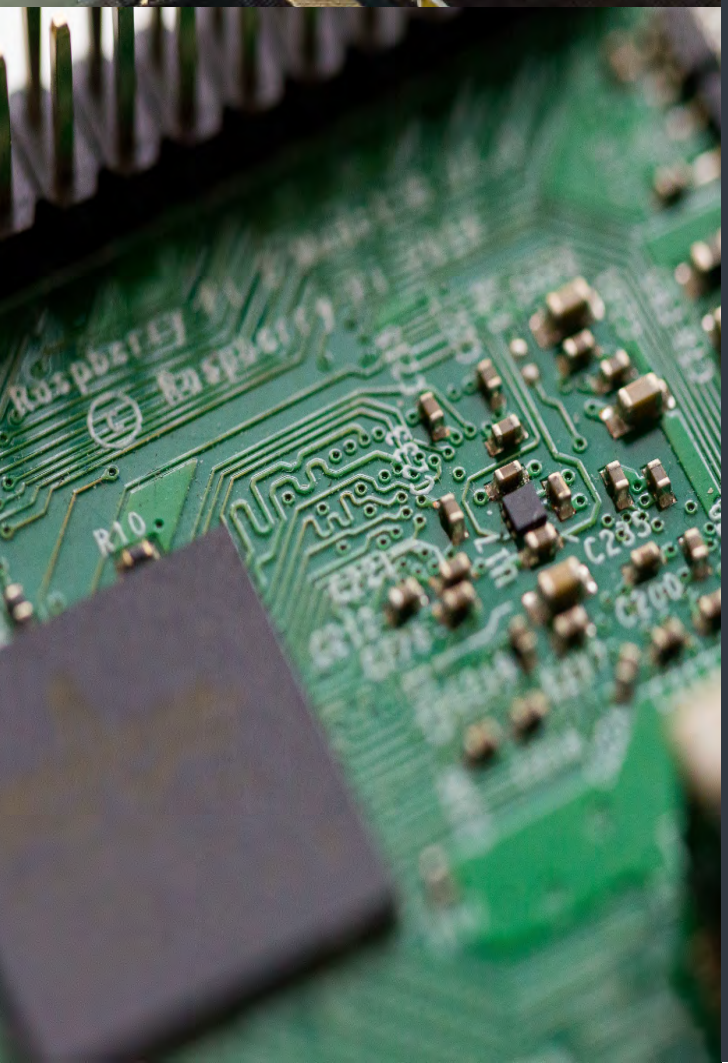
HOW TECHNOLOGY WILL CHANGE
REAL ESTATE IN THE NEXT 5 YEARS

NEXT GEN

REAL ESTATE TECH

JAMES WANG

AND REAI



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PREFACE

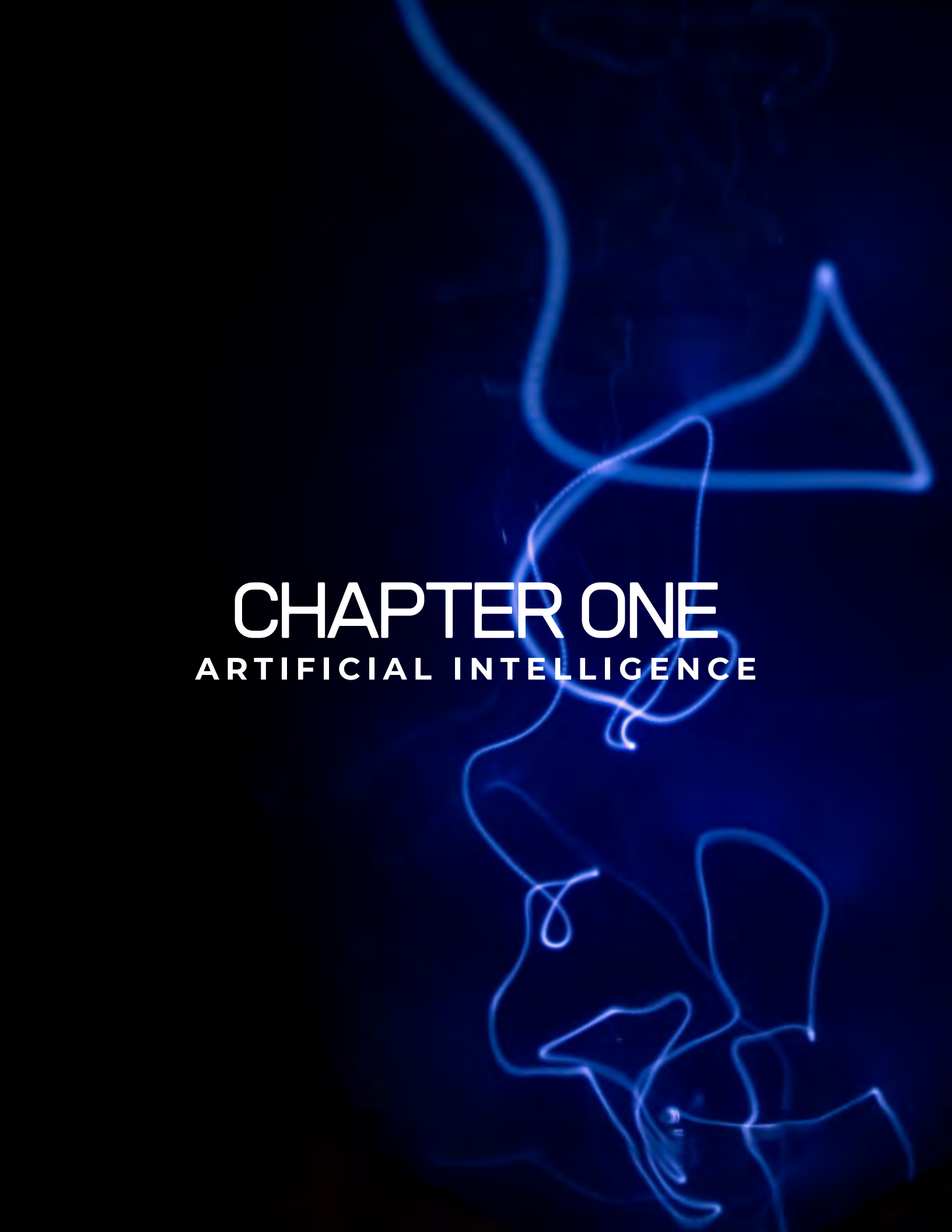
Real Estate has always been a context for innovation on a wide scale, whether in serving the consumer in residential properties or the developer/broker in commercial properties. For the last 50 years, real estate industry has been adopting technology to improve the offerings to consumers. Starting from finding houses on the internet, being able to tour houses virtually, smart electronics for usage, smart building materials being used, there has been a lot of innovation in real estate.

Real estate tech also covers tech for related service providers besides those for agency/brokerages, it includes technology for home inspection companies, property financial service companies, real estate construction companies, insurance and renovation companies, etc. Overall, the technologies empowering Real Estate is such a wide field because Real Estate itself covers every facet of our lives.

After taking stock of current status quo with maturing technologies and the set routines of the day, we should take time to step back and see what is coming over the horizon. What is there to be excited about as we course along into the future?

In the chapters ahead, the technologies that are coming to change everything we know about Real Estate will be laid out, as well as their challenges and obstacles for wide adoption. On the other hand, as artificial intelligence is leapfrogging this past decade, tremendously enhancing the processing power on various aspects of information, we are looking at major disruption and elevation of all aspects of real estate services here with the aid of AI and machine learning, including from REAI's AI platform.

Please also keep in mind, that while we can have a good idea of where technologies would be applied within Real Estate, one cannot know for sure when and what exact form of these technologies will take shape. Indeed, the future is an uncertain place. Good thing at least from our development and insight, we have a better picture about "places", with Next Gen Real Estate Tech.



CHAPTER ONE

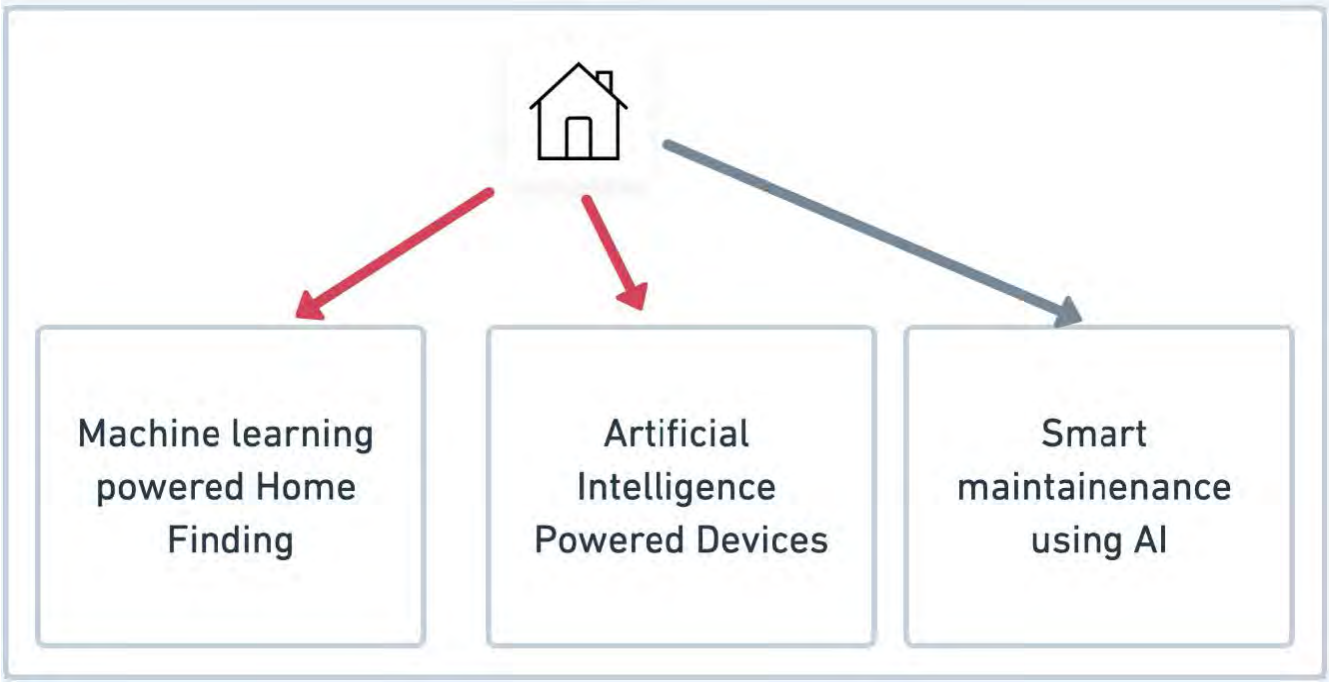
ARTIFICIAL INTELLIGENCE

OVERVIEW

For decades, or even centuries, real estate transactions are done through an old fashioned manual process- owners find some real estate agent to list their property in a market display, then buyers resort help through agent to access this display and bid on property to buy housing. There are many flaws and gaps in this key process, including agencies control what buyer or seller see, buyer do not have capacity to thoroughly study and locate the most appropriate property for themselves, buyer do not have enough information or proper advice to make the right decision, seller/owners do not have proper knowledge on the right listing price or time/media to list property information, and the right offer to accept, as well as agents interests usually not aligned with buyer/seller interests. Thus, there is wide spread buyer remorse seen in industry, where after moving in buyers regret the purchase as the property does not best fit their needs, relatively there is also certain seller remorse. In 2018, Bank of the West survey showed 68% of buyers have remorse factors, which is an all-time high for the industry.

