



LLMs in Drug Development

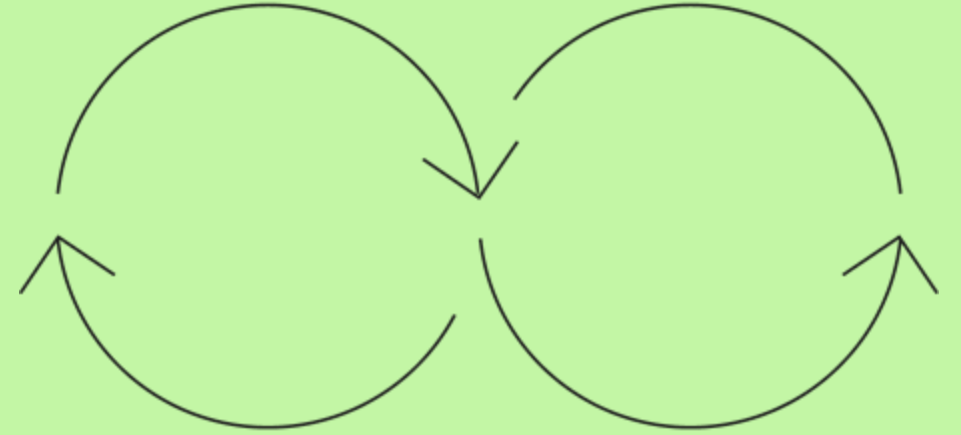
The future is closer than we think

Chris McSpiritt

March 2025

- Introduction to LLMs
- Real-world use of LLMs in Life Sciences
- Considerations for use





Introduction to LLMs

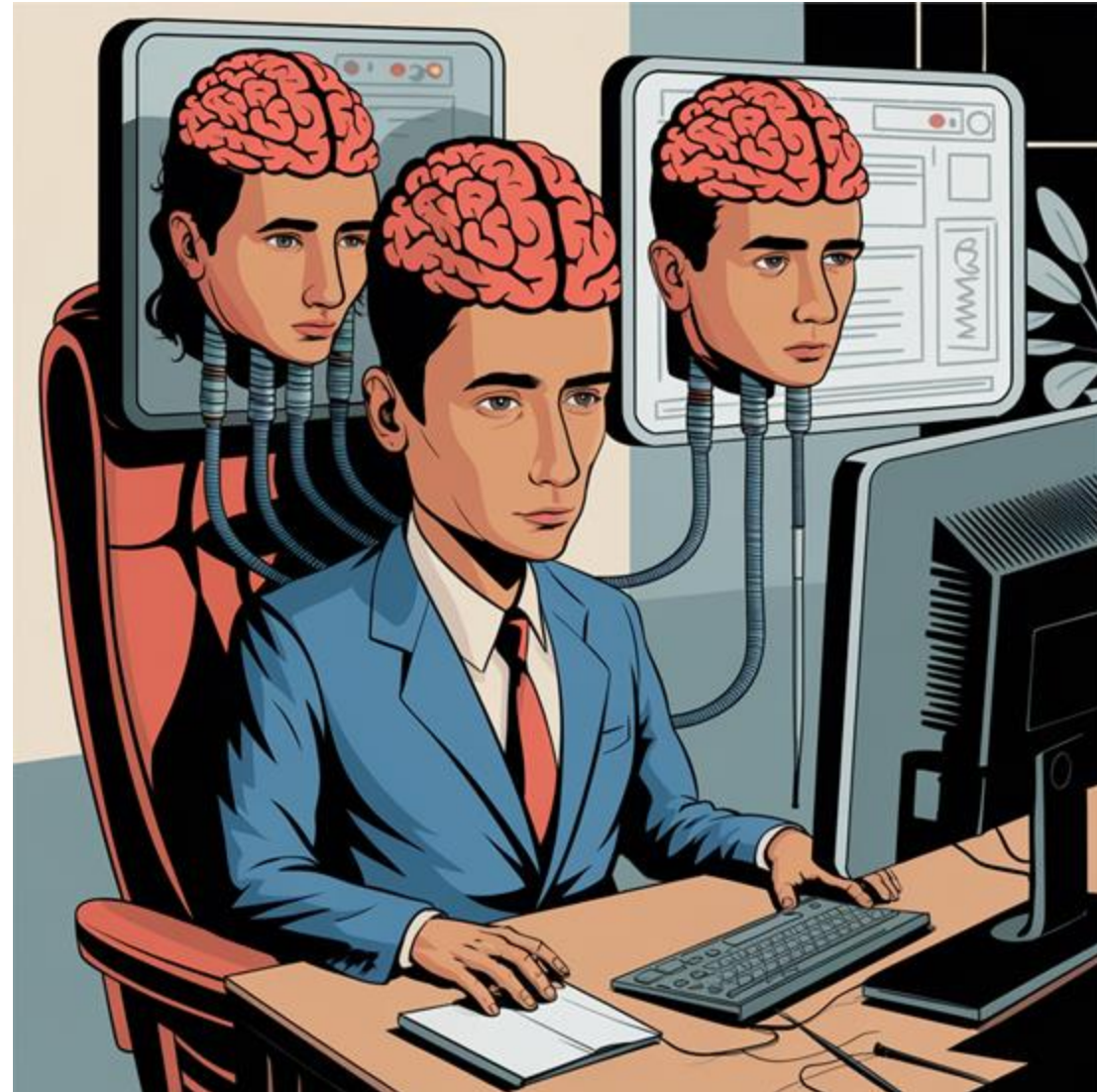
What is a LLM?

