HUMAN CENTRIC DESIGN WITH AI

Hanna Jin

PART I: RESEARCH
(40 Hours)

Identification of when to use AI in Design Delivery Workflow

Identification of how clients/user groups could benefit from AI

Connect with **PW Digital Practice** teams for resources.

Identification of Equitable Practices to Offset Existing Bias in AI

Connect with **PW JEDI** group on how to implement equitable practices to offset AI bias.

PART II: CASE STUDY

SCHEMATIC DESIGN

CASE STUDY GOALS

How to apply the identified AI Design tools from Part I in the Schematic Design phase of a project.

How to use the template to apply socially equitable practices to ensure the end goal is a human-centric approach that meets the core values of Perkins&Will.

Programming

Site Analysis

Concept Sketching

Renderings

NEXT STEPS INCLUDE NEXT PHASES OF DESIGN DELIVERY

SPRING 2023 DELIVERABLES

INFOGRAPHIC REPORT

TEMPLATE: TRACKING FOR BIAS

FUTURE INCUBATORS

AI TOOLKIT GUIDE FOR SD DELIVERY

USE OF TEMPLATE

AI TOOLKIT GUIDE FOR DD DELIVERY

USE OF TEMPLATE
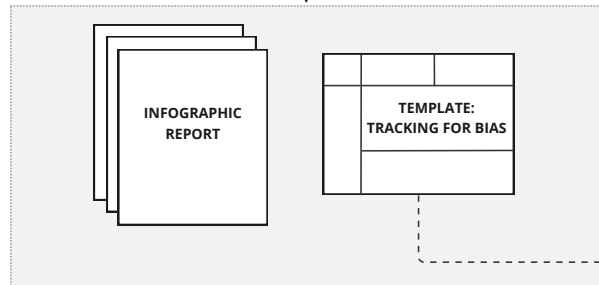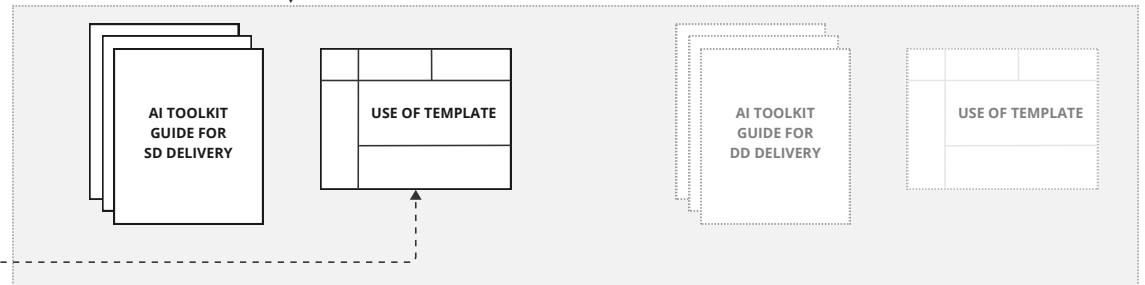
How do we keep our humanity at the forefront?

As various AI software becomes more accessible to designers, this research project aims to uncover potential AI blind spots and set up a framework for using the optimal AI tools to reach equitable human-centric design solutions.

This research project evaluates the need for AI as a tool for equity, studies the ramifications of fast design, builds a framework for process driven design with AI, and uses a recent competition from the PW Miami studio as a case study.

As we move into a world of AI, our digital heritage becomes an important aspect of how our knowledge is communicated and represented. The purpose of this research is to inspire imaginative and authentic storytelling through the lens of AI.

01 OUR FUTURE WITH AI

Imagination is an inherent trait of humanity and arguably one of the most important instincts to survival as a species. It is the precursor to creativity, the spark needed to solve mysteries and come up with solutions to problems. Courage is the partner to imagination that drives exploration and discovery. These are innovations that are driven by our passion for the things we love. These intangible qualities that have no metrics and therefore no limits are what define our human experience.

"Imagination is more important than knowledge.
Knowledge is limited, imagination encircles the world."
-Albert Einstein

01 OUR FUTURE WITH AI

Knowledge is our story. It is how we communicate with each other and pass down information through history. From stone carvings, invention of language, evolutions of art, the telephone, television, the internet and social media, we as humans continuously evolve to become more efficient and prolific through each generation.

As we move into a world of AI, our digital heritage becomes an important aspect of how our knowledge is communicated and represented.

