INNOVATION IN STRUCTURAL ENGINEERING (ISE) GRANT TEAM UPDATE

Brian Petruzzi
Andrew Sundal

NCSEA
National Council of Structural Engineers Associations

- ENABLE RESEARCH TO ADVANCE TECHNICAL & CODE-RELATED DEVELOPMENT
- CREATE OPPORTUNITIES FOR YOUNG PROFESSIONALS
- PROVIDE GRANTS TO SEAs
- GROW AWARENESS OF THE PROFESSION
- ENHANCE DIVERSITY, EQUITY, AND INCLUSION

NCSEA Foundation

ADVANCES THE SCIENCE AND PRACTICE OF STRUCTURAL ENGINEERING BY SUPPORTING NCSEA, THE STATE SEAS, AND PRACTICING STRUCTURAL ENGINEERS.

NCSEA Foundation | Core Pillars

Guiding the adoption of
technology and services
that advance the profession.

Innovation

Ensuring the future profession
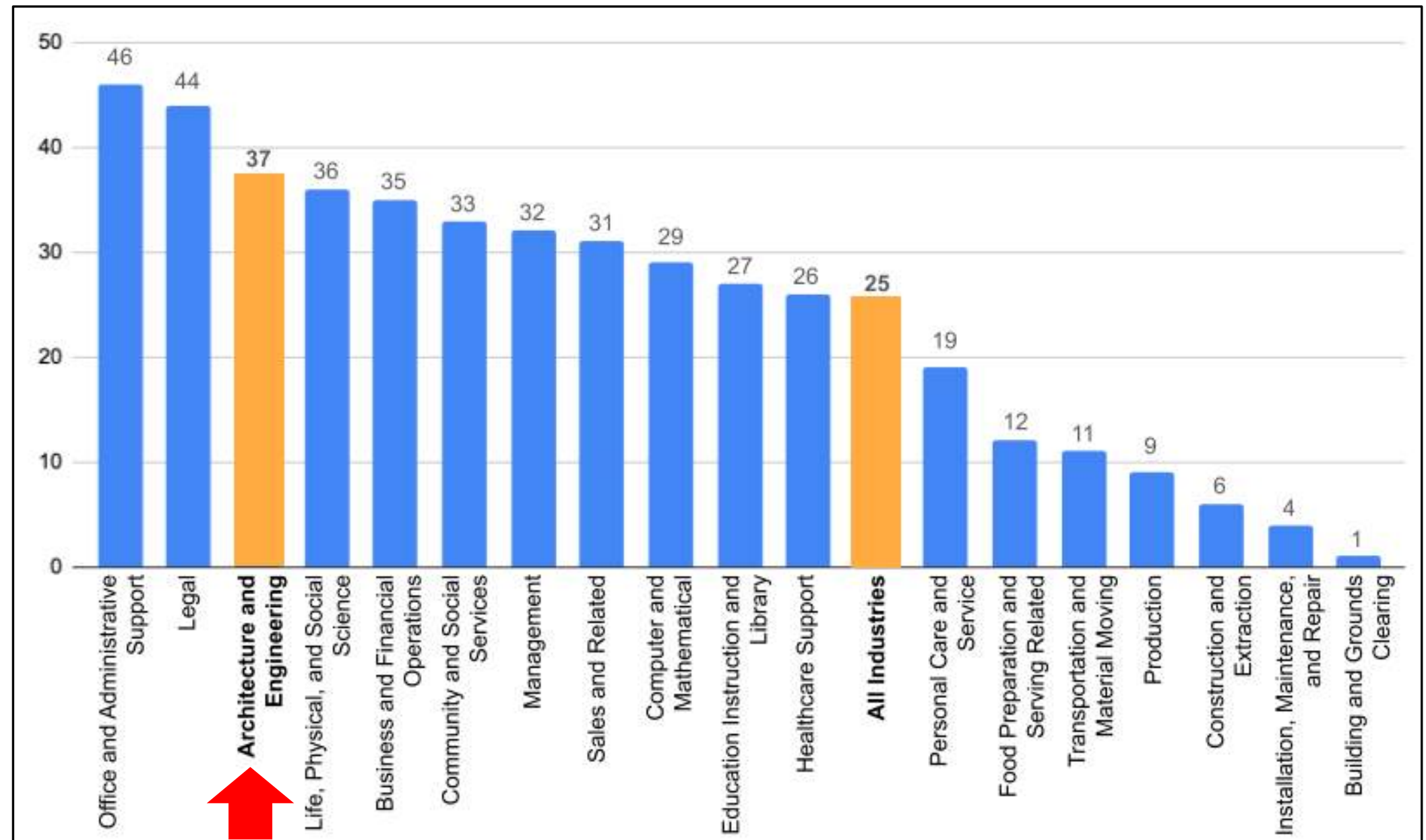is supportive, inclusive, and
diverse.

Growing awareness of the
profession and
its contributions to society
while supporting SEAs
in enhancing their local
communities.

