Intro to ZGF

Firmwide Staff

700
Employees
Firmwide

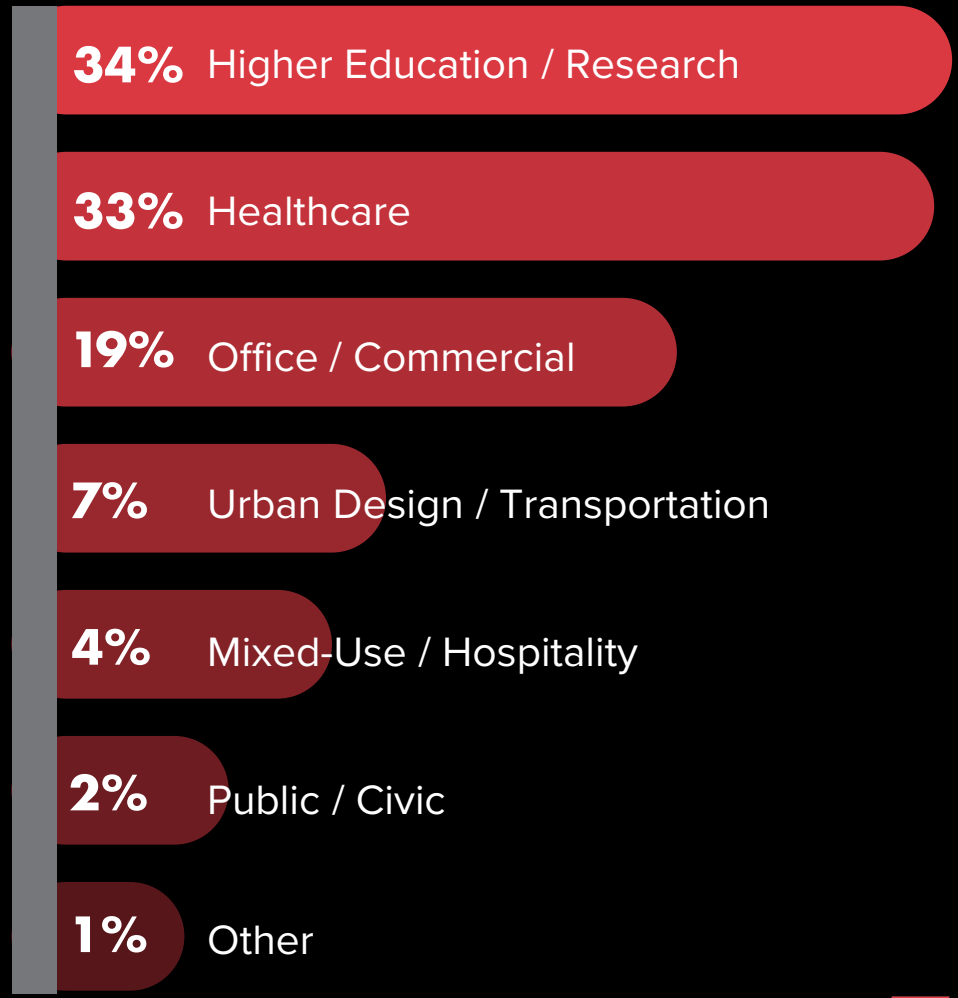
LOS ANGELES	PORTLAND	SEATTLE	WASHINGTON, DC
75	250	150	105

NEW YORK	VANCOUVER	DENVER
50	55	25

Services

- Architecture
- Interior Design
- Urban Planning
- Sustainability
- Laboratory Planning
- Medical Planning
- Fabrication
- Environmental Graphic Design

Project Types



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- AI Gold Rush
- Tools We Chose
- Tools We Create
- Tools You Can Create
- Will AI Take Your Job?
- Responsibility as Architects
- Hopes for the Future of AI

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Early Explorers and Cautious Adopters

Many considerations when adopting new technology

- Security/Privacy
- **Intellectual Property**
- Proprietary File Types or Platforms
- License Management
- Interoperability
- Deployment
- Ease of use
- Training
- **Ethics**
- **Cost**

Read the TOS/EULA

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1,000's of AI apps...