01 OUR FUTURE WITH AI

Diversity and representation in our data is more important than ever as the management of data is a key part of our digital heritage that AI models are being trained through. As a society there will be the reality of data clusters, urban settings that generally have more digital footprint, and data blackouts, areas with little research and records.

While AI is a powerful tool, it is important to remember that it is not a replacement for human creativity and judgment.

01 OUR FUTURE WITH AI

AI is a pattern learning tool that can automate several repetitive and iterative tasks and augment skills to explore creativity. With the right prompts it can identify and address current biases in designs and create more inclusive and accessible spaces.

A broad range of new skills and expertise will need to be added to all industries. At the same time, previous silos will be broken down as learning new skills will become even more accessible than before through AI. A new era of democratization in education and skills will add a wider and more diverse population to the knowledge economy.

01 OUR FUTURE WITH AI

Human-centered design with AI requires the human role to be at the forefront of the process. Skills that are less tangible and impossible to provide metrics for are what AI can not bring to the design board.

What the human role brings is design ethos, intentionality, responsibility, judgement and most importantly the imagination.

Our future with AI requires us all to continue being explorers and researchers as we revolutionize the way we design and imprint as our legacy.

02 AI AS A TOOL FOR EQUITY

I have always been technologically curious as a designer, perhaps a byproduct of growing up with a mom with a PhD in Instructional Technology. It is the intersection of data, design, and social equity topics that are brewing around the narrative of AI that inspired me to pursue this incubator topic. An AI experimentalist, a creative, and a JEDI member I hope to bring awareness to the powerful and exciting generative potentials of AI and equally to the responsibility that we bear as humans to manage these tools with integrity.

When I heard about AI for the first time, it was actually very exciting because I see it as a tool for equity. It provides tools to a lot more people and gives power to a wider set of demographics. It can get past barriers like language, or give tools to people who might not have the formal education or training to be a designer or a musician, a writer, or programmer.

Diversity in data matters.

A new era of democratization of skills will add a wider and more diverse population to the knowledge economy.

This can empower marginalized groups as AI powered tools are being developed to provide access to the information and resources needed to find jobs, housing, and education. Adding more diverse voices into the pipeline of architects and designers is how we foster a responsible, equitable practice.

AI also provides the capability to tailor designs as a personalized experience to meet the needs of various user groups. As cities become more global and diverse, this personalization is an important aspect of promoting equity and inclusion. For example, data on pedestrian traffic patterns can be analyzed to identify areas where sidewalks need to be widened, where ramps need to be installed, and where bike lanes take precedent over vehicles.

There is a lot of opportunity, but at the same time, we also need to be aware of the biases that occur in data sets. While as individuals, we do not have the power to change the course of large amounts of data, we do the have the ability to recognize, validate, and act as a human judge on the information we consume. In this regard, we also have the duty to generate responsible new content as we carve out our digital heritage for future generations.
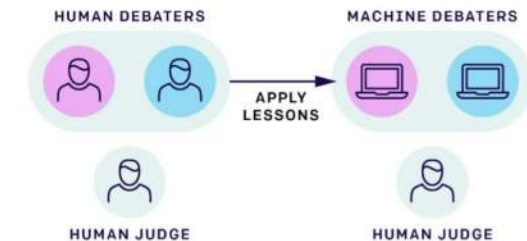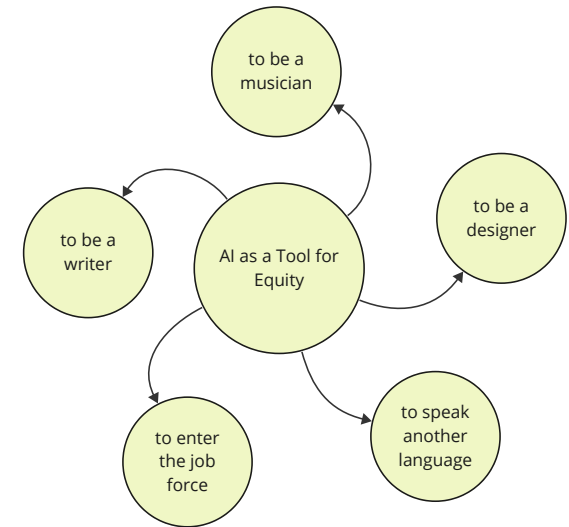
The Big Questions

- **How can we implement AI with social equity in mind and how can we bring the human role to the forefront?**

- **What is the architects role in promoting diversity and equity with AI?**

- **How do we combat AI Bias?**

- **Is AI just plagiarism?**

- **Is AI going to take our jobs?**

Fast design leads to the atrophy of the creative muscle and leads to referential, stereotypical, and ultimately, superficial concepts.

