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Artificial Intelligence and Design Professionals

I. What Is AI?

Artificial intelligence (AI) also called cognitive computing, is the use of machines to think and perform tasks like humans. Smart machines can process massive amounts of data, identify patterns, which then create new patterns, allowing machines to test hypotheses and find solutions. The machines can also do all that in record time. Computers can look for patterns in data, carry out tests to evaluate the data, and find results.

There are two types of artificial intelligence—hard and soft. Hard AI is focused on having machines think like humans, while soft AI is focused on machines being able to do work that traditionally could only be completed by humans. The main difference is that soft AI does not necessarily involve machines thinking like humans. Rather, they involve computer software and systems that do not just do tasks they have been programmed for in advance—they actually learn as they go, improving their performance through feedback

Traditional AI was focused on hard AI capabilities to perform humanlike reasoning. In that regard, there is a lot more development to be had. Yet soft AI provides tools and problem-solving resources and is now *common place in all industries*. Data we often need to analyze is massive. It may take extensive amount of time to analyze. Speed and time savings are an issue. There is also the issue of accuracy. If a reviewer is looking for buzz words or number for example, a computer can more accurately identify those. As a result of relying on computers to analyze data, computers (AI) are changing the way people think and do business. They can do research (Google is AI), spellcheck, compare and analyze documents and so forth.

II. How We Commonly Use AI?

In terms of legal research, review of contracts, and analysis of massive amounts of information, AI is used by lawyers to complete their work. AI can also assist industries that need to analyze information in real time such as news media.

AI is also used by companies trying to determine consumer patterns by analyzing the consumer's habits, age, gender etc. as well as customer satisfaction by analyzing surveys.

AI is used to build models that analyze behavior and find signs of fraud (for example, credit card usage patterns). Insurance companies use models for actuaries to price premiums.

AI can analyze stocks and markets and assist in determining probabilities of success. AI is in our cars, smartphones, search engines, homes (such as in the form of robot sweepers), surveillance, traffic etc. Video games are AI and can beat the player by learning how to play.

III. Benefits of AI

The biggest, most obvious benefit to AI applications is time savings. Computer systems can analyze more information, more thoroughly than humans can, in a tiny fraction of the time. This benefit applies to all types of AI applications. Computers can quickly: search through and identify discoverable or potentially relevant data of all forms and file types, conduct legal research that would take a skilled attorney one day to complete, and analyze contracts and other documents for errors, missing information, and inconsistent language.

AI allows earlier (and more accurate) risk. AI tools, including predictive coding, can be used to review information in real time. AI also produces higher quality work product with the use of intelligent software—which doesn't get tired, bored, or distracted—can be truly error-free. Specialized document software can enhance the organization of documents and flawlessly maintain that organization, including all internal cross-references, through the life of the document.

IV. AI in the Design Professional Field

By adding AI design business can be more responsible, fair, transparent and create a collaborative, powerful new member of their workforce. Architects and engineers can benefit from artificial intelligence and ensure better business and a stronger profession.

Technology and automation in architecture has soared, and includes, project delivery, performance, evaluation, and billings. Construction and software companies are incorporating AI quickly and architects will have to keep up. In fact, technology is advancing so quickly that the learning curve will be impossible for architects to overcome, or perhaps artificial intelligence will replace architects altogether. Billing analysis and construction-site safety to building products and performance, the data sets available to collect seem infinite.

A. Research

Working with AI starts with the research. The industry has progressed, and research and case studies are available through shared sites, but there is still a gap in sharing of big data. Typical issues that relate to data are storage capability, confidential delivery, regulations, and security. This is true in creative industries since architects are taught to keep their ideas away from competitors.

Gathering information about a project, traditionally involves traveling to a site, measuring, sketching and taking photographs. In the online and connected world, there is already abundance of data for the architect or engineer to tap into. BIM tools currently on the market allow the architect to evaluate site conditions with great precision. They can make assessments and calculations without ever having to leave their office. This allows companies to take large projects abroad that might have been logistically unachievable before.

Can socially adaptable and responsive architecture be created? For example, if the population of children in a city crosses a maximum threshold, a notification might be sent to the district to commission a new school.

B. Mundane Tasks

AI gives architects and engineers opportunities to automate mundane tasks such as, computational design tools, freeing the designer up to design more or, as a business owner, to go after

more work instead of spending a lot of time in documentation. Examples for AI can be as simple as using a calculator, BIM (Building Information Modeling) software discussed below, software that analyzes site information, GPS, drones etc.

C. Developing Site Concepts

There is a trend to use game engines to upload design projects on 3D and evaluate how all the trades work together for example, note on the software the shortest distances to the fire exits. Software designed especially for architects should be able to recognize various regulations (when Code, regulatory or building dept. changes are made the software could make those changes to the design), provide layout of spaces and coordinate everything better. Further, with AI architects can simulate the environment, without ever having to leave their computers.