With the ever expanding or exploding amount of real estate related data, what is the proper way to address the above issue? The most practical path ahead is through artificial intelligence. With deep learning and other new techniques in machine learning, AI engines can study and learn the needs of users, analyze the traits and characteristics of various properties, and project what is the best fit for particular user/buyer, thus saving huge amounts of time and effort for agents as well buyers, sellers. This proper learning and matching AI algorithm will be able to handle the transaction process smoothly, alleviating the burden from agents and their buyer clients. Companies like REAI has come out with proprietary technologies and platforms to make this a reality. The technologies and tools REAI provide also cover other parts of the real estate transaction, in essence enabling an end-to-end solution to address user needs, as well as providing AI features to elevate other layers of real estate related technologies as covered in later chapters of the book.

Other steps in the real estate transaction also manifest clear signs of antiquities, including preparing and planning buyers for house



purchase, like mortgage planning, finding the features and location appropriate for their needs, making optimal offer or deciding to accept/refuse offer, the proper way to find full background information on property and conduct inspection, the proper way to renegotiate, and proper way to proceed to closing, etc. Most of these steps are currently done under the guidance of buyer's or seller's agent, and in most circumstances the agent is not advising typically from the perspective of best interest on behalf of buyer/seller, while buyer/seller themselves are not knowledgeable or well-informed to proceed on this path themselves without agent. We can clearly see that, the role of AI to provide smart advice and guidance to user from an unbiased, neutral perspective will be instrumental, as well as to alleviate the burden of agents and shoulder most of the ground work on behalf of agents. Here, the AI system can guide user to plan for readiness on financing; plan for the proper house that's most appropriate for user, not only in short term, but also in the long run; plan for making offer in the best interest of user, plan to locate all appropriate information and solicit the right inspection, plan to negotiate and prepare for closing, etc.

REAI provides advanced AI tools to meet these needs, including:

- Mortgage guidance;
- Property need & picking guidance,
- Offering guidance;
- Property info & comparison guidance, and closing guidance.

Other aspects of real estate transaction especially involving sellers also show a big gap that definitely requires AI to fill. Currently, after property listed in MLS, the owner/seller give the control of the sales process solely to the listing agent, enabling the agent to dictate the listing term and information, etc. Owners tend to feel obligated to let agents take control, with the notion that only agents know how to do it, only agents can do it, and only agents can sell for them. These owners do not know that equipped with proper knowledge and tools, they can also manage the process themselves and can sell with maximum benefits. Here comes in the AI tools developed, which help sellers/owners take back control, and on the other hand, to help agent alleviate the work burden. A company like

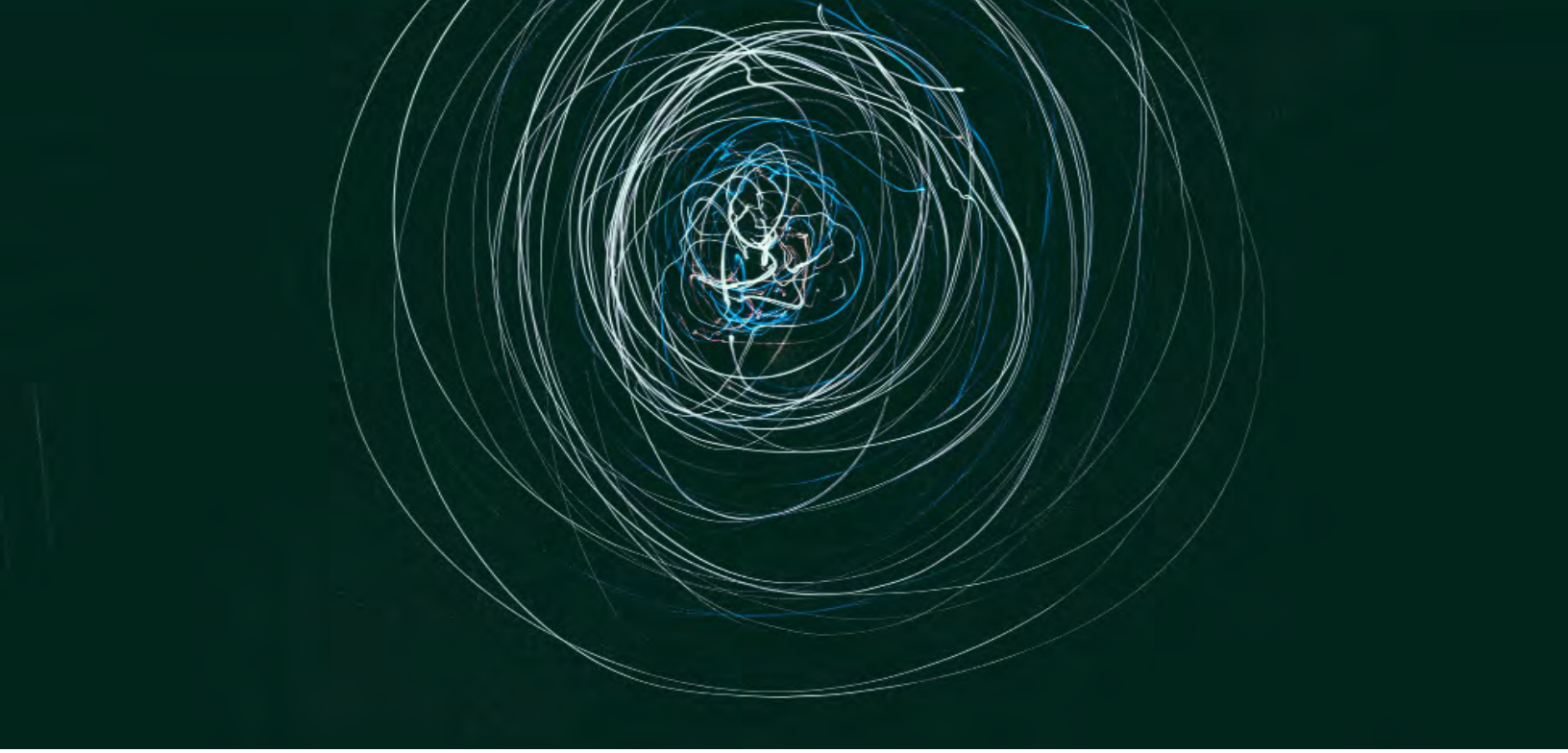
REAI is providing these AI tools to help calculate the optimal listing prices on behalf of owners, compile the information needed for a good lasting impression, and other features enabling owners to weigh the pros and cons of various offers, choose the optimal offer.

From another perspective, real estate industry ready for AI disruption can be seen because the foundation of real estate is simple: land. While complexities blossom outward from this central tenet, a plot of land and location will always exist where it is. It has low complexity and static data foundation. The land is worth this much, it exists here, is this big, and is in this market. These more static analytic bases provide a more tangible launching point from which AI can extrapolate. How this land can be developed to manifest maximum benefit to both developers, property buyers, brokerage firms, as society as a whole?

The following are some features that AI will help revolutionize the industry, in which companies like REAI already provide tools to enable them. On other new technologies in real estate industry covered in later chapters of the book, AI will also be able to streamline, optimize, and speed up the progress in those other tech fields for real estate.

Buyer and Property Deep Matching

For decades, real estate buyers have difficulty locating full relevant information on targeted properties, resulting in buyers conducting transactions without full knowledge of the



subject property, as well as without knowing clearly how the property fits their needs.

The status quo is led by Zillow (Zillow.com), where a buyer can now get a chance review property's general information including square footage, general features. This mostly parallels the information shown in MLS listing, generally basic information like public data on annual property tax, previous transaction/sales data, sometimes schools in the area, etc.

This info still falls short of user needs though, because there are many more factors for the "buy" decision, like nearby restaurants, crime situation, potential renovation needs. The buyer would struggle to find all the info needed to quickly see what property would best fit him or her specifically. They still have to resort to the extensive search effort to locate the relevant information, often without knowing the proper methods or sources.

While a good real estate agent might be able to give some advice to a buyer on this, the depth, proportion from AI system far outweigh agents in that it can consistently give a more thorough mix of information needed to make a decision. Indeed, at this age of information explosion, it is even harder for agents to weigh in pros and cons for clients on properties with all things considered, while this is super easier for a powerful AI platform.

Imagine you have to start your journey of finding and closing a house in a different state, and you have to dig out all the pieces of information directly or indirectly related to your search. But instead of this normal path, you use a platform that analyzes your needs and shows you every step down the process, down to the very house that matches you best. Wouldn't that take the normal stress right out of securing a house? REAI is providing unique matching service for buyers to properties, with properties that would fit them most, based on buyer potential and market availability. Also included in REAI is property analysis in the form of REfax Report, which provides full background information on various factors as well as analysis on future potential, that can help buyer all in one platform. This greatly saves the time and stress for the user from searching all sources on it. HouseCanary also provides such reports, but cater more towards enterprise buyers particularly on the property's valuation estimate.

With AI and deep learning, the traits and characteristics of various properties can be analyzed clearly for the individual user, and a good fit can be projected accordingly which

save huge amounts of time and effort. A proper learning and matching AI algorithm will be able to handle this process smoothly, alleviating the burden from agents and their buyer clients. REAI's proprietary technologies are exactly meeting this need.

As said, other parts of the real estate transaction are also antiquated and become obvious targets of next-generation AI companies. This includes preparing buyers for house purchase planning, mortgage planning, finding the features and location appropriate for their needs, and more. Most of these steps are currently done under the guidance of the buyer agent, and in many instances, the agent is not advising in the buyer's best interest.

