

# AI: Real Estate's New Roommate - The Good, the Bad, and the Algorithmic.

by Nikodem Szumilo and Thomas Wiegelmann

## Abstract:

**Purpose:** *This paper aims to provide a comprehensive analysis of the transformative impact of Artificial Intelligence (AI) and Large Language Models (LLMs), such as GPT-4, on the real estate industry. It explores how these technologies are reshaping various aspects of the sector, from market analysis and valuation to customer interactions, and evaluates the balance between technological efficiency and the preservation of human elements in business.*

**Design/methodology/approach:** *The study is based on an analysis of strengths and weaknesses of AI as a technology in applications for real estate. It uses this framework to assess the potential of this technology in different use cases. This is supplemented by an emerging literature on the topic, practical insights and industry expert opinions, to provide a balanced perspective on the subject.*

**Findings:** *The paper reveals that AI and LLMs offer significant benefits in real estate, including enhanced data-driven decision-making, predictive analytics, and operational efficiency. However, it also uncovers critical challenges, such as potential biases in AI algorithms and the risk of depersonalizing customer interactions.*

**Originality:** *This work stands out for its balanced examination of both the advantages and limitations of AI in real estate. It introduces the novel concept of the "jagged technological frontier" in real estate, providing a unique framework for understanding the interplay between AI and human expertise in the industry.*

## 0. Introduction

In an era where technological innovation incessantly reshapes industry landscapes, the significance of comprehending the integration of Artificial Intelligence (AI) and Large Language Models (LLMs) within the real estate domain transcends mere academic interest; it becomes a vital imperative for professional relevance and excellence. The advent of AI and LLMs heralds a paradigm shift, not just in the mechanics of real estate operations but in the very ethos of the industry. As traditional methodologies intertwine with digital ingenuity, understanding these technologies becomes essential for navigating the evolving tapestry of real estate. The profound insights offered by AI in market analysis, predictive analytics, and customer interaction pave the way for data-driven decision making, a cornerstone in the foundation of modern real estate practices. This shift is not merely about adapting to new tools; it's about re-envisioning the approach to client engagement, market strategy, and operational efficiency.

Moreover, as the industry grapples with the ethical nuances and practical challenges posed by these technologies—be it concerns of data privacy, potential biases in algorithmic decision-making, or the broader implications for employment—the depth of understanding becomes crucial for responsible implementation. It is about striking a balance between leveraging technological advancements and preserving the fundamental human elements of trust and ethical responsibility. In this context, the knowledge of AI and LLMs transforms into a beacon,

guiding professionals through the complexities of compliance, ethical conundrums, and the relentless pursuit of innovation.

Furthermore, in an industry as dynamic and competitive as real estate, staying abreast of technological advancements is not a luxury but a necessity. It's about future-proofing one's career, ensuring that one's skills and knowledge align with the inexorable march of technological progress. The integration of AI and LLMs in real estate is not just a trend but a harbinger of a new era—an era where the amalgamation of human expertise and artificial intelligence becomes the cornerstone of success and sustainability in the ever-evolving world of real estate. Understanding and embracing this shift is paramount for anyone aspiring to thrive in this new landscape, where technology and tradition converge to create unprecedented opportunities and challenges alike.

We try to offer a balanced view, acknowledging the areas where AI excels and where human intuition remains irreplaceable. We attempt to weave complex technological concepts into a narrative that is not only accessible but also engaging.

## 1. Understanding AI and LLMs in Real Estate with Focus on LLM Functioning

### *Definition and Core Concepts of AI*

Artificial Intelligence (AI) in real estate refers to the simulation of human intelligence processes by machines, especially computer systems. This technology encompasses a range of capabilities including learning, reasoning, problem-solving, perception, and language understanding. AI's adaptability makes it invaluable in real estate for tasks like market trend analysis, property valuation prediction, and automating routine operations but also for tasks requiring training and creativity such as strategy development, negotiations or management.

For example, AI can interpret extensive datasets comprising historical sales, current market conditions, and buyer preferences. This capability allows real estate professionals to harness AI for forecasting future price trends, pinpointing investment hotspots, and decoding buyer behaviour patterns (Viriato 2019). Recent research also shows that AI can be very good at developing business strategy and delivers performance on par with MBA students at top institutions (De Cremer et al. 2023). This includes developing a strategy of how to adopt AI in your organisation.

Key AI mechanisms relevant to real estate include Machine Learning (ML), Neural Networks, and Natural Language Processing (NLP):

- **Machine Learning:** ML enables AI systems to learn from experience autonomously. In real estate, ML algorithms analyze data trends to predict market dynamics and appraise property values. They also personalize property search results for clients based on their browsing habits and preferences.
- **Neural Networks:** These are crucial in handling complex data sets. In real estate, neural networks assist in predictive analytics, like estimating property prices by analyzing numerous factors, including demographics and economic trends.
- **Natural Language Processing:** NLP allows AI to interpret human language. In real estate, NLP is used in chatbots for customer interactions, helping clients with property inquiries, scheduling viewings, or providing neighborhood information.

