Pros and Cons of LLMs

Reporter: Lu Wang

Mar 11, 2025

H²designlab
Designing health and happiness

Pros-Generation

- Education: generation of accurate and versatile clinical vignettes, being an adjunct in group learning[1] and for engineering education[12] and for language learning[13] automatically creating exams or assigning grades and feedback and simulating patients for medical education[14] Math mentor and writing coach[16]

- Writing: efficiency and versatility in writing with text of high quality, improved language, readability[1,2,5, 14,16,18]

- Translating: translation promoting research equity[1,2]

- Knowledge gaining: Accelerated literature review and information seeking[1,2,8,16,18]

- Coding: generate code snippets based on natural language descriptions of desired functionality[2,3,16]

- Brainstorming: idea and hypothesis generation [16,18]

- Data creation: generate human simulation to serve as experimental participants, survey respondents, or other agents [19]

Pros-Communication and Analysis

- Gathering data: collecting patient data and administrating surveys [3]

- Multi-model and multi-disciplinary: analyzing patient-generated health data, such as wearable device metrics, news reports, and social media[3], helping to create public policies across multiple medical specialties[7]

- Data analysis and knowledge discovery[11,16,18]: analyze massive data including electronic health records or genomic data[1,2,7], and drug design and discovery[1,2] generating accurate and detailed medical records[2,5] prediction of disease risk and outcome[1,7,15], streamlining the clinical workflow, improved diagnostics[1,8,15], documentation and summarization[1,15], support decision-making for next step[5,7], Screening and parsing resumes and identifying job candidates[10] sentiment analysis and financial risk assessments[10] extracting information and identifying legal concerns, and analyzing customer reviewers [10]

- Equal or better performance than humans: Answering users' questions [2,5,7,15,16] with similar performance compared to humans[3], improved health literacy[1,15]

Pros-Interaction

- Personalization: personalized medicine[2], personalized learning experience[1] Personalized product recommendation [10]

- Easy to interact with: through prompts

- 7/24 availability: mental health support, real-time feedback[2]

- Cost: Being a free package[1] cost saving for healthcare[2]

- Accessibility and Scalability: Can be accessed through digital platforms, allowing for widespread adoption and scalability, potentially benefiting a larger number of patients[8].

Cons-Data and Training

- Lack of data for specialized areas such as in healthcare[3] or certain languages and regions[10]

- High computational cost[17], Developing LLMs consumes large amounts of energy due to their high processing power and data transfer requirements[3]

- Difficulties exist in training LLMs with multi-modal data[10,17]

- Training data contaminations: online data will be mixed with AI-generated data[3]

- Lacking Response Generation Details: lack of details behind how the prompts are designed may make the findings in different literature inconsistent[9]

- Overfitting [17]

- Catastrophic Forgetting, hinder the retention of original knowledge when learning new tasks[17].

- Restricted knowledge before 2021(the data timestamp)[1, 16] [but can be mitigated through continuous learning 8]

Cons-Result

- Absence of standardized methods for evaluating the effectiveness, accuracy, feasibility and value alignments[7,9,15,20]

- Incorrect/inaccurate information/reference[1,3,4,7,11, 15, 16,17,18], biases in generated content (such as racial, cultural, and confirmation biases)[2,4,5,7,11,16]

- Over-detailed content[1]

- Lack of detail and lack of situation awareness[15]

- Lack of originality[1,5]

- Low logical reasoning capabilities[16,17]

- Results are not always comprehensive or even reproducible[7,9]

- Significant differences with ChatGPT performing best for the Italian and worst for the French examination [14]

Cons-Usage

- Ethical concerns[1,2,4,5,7,8,11, 15, 16,17,18] Autonomy, Nonmaleficence, Justice, Beneficence, Responsibility and Liability[4] Data privacy[2,3,4,5,10,16,17,18]

- Legal issues[1,7,8,11], copyright issues[1,4] Regulatory compliance[2] Lack of HIPAA compliance[5]

- Misinformation spread[1,8,15,16]

- Transparency issues, lack of explanations or interpretations[1,3,4,8,9,10,11,15,16,18] The profit-driven nature of the field can lead to concentrations of power among a limited number of companies and a lack of transparency[15]

- Replacement of humans or seeing humans as less knowledgeable (physicians) [4,8,15]

- Overreliance and dependency[8,15]

- Safety and Controllability[17], Security and Adversarial Attacks: LLMs are vulnerable to adversarial context[10]

- Training is required for users to sufficiently make the best use of LLMs capabilities[3, 17].

- Inequality in access to LLMs, especially low-resources areas [2,3,15, 17]

- A serious threat to the use of multiple choice questions -based assessments in education[6] Academic misuse[16]

- LLMs are also evolving rapidly and unpredictably over time[5]

- Long-term intervention remained unclear (for language learning [13])

- Long-term memory retention[17]

THANKS

Reporter: Lu Wang

Mar 11, 2025