
INTRODUCTION TO
GENERATIVE AI

Dr. Avinash Kumar Singh

- **Possess** 15+ years of **hands-on expertise** in Machine Learning, Computer Vision, NLP, IoT, Robotics, and Generative AI.
- **Founded** Robaita—an initiative **empowering** individuals and organizations to **build, educate, and implement** AI solutions.
- **Earned** a Ph.D. in Human-Robot Interaction from IIIT Allahabad in 2016.
- **Received** postdoctoral fellowships at Umeå University, Sweden (2020) and Montpellier University, France (2021).
- **Authored** 30+ research papers in **high-impact** SCI journals and international conferences.
- Unlearning, learning, making mistakes …

https://www.linkedin.com/in/dr-avinash-kumar-singh-2a570a31/

eClerx Services Limited

Course Overview

Generative AI Curriculum

Lecture 1: Introduction to Generative AI

Lecture 2: Gen AI Business Applications – Part 1

Lecture 3: Gen AI Business Applications – Part 2

Lecture 4: Analytical Thinking & Technical Foundations of Gen AI

Lecture 5: Ethics, Legal & Regulatory Aspects of Gen AI

Lecture 6: Gen AI for Personal & Company Branding

Lecture 7: Creative Thinking & Industry Use Cases

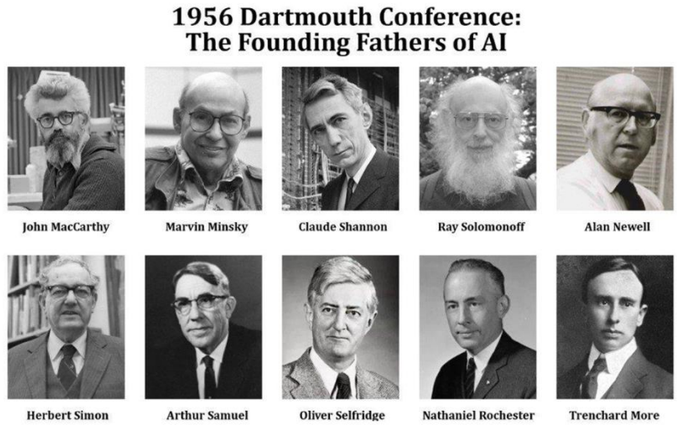
Lecture 8: Connecting the Dots – Leadership Strategies in the Age of Gen AI

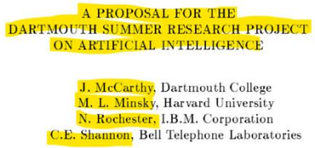
What is Artificial Intelligence? Intelligence?

Term coined: In 1955 at the Dartmouth Conference by John McCarthy (Stanford), who is also called the Father of AI.

Definition (by McCarthy): "The science and engineering of making intelligent machines."

The idea was to create systems that could simulate every aspect of learning or any other feature of intelligence.




A PROPOSAL FOR THE
DARTMOUTH SUMMER RESEARCH PROJECT
ON ARTIFICIAL INTELLIGENCE

J. McCarthy, Dartmouth College
M. L. Minsky, Harvard University
N. Rochester, I.B.M. Corporation
C.E. Shannon, Bell Telephone Laboratories

The Journey of AI

1950s–1980s

Rule-Based AI

Logic and predefined rules governed early systems. Limited by what programmers explicitly coded.

1

1990s–2010s

Machine Learning

Algorithms learned from data patterns. Shifted from rules to statistical prediction.

2

2012+

Deep Learning

Neural networks mimicked brain structure. Breakthroughs in image and speech recognition.