It is easy to get in the loop of fast design that AI enables. It can be quick and effortless with results that feel familiar and final. However, if the role of the architect was to replicate historical styles, it would have been obsolete a long time ago.

AI can generate an echo-chamber effect without the right guidance of prompts. This is how biases and stereotypes are perpetuated through a spiral of validating results by generating similar outcomes that continue to add to the statistical data.

Like fast food and fast fashion, fast design is accessible, convenient, with endless varieties. However, there is a deep social impact of feeding into the culture of consumerism and disposability as well as raising questions of authenticity.

Consider this study where ChatGPT was asked for 50 well known architecture firms paired with a 2 word descriptor. Then Midjourney was given a prompt where the name of the architect was switched out as the "style" for each of these images.

03 FAST DESIGN

Frank Llyod Wright | American
Organic, Prarie, Modernism

Ludwig Mies van der Rohe | German
Minimalism, Modernism

Zaha Hadid | Iraqi-British
Deconstructivism, Futurism

Santiago Calatrava | Spanish
Kinetic, Futurism

Renzo Piano | Italian
Contemporary, Sustainable

Carlo Scarpa | Italian
Modernism, Craftsmanship

Luis Barragan | Mexican
Minimalist, Colorful

Charles Rennie Mackintosh | Scottish
Art Nouveau, Glasgow Style

Eero Saarinen | Finnish-American
Modernism, Sculptural

Kenzo Tange | Japanese
Metabolist, Modernism

Tadao Ando | Japanese
Minimalism, Concrete

Jean Nouvel | French
Contextual, Innovative

Norman Foster | British
High-Tech, Sustainable

Bjarke Ingels | Danish
Playful, Innovative

Daniel Libeskind | American
Deconstructivism, Narrative

Rafael Moneo | Spanish
Neo-Rationalism, Contextual

Sou Fujimoto | Japanese
Organic, Transparent

Minoru Yamasaki | Japanese-American
Modernism, Visionary

Cesar Pelli | Argentine
Postmodernism, Glass Facades

Jeanne Gang | American
Sustainable, Biomimcry

Alvaro Siza | Portuguese
Minimalism, Contextual

Toyo Ito | Japanese
Organic, Lightness

Herzog & de Meuron | Swiss
Contextual, Contemporary

Peter Zumthor | Swiss
Minimalism, Craftsmanship

Fumihiko Maki | Japanese
Modernism, Simplicity

Dominique Perrault | French
Minimalism, Industrial

Kengo Kuma | Japanese
Natural Materials, Organic

Elizabeth Diller | American
Contemporary, Interdisciplinary

Kazuyo Sejima | Japanese
Minimalism, Transparency

Olson Kundig | American
Contemporary, Craftsmanship

Shigeru Ban | Japanese
Humanitarian, Sustainable

Rem Koolhaas | Dutch
Deconstructivism, Urbanism

Le Corbusier | French-Swiss
Modernism, International Style

Oscar Niemeyer | Brazilian
Modernism, Organic

Walter Gropius | German
Bauhaus, Modernism

David Chipperfield | British
Contextual, Contemporary

Steven Holl | American
Organic, Light and Space

Arata Isozaki | Japanese
Contextual, Fusion

Moshe Safdie | Canadian
Human-Centric, Contextual

Thomas Heatherwick | British
Innovative, Sculptural

Antoni Gaudi | Spanish
Catalan Modernism, Organic

Louis Kahn | American
Monumental, Expressionism

I.M. Pei | Chinese-American
Modernism, Geometric

Richard Meier | American
Minimalism, White Aesthetics

Alvar Aalto | Finnish
Organic, Functionalism

OMA | Dutch
Contemporary, Urbanists

Snohetta | Norwegian
Transdisciplinary, Sustainable

SOM | American
Modernist, Engineering

Gensler | American
Innovative, Collaborative

Perkins & Will | American
Sustainable, Design-Driven

04 PROCESS DRIVEN AI

Human-Centric Design

Human-centric design is about finding an approach to problem-solving and design that puts people at the center of the process. It involves understanding the needs, wants, and behaviors of the people who will be engaging with the design.

