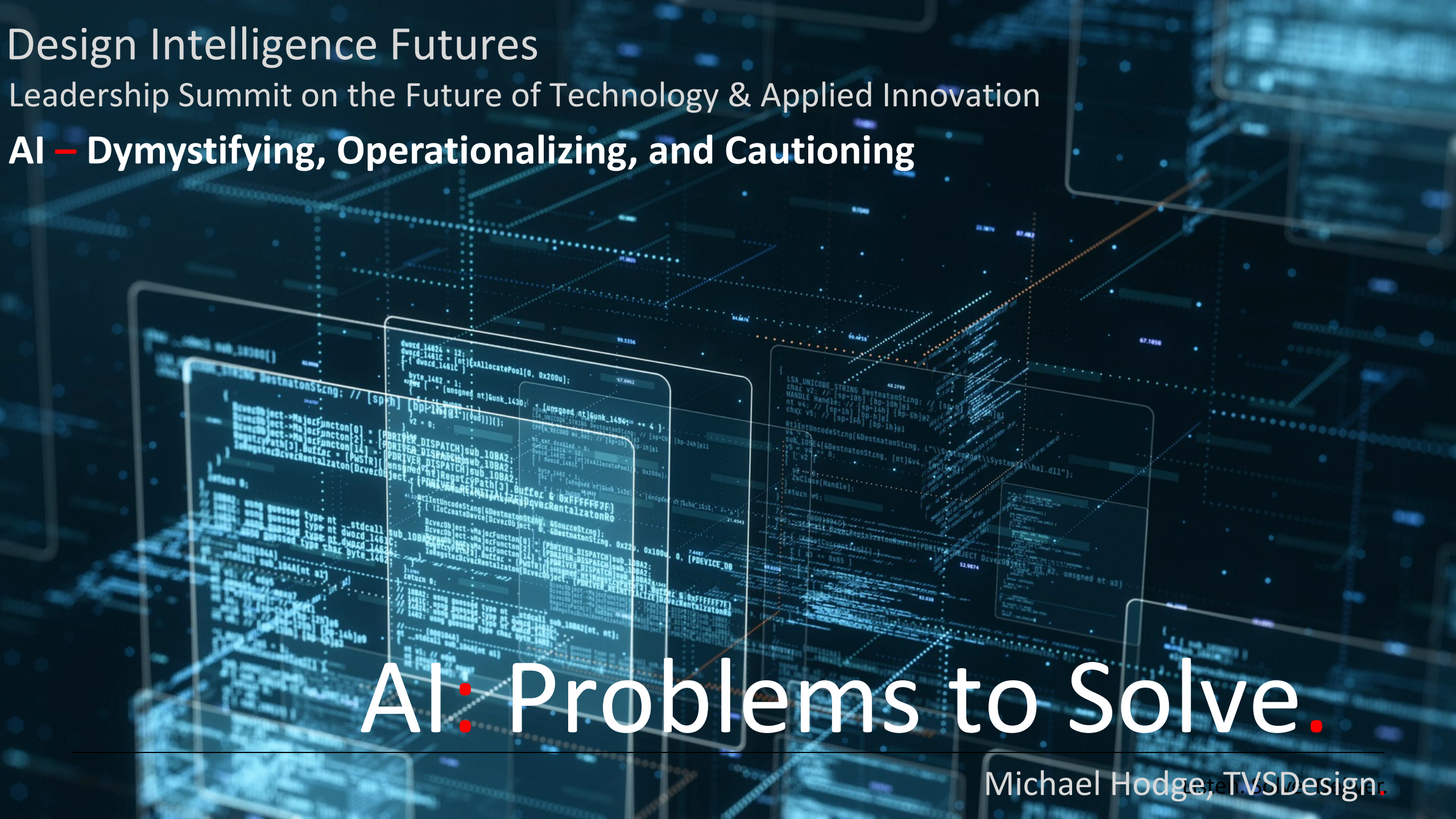
Design Intelligence Futures

Leadership Summit on the Future of Technology & Applied Innovation

AI – Dymystifying, Operationalizing, and Cautioning



AI: Problems to Solve.

Michael Hodge, TVSDesign.

Michael Hodge
Principal

DIGITAL
PRACTICE LEADERS
TVS DPS

Digital Practice and Design Technology Ops.

…established 2018.

03.

AUTOMATING PRACTICE:

Defining Use of Computation in the Architectural Design Workflow

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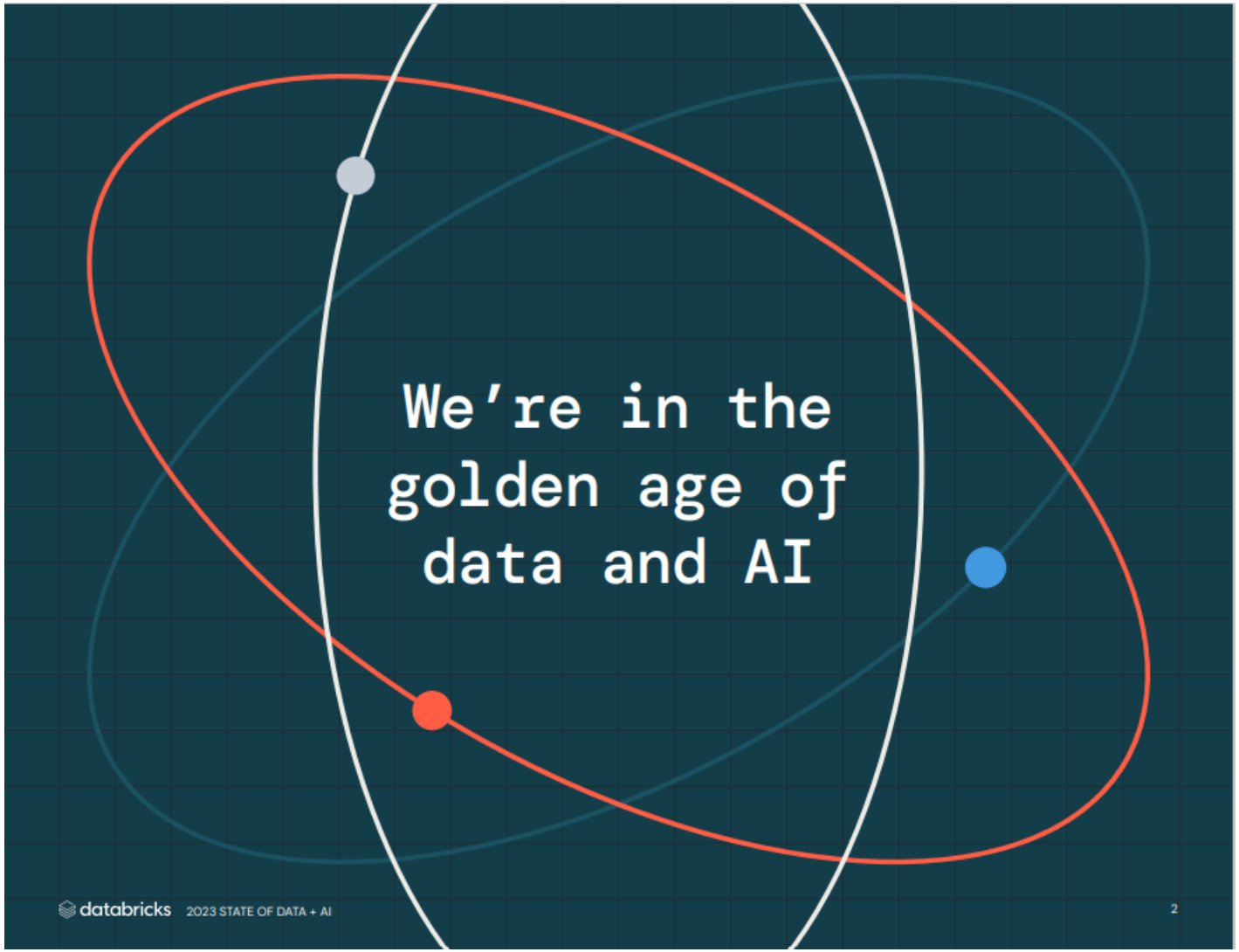
ABSTRACT