People

Advocacy

Potential to be Transformed

- Business Model
- Monetary Gain
- Codified Nature of the Profession

The share of industry employment exposed to automation by AI in the U.S. Data courtesy Goldman Sachs, 2023.

Challenges Facing the Industry

1. A Lack of **[Vision]**

2. Slow **[Adoption]**

3. **[Accuracy]** in Current AI Tools

4. Uncertainty in How Our **[Data]** Should Be Used

5. A Lack of Clarity around **[Privacy & Ethics]**

ISE Grant | Team Structure

AI Grant Team

- **Responsible for Project Goals and Deliverables.**

- Deliver an Industry-Shaping Roadmap.

- Roadmap will Inform Impacts and Opportunities

AI Advisory Board

- Thought Leaders in the field of AI.

- Provides Industry Knowledge and Experience.

- Quarterly Steering Meetings

2024 ISE Team Members

ISE Project Manager

John-Michael Wong

KPFF
San Francisco

Aditya Kaushik

Walter P Moore
Denver

Andrew Sundal

HGA Architects & Engineers -
Minneapolis

Ayush Singhania

Simpson Gumpertz & Heger
(SGH)
San Francisco

2024 ISE Team Members

Dave Martin

Degenkolb Engineers
Oakland

Emre Toprak

Arup
Washington D.C.

Sheng Zheng

Martin/Martin
Lakewood, CO

2024 ISE Advisory Board

ISE Project Manager

KP Reddy

Founder & CEO
Shadow Ventures

Robert Otani

Senior Principle & CTO
Thornton Tomasetti

Zak Kostura

Associate Principle
Advanced Digital Engineering
Arup

Kimon Onuma

Founder and President
Onuma, Inc

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2024 ISE Advisory Board

Roark Redwood

Senior Vice President
Technical and Government Solutions
NIBS

KiSeok Jeon

VP of Digital Advisory
STV

Farahnaz Soleimani

Associate Professor
Oregon State University

Strategic Planning Session Participants

AI is here now

Boston Dynamics Atlas
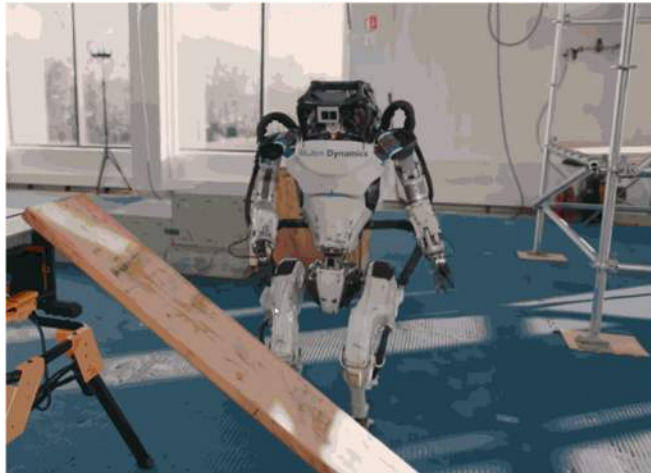
https://youtu.be/-e1_QhJ1EhQ?si=_xwxBvKec-q-YhyH

Canvas Drywall Robot

Building Codes (ICC, Upcodes, GPT)

Condition Assessment (T2D2, Aren)

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AI is here now

"What AI software are you using now?" –Survey results from April's NCSEA Webinar on AI

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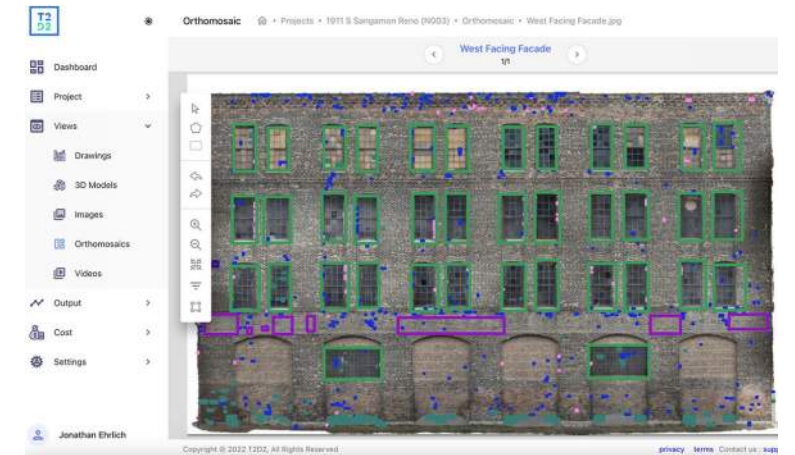
AI is different -

- *Not just another computer program*

Oxford English Dictionary
The theory and development of computer systems able to perform tasks that normally require human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages.