A Few Tools Are All You Need To Get Started

ChatGPT

Adobe Firefly

MS Copilot

ZGF

AI Pair Coding
Software Development

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Visual Studio

GitHub Copilot

OpenAI API

stability.ai

ZGF .ai

Web Apps

Adobe

Rhino

Revit

Sketchup

blender

Blender

3dxMax

QGIS

Grasshopper

M365

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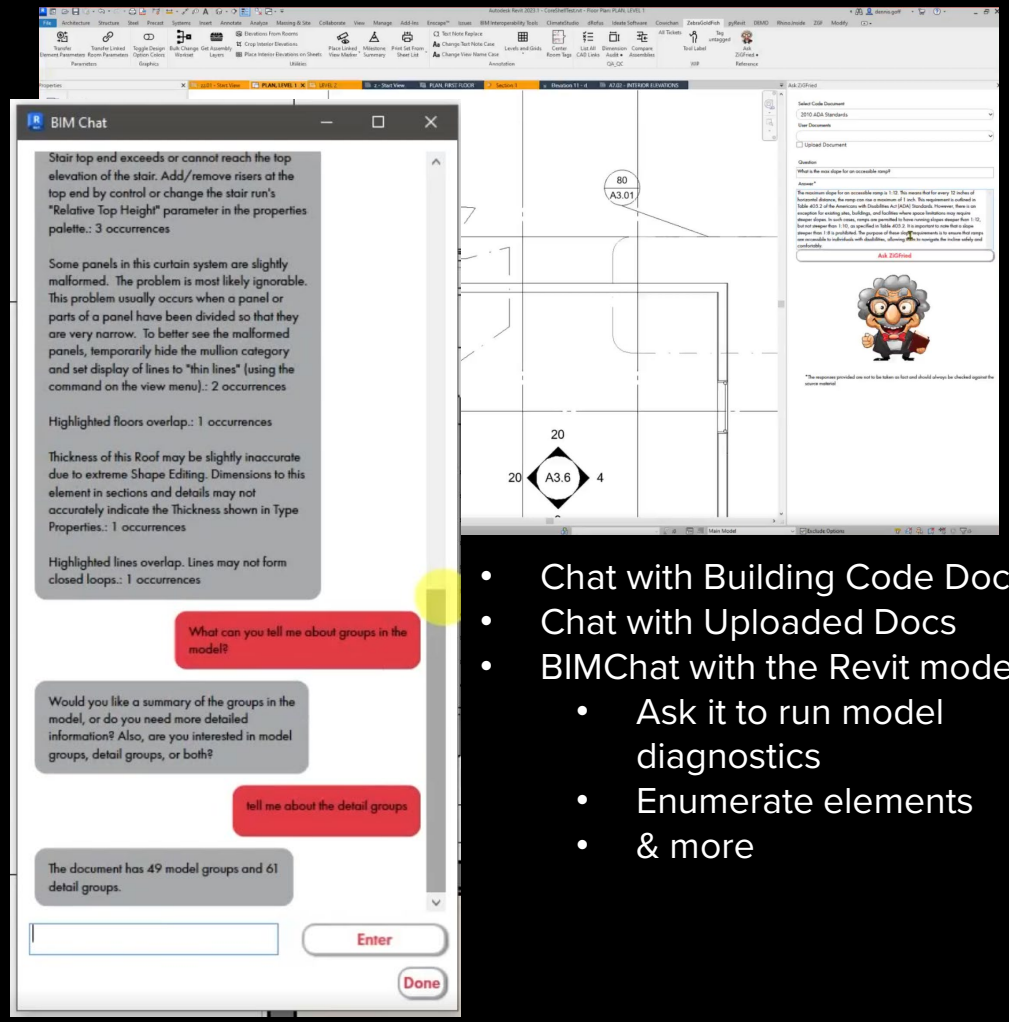
In-House AI Development