Computation in architectural design, specifically algorithmic/generative design, is a byproduct of advances in software development that have enhanced the digital tools available for explorations in all design disciplines. It is also quickly becoming a sub-discipline with a broad inter-disciplinary range. Currently, computational design methods have extended design and analytical capabilities in software tools available to architects. While there is a growing number of software applications and myriad methods for writing custom applications/programs capable of leveraging the use of algorithms for many tasks within the design process, there is limited understanding of how to integrate and adapt computational capabilities into the design workflow.

This article surveys the spectrum of computational design theory as it applies to the practice of architecture and is intended to be an instrument for presenting a framework, which stands as a knowledge model for adaptive use of programming and algorithms in the design process. It also introduces a new term, "Process Automation", which defines how computation can expedite and enhance standard task involved in the architectural design process.

KEYWORDS: computational design, parametric design, algorithmic design, evolutionary design systems, generative modeling/processes, scripting, programming, design artifacts, process objects

*from: Perkins + Will Research Journal, 2009 / VOL 01.02


We're in the golden age of data and AI
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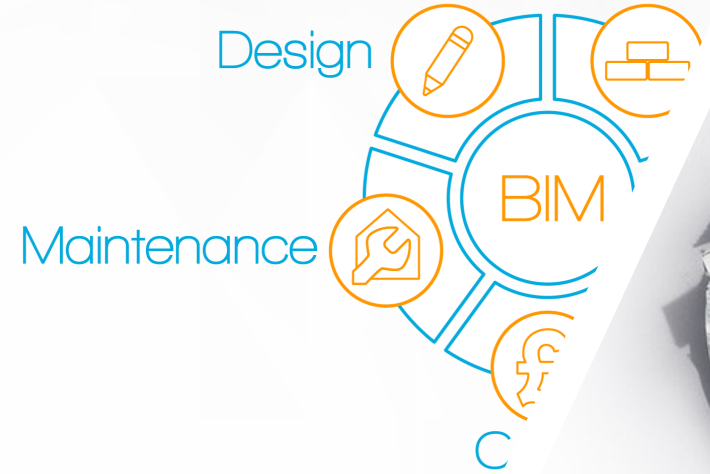
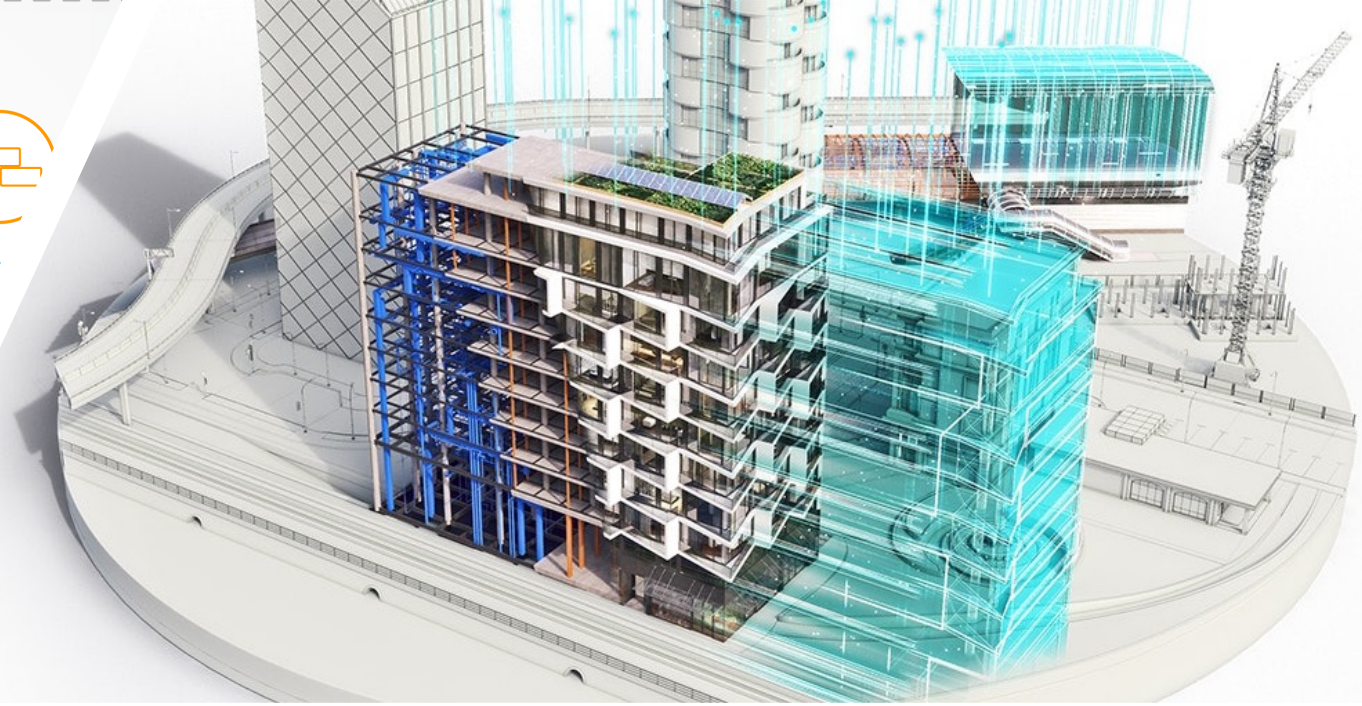
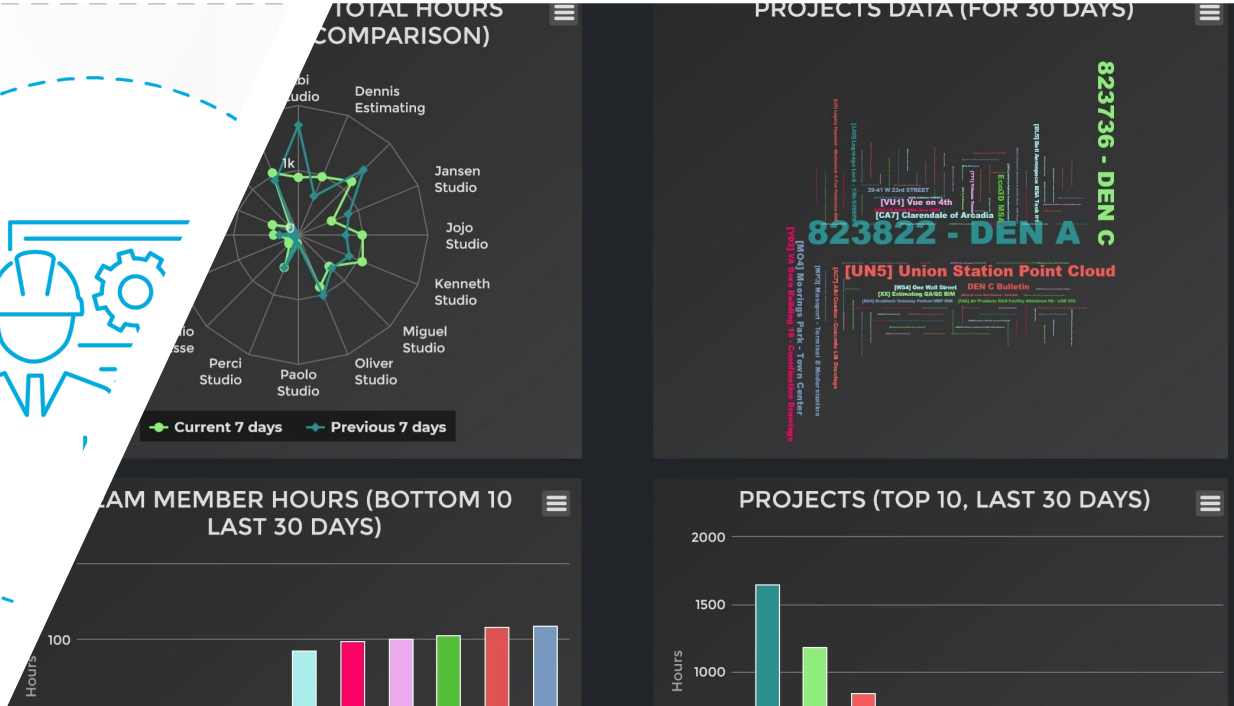
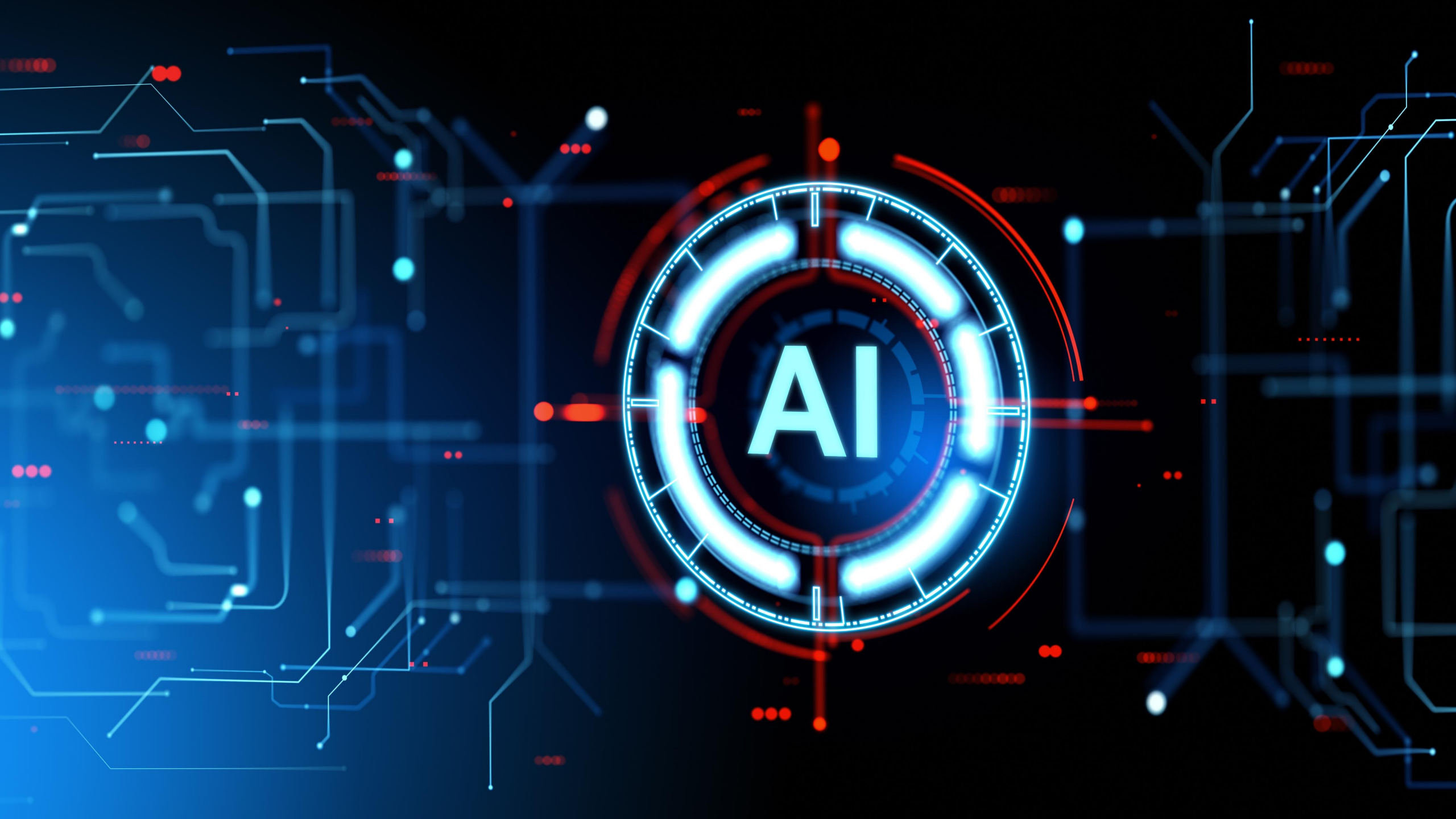




