Received: May 27, 2025
Tracking No. mb6-zfew-5nf9
Comments Due: May 28, 2025 **Submission Type:** API

PUBLIC SUBMISSION

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-0121
Comment on FR Doc # 2025-07332

Submitter Information

Name: Wenhao Zhang

General Comment

The National AI R&D strategic plan should also include the research of computational neuroscience (CNS) as well as NeuroAI, to get inspirations from the brain to develop the next-generation AI systems.
Why?
The brain is the probably only example we know so far about the existence of general artificial intelligent system, which has been shaped after millions of years' evolution. In the past, the interactions of neuroscience and AI have been brought mutual benefits to both field. For example, the study on visual neural pathway have inspired Fukushima's Neocognitron in the 1980s and evolved into convolutional neural networks (CNNs) – the backbone of modern computer vision systems powering everything from medical imaging to autonomous vehicles.
The Next Frontier: Canonical Cortical Circuits
The whole cerebral cortex is composed of the repetition of the same canonical cortical recurrent circuit architecture that is consists of excitatory neurons and distinct classes of inhibitory interneurons including parvalbumin-positive (PV), somatostatin-positive (SOM), and vasoactive intestinal peptide-positive (VIP) cells. The canonical cortical circuits act as the basic building block of brain's neural network, and their interactions emerge the sensory, motor, learning, memory, cognition, reasoning, etc. That is to say, the canonical cortical circuits offer unprecedented basic building block to develop next-generation AI architectures. Investment on the research of canonical cortical circuits is similar to the investment on research of Neuocognitron or convoulutional neural networks to some extent.
However, the research on canonical cortical circuits is like building a new wheel for AI systems, and less likely to have immediate industrial impacts. Therefore, this research is hardly to be supported by industry and needs the support by governments.
Strategic Investment Imperative
Government investment in NeuroAI research targeting these canonical circuit principles could yield transformative advances in AI capabilities while simultaneously advancing our understanding of brain function. Such systems could achieve unprecedented energy efficiency, robustness, and adaptability – addressing current limitations in AI deployment and opening new applications in edge computing, real-time decision-making, and human-AI collaboration.
The mutual benefits extend beyond technology development. As we engineer AI systems based on cortical circuit principles, we generate testable hypotheses about brain function, accelerating neuroscience research and potentially unlocking new treatments for neurological and psychiatric disorders. This bidirectional advancement exemplifies the best of translational research, where basic science discoveries drive technological innovation while engineering challenges inform scientific inquiry.
Conclusion
The historical success of neuroscience-inspired AI research provides compelling evidence for continued investment in this domain. The emergence of canonical cortical circuits as a new computational block represents a unique opportunity to maintain technological leadership while advancing fundamental scientific understanding. Government funding for NeuroAI research focused on these principles will position our nation at the forefront of the next AI revolution, ensuring we capture both the economic benefits and scientific breakthroughs that such investment invariably produces.