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Received: May 05, 2025 Tracking No. mab-b6vz-7jjq Comments Due: May 28, 2025 Submission Type: Web
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Docket: NSF-2025-OGC-0001
NITRD_FRDOC_0001

Comment On: NSF-2025-OGC-0001-0001
Request for Information: Development of a 2025 National Artificial Intelligence Research and Development Strategic Plan

Document: NSF-2025-OGC-0001-DRAFT-0047
Comment on FR Doc # 2025-07332

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General Comment

See attached file(s)

Attachments

RFI AI research

Harnessing AI to Advance Evidence-Based, Human-Centered Architecture

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AI offers an unprecedented opportunity to quantify and optimize the impact of architectural geometry on civic pride, human health, and learning. I propose an interdisciplinary research program that merges architectural science, artificial intelligence, and neuroscience to create open-source tools that diagnose and generate built environments proven to enhance psychological and physiological well-being. The project operationalizes Executive Order 14179 (Removing Barriers to American Leadership in AI) and Executive Order 14171 (Promoting Beautiful Federal Civic Architecture) by delivering datasets and models that translate cutting-edge affective neuroscience into actionable design intelligence.

Recent neurological studies identify which geometrical configurations and surface patterns fit positively with human psychological and physiological adaptation. Generative AI such as ChatGPT collects open-source data showing overwhelmingly that traditional designs resonate with human neurological responses, whereas Modernist and Deconstructivist designs cause alarm and anxiety. Built environments measurably affect cognition, productivity, and stress, yet routine design practice lacks objective diagnostics. Commercial AI platforms currently reinforce stylistic novelty rather than evidence-based quality.

No U.S. R&D program unites AI with physiological metrics of architectural experience—leaving a critical knowledge gap the private sector is unlikely to fill. The proposal introduces a new AI benchmark task: predicting human affect from spatial geometry. Extending self-supervised vision–language architectures with neurophysiological data advances core machine learning. The model generates testable hypotheses about embodied aesthetics, perceptual neuroscience, and spatial cognition.

Furthermore, recent research establishes a direct causal link between traditional architectural environments and improved learning in young children, which AI should be directed to investigate, as it affects the future of the Nation. A focused program covering the psycho-physiological effects of the shape of the built environment on users advances America’s AI leadership.

Fusing AI with human environmental sciences opens a new domain of inquiry. The construction supply chain and commercial software markets lack incentives to prioritize non-market health outcomes. Long-term, high-risk integration of AI, neuroscience, and architecture aligns squarely

with NSF’s mandate to fund transformative research with broad societal benefit. Recent experiments using eye tracking and portable bodily sensors reveal the enormous effects of environmental information on homeostasis, and its severe disruption by exposure to some “fashionable” iconic buildings. AI plays a key role in collecting experimental data and synthesizing them into easy-to-use tools for diagnosing urban environments.

The Federal Government needs to spearhead and fund such research because the two closely affiliated industries will not do it. Building and construction industries strongly resist Executive Order 14171 (Promoting Beautiful Federal Civic Architecture), as they did the original Executive Order 13967 (Executive Order on Promoting Beautiful Federal Civic Architecture) issued in 2020. The architecture profession is not interested in changing from its standard building typologies of concrete, glass, and steel buildings, even after those are shown to cause psychological distress to users. This gap represents a market failure that requires federal investment.

The other industry affected is the private information technology sector. Investing in AI that discovers beauty in buildings does not appear very profitable. Current architectural clients employ standard AI programs—text-to-image and large-language models—to produce untested designs for major buildings. Developing AI software that learns to diagnose beautiful and healing buildings and urban spaces is new. The goal is to assemble and verify an open, FAIR compliant corpus linking 2-D/3-D geometry with psycho-physiological responses (eye tracking, HRV, fMRI). The next step develops multimodal, explainable AI models that predict affective and cognitive outcomes from spatial geometry across scales: from urban space, to the building façade, to the entrance, to the composition of windows, to architectural details, etc.

American Architecture should employ AI for both diagnostics and design. This is where national interest requires government leadership. AI has already found tremendous applications in healthcare and medical diagnostics, but nothing of the sort has occurred yet with architecture and urban planning. The software industry focusing on short-term applications cannot expect to attract architectural firms as clients of “empathetic” AI. Commercial AI is not yet developed to implement a critical verification of sources to remove confused and untested notions that the industry continues to use to promote ugly buildings.

This program will be at the forefront of human-AI interaction. Joining AI with architectural and urban design—in the pursuit of beauty and emotional well-being—guarantees that AI development serves vital public interests rather than being driven by unpredictable market forces. Executive order 14179 is focused on promoting human flourishing, in an area that industry is unlikely to address. Prioritizing novel AI mechanisms for diagnosing and creating designs that boost human cognition, creativity, and mental health equips Federal agencies with metrics to procure buildings that reduce stress, boost productivity, and lower lifetime healthcare costs. This supports inclusive, health promoting civic spaces that strengthen community well-being.