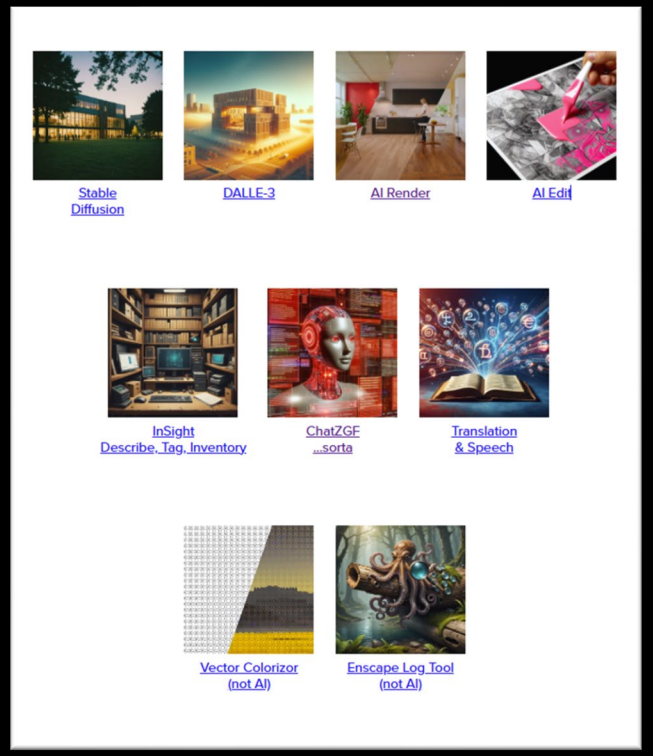
Ziggy, the AI Chatbot in pyRevit

Dennis Goff

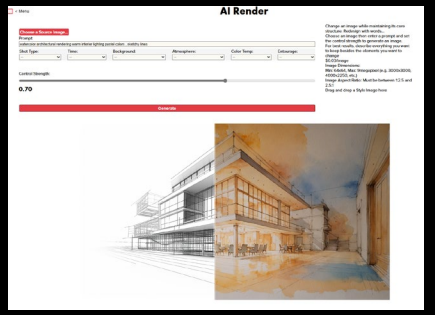


- Chat with Building Code Docs
- Chat with Uploaded Docs
- BIMChat with the Revit model
  - Ask it to run model diagnostics
  - Enumerate elements
  - & more

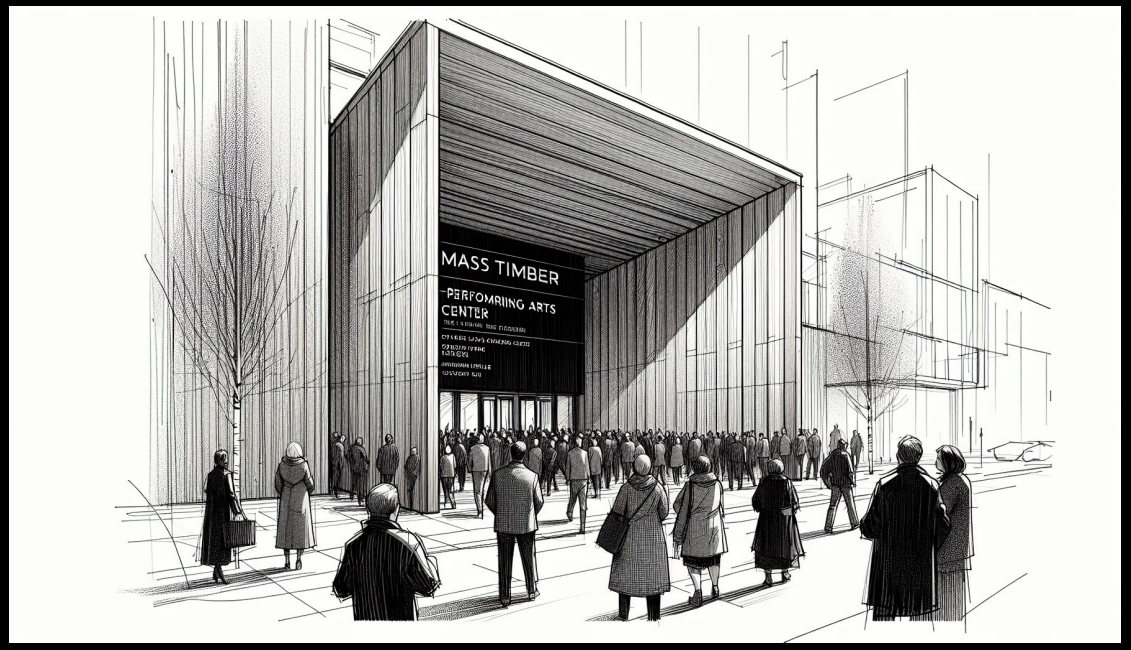
ZGF.ai – Internal AI Toolkit



- Text to image Stable Diffusion & DALL-E
- AI Rendering/Reimagining
- AI Selective Editing
- Text to Voice
- Image Analysis
  - Generate Alt-text for images
  - Tag images
  - Inventory Images
- ChatZGF
  - Meeting notes from Teams transcripts.
  - Summarization
  - Grammar and Style Check
  - Proofreading
  - Coding Assistance



The image depicts a modern building at night. The structure features a striking facade made of warm wooden panels, illuminated by lights embedded in the overhanging roof. Large glass windows reveal the bright, open interior. A crowd of people, dressed warmly, gathers outside the entrance, which is situated on an urban street with additional buildings visible in the background. Streetlights and the glow of city traffic add to the nighttime ambiance.