AI Integration in the Design Process

User Behavior Research:
AI can analyze large amounts of data about user behavior. This data can be used to pinpoint trends and patterns that can help designers to better understand the needs and wants of their users.

Expanding and Iterating on Ideas:
AI can be used to expand on concepts by generating a wide range of possible solutions whether it is text, visual, or even audio. Several AI tools can iterate variations that can range from slight refinements to chaotic alterations that can lead to new and unexplored outcomes.
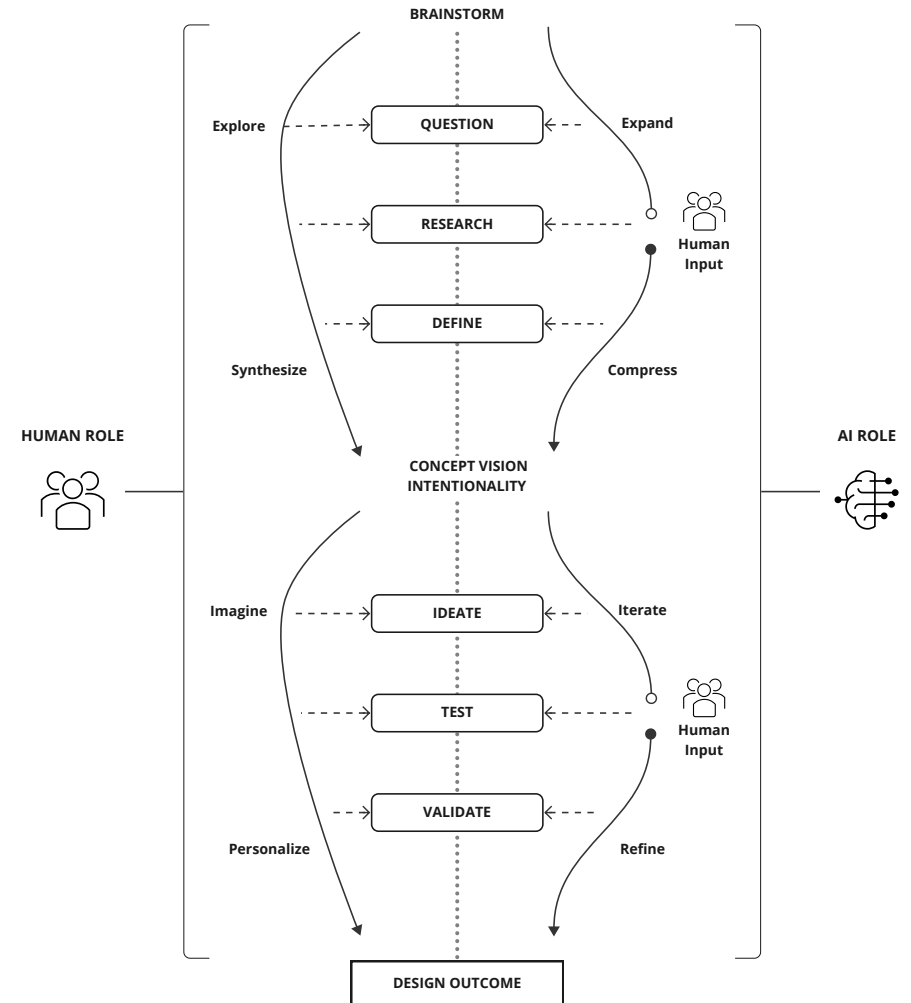
What the human role brings is design ethos, intentionality, responsibility, judgement and most importantly the imagination.
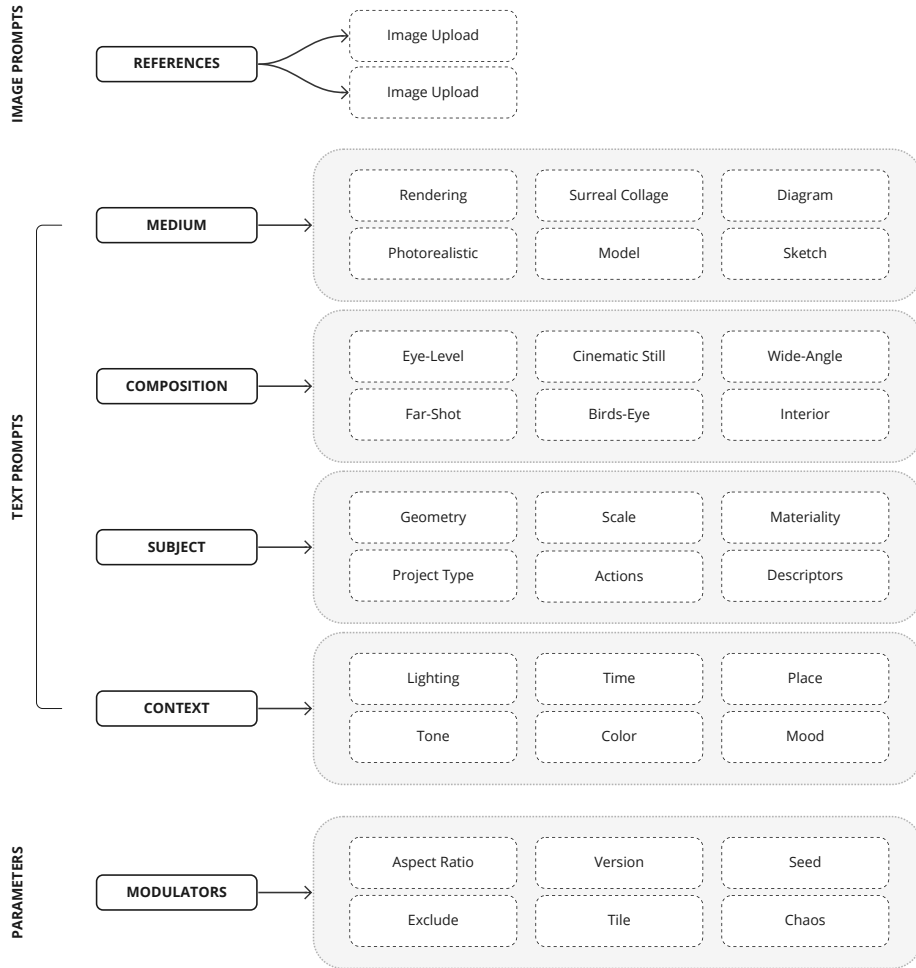
Prototyping and Testing:
New AI tools are being developed to test digital prototypes. This can help designers to identify problems earlier in the design process. Cities are even investing in digital twins to accurately analyze and simulate real life conditions.

