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General Comment

Submission for the 2025 National Artificial Intelligence Research and Development Strategic Plan

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Aligning AI with brain mechanisms: a strategic federal priority

While the next era of AI will benefit from more data or larger models, it will ultimately be defined by our ability to build principled, generalizable intelligence, systems that can learn efficiently, operate in unpredictable environments, and generalize with limited supervision. These are the same capacities already solved by biological intelligence, particularly in the primate brain.

To realize this goal, the U.S. government should prioritize research that aligns AI development with the underlying mechanisms of the brain. AI should not merely mimic human and primate outward behaviors. Rather than reverse-engineering phenomenology (e.g., vision, language), we must focus on reverse-engineering the computational processes that produce it: how brains represent information, learn from experience, and generalize across domains.

The brain matters for AI. The brain is the only known system that achieves real-world general intelligence: it can learn continuously, adapt rapidly, and do so with orders of magnitude less data and power than today's most advanced models. In primates, for example, visual processing supports not only perception but also cognition, memory, and language. These capabilities emerge from intricate neural circuitry, refined by evolution, that is still only partially understood.

Industry cannot be expected to solve this problem. The private sector is optimized for near-term returns and constrained by existing computing paradigms (e.g., whatever works well with GPU/TPU-based architectures). Consequently, it largely avoids the hard problems—such as understanding how the brain learns so efficiently without gradient descent (instead relying on local learning algorithms), or why the brain's representations are so robust. Instead, current efforts focus on scaling, rather than understanding.

Academic neuroscience and AI research, backed by federal investment, must fill this gap.

Recommendations

To meet the national interest in trustworthy, efficient, and truly general AI, the 2025 Strategic Plan should support:

-Mechanistic modeling of brain computation: Invest in research that decodes how real neurons and circuits represent and manipulate information, particularly in domains like vision, decision-making, and learning.

-Cross-disciplinary centers: Create funding mechanisms that bridge neuroscience, cognitive science, and AI, enabling joint training and collaboration across disciplines.

-Hardware aligned with biology: Support basic research into architectures inspired by neural dynamics, energy efficiency, and parallelism in the brain.

-Long-term programs for high-risk, high-reward research: Encourage transformative approaches to understanding intelligence, even where short-term applications are unclear.

-Open access data and models: Federally supported, well-curated datasets from neuroscience (e.g., brain activity during natural tasks) can accelerate AI modeling grounded in biological principles.

AI will increasingly shape our economy, society, and national security. But for AI to reach its full potential (and to do so in a way that is safe, interpretable, and aligned with human values), we must take seriously the challenge of aligning artificial systems with the most successful general intelligence system we know: the brain. Only the federal government has the vision and scope to lead this effort.

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