At its core, a large language model is a type of machine learning model that can understand and generate human language via deep neural networks.

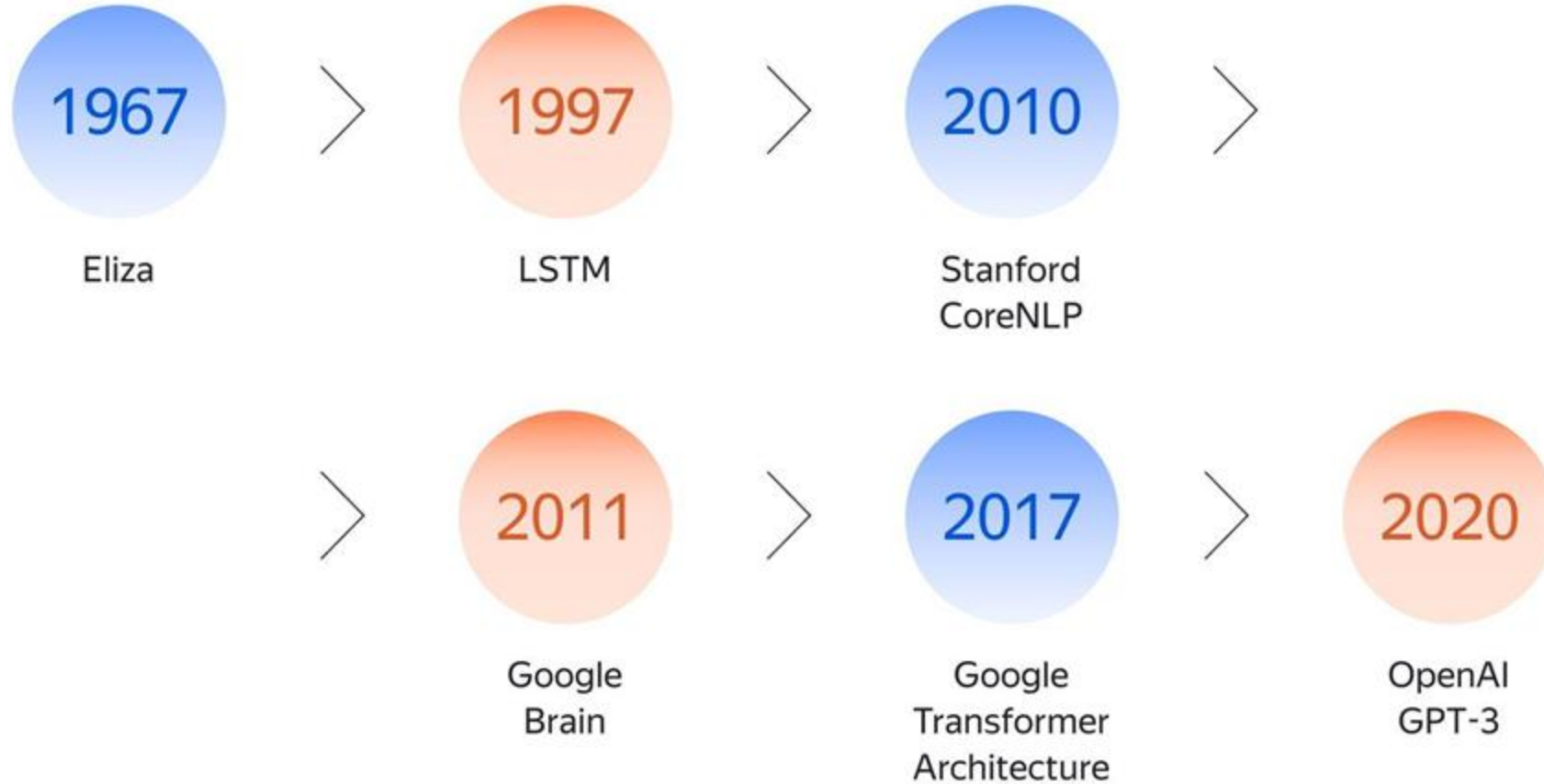
They are trained on massive amounts of text data, enabling them to perform various language-related tasks.

