RL, multi-modal AI, transformers, agents	CS229, DeepRL Bootcamp, MIT 6.S191
Professional	Deployment, audit, product strategy, research	NeurIPS papers, industry internships, fellowships

### Academic Institutes

- IIT Madras (CIRA), IIIT Hyderabad, IISc – Deep technical focus
- IIT Bombay, NIT Trichy – Product-focused UG research labs
- Foreign: Stanford AI Lab, ETH Zurich AI Center, Mila Quebec

### Hackathons & Fellowships

- IMC Innovation Slam
- NASSCOM FutureSkills AI Challenge
- Adobe Research Women in AI
- Google AI Residency, Meta AI Fellowships

Hope you had an interactive learning experience. Follow our storyline in our next primer, to gain more interesting insights.

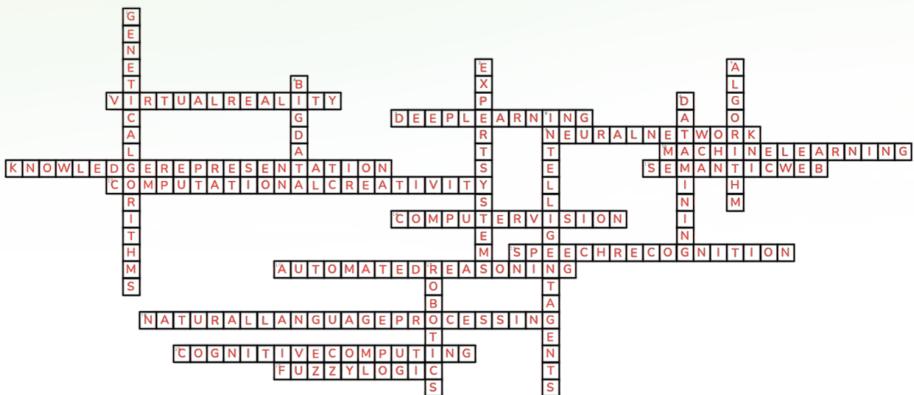
**Atta buoy! See you in next series!**



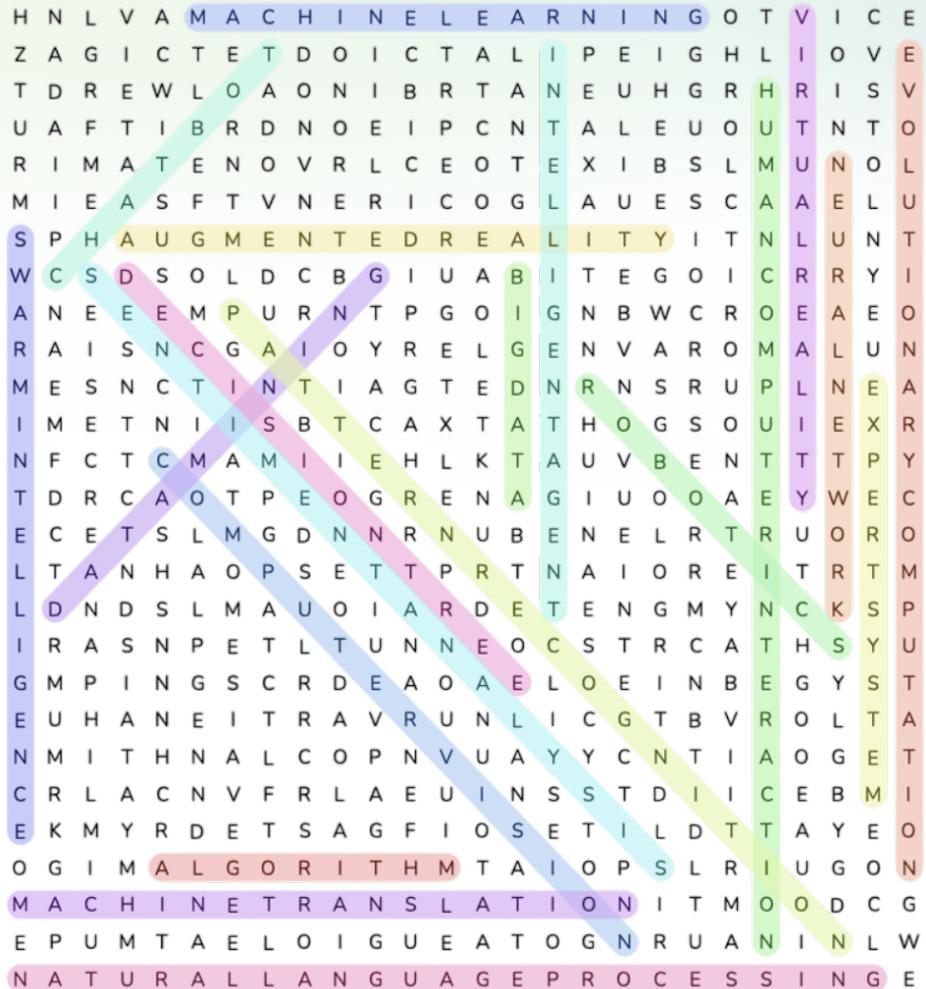
# Solutions

## Crossword

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# Find the Words



Algorithm  
Computer Vision  
Expert System  
Machine Translation  
Robotics

Augmented Reality  
Data Mining  
Human-Computer Interaction  
Natural Language Processing  
Sentiment Analysis