AI and smart construction




AI

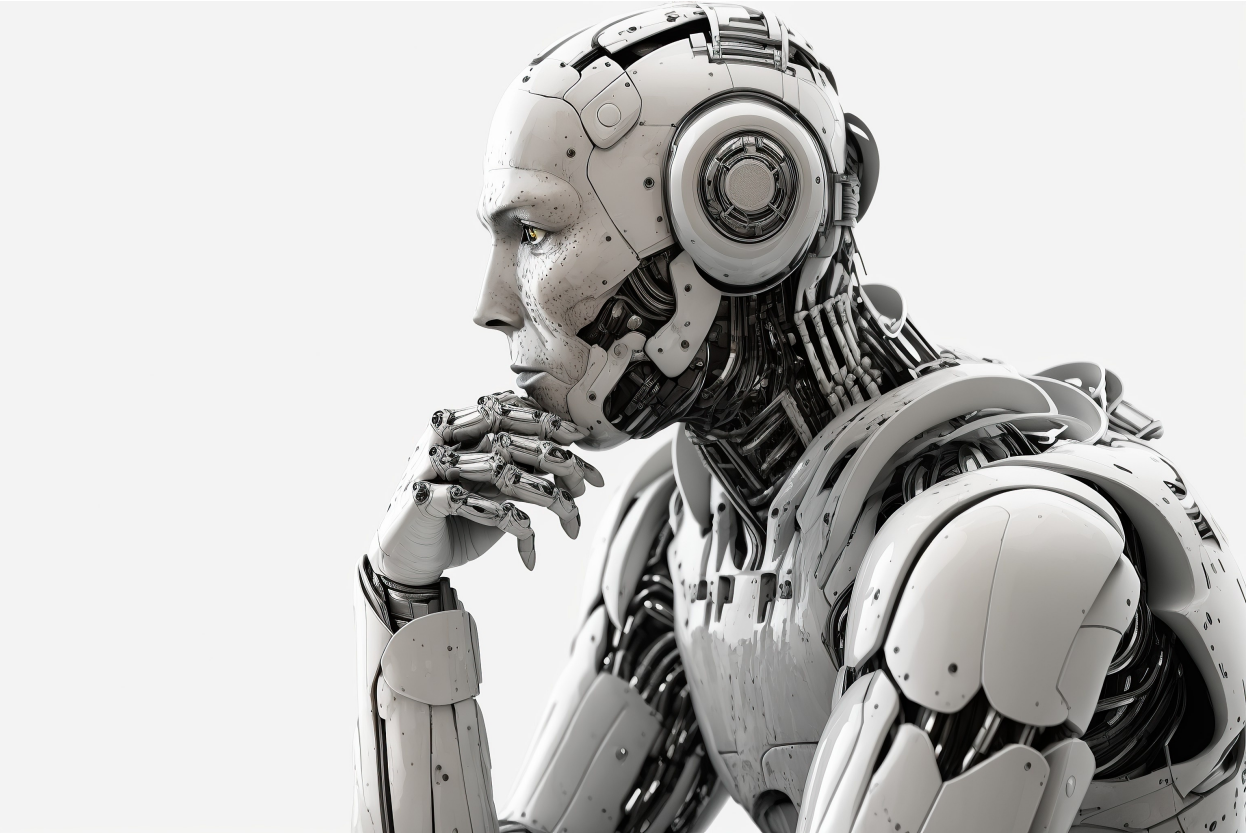
What is the Future Role of Architects/Designers in the Age of AI and Data?

https://www.archdaily.com/995781/what-is-the-future-role-of-architects-in-the-age-of-ai-and-data

CHANGE

Job
interview

What is the Future Role of AI and Data for Architects/Designers in this Age?



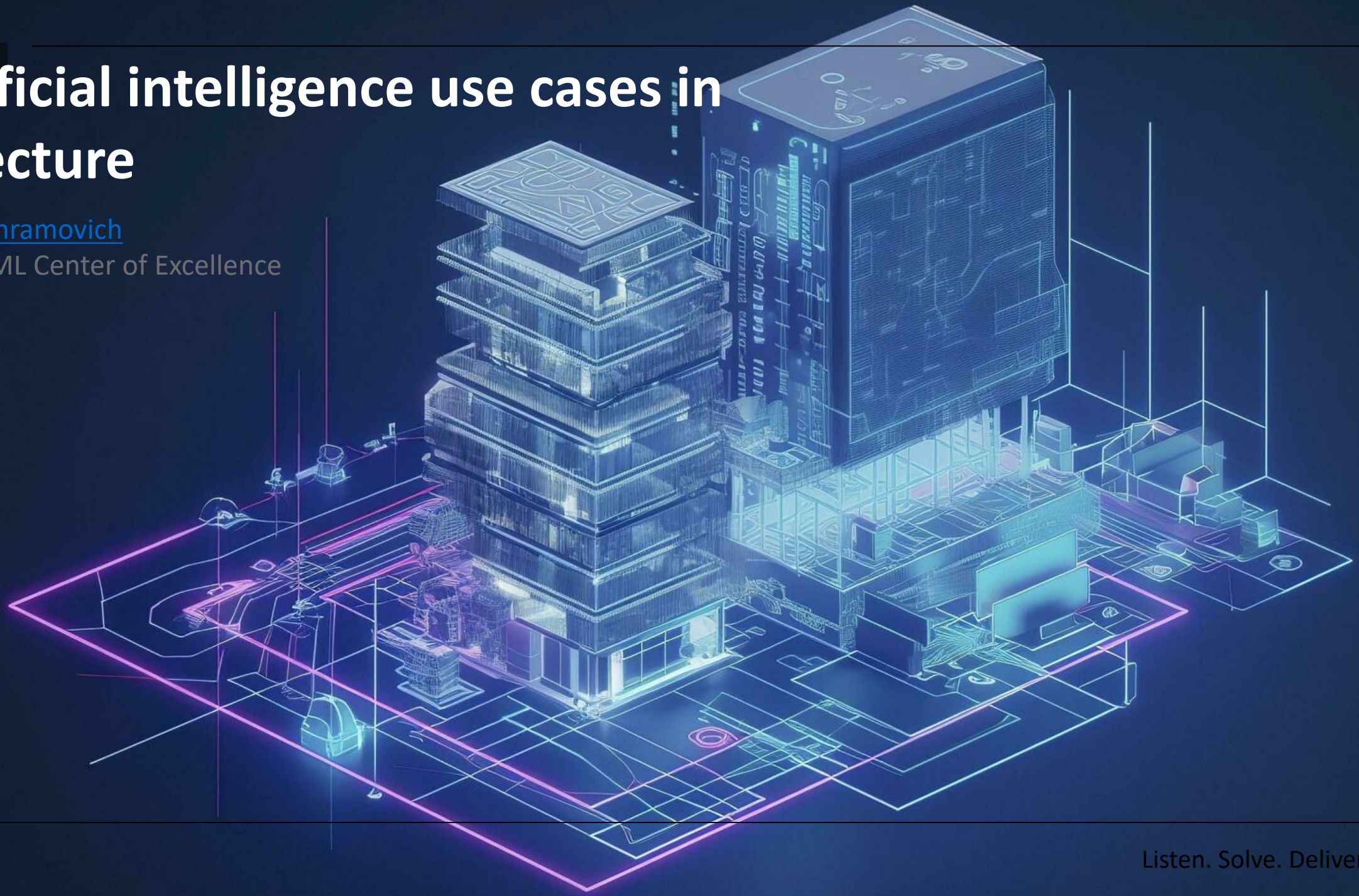
Problems to Solve:

1) **Definition**. For Understanding
2) **Acceptance**. To Implement
3) **Adaptative Co-Existence** – Tools, Processes and Thinking

Definition.

10 artificial intelligence use cases in architecture

[Aleksandr Ahramovich](#)
Head of AI/ML Center of Excellence
itransition



1 Streamlining early-stage planning

Floor plans are integral documents that architects use to create a layout of a building. Using generative adversarial networks (GANs), architects can generate floor plans based on building dimensions and environmental conditions, minimizing the need for manual drafting. On top of that, machine learning models can adapt to an architect's habits and methods over time, further improving workflows.

2 Improving architectural mapping

By augmenting any camera with computer vision, architects can autogenerate floorplans and CAD models by capturing images of existing physical spaces. This technology is currently being tested for use in architectural mapping, allowing architects to better understand an existing building before proceeding with construction or renovation work. By leveraging AI algorithms for this purpose, architects can dramatically reduce the time and cost associated with mapping out a new space.

3 - Optimizing sketching

AI design solutions can play an important role in sketching and ideation by helping designers expand their creativity and generate more feasible ideas in a shorter time frame. Currently, it’s not uncommon even for professional architects to turn to publicly available AI tools like MidJourney to speed up sketching and concept generation. AI can quickly draft multiple options, however architects will have to choose the best one and polish it manually. AI can't create the final solution, but offers many versions that save time at the initial design stages. Still, human intervention is needed.

4 - Streamlining compliance

Taking a design through multiple rounds of compliance checks can be tedious and time-consuming. AI can accelerate this process by automatically analyzing building codes and designs for compliance and detecting any potential issues before the design makes its way to a customer. With compliance automation, architectural firms can save time and resources, reduce compliance risks, improve user experience, and boost confidence in their designs.

5 -Improving urban planning

Urban planning is highly complex and requires considering multiple factors, such as population density, road congestion levels, public transit options, green spaces, etc. With the help of AI, architects can create 3D models to simulate how a future urban environment will look and function amid real-world constraints. Such simulations enable planners to optimize decision-making and predict potential problems before they arise.

6 -Optimizing building energy management

With the help of machine learning, it’s possible to optimize energy consumption in buildings. AI-based solutions can detect inefficiencies and suggest optimal settings for air conditioning, ventilation, heating, and lighting systems to ensure that a building performs at its best. What’s more, AI tools allow for assessing the thermal efficiency of the architectural project prior to construction.

7 - Improving construction safety

Construction safety is a critical concern in the industry, and its importance is only increasing due to the escalating complexity of new projects. By using on-site computer vision-enabled cameras, it’s possible to detect safety breaches, like employees’ close proximity to heavy machinery, in real-time and immediately alert project supervisors. By feeding AI models with BIM data, construction safety officers can detect areas that are most likely to cause accidents and plan site movement to avoid them.

8 - Enabling parametric architecture

AI-assisted parametric design has emerged as an innovative approach to creating complex building designs tailored to specific objectives. Based on various parameters, including building materials and spatial limitations, AI models can code a design by programming the geometric rules. Parametric design enables architects to ensure that each design meets specific criteria.