AI has the capability to guide or process tasks for the buyer, instead of the buyer going out and tackle them all. Companies like REAI have a platform to do just this, in a convenient way. Thus turning a stressful journey into a manageable errand.

Virtual Agency & Smart Chatbots

By many industry surveys, chatbots are continuing to grow in popularity, and by 2020, over 80% of business is expected to use a chatbot in their practice. In contrast, the real estate industry had rarely seen a functional chatbot, agents and clients still rely on the phone call, email, messages, social media, etc. for communication and providing advice/guidance. Real estate is notoriously behind the time in this respect.

In regards to real estate chatbot, in particular, the development is fundamentally difficult as it is tasked with studying the pattern of words and sentences possibly in human interaction and reply appropriately. The status quo chatbot commonly seen in other industries are done through pre-populated questions and pre-populated answers, and thus users can get general answers from those common questions and not much else. The task is actually much needed in real estate.

Currently, the only market has seen the tool is from OJO Labs, which provides a chatbot in their mobile application, with definitely human involvement on the OJO labs side to address user query. REAI will definitely launch our much more robust AI Chatbot REBO for real estate industry soon.

This will tremendously alleviate the burden of real estate agents, who do not have the capacity to answer all questions from clients or potential clients properly, let alone on a 24-7 basis. This REBO system from REAI can function as an around the clock virtual assistant to help, advise and guide users along the way of their real estate transaction process.

By 2020, over 80% of real estate businesses are expected to use a chatbot or some other form of automated responder in their practice.

Agent-Side Lead Sourcing

Currently, agents must pay up front fee for prospective client information, or leads, that may end up being a real client, or waste of money. With minimal information, the likelihood that the lead is useful does not inspire confidence.

On AI platforms such as REAI, the naturally occurring relationship between potential buyer and their potential agent occurs in a sea of data. When both are on the same platform, the movements of the buyer can be utilized to inform the right agent on the other side what the buyer wants in real time. Verbal language between humans becomes much less efficient in comparison.

When the appropriate agent is matched to a buyer based on their needs, and the agent pays for the lead, the information agent gets is comprehensive. It includes information that buyers look at this property, buyers saved

this property, and the commonalities among their saved properties, i.e., these properties are close to public transit; or by the AI analysis, these buyer at this age have more tendency to give birth to kids in two years, etc. With this ideal buyer lead for agent, agent can easily lead the buyers to ideal homes quickly and easily.

The communication and understanding then becomes simultaneous, and with projections into the future, even anticipatory. As either a complement or alternative to deep matching, AI can optimize the human elements of the process.

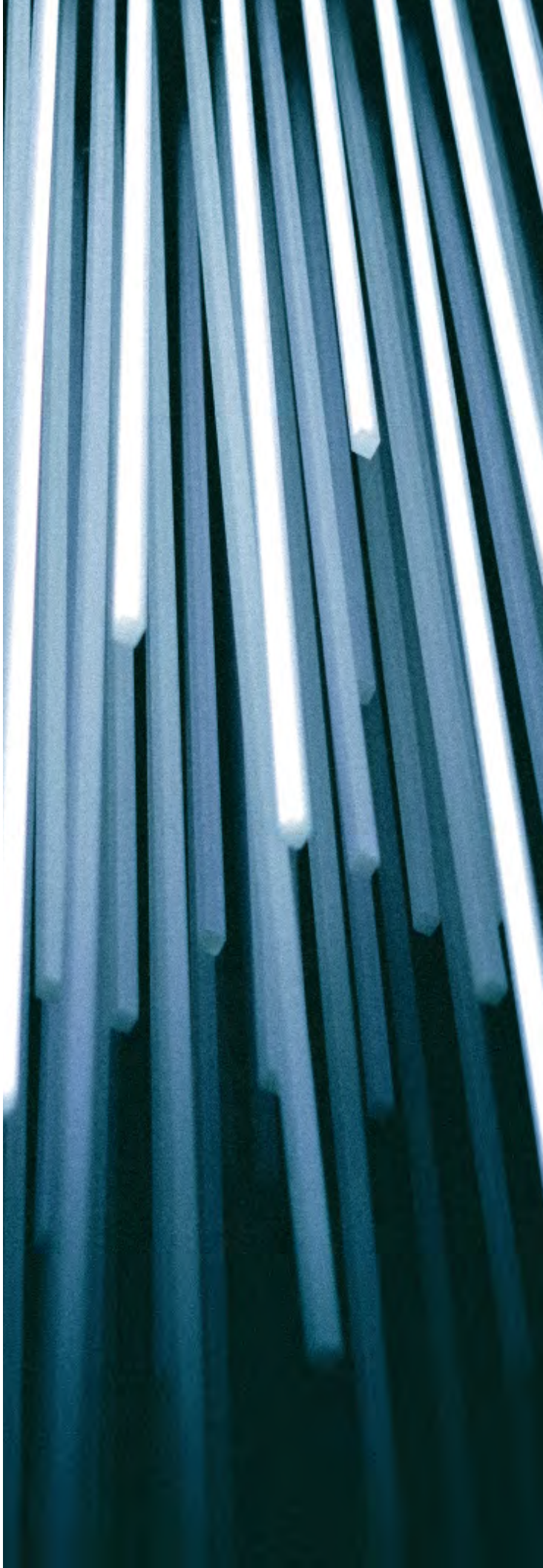
Automated Property Appraisals

The calculation of a property's value goes much further than the initial asking price. A lot of the value includes the projection of its price in the future, the projection of the location's attractiveness in the future, and many other factors. The collection and allocation of these factors in a multivariate calculation is one of the strengths of AI, as well as its scalability in being repeatable. [1]

Financial analysis is an intensive process and can make the investment cycle of research, buy, and profit quite slower. Furthermore, one might get the costly human error element that can cause someone to mistakenly choose a property with much limited profitability. With AI-powered property appraisals, it will not require brain power to quickly figure out what to invest in. This will also help a seller offload a property quicker, as the rate of activity and finding properties to buy will only increase.

REAI has systematic process to curate info from various sources, where normal user will usually spend hours researching for it. REAI's REfax Report uses its unique AI process to curate data and automate research for user, providing in-depth analysis and forecast of the future value/potential of properties, whether buyer is investing in a commercial property or in residential property. Even for the qualitative appraisals for finding properties that fit you personally, REAI system can automate the overwhelming majority of it.

With AI taking care of appraisals, it really low-



ers the barrier to making really good investment decisions. The market itself gets more "intelligent", making happier investors everywhere.

Property Management Automation

A large part of this aspect of technology would be covered in the Smart Home, and Internet of Things Chapter and another strength of AI is the ability to be combined with other technologies to enhance them. It has a high confluence potential. The devices in your home or apartment work in tandem to create the convenience of modern living. When combined with the general affairs of the property, like rent and yard work/landscaping, the management of an estate becomes a prime candidate for AI to automate. This could be for apartment complex management companies or the owner of the property themselves.

> *The ability of Artificial Intelligence to be combined with other technologies gives it strong potential for rental and estate property management.*

When you think of the devices behind home convenience, you may think of heating, air conditioning, vents, the laundry room, pest control and more. Most of these things have a maintenance cycle or life expectancy. With the addition of AI, the available data of all of these products and services, along with captured usage data, can allow the owner or company to anticipate when service is needed for any part of the property at all times.

Whether in a residence or commercial property like a restaurant, with a proper AI platform like from REAI, you will not see the important function in your property breaking down, nor will you miss a deadline for it. The anticipation afforded by AI means a seamless living experience among things that can break down or malfunction.

Home and Property Security

Artificial Intelligence can help improve home security.

1. Computer Vision: With the camera and sensor technology, visual recognition has improved by leaps and bounds.The most direct use can start from using facial recognition to run someone's image against a public criminal or sexual offender database. The house can lock up to various elevated security levels depending on who steps onto the property. This would anticipate any "easy" break-ins. [2]

2. Fraud and Anomaly Detection: Any anomalous patterns can be detected with advanced fraud detection algorithms. Ranging from vision based traffic patterns outside home or neighborhood data, AI can help solve crimes. [3]

Better Projections of the Future

Existing service providers like Zillow now rarely provide or provide very limited real projection of property price, neighborhood, crime, future trends, etc. Zillow provides Zestimate feature about the current house value, which was deeply controversial both from accuracy perspective as well as complaint and legal perspective, and Zillow does not provide analysis or projection of various characteristics of property going into the future. A well designed, uniquely powered system including deep data analysis and projection of the future characteristics of the house, neighborhood, city will be greatly needed going into the future. And REAI REfax and the property neighborhood heatmap is perfectly positioned

to fit the needs on this.this property, and the commonalities among their saved properties, i.e., these properties are close to public transit; or by the AI analysis, these buyer at this age have more tendency to give birth to kids in two years, etc. With this ideal buyer lead for agent, agent can easily lead the buyers to ideal homes quickly and easily.

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Find Background Info of House

Currently user has to resort to traditional tools like Zillow, Google, or county offices to search for house background information, which tends to be very tedious, time consuming, and inefficient.

The New way ahead: The new method for background information is no longer through arcane channels of agent or Zillow, etc., nor is through long hours of search; but through intelligent AI services like REFAX from REAI- which is through AI data curation and further deep analysis/projection, REFAX provides persocalized report like REfax premium report with personal analysis and guidance, catering to consumer's individual needs on commute, renovation, neighborhood, price projection, school, weather, shopping, recreation, night life, etc.

Communication, Personal Advice & Guidance

Currently buyer/seller has to communicate with others and their agent using traditional methodologies, including phone, text, email, social media messages, or face to face with agent

The New Way ahead: The new and more efficient process ahead is through AI enabled tools, including AI chatbot, daily reports, etc.- Companies like REAI provides bot and reports to enable prompt, efficient communication, other players who provide chatbot also include OJO Labs.