D. AI in Urban Planning

Information gained from ordinary people devices can be analyzed by AI to automatically generate plans. An architect could look into every person's life. By knowing what people like, post online, buy or where they go, complex algorithms can compile and present great possibilities to architects. By already knowing everything about us, our hobbies, likes, dislikes, activities, friends, our yearly income, etc., A.I. software can calculate population growth, prioritize projects, categorize streets according to usage and predict a virtual future and automatically draft urban plans that best represent and suit everyone. That is, data that is constantly being uploaded onto a cloud, can be sorted and analyzed and draft a rough plan. This plan can then be improved upon by architects and planners.

Tesla Motor's Autopilot software is a good example of how this works. Every Tesla car around the world is constantly uploading information about the roads they are driving on. This information is gathered in a cloud and then uploaded into other Teslas for future reference. This allows for all Tesla cars to be up to date with all the conditions of the roads and the maneuvers each car should make. This same information on Tesla's cloud could be used by engineers to know the number of cars that pass through each road, prioritize the repairing, widening and changing of roads. AI has the potential to influence the architectural design process, project priorities etc.

E. Design Decision-Making

An AI design technology is an interconnected, self-designing system that can upgrade itself. An architect will input project parameters, and the computer system will then suggest a range of solutions which fulfill these criteria. Future architects would be less in the business of drawing and more into specifying requirements of the problem and selecting a solution based on artistic preferences. Some software can even recognize sketches and text as we input data, so they can build on schematic drawings. This enables the designer to collaborate with the computer.

F. Client and User Engagement

The gaming industry idea of 'augmented reality' can change the perception and engagement of architects. It would enable people to engage with a design prior to construction and select the most appealing proposal from their experiences within its simulation. It would allow a client to move through and sense different design proposals before they are built. Lights, sounds, even the smells of a building can be simulated.

G. The Rise of Robot Craftsmen

AI systems are already being integrated into the construction industry with 'robotic craftsmen' in fabrication. This idea can offer architects completely different aesthetics, detail and ornamentation. BIM can also identify missing elements in the plans and provide updates in real-time.

H. Integrating AI Systems

Integrated systems can assist in picking furniture and energy monitoring in homes and do more complex tasks for larger projects. AI can help to better understand the functional and user-optimized building environment. Legal/ethical/claims questions that arise however include, ownership, agency and privacy in data gathering and use.

One of the changes brought by technology and integrated systems is using more design-built projects. Design built is a single entity delivery where the design and construction services are contracted to a single entity. The design-builder controls both the design and construction processes from the beginning of preparation of the design documents through final acceptance of the project. The entity manages the design team *and* the trade subcontractors.

Advantages in design built projects is the speed of delivery (greater overlap of tasks resulting many times in a streamlined delivery to the owner), selection criteria (looks at lowest price, qualifications, capabilities, and experience), communication/collaboration is enhanced through a single team under one contract (although there can be more risk due to lack of direct line of communication with the owner), and less changes because of a close relationship between the design and construction teams, resulting in fewer change orders.

Disadvantages of design built can be cost upfront for the consents, and the delivery will include construction related. Because the design-builder is in charge of both design and construction, it will be responsible for delivering the project specifications including, performance based. Moreover, design-built projects are responsible also for means and methods/safety. The design-builder will be responsible for overall coordination of design (sub-consultants) and construction (the trades). This greatly increases this entity's responsibilities when it comes to delivering the project on-time; concomitantly it increases the responsibility for delay damages. Construction can also start without complete design, procuring payment and performance bonds may be more difficult and this can limit the selection of companies that can perform the work.

I. Building Information Modeling

This is common on large scale design-build project where integration and cooperation is key. Some issues that may arise include, who is responsible for the overall management of BIM on the project? Risk allocation can also be tricky. Other issues include, who has access to BIM? Who has control over changes being made? (Changes should be made to only one model, identify only one or two individuals authorized to incorporate information and require verification of lack of conflicts post-incorporation of information). Finally, designers should make sure everyone on the project is proficient in and required to use BIM.

J. Global Position Systems

Global Position Systems (GPS) is another tool a designer utilizes in all aspects of the design but more so when they design from their own office on the computer. GPS can assist in measuring the site conditions remotely. Claims can arise when the technology is not working properly through no fault of the design professional. For example, a geotechnical engineer is using a tool implementing GPS to identify certain types of subsurface conditions and the technology gives an improper reading. This improper reading causes an inaccurate assessment or survey of the location and/or integrity of the foundation. This issue is not caught until work continues and now work has to be redone or undone for proper installation (e.g., conduit must be ripped out and reinstalled). The design professional could be subject to a malpractice suit because of his use of the technology and will likely not be able to pass that risk down to the manufacturer/designer of the technology. One way to avoid this type of risk is to use a more traditional method to double check the technology once or twice to arguably establish compliance with the design professional's standard of care.