AI Uses a Lot of Data

- Training
- Context
- History
- Rules
- Access to data
- Processing time
- Model selection
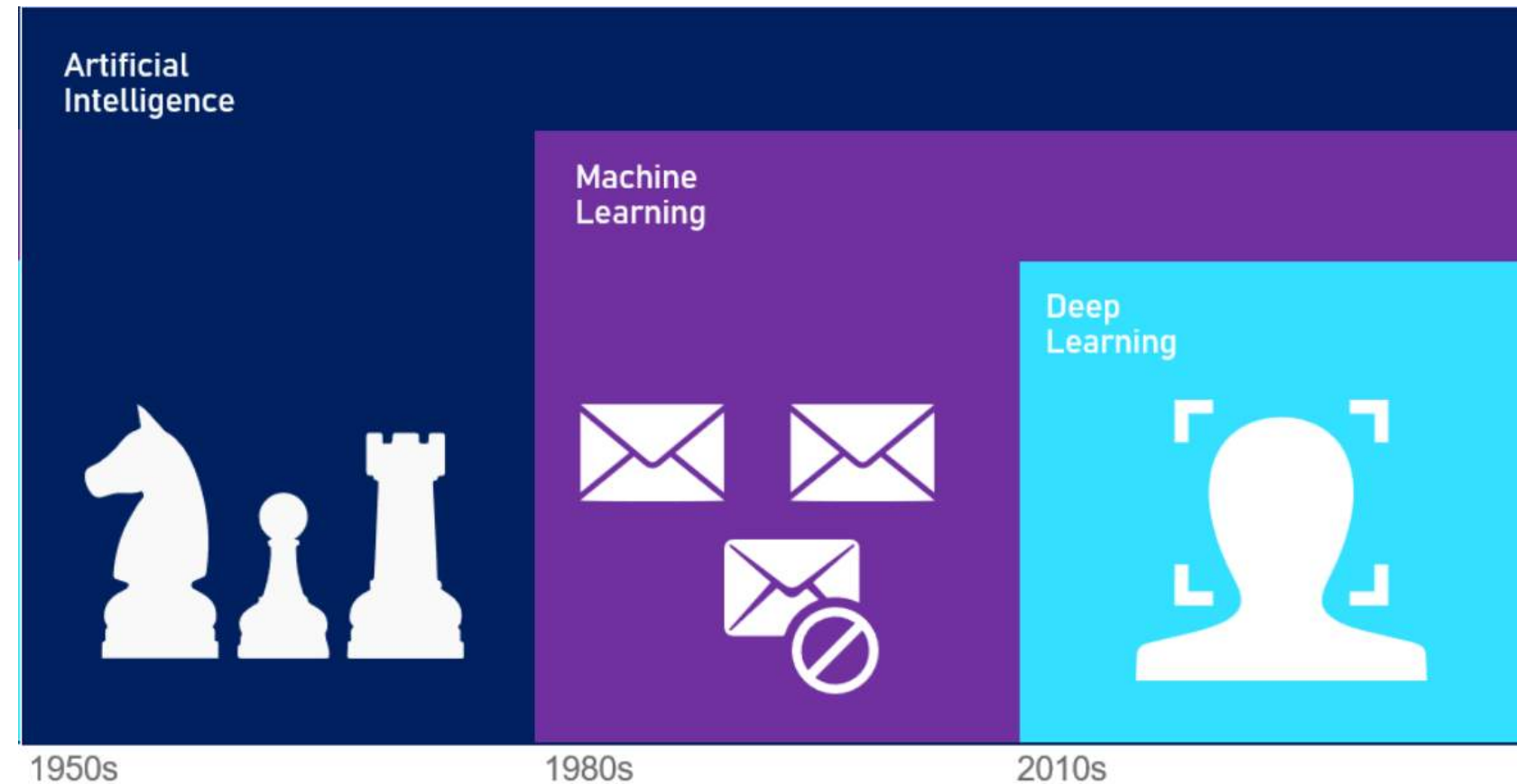
More like asking people with different experience levels or background

AI will change us

"We should stop training
radiologists now.

It's just completely obvious that within five years, deep
learning is going to do better than radiologists."

Geoffrey Hinton, 2016

AI Pioneer

Radiologists:

"Will AI replace radiologists?", is the wrong question.

The right answer is:

Radiologists who use AI will replace radiologists who don't."

Curtis Langlotz, 2019

Professor of Radiology

Stanford University

Structural Engineers:

"Will AI replace Structural Engineers?", is the wrong question.

The right answer is:

Structural Engineers who use AI will replace Structural Engineers who don't."
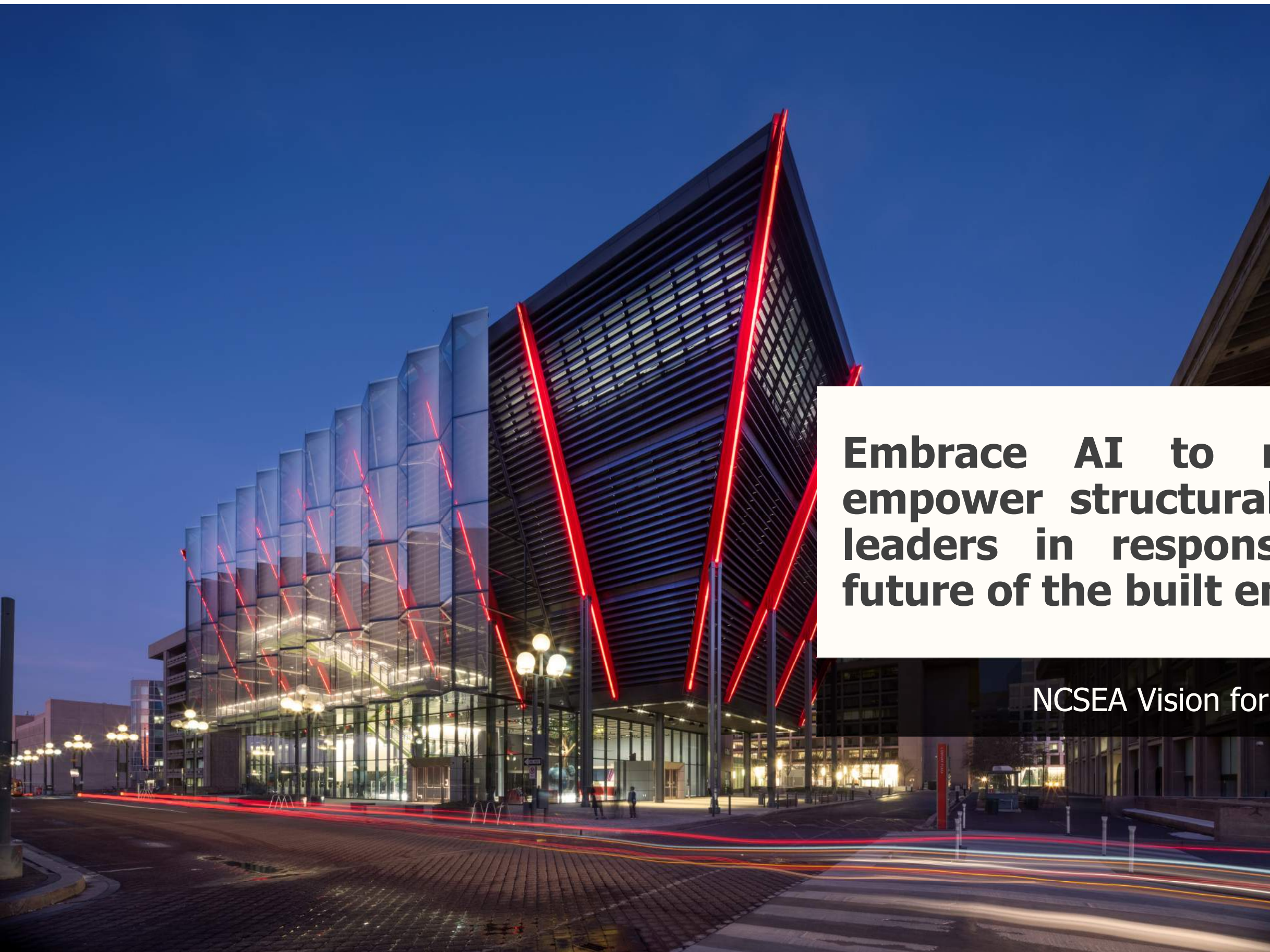
Embrace AI to revolutionize and empower structural engineers to be leaders in responsibly shaping the future of the built environment.

NCSEA Vision for AI in Structural Engineering

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NCSEA Foundation can help with AI

Q1 2024
- ✓ Strategic Planning Session
- ✓ Industry Roadmap
- ✓ 2024 Operational Plan

Q2 2024
Steering Meeting
NCSEA Leadership Meeting
NCSEA Webinar

Q3 2024
NCSEA AI Implementation Plan
Vision for AI in Struct Eng
Structure Magazine Article
Webinar

Q4 2024
Steering Meeting
NCSEA Awareness Meeting
NCSEA Summit Presentation
NCSEA White Papers

Q1 2025
Continue Delivering Projects with 2025 ISE Grant Team

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April STRUCTURE Magazine Article

2024 Today | **Near-Term** | **Longer-Term** | **Future** →

Learning and Strategy

- Learn about technology
- Establish strategy to evaluate technology
- Set goals about future client needs

Develop, Implement and Engage

- Leverage AI for working solutions (technical + project management)
- Launch pilot projects and build small successes
- Continuous learning with more experience

Growth and Focusing Strategy

- Assess growth and success internally + externally
- Establish strategy as clients/partners also adopt AI
- Consider business strategies that best leverage AI