3

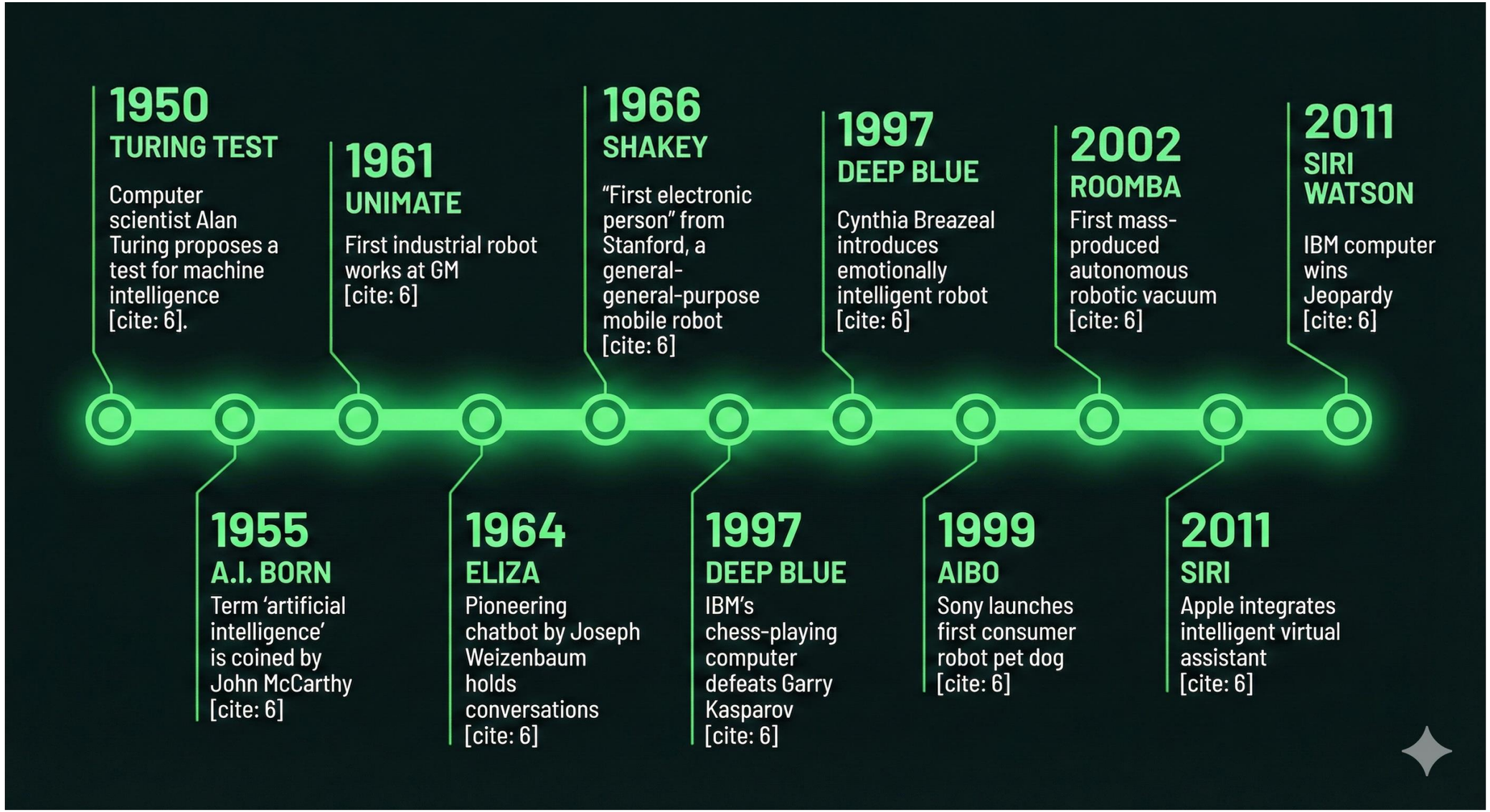
2022+

Gen AI Explosion

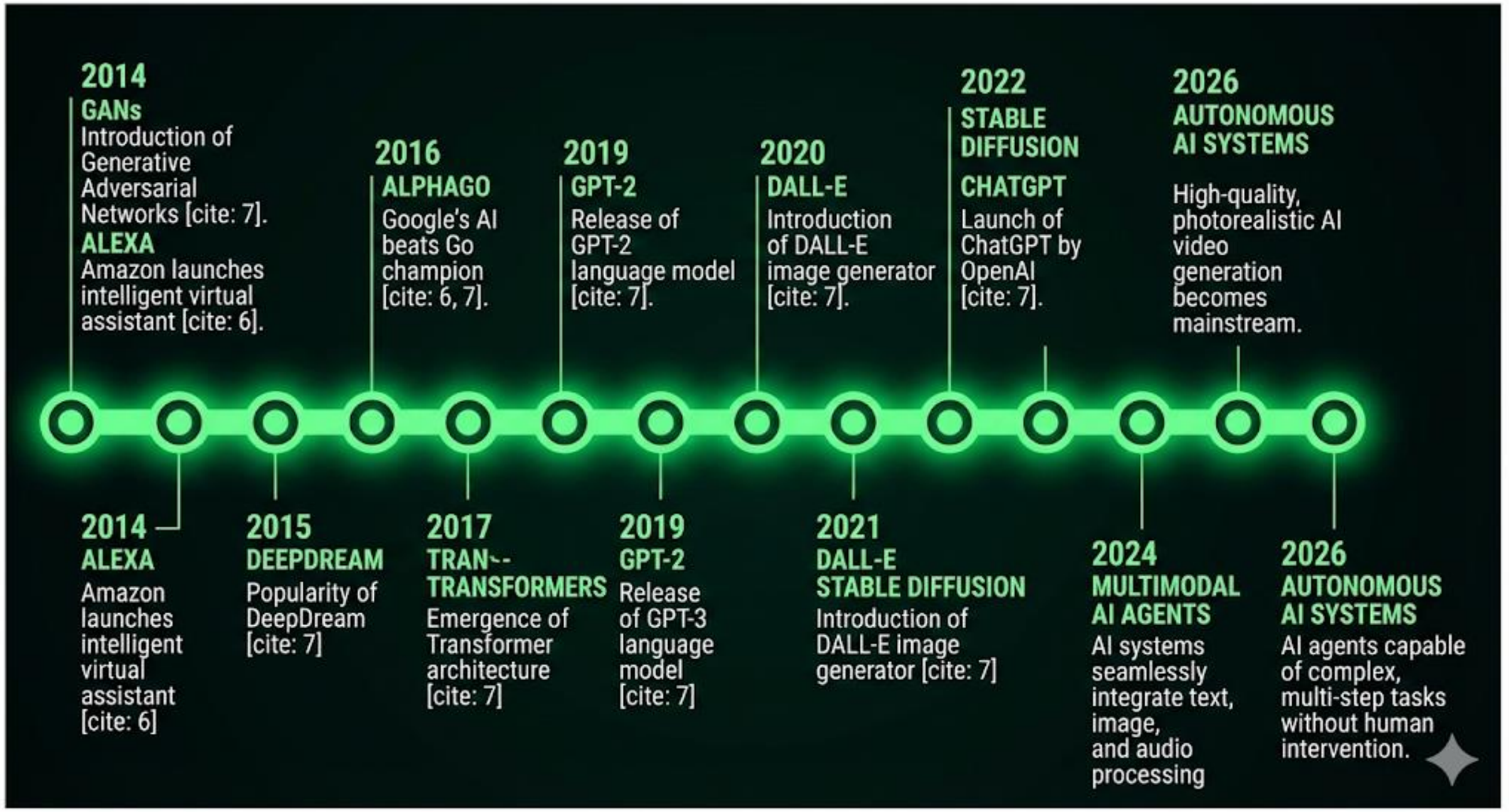
Creation of new content. Democratized AI for millions through accessible interfaces.

4

Generative AI Timeline



Generative AI Timeline



What Is Generative AI?

The Core Innovation

Unlike traditional AI that analyses existing data, generative AI creates entirely new content—text, images, audio, video, and code—from minimal input.

How it works: You provide a prompt like "Draw a futuristic city," and the AI generates a unique image that never existed before.

Forms of Generative AI

Text Generation

ChatGPT

Writes articles, code, poetry, and conversational responses with human-like fluency.

Image Creation

Midjourney, DALL-E

Transforms descriptive text into photorealistic or artistic images instantly.

Video Production

Sora

Generates realistic video clips from textual descriptions for content creation.

Audio Synthesis

Voice Cloning

Replicates voices with minimal samples, enabling personalized audio content.

Code Writing

GitHub Copilot

Autocompletes programming code, accelerating software development cycles.

How Gen AI Works

Transformer Architecture Architecture

Processes words in parallel, understanding context through attention mechanisms. This enables understanding relationships between distant words.