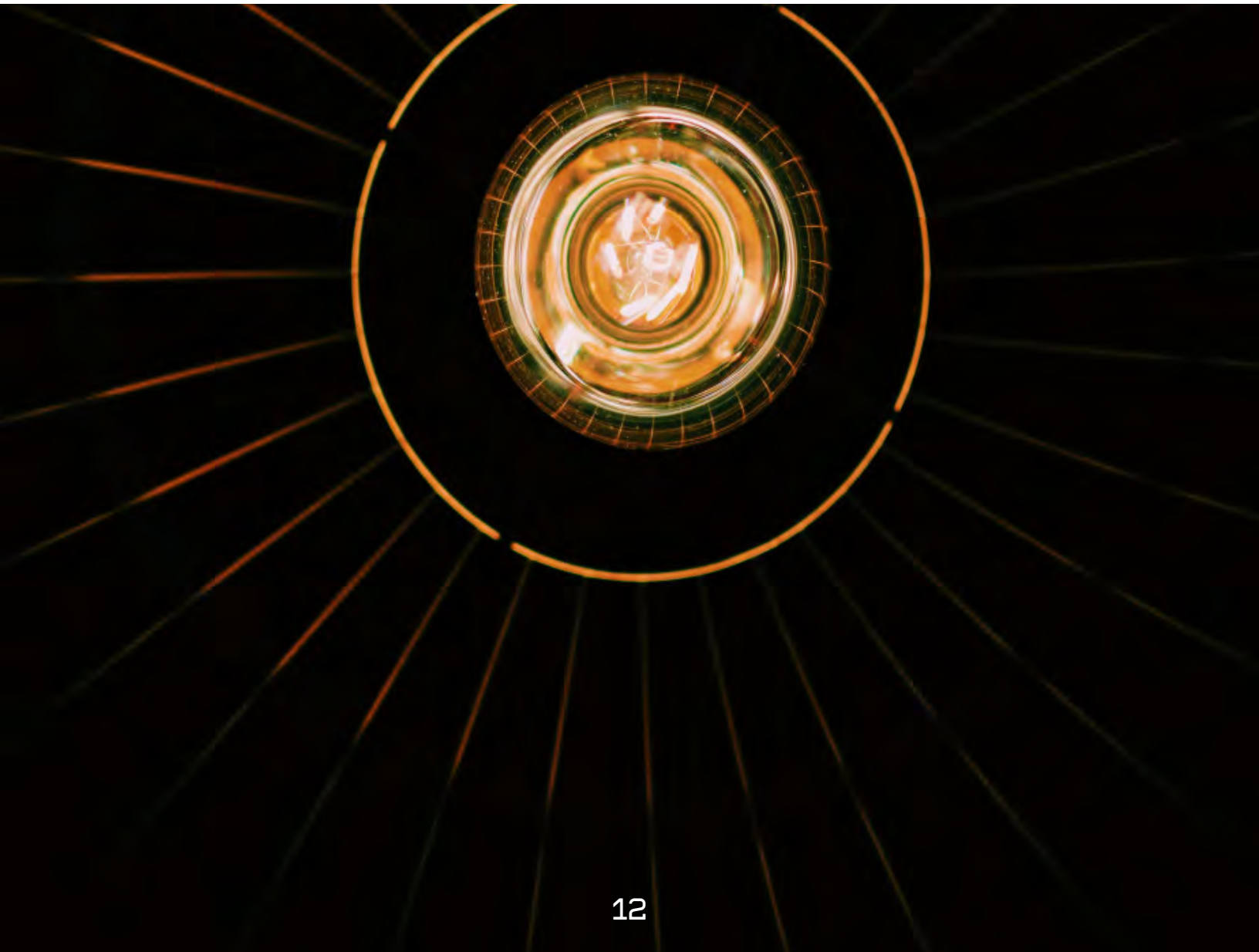
Peer to Peer Interface/Social Info Exchange

Currently users have to resort to traditional methods for peer to peer interface, including talk to agent to get advice, or get limited information from other users in NextDoor, which is mostly about neighborhood notification on an online listing basis.

The New way ahead: Services like REaiSocial from REAI, where user can interface with others and get more personal and intimate information exchange catering to their needs from peers, in a seamless and efficient manner.

References

1. Zestimate https://www.zillow.com/how-much-is-my-home-worth/
2. NEST cam Outdoor. https://store.google.com/us/product/nest_cam_outdoor?hl=en-US
3. https://www.flocksafety.com/



CHAPTER TWO

BLOCK CHAIN FOR REAL ESTATE

REAL ESTATE MEETS BLOCK CHAIN

While AI being the key player in real estate industry revolution, with its influence and help, blockchain technology will also play a big role to make the industry more transparent, open, and democratic. The real estate space has been targeted for revolution by blockchain and cryptocurrency technologies. From fraud prevention to digital market creation, the potential for transformation in Real Estate is huge. One obvious advantage for a user on the blockchain app here is that the user does not need to understand blockchain from a technical standpoint. As such, the technical fundamentals of blockchain will not be covered in this book.

DIGITAL CONTRACTS, AGREEMENTS, TITLES, AND REGULATION

Digitizing the official documents associated with the transaction and ownership of a property opens up new possibilities in Real Estate. When using the built-in ownership verification of blockchain, transparency in contracts and titles means no more murky transactions of real estate. Issues on contract and title can be largely eradicated. In another word, No more owning a property and finding out later it is in the process of being foreclosed, or someone else is tax lien holder of the property and claim ownership.

Moreover, it also means that these platforms or apps can create portable versions of their software and become embedded in larger platforms. When the actual contractual agreement is made and maintained digitally, all of the other functions of real estate can also be digitized. Companies could take care of different elements of Real Estate activities so that at closing, there can be no more paperwork needed or physical presence of the parties required in those activities.

The Smart Contract feature in Blockchain can also be utilized to expedite the transaction process, making the transaction or certain transition process automatic, hassle and fraud free, with no human input needed, making sure that the right ownership and transaction

is carried through once the necessary steps are met.

Consequently, with the advent of Smart Contract, the regulation and legislation in real estate industry can also be improved, streamlining the transaction process and enabling digital ledger of the records, enabling the industry regulation to be much more efficient, with less human effort, mistakes or cost. The transaction or other real estate process will be totally transparent, easy to track and review, and the scenarios of fraud tremendously reduced.

DECENTRALIZED P2P RENTAL AND INVESTMENT

Like Airbnb, peer-to-peer platforms do not require a blockchain system or a cryptocurrency. However, there are sure benefits to doing it that way.

Firstly, there would not be a foreign exchange fee needed, as tokens for such platforms can be exchanged in the user's home country where available. This saving for users on the transaction helps the case for wider and deeper user adoption worldwide.

By being on the network with blockchain, instantaneous "smart contracts" can be made and sealed to ensure transparency and the swift execution of even most complicated papers and terms. The risk of making an order for stay with payment processed yet property unavailable will surely disappear, as the money is distributed upon receipt of the goods or service only. Furthermore, the risk of the owner not getting the property back would also disappear in this smart contract.

TOKENIZED PROPERTIES FRACTIONAL OWNERSHIP

One benefit of digital cryptocurrency is the shrinking of units to tiny fractions. You can own 0.0000021 Bitcoin, but not US Dollars. When applied to Real Estate, you have the worldwide accessibility of information and fractional unit transaction combined to create a digitized Real Estate market.

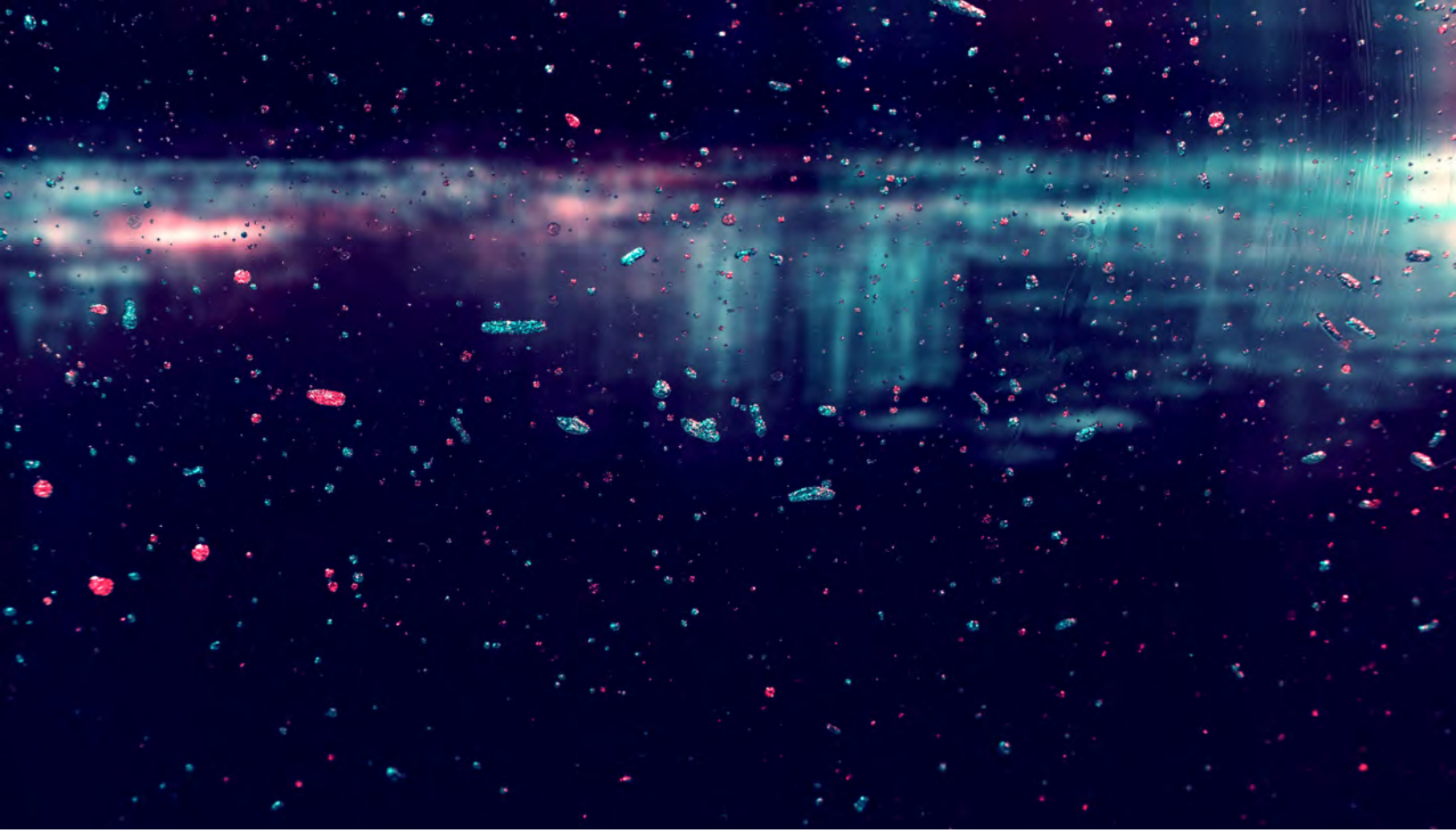
When something has its own crypto-currency, it is considered to have been "tokenized". The built-in verification of ownership history in blockchain structures guarantee the consistency of ownership of the crypto assets, the intrinsic value possessed, and the ownership (partial) of the property. The integrity of the network is thus preserved. Similarly, buyers or family can purchase or sell partial ownership of properties, and process transactions seamlessly.