The most common use of LLMs is by individuals looking to:

- Get Quick Answers
- Brainstorm or Create Content
- Drive Automation and Efficiency



HISTORY OF LARGE LANGUAGE MODELS



PROMINENT LLMS IN USE TODAY

Closed Source Models



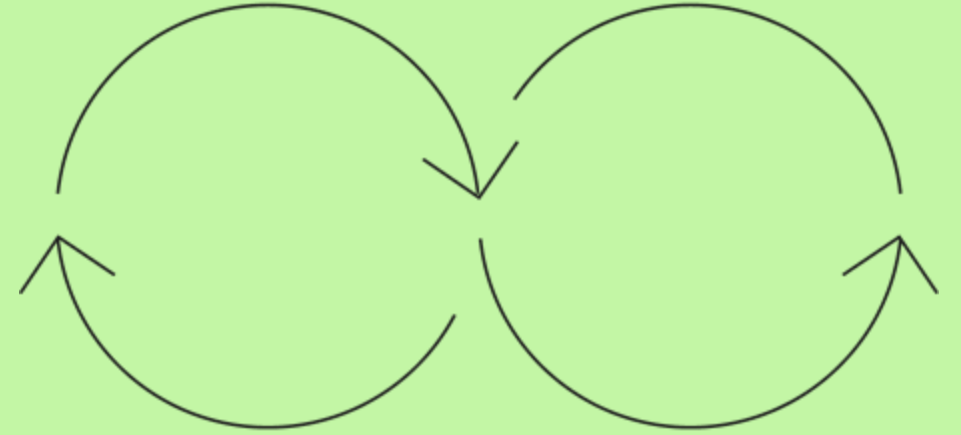
Claude

Gemini

Open Source Models



deepseek



Real-world use of LLMs in Life Sciences

LLMs support the entire drug development lifecycle

RESEARCH



BIOINFORMATICS

Uncover patterns for disease prediction, drug discovery, and genomics



DISCOVERY

Rapidly analyze vast datasets to identify target and drug candidates

DEVELOPMENT



PRECLINICAL

Accelerate formulation development, predict toxicology, and accurate dosing regimens



CLINICAL

Plan for and optimize trial execution. Streamline statistical analysis for regulatory submissions.

Corporate Operations

Bioinformatics & Drug Discovery

Bioinformatics - Understanding Biological Systems

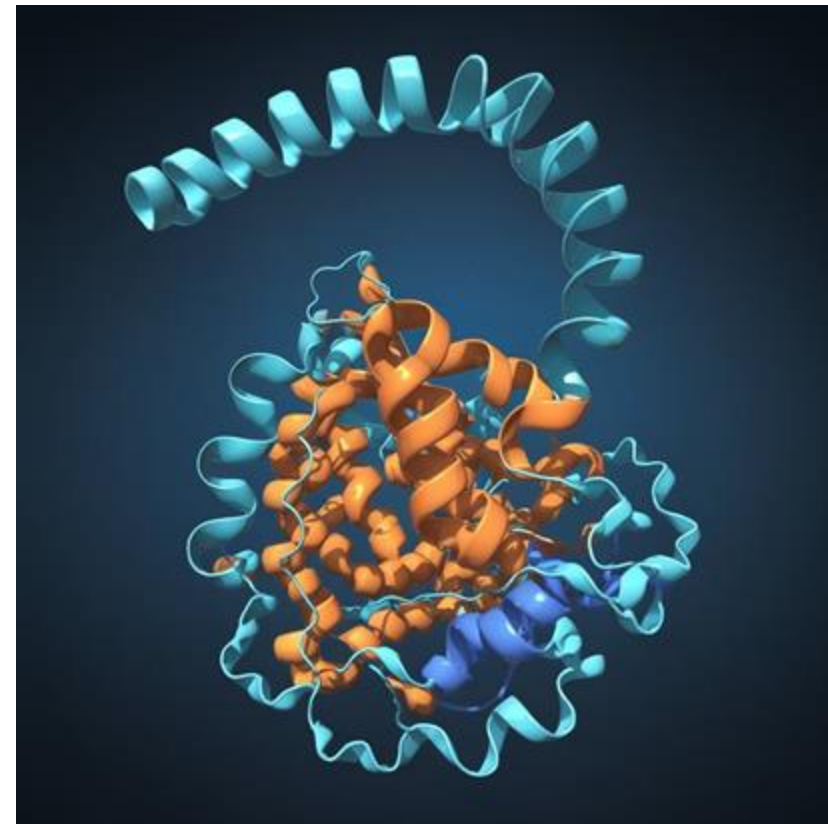
LLMs assist researchers in understanding complex biological systems, enhancing the development of effective drugs.