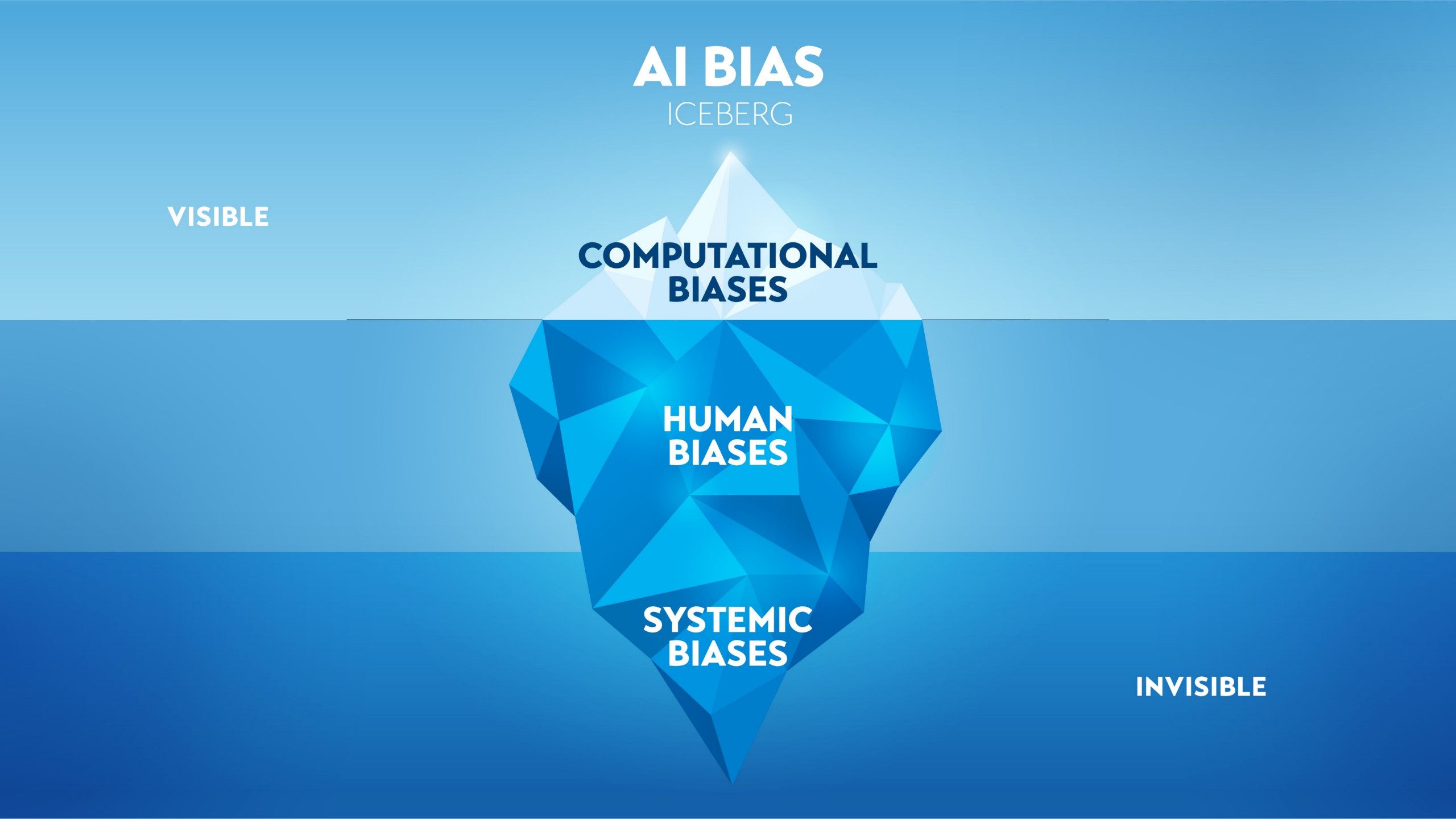
9 - Automating documentation

Architecture projects typically require a great deal of paperwork, including contracts, permits, and other documents. AI-based solutions can automate this process by extracting relevant information from building plans and automatically generating the documentation needed for a project. This way, architects can ensure document accuracy while saving time on manual tasks.

10 - Revealing safety hazards

Besides creating a part of the project, AI and machine learning models can also act as an additional validation system and detect flaws in engineering designs, such as weak spots in a structure due to defective materials or construction techniques. Also, by making AI models assess existing designs and structures, architects can identify risk areas before any building work begins.

Acceptance.


AI BIAS
ICEBERG
VISIBLE
COMPUTATIONAL BIASES
HUMAN BIASES
SYSTEMIC BIASES
INVISIBLE

The Iceberg Model

1.Events : First, observe and describe what has happened or what is happening. You'll have better results if you are able to duplicate (recreate) or reenact the steps that led to the discovery of the problem.

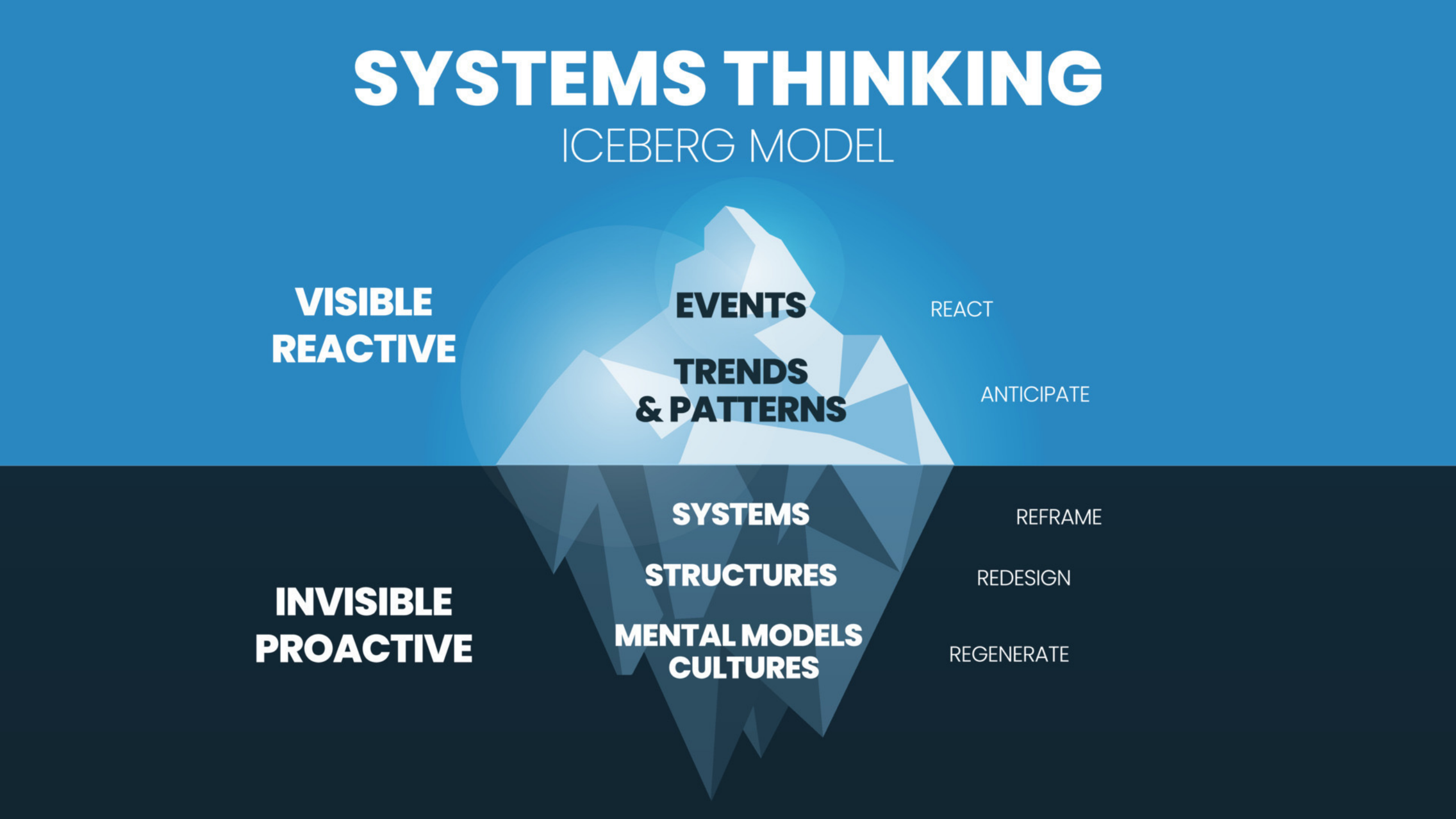
2.Patterns & Trends : Then, determine if this event or similar events have happened before? What are the patterns of occurrences? What trends have you seen? Is there a particular situation, environment or role that experiences this problem?

3.Structures & Systems : Then, identify the things, procedures or behaviors that contributed to this event. Why is this happening?