Disruption and Transformation

- Assess your value among startups/competition
- Innovate and perpetuate

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NCSEA Webinar Survey Results
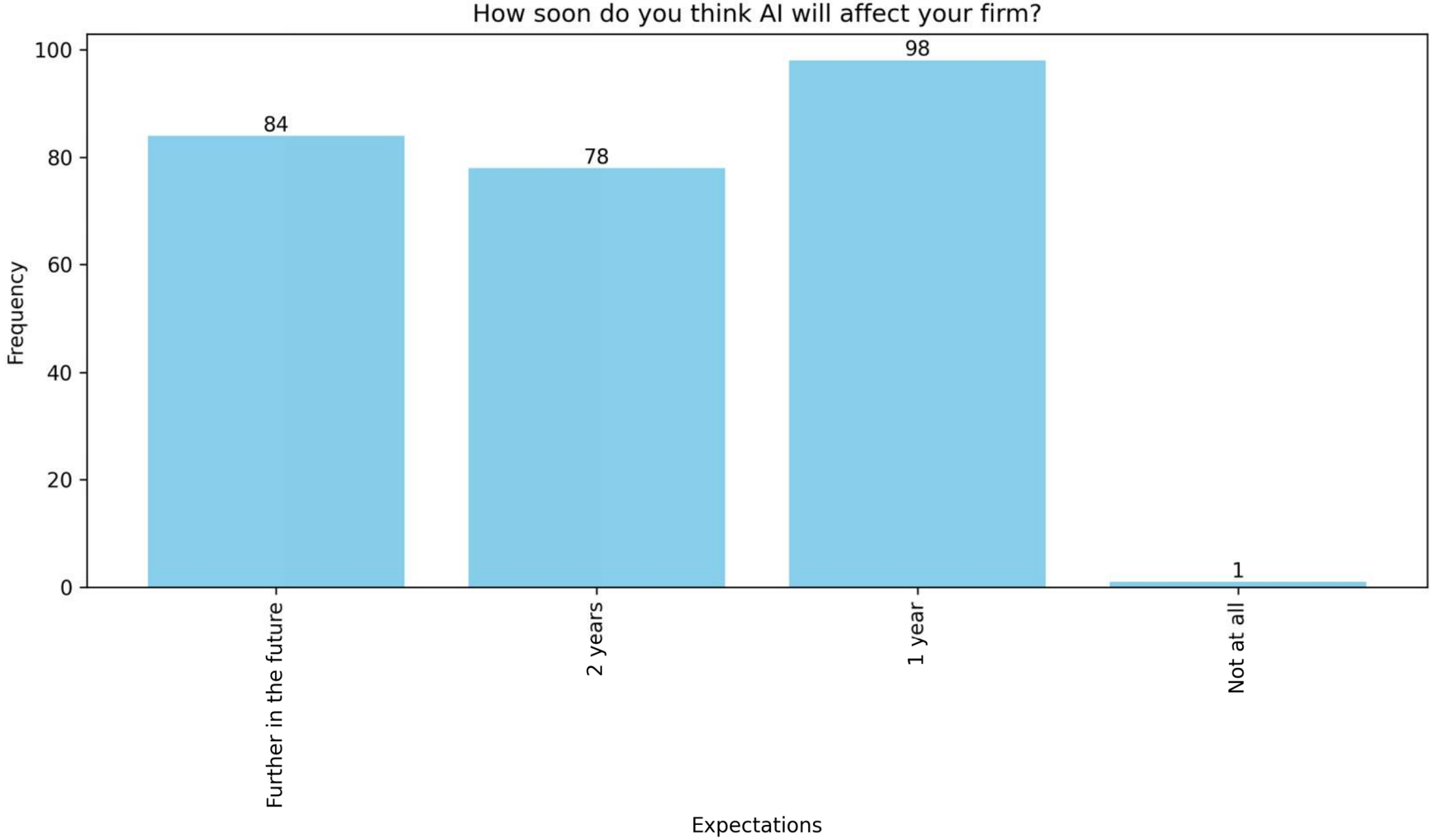
NCSEA Foundation's AI Initiatives support the SE Profession

ISE Team develops Roadmap for 3 Initiatives

AI Education

- Support SEs in advancing their understanding and use of AI

AI Tools & Innovation

- Provide information about AI tools, policies, and innovations that SEs can use in their work

AI Partnerships

- Pursue education and research partnerships advancing the use of AI in structural engineering

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AI Education Initiative

Advisory Board recommended to start here

Policy & Guidance	Instruction	Knowledge Sharing
• AI Policy examples • Data security guidance • Financial investment data • Ethical guidance • Legal framework	• AI Strategy examples • Research paper highlights • Short courses on AI Platforms & tools	• Local SEA forums • Website articles • Podcast • Online forums