With the influence and help of AI, blockchain technology will play a big role in making the real estate industry more transparent, open, and democratic.

TRANSACTION SECURITY AND FRAUD PREVENTION

Transaction security and fraud have always been a pain point for buyers/sellers, as well as agents and closing attorneys. We have seen many cases which manifested this issue, where closing is in well in the way when something surfaced around problems of title &deed, or previous owners owing fees to the county causing buyer have to incur extra fees to officially claim ownership, or tax lien situation from tax delinquency causing the seller/owner unable to claim legal "owner" for properly sales, etc. There can be many elements that would cause the title and deed "unclear" from legal perspective, while owners, sellers, agents and closing attorney do not have capacity to catch them promptly, causing transaction issues or fraud.

These issues can sure be resolved through



blockchain technology, where the title ownership and the transfer of title is transparent, and available for everyone to check, thus reducing the issues of fraud. The current tax lien property "purchase" is a widespread misconduct where certain investors take advantage of the owners' negligence in paying property tax and thus can claim ownership by paying tax & fees which is relatively small fee compared to house value. Blockchain technology will eradicate this potential loophole of tax lien, and make the ownership clear, proper, and easy to track.

Another potential fraud perceived in industry is the situation where money being sent to a person who impersonates a real estate agent. In this case, the impersonator normally sends an email to the buyer with a spoofed "from" address or a hijacked account, and the email instructs the buyer to change the pre-arranged plan to send money to a different account number now, thus when the money hits the account, the impersonator withdraws the money and closes the account. So how do we deal with it?

As we see, today's centralized approach to credentials which manage with name/password pairs puts the burden of identifying individuals on the business, as well as the risk of identification fraud. Here comes Self-Sovereign Identity, or SSI, which provides a much better identification of the individual, allowing the buyer to know who is really sending the message, and the bank to know who is opening and closing accounts. With SSI, the credential issuer assumes the risk of potential fraud. Credential issuers can be government entities like national, state, county, or local governments, or businesses entities like bank, supermarket, utilities, or institution and trade organization like unions, association of realtors, etc.. Thus we see a fascinating future here users approach business with pre-verified identities they carry in wallets on their mobile devices, and the business simply checks the verification token using a public blockchain, this will create a much more secure and efficient process. We have seen blockchain system like Sovrin [https://sovrin.org/] that helps digital identity management these days, and we will definitely see more advancement in the field.

TRANSACTION PROCESS, MACHINE LEARNING AND BLOCKCHAIN

As there are multiple verticals, events and stakeholders involved in the transaction process, including brokers, MLS, lenders, title companies, county admin, etc., the most efficient way to keep track of transaction process as well as any changes to it becomes essential. The currently seen policy from RESO (Real Estate Standards Organization) indicate that the stakeholders need to document the changed state of contracts, listings, agreements, etc. We can see that the most efficient path on this is to write the changes, or events to the blockchain.

Currently there is no document that can be made to capture the entire changes and process efficiently. Today, each vertical have their own and centralized system that are used to specifically service their users, which in turn is very difficult to get an overall clear view of the whole transaction. Some attempts had been made to create "transaction processing systems" that control or track the transaction. However, these efforts had difficulty getting traction because each vertical still wants control of the detail information they need, i.e., listing, loan, title base, public records, etc.. Thus, utilizing a blockchain-based Event Model, together with machine learning to optimize the process, we enable the new approach to easily track status when dealing with a complex, multi-vertical process like the sale of a house. In this approach, each vertical retains their detail information and reports "events" that occur with the detail information. This way, the consumer and stakeholder create win-win for all.

> *Blockchain enables an end-to-end transaction history for the many parties involved in the average real estate transaction.*

BLOCKCHAIN, DISTRIBUTED LEDGER, SMART CONTRACTS

In normal scenario of property purchase with mortgage, the buyer will not have deed immediately after closing, with the deed and title held by the financial institutions who provide mortgage loan to the buyer. In case the buyer can't continue to pay mortgage, the financial institutions will foreclose and sell the property as they see fit to avoid financial loss. There can sure be potentials where some parties within or affiliated with the financial institutions illegally make duplicate copies of the ownership deed document, which could be utilized to conduct fraudulent property transactions, and the situation can be very harder to detect and prevent. On the other hand, with blockchain and digital distributed ledger, this will be easily avoided, with ownership information open and transparent that everyone can track easily, and validates accordingly, where changes are only possible when consensus is achieved.

Contrary to the scenarios where Bitcoin owners lose their cryptocurrency holdings when they lose the key to the tokens, for real estate property owners whose property is tracked in bloackchain and digital ledger, they will not face the scenario of losing their house once they can't find the key, as all the real estate transaction record is logged securely, and owners can always reclaim their key through deeds/title verification and county system.

Again smart contracts will also be key in achieving smooth and most efficient real estate transaction, through the automation of various real estate processes. Once the condition of the steps is met, say the range of seller's acceptable price, mortgage requirement, inspection results and acceptable criteria, the green light is automatically given to authorize

the execution, proceeding to the next step seamlessly. The smart contract in blockchain can thus save huge amounts of time, effort and resources for all stakeholders.

AI technologies will definitely enhance the pace and capacities that Blockchain can help improve real estate industry, optimizing the chain and streamlining the needs/changes/action process, meeting real estate related needs much more efficiently, including identifying, tracking, notifying, addressing issues, in a transparent, proactive and automated basis.

Other areas involved in blockchain technologies also include:

- Asset ownership history
- User info

Company like REAI and others will also provide AI solution on these fronts to enhance the revolution.

CHAPTER THREE

IOT AND SMART HOMES

CURRENT STATUS OF THE "SMART HOME"

As we observe the dominant influence brought by and will be even more heavily brought by AI technology, another field that will also be influenced and elevated by AI to push industry revolution is IoT/Smart Home. So far Smart Home technology has fallen short of what people imagined it would be. Wireless locks, automated blinds, app-activated security, digitalized fridge inventory are all interesting stuff but are barely just extensions of their original vision. To many people, the smart home appears like a regular house.

When we wonder on the possibilities of the Smart Home, what comes to mind is the orchestration of technologies and platforms that extends further than the confines of the house, and not just with an app. While setting your lock or thermostat from the road is impressive, the possibilities of the Smart Home should be able to go much further. But how?

What is there besides a device Smart hub for physical home devices?

THE REAL SMART HOME WITH A DIGITAL LAYER

What is needed is another layer, another platform. Smart Hubs are a start, but are ultimately limited to inspiration from the devices within. A digital layer that could include management of the Smart Hub would open up the possibilities more commiserate with what the future should look like.

What would these capabilities look like?

This digital platform could connect to your social. Imagine your house knows from Facebook that someone coming over the house is a

friend and enjoys Spanish culture and Salsa music. When he or she comes over, the lights and music change according to your guest's tastes automatically. It could ready itself for a party.

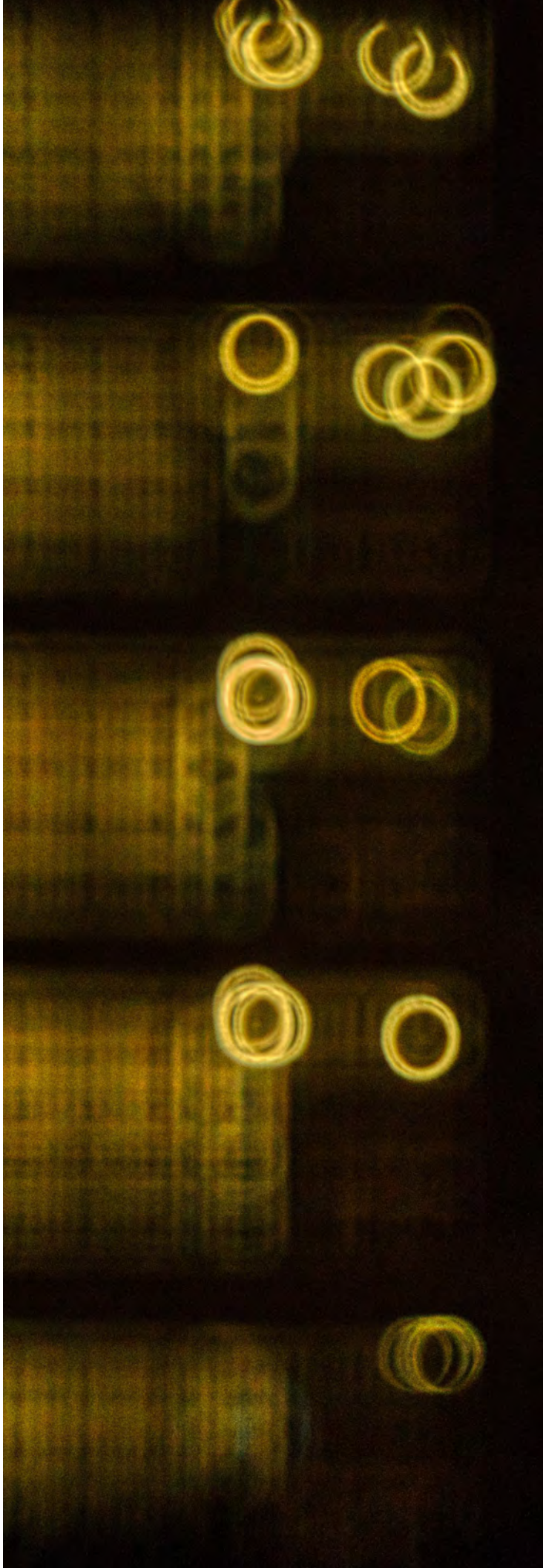
With sensors, the platform could allow the house to adapt to its environment. In response to a rain forecast, the roof opens a water collecting mechanism. Seismic shifts prompt the house to adapt for minimal damage. Unknown people sneaking around the house will bring an alarm or shutdown.

Combine the platform with artificial intelligence and you have a virtual assistant with far more capabilities than Alexa, and embedded within the house itself. With AI and the digital platform, new ideas for products and services would arise. REAI is providing its AI technologies to enhance the capacities of smart homes and IoT application.

These are but a few examples of what is made possible by a middle layer in which the devices and their hub can be embedded. Then we may finally see what movies portray of a home 50 to 100 year into the future.

this property, and the commonalities among their saved properties, i.e., these properties are close to public transit; or by the AI analysis, these buyer at this age have more tendency to give birth to kids in two years, etc. With this ideal buyer lead for agent, agent can easily lead the buyers to ideal homes quickly and easily.