The image is an architectural drawing depicting the exterior of a building identified as the "Mass Timber Performing Arts Center." The structure features a modern design with tall, vertical lines and a prominent, overhanging roof. A large crowd of people is gathered at the entrance, which is located in the center of the image. They appear to be entering the building. There are some leafless trees on the sidewalk. The overall composition emphasizes the verticality and scale of the building, and the scene suggests a bustling, urban environment.

You Can Create and Share Single Page Apps

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ChatGPT Use Case

Tim Meyers – Sustainability Expert, *Not a Coder*

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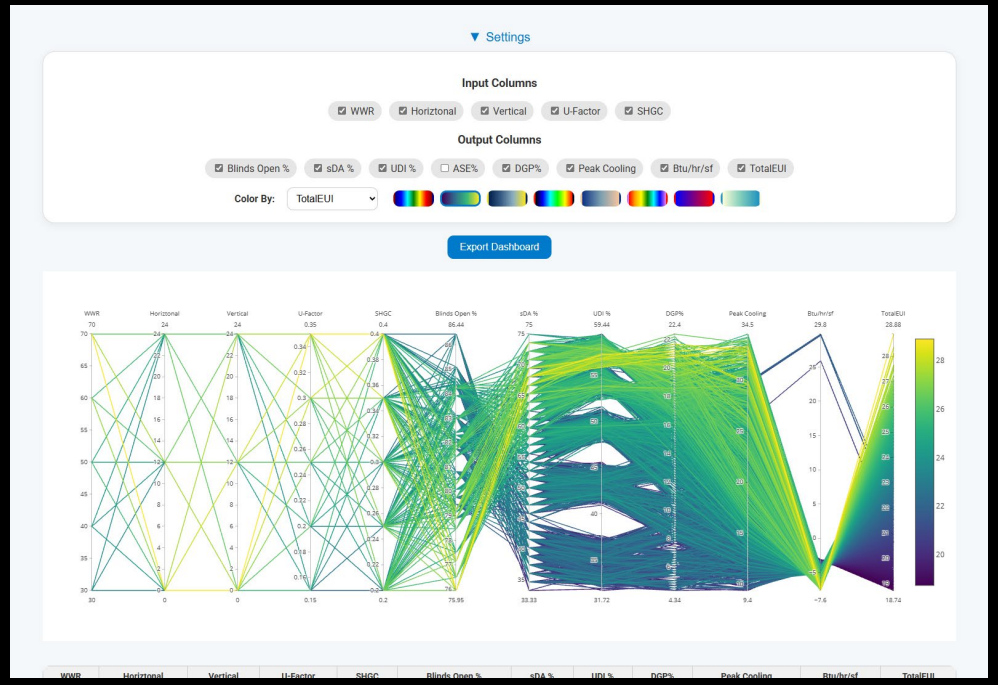
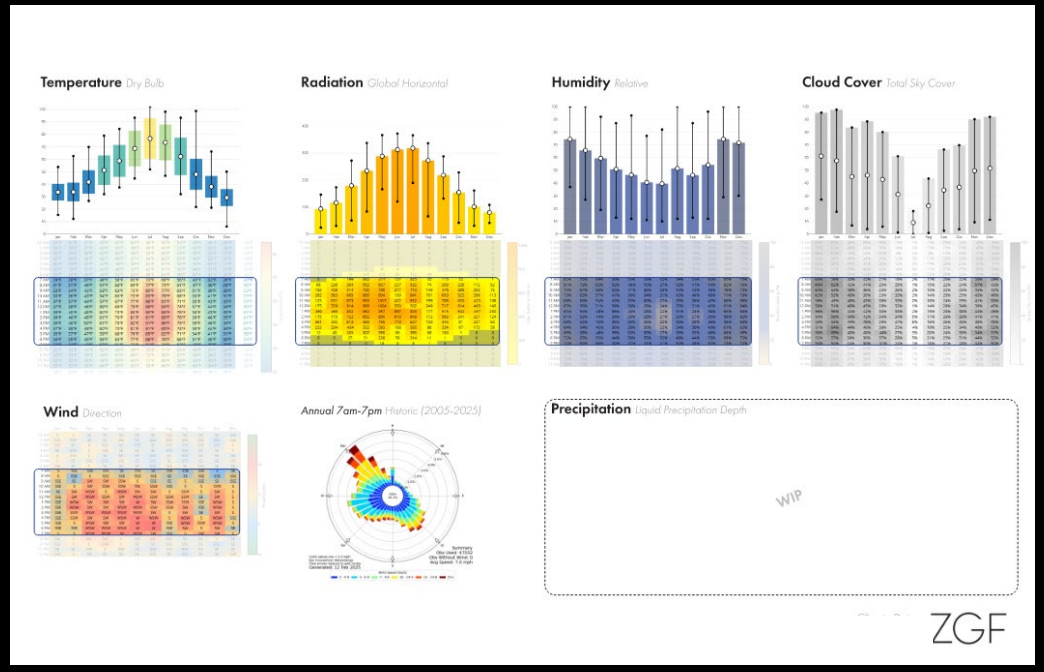
Interactive Parallel Coordinates Chart in <2hrs