- Genomics
- Proteomics
- etc

Drug Discovery - Target Identification and Molecular Design

In drug discovery, LLMs assist scientists in finding the right disease targets and designing new molecules (small drugs, antibodies, RNAs) with desired properties

- Research reviews
- Molecule generation



Preclinical Research



Predictive Modeling for Drug Efficacy and Toxicity



Automated Experiment Documentation and Analysis

Clinical Research/Trials

LLMs are improving how clinical trials are designed and run – from finding eligible patients to analyzing trial data – thus making trials more efficient:

- Optimizing Trial Protocols
- Streamlining Patient Recruitment
- Enhancing Patient Safety
- Enabling Adaptive Clinical Trials
- Statistical Programming
- Clinical Study Report Authoring



Corporate Operations

Automation of Administrative Tasks

- LLMs automate repetitive administrative tasks, freeing up valuable time for pharmaceutical professionals to focus on critical research.

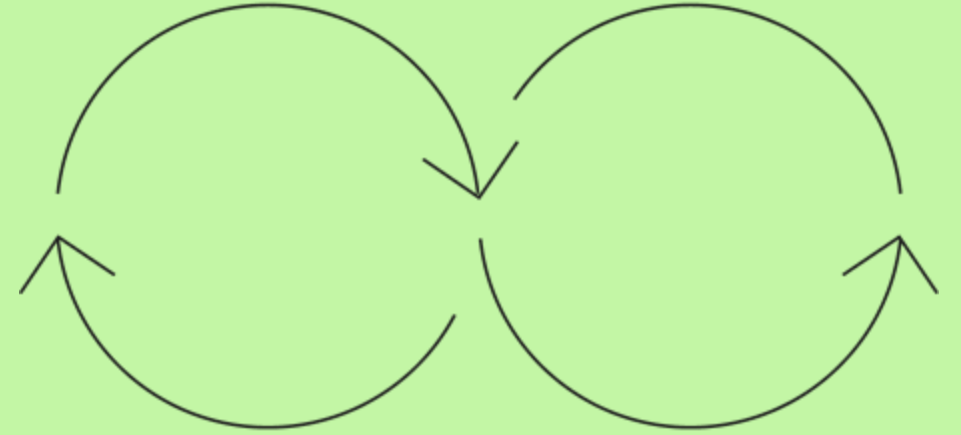
Streamlining Communication

- Enhanced communication processes help teams collaborate more effectively, improving overall workflow and project outcomes in pharma.

Improved Decision-Making

- LLMs improve data management efficiency, enabling better access to research data and facilitating informed decision-making.





Considerations for use

The concerns

Data Privacy Issues

Large Language Models (LLMs) can inadvertently expose sensitive data, raising significant privacy concerns in research contexts.

Security Challenges

Handling sensitive patient information presents security challenges that must be addressed to protect individual privacy.

Regulatory Compliance

Adhering to data privacy regulations is essential in research involving LLMs and sensitive information to ensure compliance and trust.



The solution

Interdisciplinary Teams

Building interdisciplinary teams is crucial for successful implementation of LLMs, enabling diverse perspectives and expertise.

Robust Data Infrastructure

Investing in a robust data infrastructure is essential for supporting the performance and scalability of LLMs.