The communication and understanding then becomes simultaneous, and with projections into the future, even anticipatory. As either a complement or alternative to deep matching, AI can optimize the human elements of the process.



CHAPTER FOUR

SMART CITIES

THE VISION OF A SMART CITY

We have talked about smart home. On industry perspective as whole, from smart homes to smart building, and then further to smart city planning, AI and real estate technology advancement will definitely help city or urban planning be much more efficient, creating an environment of more energy-efficient, logistic-friendly, occupancy-optimized livable space, with better nature preservation, and less construction needs.

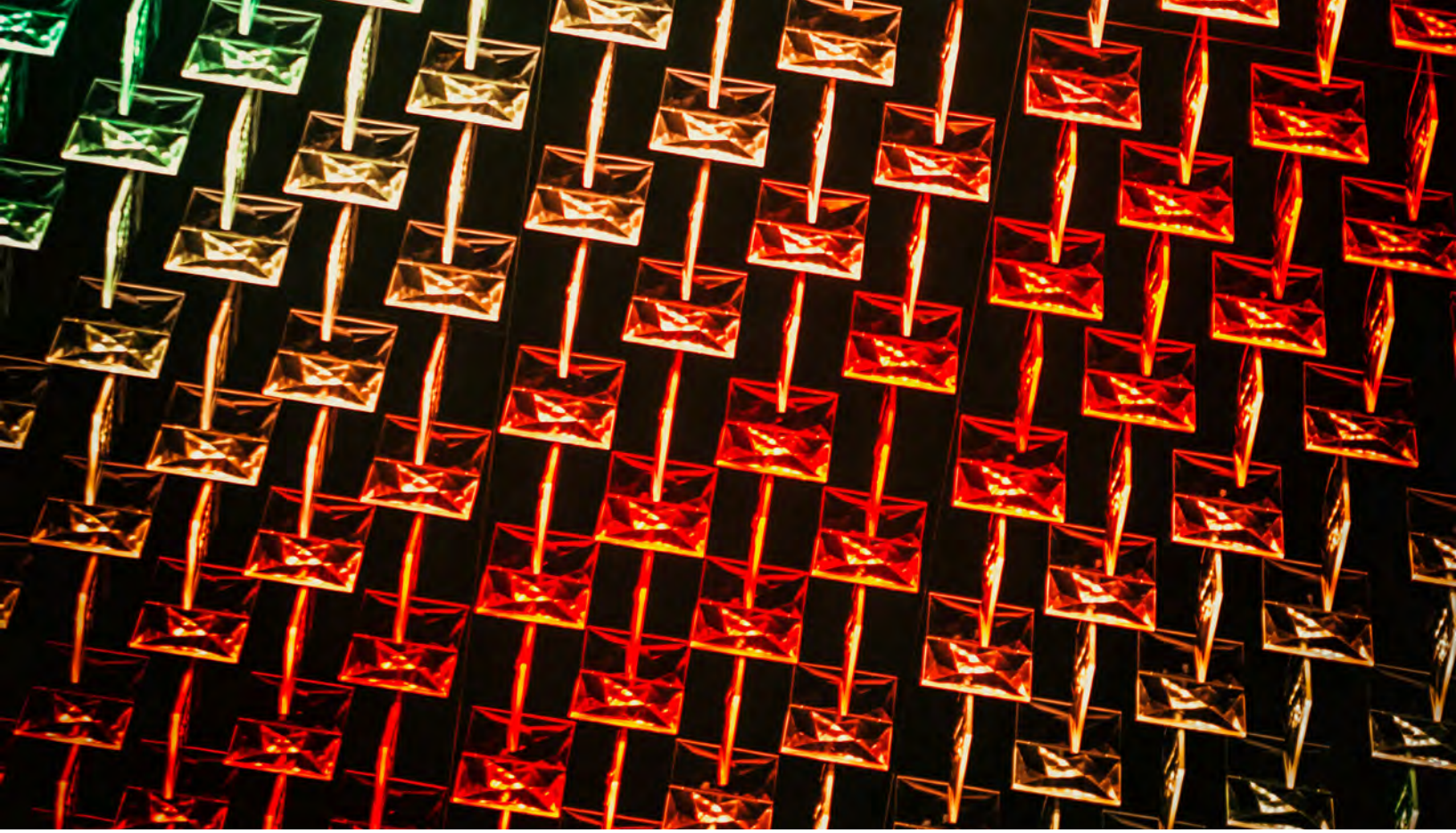
Smart Cities are coming to a metro near you. These "connected" cities are expected to be more desirable to live in than those that are not "smart". And generally, the more desirable a city gets, the higher the value of its real estate (duh, right?).

But the devil is in the details. How will this increase be manifested? Will it be an equal increase all around? Will the effect stop at some point? To answer this, we'd have to get a deeper understanding of what a smart city achieves and what actually makes it "smart".

Besides being cool, the value they offer is making infrastructure and overall living in the city more efficient.

THE IMPLEMENTATION OF A SMART CITY

The Wikipedia definition of a smart city is: An urban area that uses different types of electronic data collection sensors to supply information which is used to manage assets and resources efficiently... This includes traffic and transportation systems, power plants, wa-



ter supply networks, waste management, law enforcement, information systems, schools, libraries, hospitals, and other community services.

This would mean using real time data for likewise optimization of traffic patterns, better internet infrastructure for homes & offices, better crime prevention, digitization of government services, and much more. The more mature state of the Smart City would come when this further developed instance of public data is used for enterprise. Theoretically, private companies would use this data to develop a technological framework that would coordinate all the moving parts of a city, so as to become a singular super entity.

IMPACT OF SMART CITY

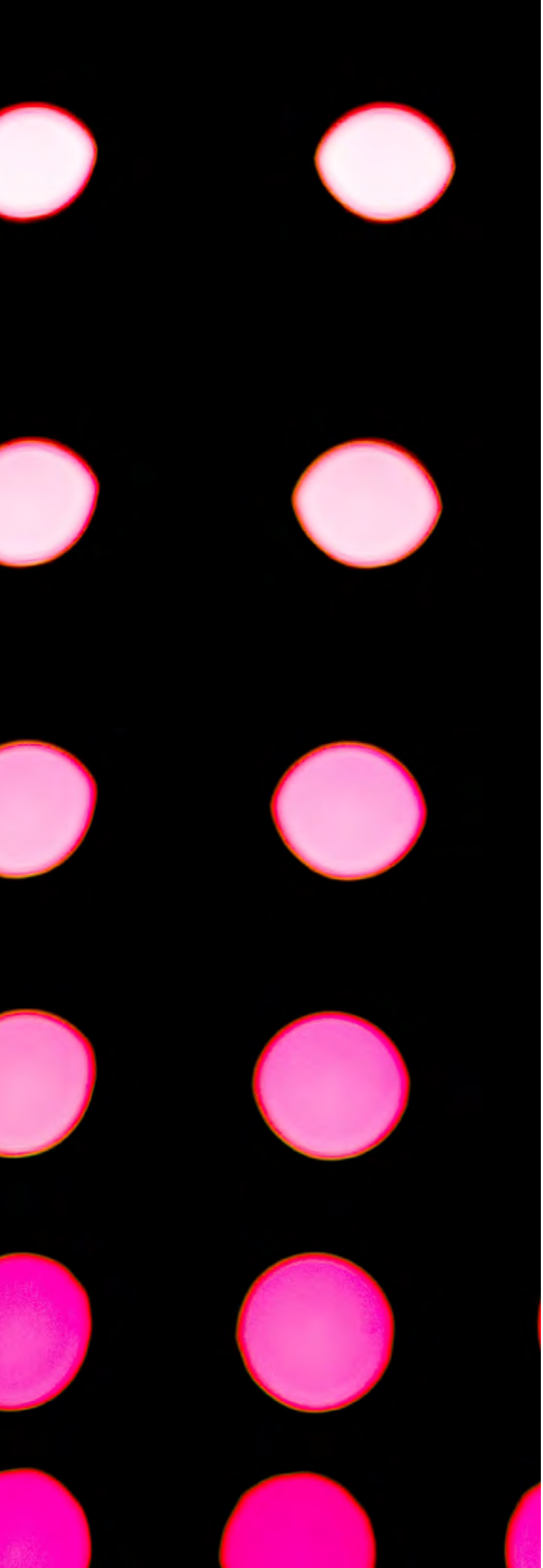
One of the biggest impacts of the Smart City efficiency gains is in everyday logistics: Commuting to work. Using the internet. Going out socially. Running errands.

When traffic is optimized and the people on the outskirts can enjoy the things usually only available in the Midtown, what you end up getting is the socio-technological effect of the world "shrinking". Like how social media has done this from the standpoint of interpersonal network reach and general awareness, Smart Cities would literally shrink the amount of time it would take for you to get anywhere and do the things you need to do.

In Real Estate, a lot of what makes a "luxury" home is the location, as in its vicinity to the city and the popular elements of it. As Smart Cities extend the range of distance that someone can enjoy the benefits of centrality, the radius of what is considered a "luxury" location would also extend.

The knee jerk reaction here is to think that it necessarily means a general and proportional bump of real estate values all the way out to the sticks. While this may be true when comparing between a Smart City and a non-connected city, one must remember that the pool of demand is not infinite.