The design flow chart depicts where the human role would have the most input in the "explore" and "imagine" phases with the bulk of repetitive tasks being aided by AI. It's important to note that without human input, the "compress" and "refine" path wouldn't occur.
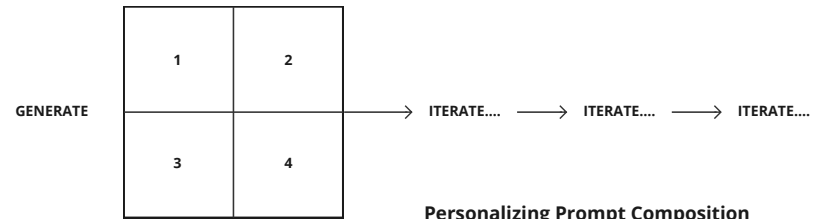
HUMAN-CENTRIC DESIGN PROCESS WITH AI

BRAINSTORM

Explore — QUESTION — Expand

RESEARCH — Human Input

Synthesize — DEFINE — Compress

HUMAN ROLE — CONCEPT VISION INTENTIONALITY — AI ROLE

Imagine — IDEATE — Iterate

TEST — Human Input

Personalize — VALIDATE — Refine

DESIGN OUTCOME

ARCHITECTURAL IMAGE GENERATRION PROMPT KIT OF PARTS

IMAGE PROMPTS

REFERENCES
- Image Upload
- Image Upload

TEXT PROMPTS

MEDIUM
Rendering	Surreal Collage	Diagram
Photorealistic	Model	Sketch

COMPOSITION
Eye-Level	Cinematic Still	Wide-Angle
Far-Shot	Birds-Eye	Interior

SUBJECT
Geometry	Scale	Materiality
Project Type	Actions	Descriptors

CONTEXT
Lighting	Time	Place
Tone	Color	Mood

PARAMETERS

MODULATORS
Aspect Ratio	Version	Seed
Exclude	Tile	Chaos

*NOTE: These are just examples of some of the many ways to arrange and code prompts

GENERATE

1	2
3	4

ITERATE.... → ITERATE.... → ITERATE....