The last category is attracting significant attention lately due to breakthrough in its subset: Large Language Models (LLMs) like GPT-4. They represent a breakthrough in AI's language processing capabilities. They are trained on extensive datasets of text, enabling them to generate coherent, contextually relevant text. LLMs operate based on probability, predicting the likelihood of a word or phrase following a given input. This probabilistic nature means that they can generate different outputs each time, depending on the input and the model's training.

In real estate, this probabilistic approach enables LLMs to draft unique and appealing strategies, provide varied responses in customer service interactions, and analyse legal documents with nuanced understanding. However, their probabilistic nature also means that the information provided might not always be entirely accurate or consistent, requiring human oversight for verification and context-specific adjustments. This subtle point renders LLMs extremely useful for some tasks in real estate but extremely dangerous for others.

AI and LLMs find diverse applications in real estate. AI enhances efficiency in property management, automating tasks such as lease processing, maintenance scheduling, and energy usage optimization. In valuation and investment, AI provides data-driven insights, analysing vast data to offer informed perspectives on property values and investment potential.

LLMs bring advanced language capabilities to these applications. They aid in creating targeted marketing materials, automating routine client communications, and initial legal consultations for transactions. Their ability to generate diverse content based on probabilistic models adds versatility and depth to client interactions and documentation in real estate.

Importantly, while all AI models rely on data to be trained, increasingly using AI does not necessarily require any data. Generative AI, is a class of models that creates genuinely new content with simple instructions called prompts. While writing good prompts is a skill (and can even be a profession - prompt engineering), even simple prompts can generate content that is extremely useful and requires no data input beyond the prompt. Many of these pre-trained models that just need to be promoted are offered as a service online but there are also many that are open-source which means that they can be downloaded (for free) onto a local machine and run offline. This not only means that organisations no longer need large amounts of data to deploy AI, but also that they do not need to be concerned about sharing data with external service providers.

## **2. Strengths of AI and LLMs in Real Estate**

In the commercial real estate sector, AI and Large Language Models (LLMs) like GPT-4 have brought significant advancements, particularly in data processing and language-based tasks. The strengths of AI and LLMs in these domains are reshaping how various aspects of real estate are managed, offering new efficiencies and capabilities (McKinsey & Company 2023).

### *Enhanced Data Processing and Analysis in Real Estate*

AI's ability to process and analyse vast amounts of data efficiently is a game-changer in real estate. For example, AI can swiftly sift through complex property databases, historical transaction records, and vast market trends data to identify patterns that would be time-consuming for humans to discern. This capability is instrumental in areas like property valuation, where AI algorithms can analyse past sales data to predict future market values, or in investment analysis, where AI can evaluate potential investments based on historical

performance and current market conditions. AI can also write and run complex data analysis code providing insights into the data. For example, AI's predictive analytics can forecast future market trends, helping real estate professionals make informed decisions about property development, investment strategies, and portfolio management. With the right data, AI can predict the rise in demand for certain property types in specific locations, allowing developers and investors to strategically plan their projects and investments. The notion of using market data analytics recently found support in Szumilo's (2021) study on price discovery, a process that AI can use to predict trends with increasing accuracy.

### *Innovative Applications of LLMs in Real Estate*

LLMs have revolutionized tasks involving human language in real estate. One key application is in automating customer service and knowledge management. AI-powered chatbots, enhanced by LLMs, can handle customer inquiries efficiently, providing instant and accurate responses to queries about property details, availability, or booking viewings. For larger organisations they are also invaluable as knowledge management agents that know more about the organisation than any employee. These chatbots can learn from interactions, improving their responses and customer service quality over time. LLMs also aid in legal document analysis, assisting in the review and drafting of contracts and agreements, ensuring compliance with legal standards and reducing the workload on legal teams. Additionally, in market analysis, LLMs can provide real-time insights by analysing news articles, social media posts, and economic reports, aiding in making informed investment decisions.

### *AI and LLMs Enhancing Real Estate Operations*

In operational aspects of real estate, AI and LLMs offer significant enhancements. AI-driven property management systems can automate routine tasks like maintenance scheduling, tenant communication, and rent collection, improving operational efficiency. In marketing and sales, AI optimize advertising campaigns by analysing consumer data and market trends, targeting the right audience with personalized marketing messages. LLMs, with their advanced language capabilities, play a crucial role in creating engaging marketing content, drafting persuasive sales pitches, and even assisting in negotiation simulations, preparing real estate agents for complex deal-making scenarios.

### *AI's Role in Strategic Decision-Making in Real Estate*

Beyond operational tasks, AI's role in strategic decision-making is increasingly significant. AI's data analysis capabilities can inform high-level strategy, such as identifying emerging markets, assessing the viability of large-scale developments, or optimizing portfolio diversification based on predictive market analyses.