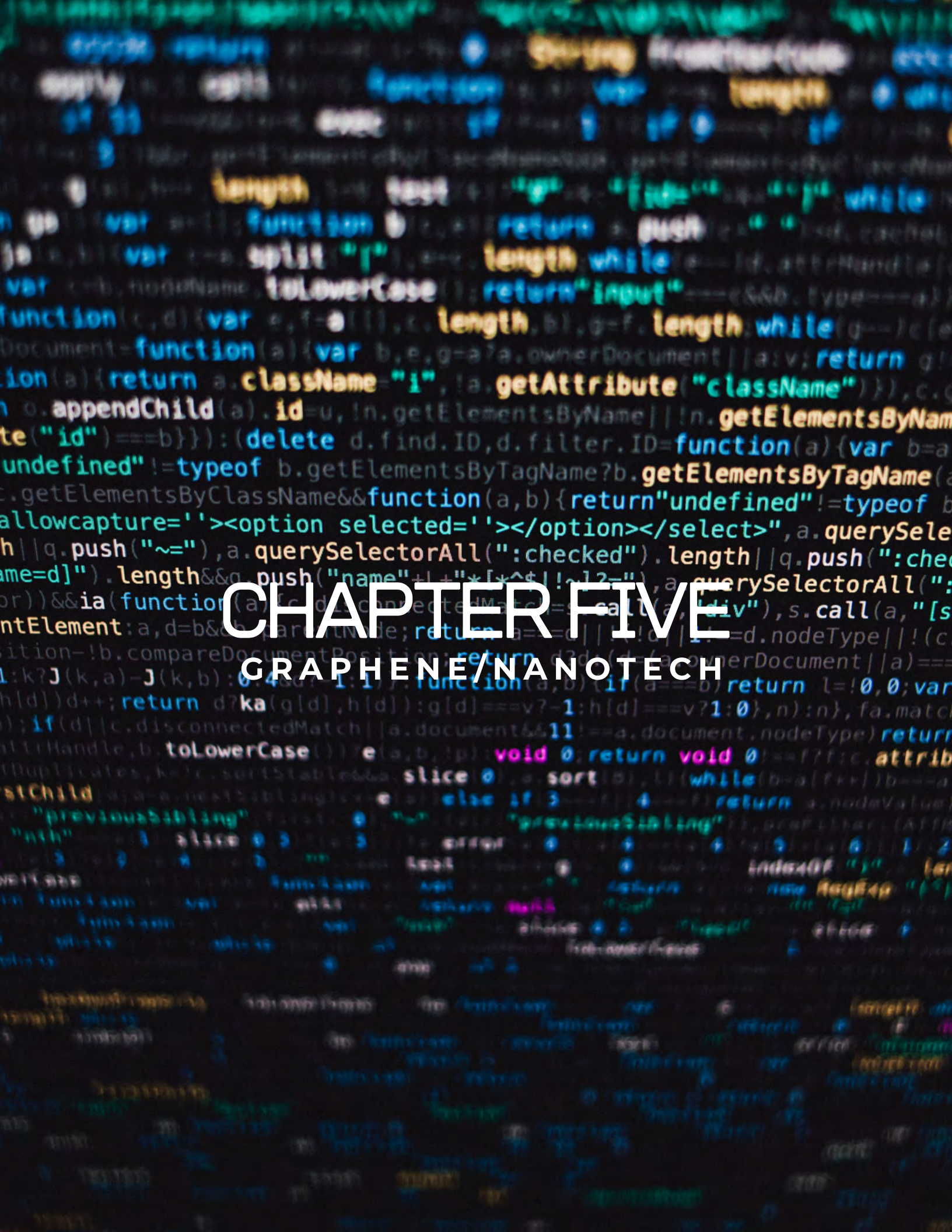
When "democratizing" the benefits of the city outwards for a finite group of buyers, you



would likely see that same flattening out of real estate values as you wonder out from the center. This means the premium for the luxury city location would shrink as the world “shrinks”.

Ironically, it would also mean a reversal of the modern urbanization era, as this technology becomes more ubiquitous. When people can enjoy a 30 minute commute at the 3pm road time, but not during 5pm rush hour, it no longer becomes a necessity to live within stone’s throw of their workplace.

Company like REAI is also working on providing unique AI technologies to enhance the feasibilities and capacities of the above optimization, features, as well as plans in smart cities.



CHAPTER FIVE

GRAPHENE/NANOTECH

NANOTECH OVERVIEW

Besides the AI technology revolutionizing the industry from the overall process perspective, on the material side there will also be tremendous changes to bring future benefits. As we know, Nanotechnology is changing in many industries and fields. Of course Materials Science is to be particularly impacted, and it just so happens to be closely intertwined with Real Estate. You may have read about the wonder material graphene, but there are many others as well, including Borophene, Germanene, Silicene, Stanene, and more.

These Nanomaterials will affect real estate in various ways. While for many options that we could imagine, mass production of the material will limit what can be done or economically viable in the immediate future. However, we do see what can be done with this technology.

APPLICATION IN REAL ESTATE

Elaborated below are the different forms this technology will take in Real Estate or will likely take, based on the properties discovered about them.

LIGHT & STRONG

Materials from which the frames of houses and buildings can be built would be stronger and lighter than ever. Because of this, it would require less material for the same level of performance. More overall room on all sides could be achieved for the same house. And more material can make it even stronger, so that it could perhaps stand up to the destructive forces of a dead-on tornado strike.

This also has impacts on the 3D Printed homes sector. Lighter materials to be printed means more can be printed in one fill-up of material. More capacity and efficiency means lower cost and eventually lower prices, for even better homes.

For commercial real estate and skyscrapers, the material would allow them to be impervious to plane crashes and terror attacks. Even larger structures could be built, a veritable Tower of Babel, so to speak. From design perspective, architectural creativity could literally reach new heights. What would have been structurally unsound before could now show a true fusion of art and commerce.

4D CUSTOMIZATION

With this promise, it also includes the possibility of adding more functionality to the structure. This could be in-place adaptation to weather and natural catastrophes, or structural changes to make for social events, both inside and out. Want to make a haunted house for a Halloween party? Recreate Winterfell castle for a Game of Thrones party?

Maybe you don't really need a yard. Extend the size of the house to the size of both front and back yards. Or perhaps you want to have more field for a pickup football game. All of this flexibility would become possible because the units making up the build are just atoms thick.

Just as within the home, entire office layouts can be customized immediately to the tenant's liking. Have a board meeting and no space is available? Have walls come up from the floor in an empty space and form a table and chairs from the bottom. The possibilities for the future are exciting.

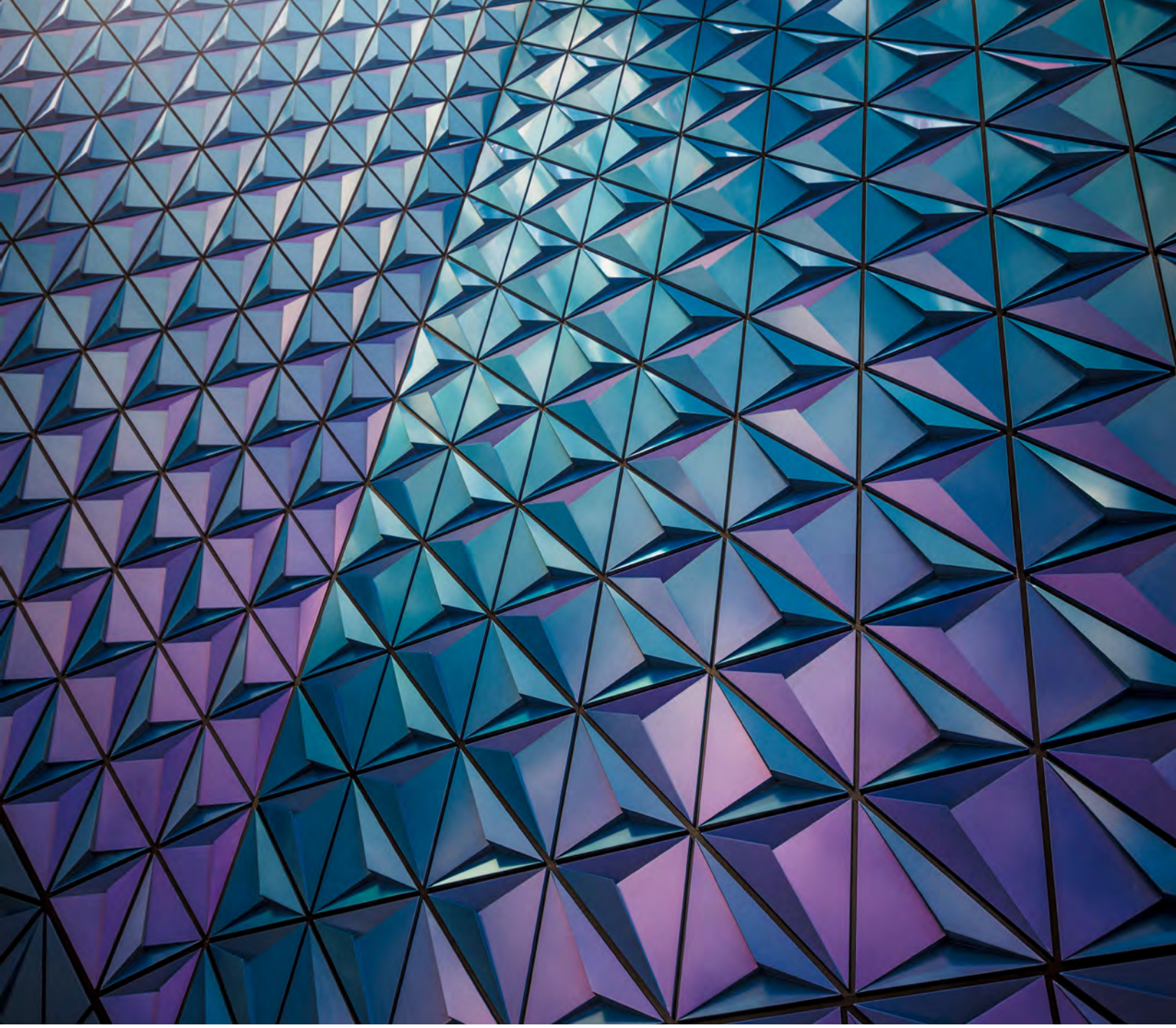
POWER

Strands of conductive phosphorene can allow for the most flexible circuitry imagined, on the atomic level. More power capacity and efficiency, as well as short term battery storage, could make your power bill a fraction of what it is. When mixed with solar and other possible alternatives, houses could start to produce all their own energy. With nanotechnology, energy could be collected from a multitude of sources.

With more power generation comes more possibilities for what can be done on the real estate properties. From the commercial side, this means much more affordability for commercial needs. For all the science parks which have high energy needs on experiments and the like, or just self-powering 5G internet for the building, it really elevates the functionality.

HOME MEDIA

A combination of circuitry and surface technology in the home would eventually change any surface in the home to a computer or TV monitor. The sound could also be made part of it. Nanotech and the SmartHome are natural buddies in integrating a truly futuristic experience into your life.



If you can interact with your home, and the home can adapt to serve you, this would make the person and the home a truly symbiotic relationship.

While we sort of get further in the future here, we start to put into form what this all means, as for nanotech in Real Estate. Currently this technology is only at the stage of being applied to batteries in the near term. We are looking forward to see tremendous revolution on this front, and AI technology will definitely help enhance the development, application and capacities of it as well. Companies like REAI is proceeding to also help enhance on revolution of this field through AI perspective.