Our future with AI requires us all to continue being explorers and researchers as we revolutionize the way we design.

### Personalizing Prompt Composition

There are many ways to design your own prompt composition but it is apparent that several layers of design direction need to be made by human input to take the driver's seat while using AI tools. Developing a process and having an understanding the prompt composition is part of how to find your personal AI voice. It is in the personalization of the process that keeps the human at the center of the design story.
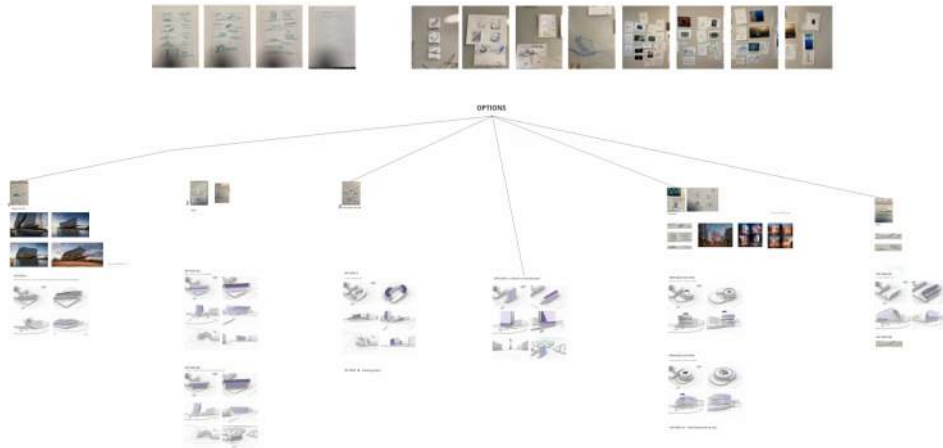
There is a high responsibility to write our digital heritage with a rich blend of voices from a diverse collective. It is this ongoing collective of individual and personal design voices that promote equitable and inclusive practices.

06 CASE STUDY
PW MIAMI
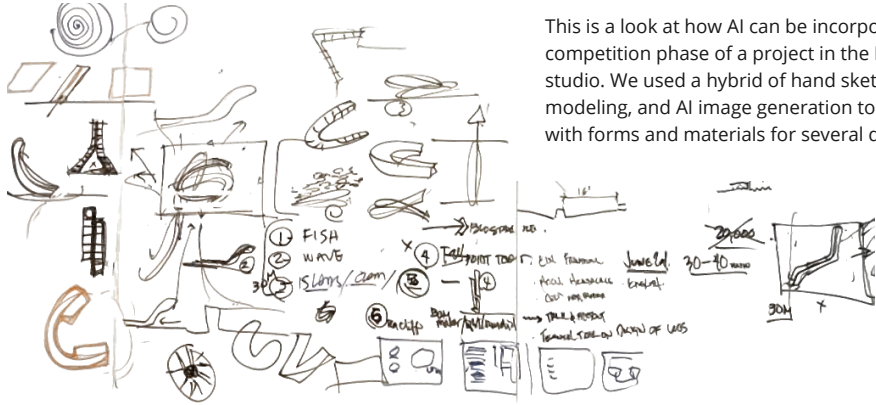
This is a look at how AI can be incorporated in a competition phase of a project in the PW Miami studio. We used a hybrid of hand sketching, 3D modeling, and AI image generation to experiment with forms and materials for several design options.
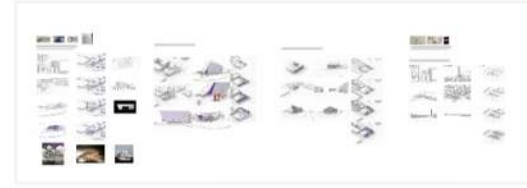

A1 / A2 DESIGN OPTIONS - 07/27

A1 / A2 DESIGN OPTIONS - 07/28

ITERATE....

A1 / A2 DESIGN OPTIONS - 08/01

ITERATE....

A1 / A2 DESIGN OPTIONS - 08/02

ITERATE....

B CLIENT FORMAL GUIDANCE - 08/03

ITERATE....