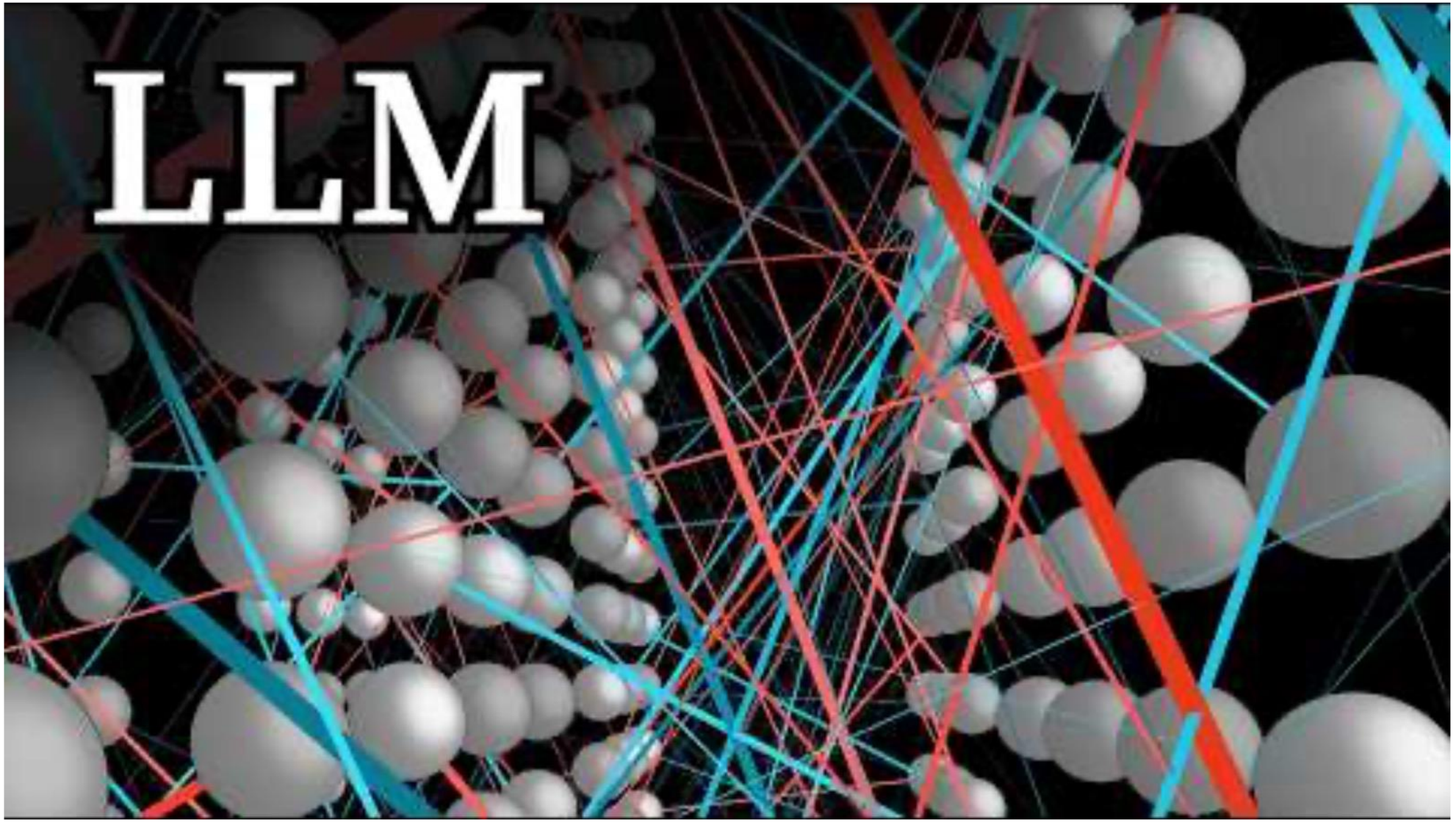
Large Language Models Models

Trained on billions of text examples. Models like GPT-4 learned patterns from virtually the entire internet.

Next Token Prediction

Predicts the most likely next word repeatedly. Sophisticated "autocomplete" that chains predictions into coherent content.

How Gen AI Works



Applications Across Industries

Business Operations

Automated report summarization, intelligent chatbots for customer service, and data analysis at scale.

Healthcare Innovation

Accelerated drug discovery by predicting molecular interactions, medical imaging analysis, and personalized treatment plans.

Manufacturing Excellence

Predictive maintenance through sensor data analysis, quality control automation, and supply chain optimization.

Human Resources

Resume screening automation, personalized onboarding experiences, and employee training content generation.

Education Transformation

Personalized tutoring systems, adaptive learning materials, and instant feedback on student work.

Key Challenges & Risks

AI Hallucinations

Models generate confident but factually incorrect information. Verification remains essential.

Bias & Fairness

Training data reflects societal biases, leading to discriminatory outcomes in sensitive applications.

Privacy Concerns

Models may memorize and reproduce private information from training data without consent.

Deepfakes & Misinformation

Realistic fake content threatens trust in media, enabling fraud and disinformation at scale.

The Future of Generative AI

AI Agents

Autonomous systems that take actions, not just respond. Capable of planning, executing, and learning from outcomes.

Multimodal Integration

Seamless understanding and generation across text, images, audio, and video simultaneously.

Personalized Assistants

AI that learns individual preferences, adapts to unique needs, and anticipates requirements proactively.

Key Takeaways

Evolution of Purpose

Shift from analysing data to creating new content fundamentally changes what AI can accomplish.

Universal Impact

Every industry—from healthcare to entertainment—will be transformed by generative capabilities.

Responsible Innovation

Ethical considerations, bias mitigation, and robust safeguards are critical for trustworthy deployment.

The generative AI revolution is not just technological—it's a fundamental shift in how we create, communicate, and solve problems.