4.Mental Models : Finally, what are the beliefs and assumptions that created and shaped the system/triggers that caused this problem?

SYSTEMS THINKING

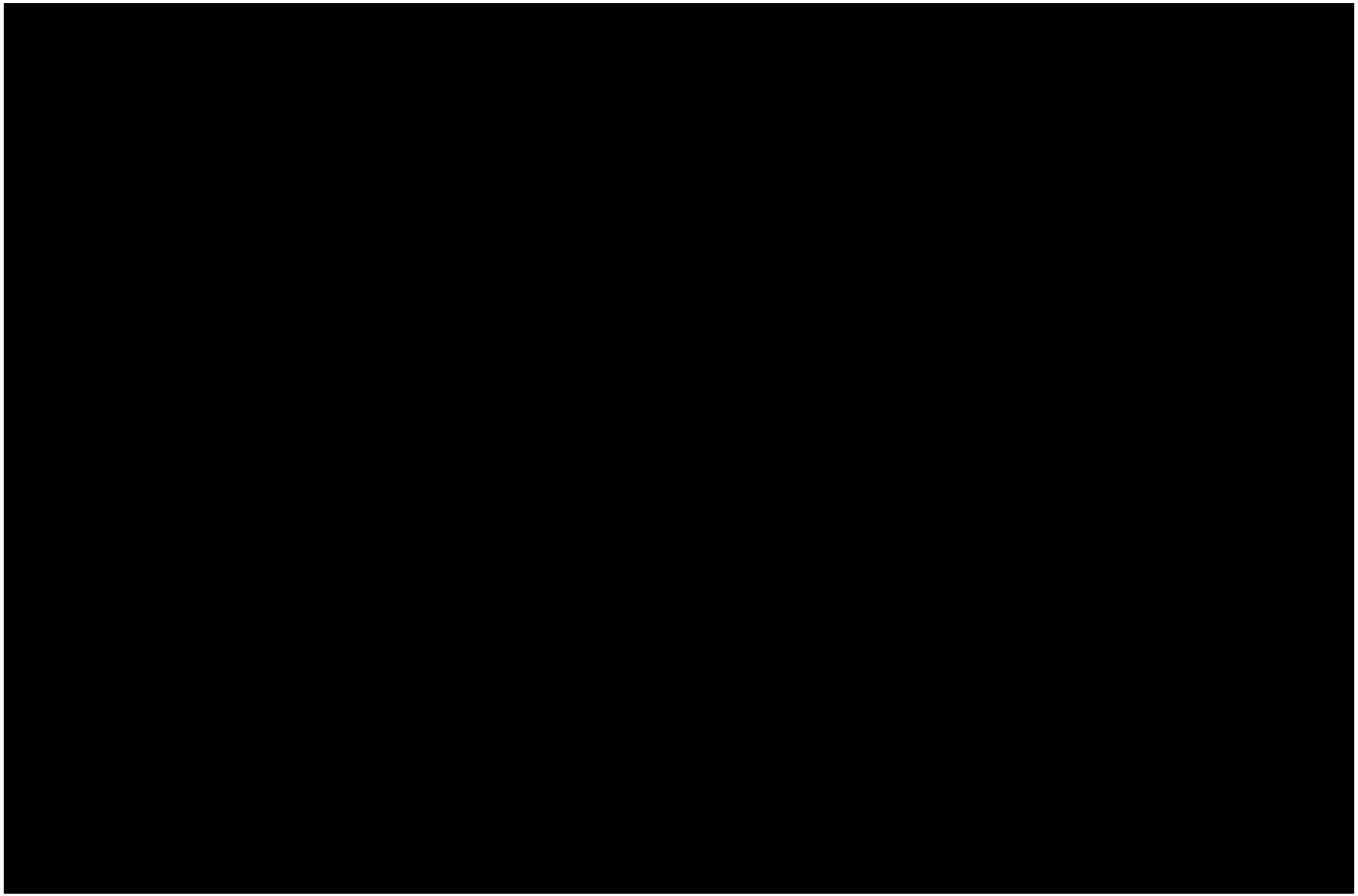
ICEBERG MODEL



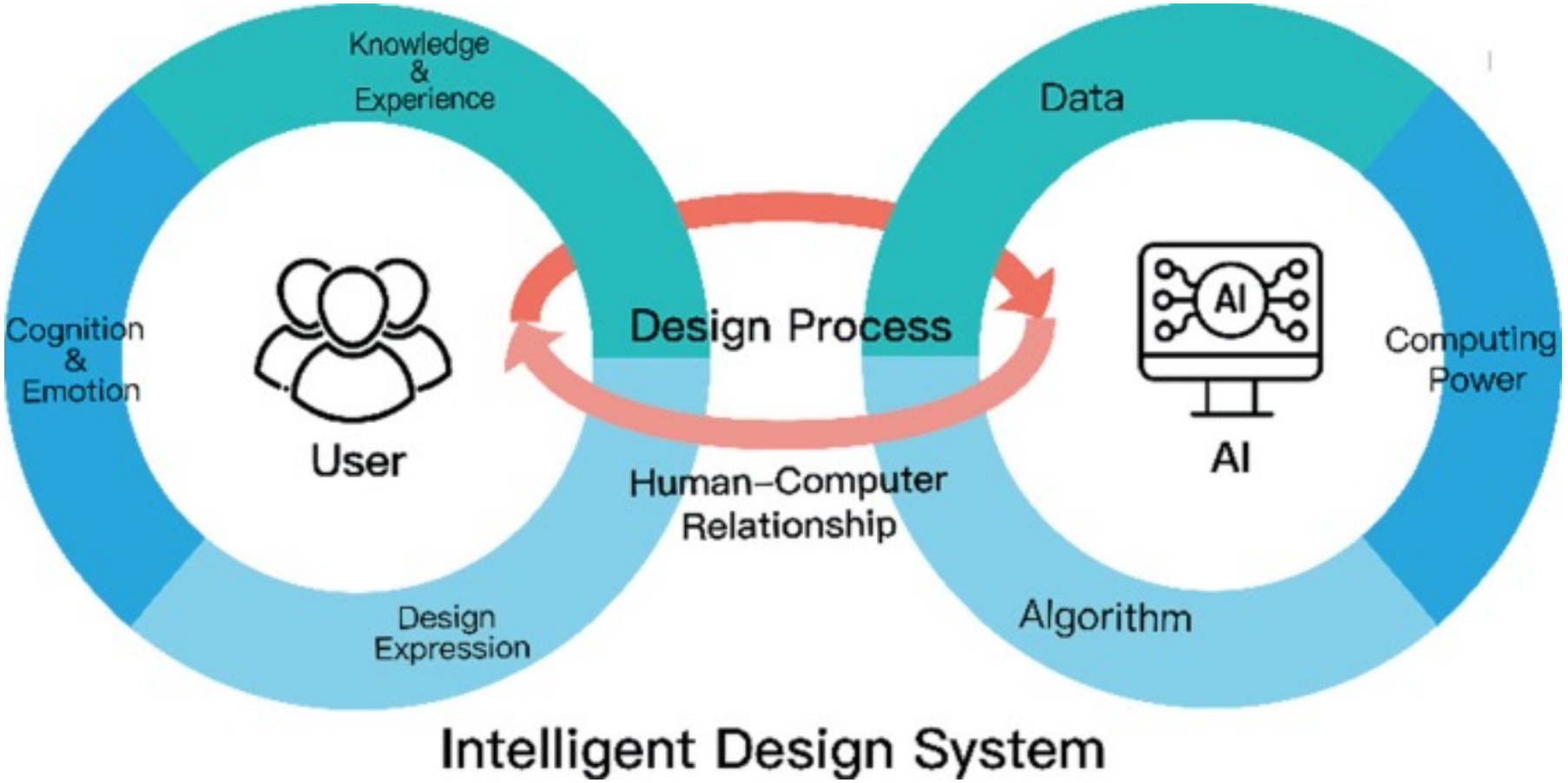
Do you feel your Organization has Accepted the Age of AI and Data?