THREAD by Thornton Tomasetti, was down/inaccessible. Tim worked with ChatGPT to deliver a single page application (html file) to create the interactive charts from .csv data generated in Grasshopper



Single page apps, created with ChatGPT, are easy to deploy and share among peers. The single HTML files can be opened in any web browser. This simplifies the process for users less familiar with Grasshopper.



Will an AI Model Replace Architects?

No*

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Do I believe a generative AI model, akin to GPT, or StableDiffusion, that will generate an accurate BIM model or coordinated drawing set?

Not likely.

Why?

Compute complexity, time, cost and accuracy.

Simplified, language models, like GPT4, are 1-D

- GPT4
- 25,000 GPUs × 90 days × 24 hours = 54 million GPU-hours
- ~50 GWh consumed.

Image models are 2-D.

- Grid of pixels multiplied by their color channels, RGB.

The results from these models do not need to be perfectly accurate or deterministic in their results.
Their semantic meaning to the user can be ‘good enough’

A 3D BIM model or a sheet set need to be near perfect. Plans, sections and elevations need to coordinated and align perfectly.

https://en.wikipedia.org/wiki/GPT-4
https://www.trgdatacenters.com/resource/ai-chatbots-energy-usage-of-2023s-most-popular-chatbots-so-far/

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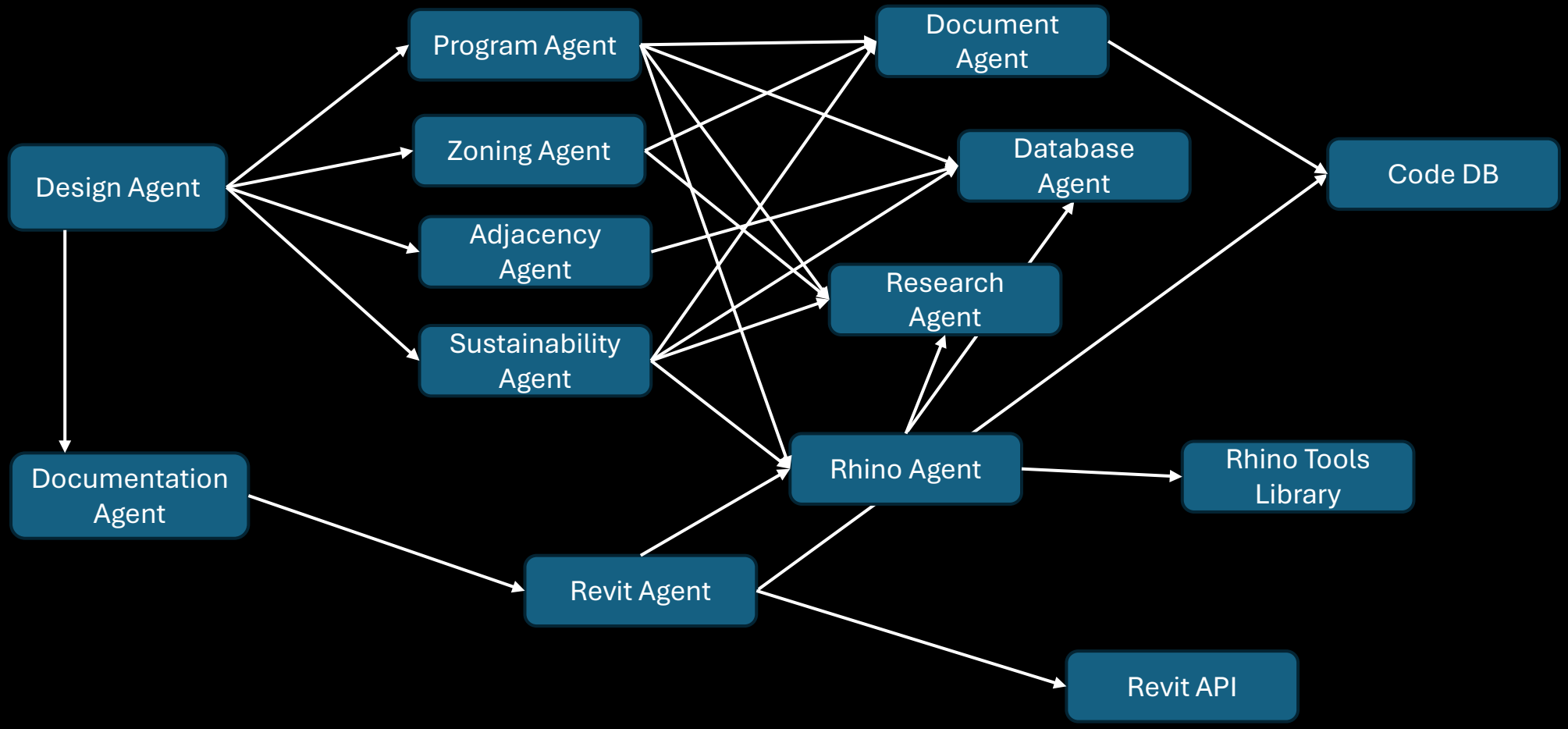
But... a team of AI agents, each an expert at its smaller, simpler task, might come close some day.
AI does not do well with huge project context. But it is excellent with smaller tasks.
An AI Agent is a ChatBot with tools, resources and reasoning.



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As Architects, What is Our Responsibility?

Ethically integrating AI into architecture requires balancing technological innovation with responsibility to ensure our work remains human-centered, sustainable, and equitable.

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What is Our Responsibility to our clients?

- What is lost from the design process by having AI do the leg work?