Culture of Innovation

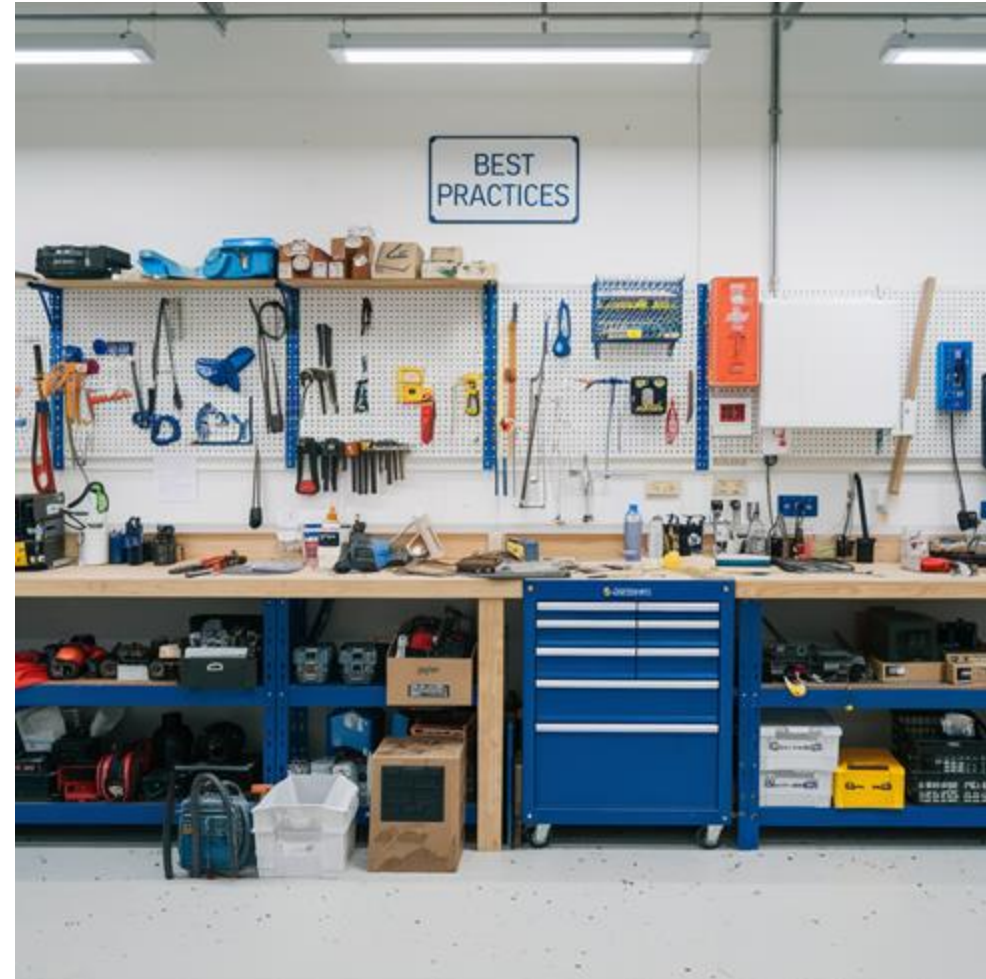
Fostering a culture of innovation encourages creativity and adaptability, maximizing the potential of LLMs in organizations.

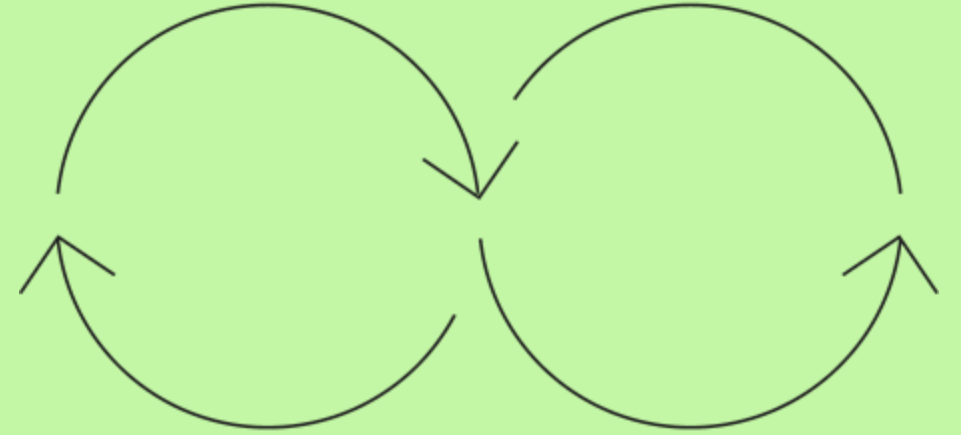
Continuous Training

Continuous training and learning are vital to keep teams updated on LLM capabilities and advancements in technology.

Embedded Governance

Ensuring that processes are established collaboratively and then embedded into process execution - not merely as after-the-fact documentation.





FUTURE OUTLOOK AND INNOVATIONS

The future