NCSEA Webinar Survey Results

How can NCSEA best help you with Artificial Intelligence?
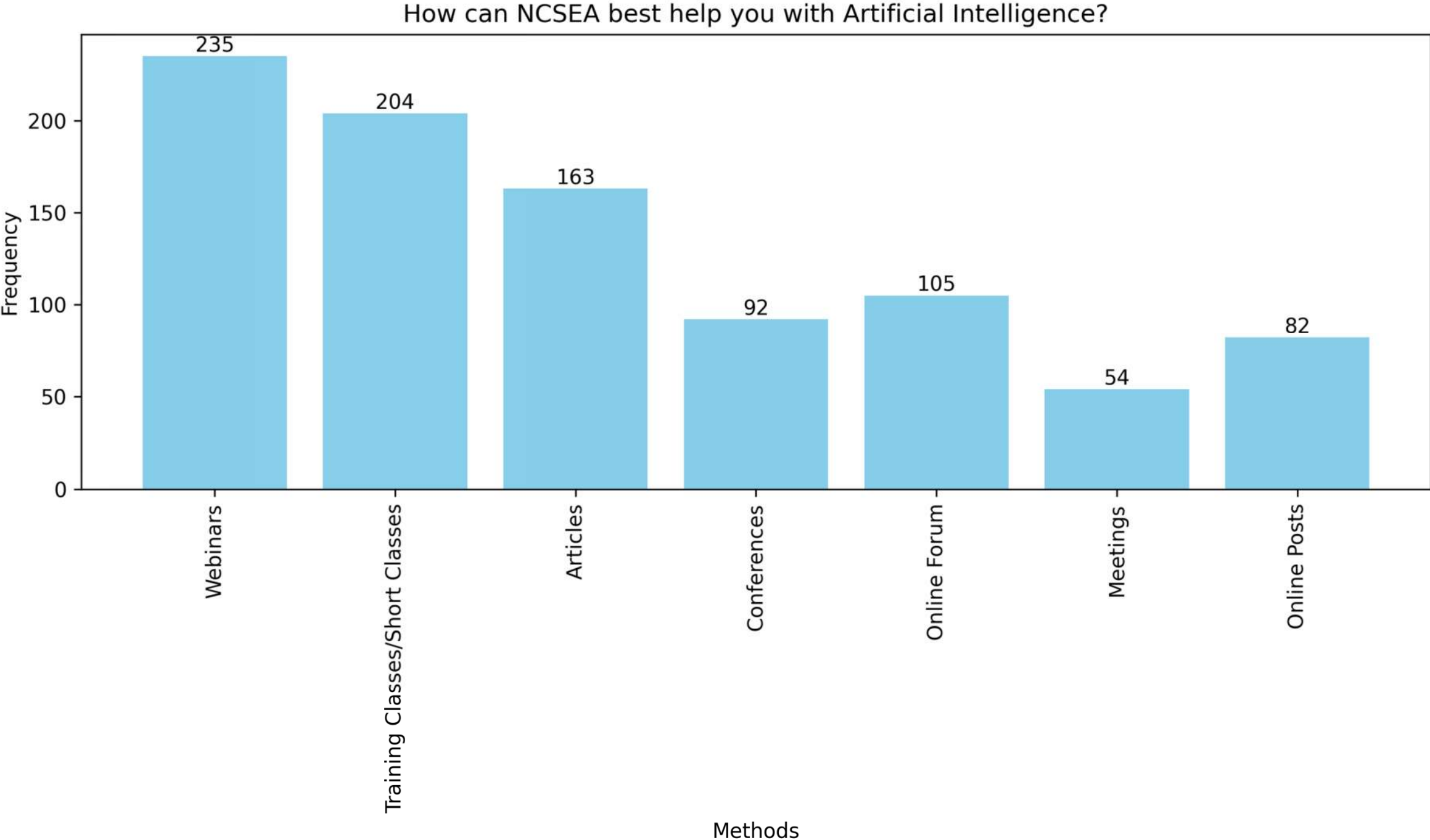
AI Tools & Innovation Initiative

Datasets	LLM, Chat, RAG	Tool Sharing	Vendor Software
• Awareness and examples of open-source data • Synthetic data for AI development • Examples for ML Training	• Make NCSEA Chatbot – SE GPT • Structure Magazine • Webinars • + more	• AI/ML libraries relevant to SE workflow • Case studies on available tools • Example applications for SE tasks	• Platform for awareness of helpful tools • Real world examples