- Surrendered Ownership
- Empathetic Design
- Stakeholder input
- Community outreach
- Solve for social issues
  - Inclusion
  - Comfort
  - Neurodiversity

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What is Our Responsibility to the Environment?

- AI is Not climate friendly
- ZGF is known for our sustainable design
- We are early adopters of the AIA 2030 Commitment
- Total data centers will need 1,000 Terawatts by 2026
- AI data centers *alone* will need 68 GW in total by 2027. California needs 86GW
- 327GW by 2030 = 261–280 million average U.S. households.
- Large Hyperscale Data Centers use 200 million gallons of water per year
    - 300 Olympic Swimming Pools

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https://www.rand.org/pubs/research_reports/RRA3572-1.html

Explained: Generative AI's environmental impact | MIT News | Massachusetts Institute of Technology

Would you hire an intern that's known to have a high carbon footprint?

Current LLMs are getting better all the time but are still prone to mistakes and their energy use is growing exponentially.

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Hopes for the future

- Smaller Models:
  - More specialized, less generalized models
  - Energy needed to train and use models grows or shrinks in a linear relationship.
  - Model accuracy also relates to size.
  - Ex: image model only trained on architecture / trained on far fewer images than a general model
  - Single language models could cut energy needs by up to 50-60%

- IP Ethical GenAI like Adobe's Firefly.
- Less bias

- Mixture of Experts (MoE):
  - Same large model, different technique in training and inference
  - MoE splits a large model into many "expert" subnetworks
  - 1000x increase in model capacity for little increase in energy consumption
  - Small subset of a model is used for inference.
  - Energy use based on *active* parameters rather than the *total* parameters of LLm.

https://proceedings.mlr.press/v162/du22c.html

https://dl.acm.org/doi/pdf/10.1145/3721146.3721953

https://huggingface.co/blog/moe

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