Top: Sketching and brainstorming session with the team
Bottom: Organizing ideas into options to test with modeling and AI
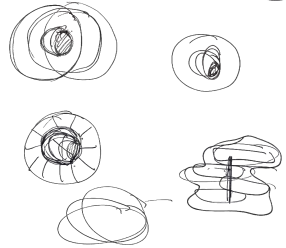
Rounds of iterations to refine and eliminate options

06 CASE STUDY
PW MIAMI

Starting with hand sketches inspired by the biodiversity of the adjacent ocean. This image above shows a study of coral plate formations and jellyfish membranes. Then massing studies are done at the same time exploring sketch to render image generation on LookXAI.

Prompt: Mid-rise hotel, tech hub city context, architectural render, building, realistic, jellyfish
*note AI added a jellyfish in the sky?

Prompt A:
Imagine, A high-rise mixed-use sustainable tech architecture emphasizing biophilia with people interacting with the building, photorealistic, architectural photography, jellyfish facade

Prompt B:
Imagine, a glowing mesh stretched facade architecture concept, a high-rise tower with three stacked volumes with atriums in between, tech hub city context, people in streetscape, biodome

Blend of Prompt A + Prompt B

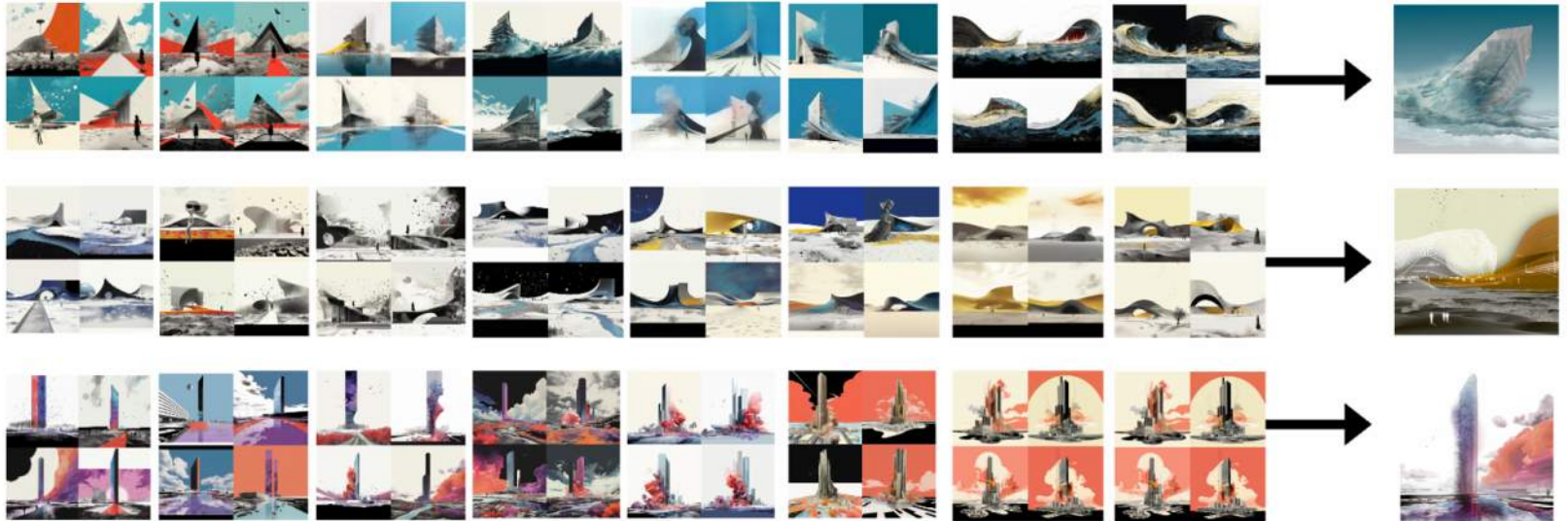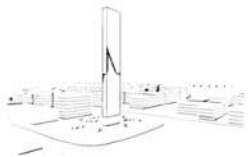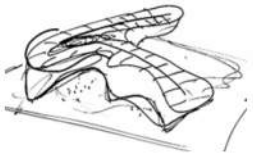# 06 CASE STUDY
PW MIAMI

Project: Confidential Competition

Team: Pat Bosch
           Jamie Chow
           Angel Suarez
           Stephanie Tramutola
           Xiao Wang
           Juan Yactayo

<u>**Case Study Conclusion**</u>

Considering we had several design options to explore in a short time frame, <u>the AI tools helped us visualize and explore facets of the design we normally would not have so early on in the concept stage.</u> The team also tested visual representation styles in an effort to convey an abstraction of the concepts.