AS0

Sheng's Tool for Surface Roughness

Courtesy Sheng Zheng – Martin/Martin

AI Partnerships Initiative
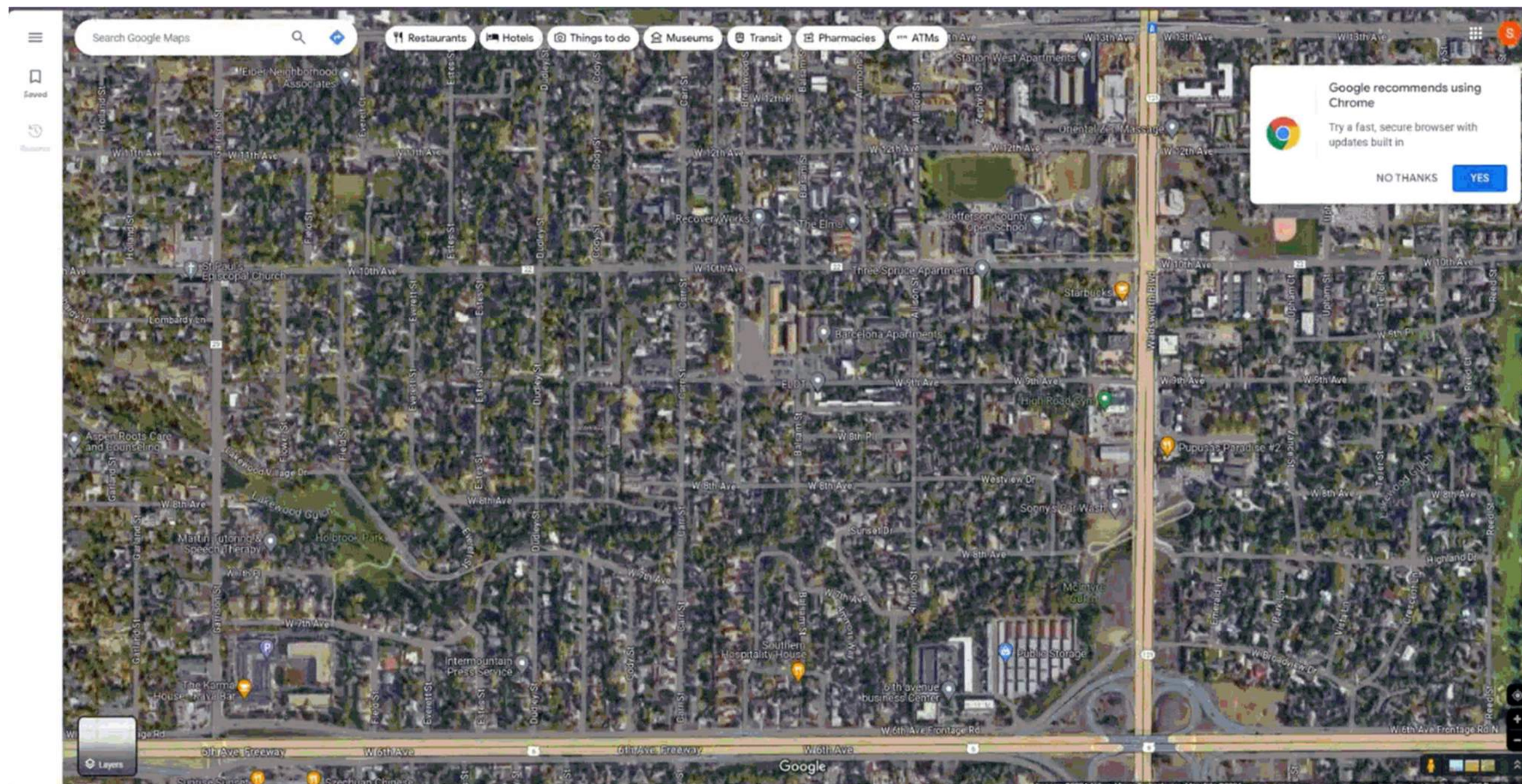
Universities	AEC & SE Industry	Events
• Student projects and research initiatives • Platform for sharing latest research • Industry advisor network for AI projects	• Connect with SE 2050 data + other sustainability databases • Platform for guest speakers on AI • Local SEA collaboration	• Hackathon • Virtual Competitions • Grand Challenges