Adaptive Co-Existence.

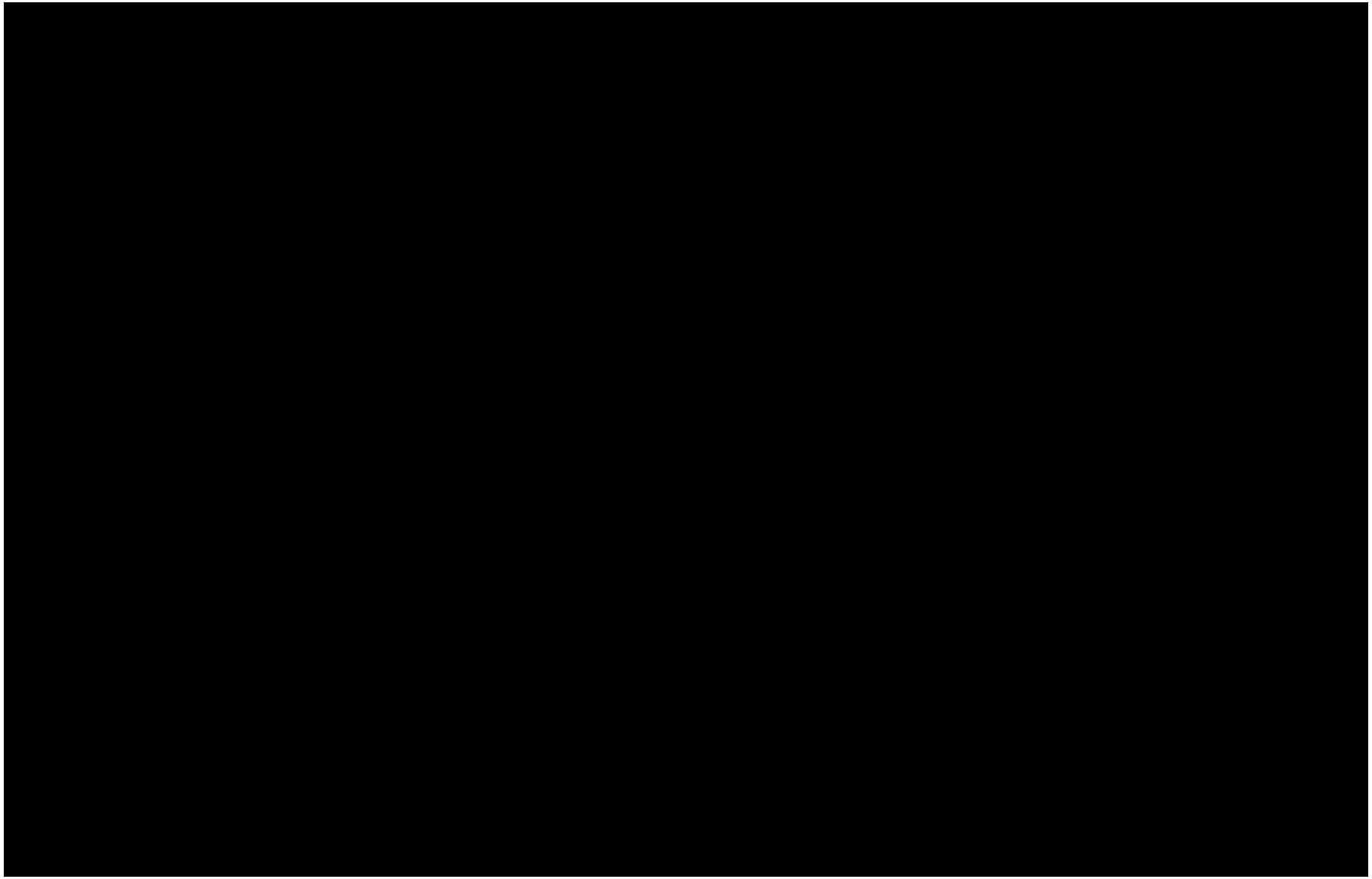
CHATBOT
VIRTUAL
ASSISTANT
48%



AUTODESK AI



From: “A Co-creation Interaction Framework and Its Application for Intelligent Design System”, Zhiyuan Yang, Wenbo Yang, Guang Yang & Changyuan Yang



"A.I. like any other technology, has the potential to 'inform' our creativity. We don't stop being creative, we just learn to adapt our creativity in a new paradigm. When cameras were invented, painters lamented the lack of creativity of such a tool. Now we have photography as a separate domain of art. Creativity for me is learning to pose the right questions at the right time, and artists will always stand out among the crowd of tool users, because artistry is internal, and tools are tools.

When the AI spring of 2022 happened, so many people wanted to showcase their art through AI, but only the very best few managed to stand out from the rest. (i suppose Im among them, humbly). Because in a scenario where everyone can do one thing, it takes an artist to do something different" says **Tim Fu**.

https://www.homejournal.com/en/people/Revolutionizing-Architecture:-Exploring-A.I.-Design-with-Tim-Fu-from-Zaha-Hadid-Architects/5936/

The Future Role of AI and Data for Architects/Designers in this Age is as a collaborator, assistant, facilitator, quality assurance, code checker, and ...

The organization of the future:
Enabled by gen AI, driven by people
September 19, 2023 | Article

Listen. Solve. Deliver.