K. Drones

The use of drones on construction projects has increased and will likely continue to do so in the foreseeable future. One commonplace usage enlists drones in the inspection of the overall progress of a project and in inspecting various types of difficult to reach areas. Their most obvious advantage — their ability to fly — is conducive to this project function and can provide a design-builder and/or other design professional with a quick and efficient way to gather project information. There are however, risks to the use of drones including, the amount of data being collected and the requirements of storing and/or producing such data, the potential for accidental damage to person and/or property and invasion of privacy.

L. Use of Email

This is typically the most common method of communication on a job-site, outside of person-to-person conversation. While this provides the benefit of creating a "paper trail" to document decisions and conversations, design professionals should use discretion in determining what to include in their emails. Those should then be uploaded into the integrated software and be used to modify the project.

V. Status of Law/Regulations

Currently, all the legislation around technology is concerned with data privacy and autonomous vehicles. Regulation of AI is important to protect customers who will buy and use AI-enabled devices. The Kenan Institute of Ethics at Duke University has evaluated the idea of "adaptive regulation," to provide users and developers with some guidelines in connection with emerging technology at an early stage. IBM, AI Global, and Future of Life Institute are a few companies who created guidance for design, development, and use of AI. Yet in the most part, the law regarding AI will come from judicial decision making,

In comparison, the Web Content Accessibility Guidelines (WCAG) has developed, in cooperation with individuals and organizations around the world, a single shared standard for web content accessibility that meets the needs of individuals, organizations, and governments internationally. While this relates more to the user and not to the developer (such as it relates to the American with Disabilities Act (ADA)), it shows that universal standards can be developed. The Dept. of Justice has not formally adopted the WCAG standard, it has directed businesses to the WCAG. Can something like this be created for AI development?

VI. AI and Intellectual Property

There are concerns of intellectual property, copyright, and patent issues when developing AI and those concerns transcend to how open for review can/should an AI program be? The Copyright Act - 17 U.S.C.S. ' 102(a) lists eight categories of "works of authorship" covered by the Act. We see many lawsuits in connection for example, with music or film where the claimant alleged that his/her content was improperly copied into a new song/writing/movie. To what extent can AI developers trace their fingerprint when software algorithms may be similar?

VII. AI and Privacy

There are "four distinct kinds of activities violating the privacy protection and giving rise to tort liability: (1) intrusion into private matters; (2) public disclosure of private facts; (3) publicity placing a person in a false light; and (4) misappropriation of a person's name or likeness ...Prosser's classification was adopted by the Restatement Second of Torts in sections 652A-652E. California common law has generally followed Prosser's classification of privacy interests as embodied in the Restatement." *Hill v. National Collegiate Athletic Assn.* (1994) 7 Cal.4th 1, 24. The tort of intrusion "encompasses unconsented-to physical intrusion into the home, hospital room or other place the privacy of which is legally recognized, as well as unwarranted sensory intrusions such as eavesdropping, wiretapping, and visual or photographic spying." *Shulman v. Group W Productions, Inc.* (1998) 18 Cal.4th 200, 230. The latter, are all intrusions that can occur with AI.

AI needs massive data. This makes it necessary to collect and sell data. Yet this also means that there is no privacy. Information is constantly recorded. The element of intrusion "is not met when the plaintiff has merely been observed, or even photographed or recorded, in a public place. Rather, 'the plaintiff must show the defendant penetrated some zone of physical or sensory privacy surrounding, or obtained unwanted access to data about, the plaintiff." *Sanders v. American Broadcasting Co.* (1999) 20 Cal.4th 907, 914—915. Accordingly, if the drone invasion is over private land then an invasion of privacy may be claimed.

VIII. AI and Cybersecurity

Cyber claims can include, gaining unauthorized access to a computer system or its data, theft and fraud, disruption such as, taking down of entire web sites or access, demand for ransom, and installation of viruses or malicious code. The more we rely on AI and connect all our devices, home security, even smart refrigerators and coffee makers, the more these machines know about our habits and the more exposed we are to theft/fraud.

Developers have been using game theory to develop algorithms (AI) about strategic defense from cyber-attacks. The U.S. National Institute of Standards and Technology created standards for cryptography. Yet, if companies produce AI-enabled devices after which they go out of business, the security of their products will not be protected.

IX. Insurance and Claims

Various types of insurance products are available for the owner, design-builder, contractors, and design professional sub-consultants. These products should be thoroughly and properly evaluated in an effort to insure risk where possible. A design professional should recognize that many design-build projects, especially the large ones, will require very high professional liability limits. For large projects (public utilities, highways, airports, large-scale municipal projects), there are project specific as the exposure on such a project is typically much greater than the exposure for which a practice-specific professional liability policy is intended.