Datasets
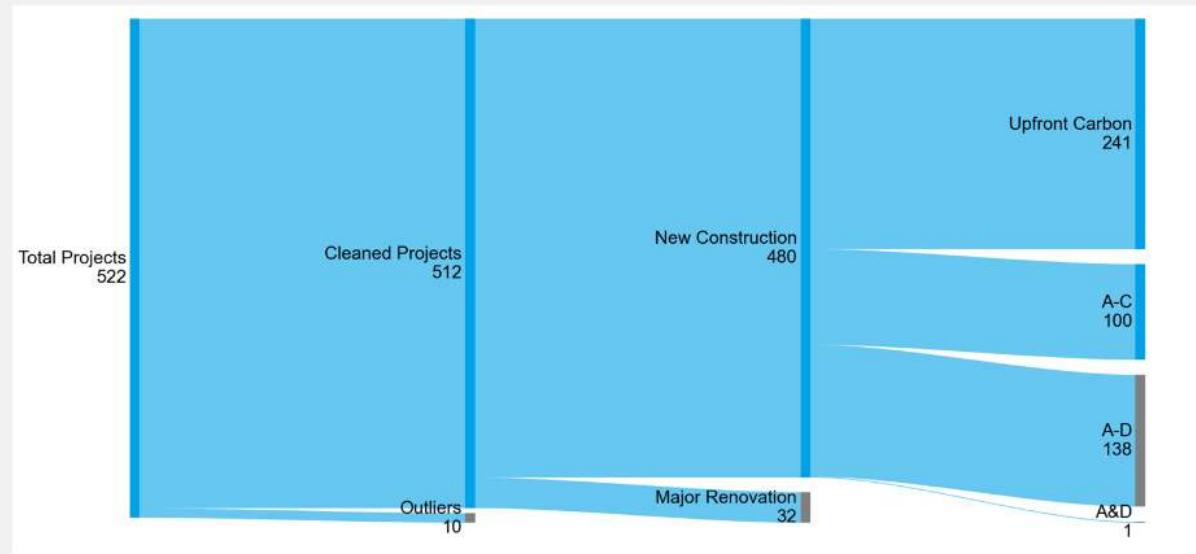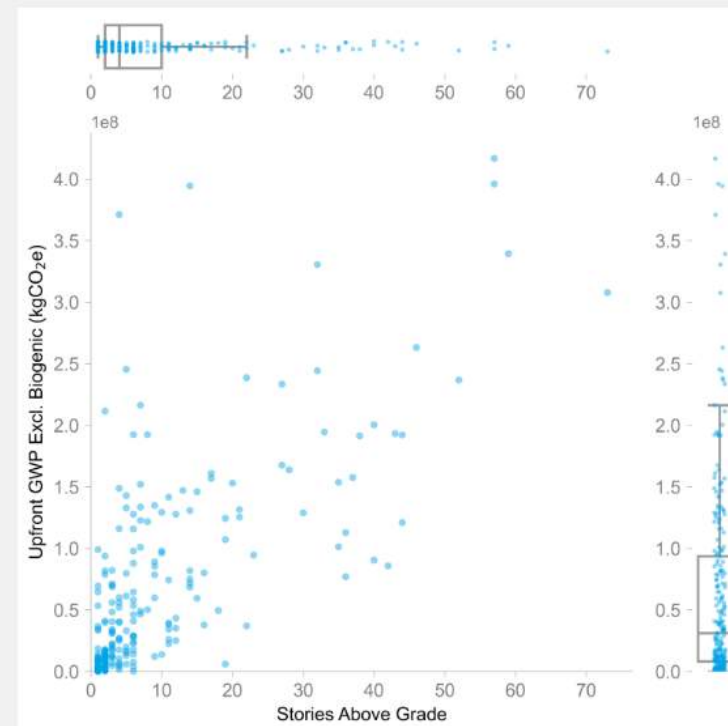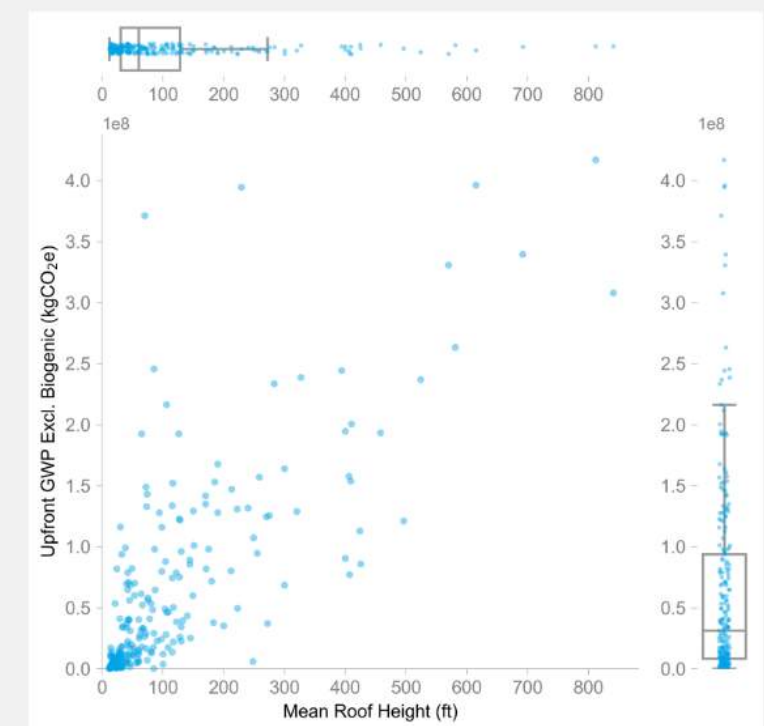
Courtesy Lauren Wingo, ARUP & SE2050 Committee

What can firms do now?

Advisory Board identified Education as the top initiative this year

Awareness   Learning   Strategy   Data

What can firms do now?

Start thinking about Data!

>> Data

"It's not a technical problem – it's a cultural problem."

- Large Firm Executive

- **Agility** – Small firms are more agile, and able to quickly adapt to new technology and integrate them into their workflows

- **Flexibility** – Small firms are more flexible in terms of the types of projects they take on and resources to devote to them, helping them experiment with AI technologies and applications.

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Questions for NCSEA Committees

Academic
Engaging students in a hackathon? Research Partners?

Code Advisory
How can we automate code compliance?

Communications
How do we communicate most effectively?

Education
Best methods to provide AI classes? Gaps in professional development?

Resilience
Is there data available to assist in identifying hazards?

SEER
AI-assisted conditional assessment?

YMG
Engaging young members in hackathon? Trainings?

SE3
Does AI "even the playing field" between small and large firms? Datasets available?

Licensure
ChatGPT passed the FE exam! How do we reskill future engineers?

Sustainability
How do we leverage data-driven design for more sustainable structures?