There are other Building technologies including new technologies on construction, such as modular building &its improvement, which will be covered separately in other sessions by REAI on how AI will enhance the revolution on those fronts as well for real estate industry.

CHAPTER SIX

AR/VR

Now we have explored the wonders AI can bring to the real estate industry, from another perspective AI can also enhance the revolution on another angle- AR & VR. As we know, VR and AR have been only on the mind of nerds for a long time. And now, thanks to them, they are gradually coming to our daily life. As we challenge the old notions of reality, business is sprouting up to take their shot at revolutionizing various industries.

One such industry is Real Estate. With Real Estate, there is much emphasis on real, physical presence. While VR provides a complete departure, Augmented Reality projects to be more relevant to the industry. Below are the ways that Augmented Reality can change the industry:

THE END OF BLUEPRINTS

The designing of a home take some architectural planning. Then you add interior design planning, and you have a few spaces ripe for revolution. Planning that requires visualization in the mind for what could be, can now literally be visual.

Why pore over a paper or digital outline when you can get inside it? Why obsess over proportion when you can expand or contract it with your hands? When mixed with the advent of 3D Printing of houses and AI, house and building creation become a truly seamless process, with no stops along the way.

Especially when needing to be creative within a plain space, interior design also taxes the mind's ability to see what can be. With AR, designers can create much more nuanced aesthetics. Through these technologies, things can get cheaper and things can become enhanced. This would be an example of the latter.

FAUX DECOR

But what about making things cheaper? The nicer things in life can be harder to get, being subject to supply and demand. Besides further streamlining the building process, reality itself is in the eye of the beholder with augmented reality.

If we all saw through an augmented reality lens, the look of high-end materials could be reproduced by the program, with something

of similar texture and weight taking its place in physical reality. How about the look and light of a chandelier you never need to clean or worry about falling on you?

We could be surrounding by nice "things" without needing to worry about cost or about how rare a certain Persian rug is. You could have a huge flat screen TV showing you a movie that is just projected from your lens and held proportionally in place to a certain location and dimension on your wall.

And better still, change the color of your rug or the pattern of your kitchen counter, just by switching out the previous ones in your Home AR program! You could also have celebrities in the house and virtual parties. With the nature of reality up for grabs, so much more becomes possible.

GOING PLACES IS SO YESTERDAY

Think of all the people you have to meet in the process of purchasing your property. For trips and conversations not made obsolete by apps, you still have to take time out of your day and drive there. You are at the behest of the laws of time and space.

While imaging that, to meet agent and mortgage consultants, you could schedule one to appear in your home through your AR lens and have everything done from your couch.

What about vacation homes? Wanted a house in Barcelona? How about next to the Parthenon, back in Ancient Greece? On the moon? Just look out your "windows"!

Whether it is meeting people without actually going to them, or enjoying places without going there, you can be more productive or lazy. However you like!

Again, AI technology will play a key role here also in elevating the application of AR/VR in real estate. Company like REAI is working on AI technologies to enhance the AR/VR capacities further, and to make our daily life more fun and powerful!

Elaborated below are the different forms this technology will take in Real Estate or will likely take, based on the properties discovered about them.

CHAPTER SEVEN

SOLAR/ALTERNATIVE ENERGIES

One more area where AI can elevate the industry revolution is through help improving the application and implementation of alternative energy. As we all know, Energy reservation and efficiency has always been a keen element in real estate evolution. From Nest [1] thermometer and smart home control device for saving energy consumption, to Solar panels that self-generate power for properties, the alternative energy sources are gradually becoming a key element in real estate renovation.

CURRENT AND FUTURE ALTERNATIVE ENERGY APPLICATIONS

With the tremendous increase in energy consumption, power outage is a common scene in urban living, causing big impact to residents, including loss of functioning of appliance, waste of food, loss of work, heat stroke, etc. A safe and convenient alternative energy is clearly seen as a necessity. Tesla has started to provide energy pack Powerwall [2], an automated home energy package, which includes Tesla power battery with relative solar system, that can backup power seamlessly with or without solar. When a grid outage is detected by Powerwell, it automatically become user home's main energy source. On a typical day, Powerwall and its solar will meet all of user's home energy needs. Powerwall integrates with solar to store excessive energy generated in the day, make it available when user needs it, and reduce reliance on utility companies.

Alternative energy sources will undergo major renovation and upgrades in the coming decades. And similarly, AI will also play a major role in enhancing the implementation and application on it, by projecting, optimizing and preparing various energy usage scenarios. Company like REAI is also proceeding to utilize its AI technologies to help on this front.

References

1. Nest, https://www.nest.com
2. Powerwall, http://www,tesla.com/powerwall

CHAPTER EIGHT

3D PRINTING

CURRENT PLAYERS

Of course, AI will also play an essential role in promoting another frontier for the real estate industry, which is 3D printing of properties. 3D will ultimately become a new source in home building, thus an innovation front in real estate. Currently, few companies are exploring this new frontier, including Icon [1] in the US, international serving non-profit groups like NewStory Charity [2], and international players like Apis Cor [3], BatiPrint[4], etc.

Icon prints out small 350 sq ft homes at $4,000 cost in just 24 hours. They already have a community of such small houses, the first in the US. Icon is confident that they can print an average-sized house (2000 sq ft) for $20,000. To give some perspective, the average markup on new house construction is roughly 30%. If Icon wanted to make the same margin, they could charge $27,000 for it. We are talking about the almost same house for 10% of the current average price in the US. That is the power of 3D printing.

MAKING IT UBIQUITOUS

While it is a little early to assume similarity in all possible instances, technology has a way of making cost inputs cheaper and functionalities more advanced over time. The first question would be for how to make house 3D printing ubiquitous? It would not happen overnight, as people would not spend $15,000 to demolish their own house and then $20,000 to replace it, just to sell it at the same price.

For institutional developers, wide-scale adoption could commence immediately, provided the functionality is there on the houses they plan to build. For individual land developers, it would be piecemeal replacements within traditionally built developments. They are looking at properties and empty land that the price would be much closer to zero than the price of the houses surrounding it.

INDUSTRY TREND BROUGHT BY 3D

As there would be a big rush to cash in on this ridiculous margin, the forces of supply and demand would be particularly dynamic in this case. As 3D printing of houses gets more popular, the price of both 3D printed and traditionally built houses will go down. However, the price will not be the only deciding factor of demand.

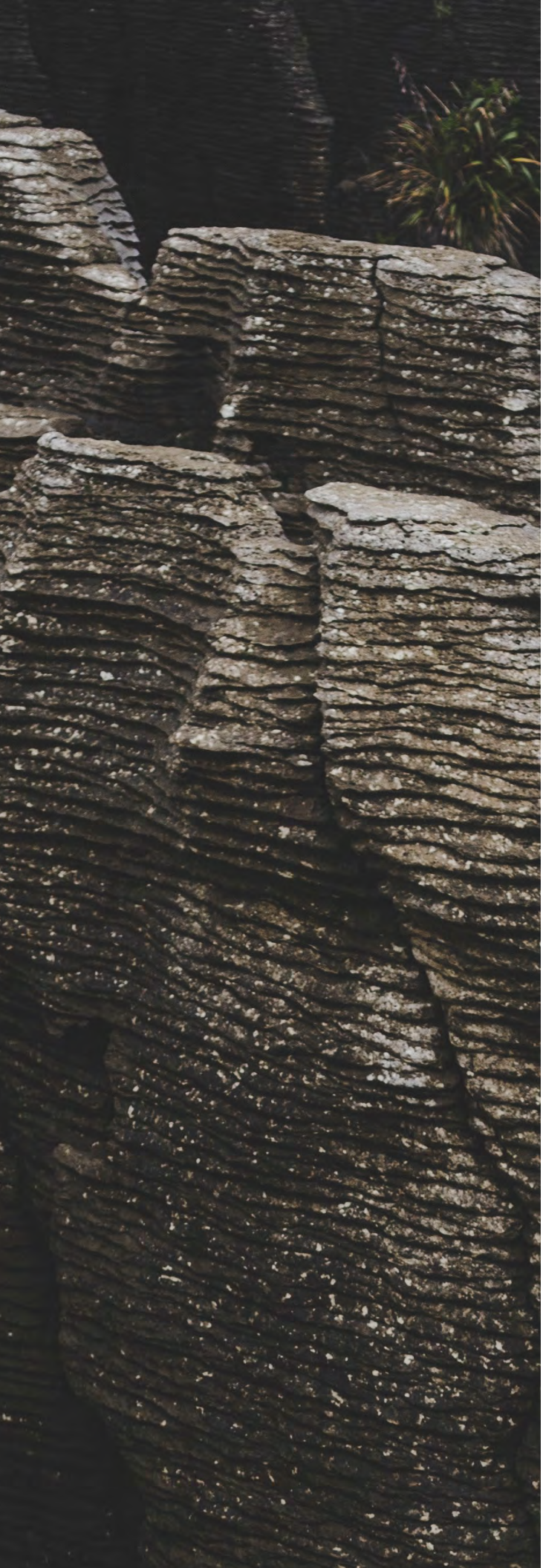
As the functionality increases, more customization of design can take place. People want nice things when they can have it. There would essentially be a new kind of market, with the price's foundation based on the 3D printing cost structure. When 3D printing becomes the norm and the price equilibrium gets closer to cost, you might see a mansion go for $150,000. And these price points can go down even further once advanced AI is introduced to the process.

Consider the Model T as a case study. At the time, Manufactured motorized cars were not much more expensive than a nice horse, and they got cheaper and cheaper as time went on. Then companies like Lincoln came into the picture offering more features and the concept of luxury. The same dynamic could happen for 3D printed homes.

As we get further and further into the future, more capabilities could mean the wholesale printing of entire housing developments in one, including roads and sidewalk. And larger buildings can sure be included here, where 3D printing ventures into commercial real estate. The price of real estate as a whole eventually gets cut off at the knees.

With this, 3D printing will be a game-changer in how much it takes of the average person's life and budget. Losing those jobs to AI won't be as bad when AI and 3D printing will also be lowering the cost of living to an even larger degree.

On the other hand, AI is playing a key role in the revolution of 3D in real estate, from optimal calculating and projecting the proper-



ty component needs, building time and schedule, 3D material needs, etc. A company like REAI will also proceed in assisting this industry revolution by developing its AI technologies further to help improve the real estate 3D printing capacities.

References

1. https://iconbuild.com
2. http://newstorycharity.org
3. http:// apis-cor.com
4. http://batiprint3d.fr

NEXT GEN

REAL ESTATE TECH

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For more information about REAI and the future of Real Estate technology, vist the website:

http://reai.co

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