In conclusion, AI and LLMs offer transformative potential in the real estate industry. Their strengths in data processing, analysis, and language-based tasks are enabling more efficient operations, informed decision-making, and innovative approaches in various real estate domains. As these technologies continue to evolve, their integration into real estate practices is poised to become even more integral, driving advancements and efficiencies in this dynamic industry.

### 3. Limitations and Ethical Concerns of AI and LLMs in Real Estate

The integration of AI and Large Language Models (LLMs) like GPT-4 in commercial real estate, while promising, poses a complex landscape of challenges and opportunities. Insights from studies, such as those with Boston Consulting Group, reveal the "jagged technological frontier" of AI, which is particularly relevant in the multifaceted real estate industry (Dell'Acqua et al. 2023).

#### *Navigating the Jagged Technological Frontier in Real Estate*

The jagged technological frontier concept is pivotal in understanding AI's varied effectiveness. In real estate, this translates to AI excelling in certain tasks while faltering in others that seem similar in complexity. For instance, AI can adeptly analyze market trends and property data, but it might struggle with tasks requiring deep contextual understanding, like assessing the impact of local zoning changes on property values. This disparity necessitates a careful evaluation of where AI can be optimally employed, such as automating property management tasks, versus areas where human intuition is indispensable, such as in negotiating complex contracts or understanding nuanced client needs.

#### *Performance Variability and AI Integration in Real Estate*

Studies show that AI improves productivity and quality in tasks within its capabilities but decreases correctness in tasks beyond its frontier. In real estate, this means AI could enhance efficiency in tasks listed above but, for some decision-making, such as determining investment viability or interpreting nuanced market signals, over-reliance on AI could lead to suboptimal outcomes. The real estate industry, with its blend of quantitative and qualitative tasks, must thus be vigilant in how AI is integrated into various workflows.

#### *Centaur and Cyborg Models in Real Estate Practices*

The Centaur and Cyborg models of AI integration offer a useful framework for real estate professionals. Centaur behaviour in real estate might involve using AI for initial market analysis and then applying human expertise for deeper insights into market dynamics. Conversely, Cyborg behaviour could see continuous interaction with AI in tasks like updating real-time property valuations, where AI provides initial estimates that are refined through human expertise. These models illustrate how AI can complement human skills in real estate, rather than replace them.

#### *Ethical and Operational Implications in Real Estate*

AI's role in real estate is not just about performance enhancement but also involves ethical and operational considerations. The ambiguity of AI's decision-making processes and its ability to execute tasks with minimal human input raise questions about transparency, accountability, and reliance. In real estate, this could manifest in ethical dilemmas over AI-generated property appraisals or bias in AI-driven market analyses, necessitating a balanced and ethical approach to AI usage. Cyber security also becomes a little more complicated with AI and although it is relatively easy to use AI securely even with very confidential data, it requires training of AI users.

## *Hallucinations*

Because of the probabilistic nature of content generated by AI, it can never be assumed to be completely correct. For example, while AI is very good at producing document or book summaries it is impossible to know if reports is in the analysed text without checking the source. This means that everything that AI produces has to be checked and this usually needs to be done by a human who accepts the responsibility for the output. This means that while AI is outstanding at generating first drafts of texts, strategies, computer code or even creative ideas, it is not be suitable for work without supervision.

## *Adapting to AI's Evolving Role in Real Estate*

Real estate professionals must adapt to the evolving role of AI, understanding where it enhances performance and where it might hinder it. For example, AI can significantly increase efficiency of labour intensive tasks and make many processes less expensive. However, in areas such as personalized client advisory or navigating complex regulatory environments, human expertise remains crucial. Understanding the dynamic nature of AI's capabilities in real estate is key to leveraging its benefits while mitigating its risks. Traditionally, deploying AI has been reserved for large organisations with access to large amounts of data, resources and internal expertise. A team at Columbia University has created some very good examples of how this approach can be leveraged effectively and leads the way in popularising this strategy. However, recent developments in AI technology make it possible for smaller organisations or even individual teams to leverage the technology. Indeed at team from University College London believes that this is the future of AI adoption in real estate. Training is the only entry cost of using Generative AI and in comparison it is very low. However, as the technology is developing quickly the amount of training required to catch up with the state of the art practice increases accordingly. By far, the easiest way to start deploying AI in real estate is to make sure that a member of your team is trained on the very basic use of Generative AI in real estate and can find the most effective ways to improve your operational efficiency using AI. Once it is apparent what the technology can and cannot do, it will be easier to decide on how to adopt the long-term strategy to leverage the new technology.

In summary, the integration of AI and LLMs in commercial real estate offers considerable advantages but also presents significant challenges. Real estate professionals need to navigate this landscape by understanding AI's strengths and limitations, employing models like Centaur and Cyborg for optimal AI-human collaboration, and addressing the ethical and operational implications of AI use. By doing so, they can harness AI's potential effectively while ensuring responsible and ethical application in the diverse and complex world of real estate. Training is crucial at all organisational levels as it will determine if AI is used the right way.

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