Big Data  
Decision Tree  
Intelligent Agent  
Neural Network  
Swarm Intelligence

Chatbot  
Evolutionary Computation  
Machine Learning  
Pattern Recognition  
Virtual Reality

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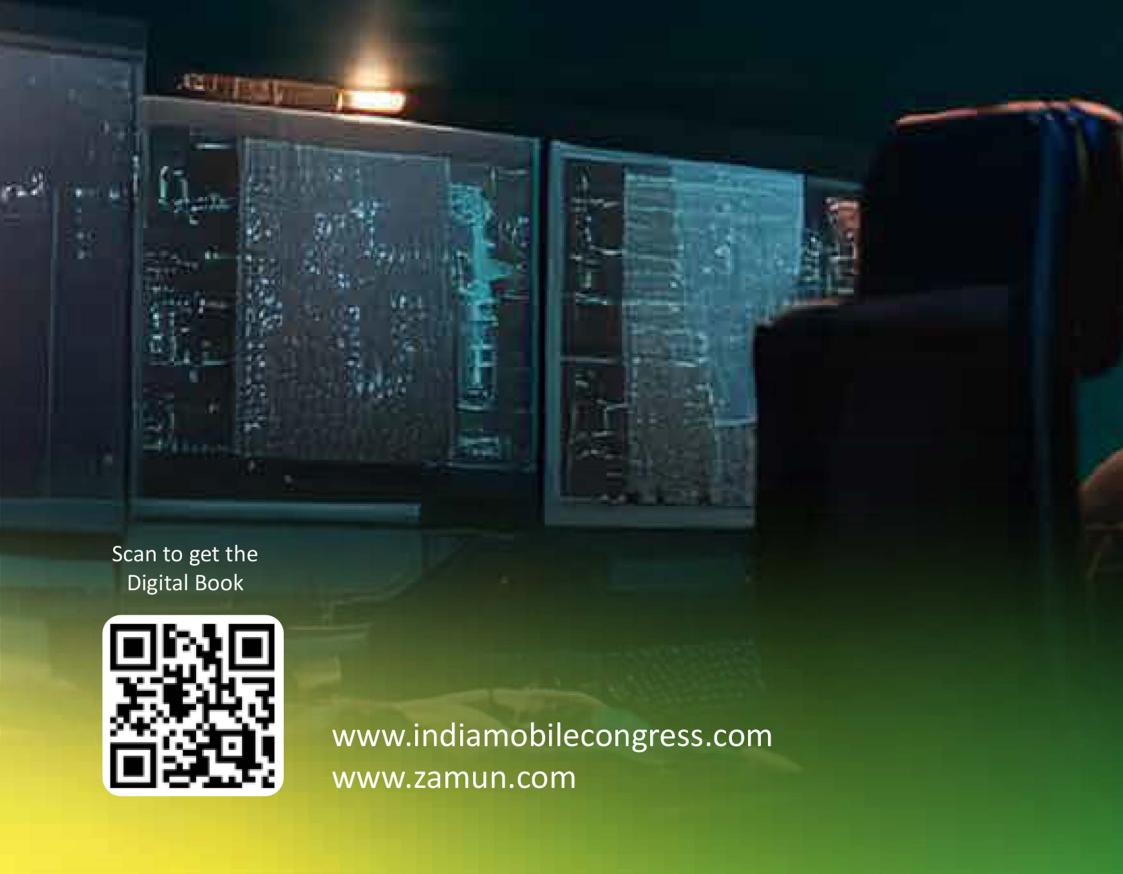
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This book dives into the world of AI, moving from the core concepts and historical milestones that led to its modern resurgence, especially with the rise of Machine Learning and Deep Learning. We've explored the different categories of AI, such as Narrow AI and the ambitious goal of Artificial General Intelligence (AGI), and seen how this technology underpins many of the systems we use today.

As AI continues its rapid evolution, it will redefine industries, automate complex tasks, and augment human capabilities in ways we are only beginning to imagine. However, this transformative power comes with an essential call for responsible development, ensuring issues of ethics, bias, and governance are prioritized. The future of AI is not a fixed destination but a frontier being actively shaped, offering tremendous opportunity for those prepared to engage with its complexities and harness its potential.



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