The images we shared with the client were a hybrid of the surreal AI imagery generated from hand sketches and 3D modeling done by the team. It helped share the poetry of the story rather than getting distracted by the unresolved realism AI generated images can create.

Moving forward, there are several paths to navigate with new AI tools being generated. Tools to analyze specific user program, environmental factors, coordination clients and consultants, and more we haven't invented yet.

<u>**We need to stay engaged in the process, and be disrupters in the echo-chamber effect of fast AI design. Human -centric design is about how we choose tell our diverse collective of stories and AI is a tool to help us through various points in the process.**</u>

07 DESIGN BLUEPRINT

5 V's of Data

Volume -   ensuring there is a large enough sample size

Velocity -   how fast is the data coming in

Variety -   variety of sources and formats, diversity in data

Veracity -   data quality and accuracy / trust

Value -   data strategy (how is the data collected and analyzed?)

Is there an organization or authority that is auditing algorithms?

To ensure that AI-powered design is equitable and inclusive, it is important for architects and designers to work with data scientists to develop AI models that are trained on diverse data sets.

Its not AI that is biased, it's the dataset

Dataset Management Authority

PW Dataset?

Regulated Datasets

Core Values

- Create a process to define your vision and intentionality.
- Develop your personal voice with AI.
- Build diverse teams to train and assess AI.
- Follow instinct, machine learning can also be wrong.
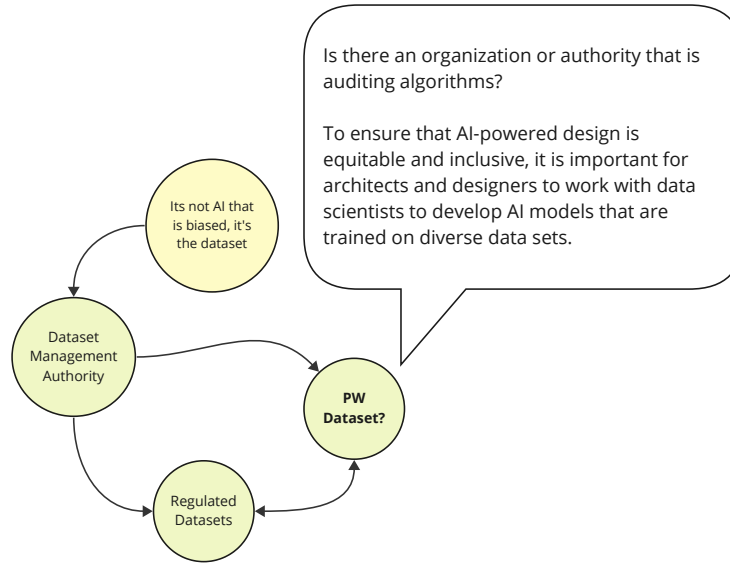
Best Practice

- Date generated results
- Record prompts
- Be diligent about logging and tagging data
- Test and Iterate

References

Wang, D., Weisz, J. D., Muller, M., *et al.* **Human-AI collaboration in data science: Exploring data scientists' perceptions of automated AI**. *Proceedings of the ACM on Human-Computer Interaction*. 3(CSCW), 1-24. (2019). https://dl.acm.org/doi/10.1145/3359313

Wang, D., Andres, J., Weisz, J., *et al.* **AutoDS: Towards Human-Centered Automation of Data Science. In Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems.** *CHI '21: Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems.* May 2021, https://research.ibm.com/publications/autods-towards-human-centered-automation-of-data-science

Weidele, D. K. I., Weisz, J. D., Oduor, E., *et al.* (2020, March). **AutoAIViz: opening the blackbox of automated artificial intelligence with conditional parallel coordinates.** *IUI '20: Proceedings of the 25th International Conference on Intelligent User Interfaces* March 2020, https://research.ibm.com/publications/autoaiviz-opening-the-blackbox-of-automated-artificial-intelligence-with-conditional-parallel-coordinates

Alkan, Ö., Daly, E., Vejsbjerg, I. **Opportunity Team Builder for Sales Teams**. *23rd International Conference on Intelligent User Interfaces*. 2018, https://dl.acm.org/doi/10.1145/3172944.3172968