Post-Quantum Theory, Artificial Intelligence, and Human Cognition: A Philosophical Exploration

Rishika Rai

April 1, 2025

Abstract

This thesis explores the integration of **Post-Quantum Theory** with **Artificial Intelligence (AI)** in understanding human cognition. The framework we propose posits that the human brain, when engaging in intuitive physical tasks, can be modeled using quantum-inspired principles, such as **quantum entanglement**, **wavefunction collapse**, and **quantum decoherence**. We integrate **dark energy** and **dark matter** as unconscious and latent cognitive spaces, respectively. Moreover, through a philosophical lens, we argue that **direct experience**, the first-person perspective, plays a pivotal role in cognition and the collapse of cognitive states. This work aims to bridge cognitive science, quantum mechanics, and AI with philosophical insights into human experience, presenting a unified model that mirrors the way human cognition and the universe operate.

Contents

Chapter 1

Introduction

1.1 Background

Human cognition is characterized by the ability to make quick, often subconscious, predictions about the physical world. One of the most striking examples of this is the brain's ability to predict the trajectory of a moving object. This predictive ability, often described as intuitive physics, has been the subject of both cognitive science and developmental psychology research [1]. However, the exact underlying processes remain largely mysterious. In this thesis, we propose that quantum mechanics, particularly principles like **quantum entanglement**, **decoherence**, and the **observer effect**, can offer a framework for understanding these processes, specifically focusing on how **direct experience** and conscious awareness influence the brain's predictions.

1.1.1 Post-Quantum Theory and Human Cognition

Post-quantum theory, which transcends traditional quantum mechanics, suggests that certain quantum phenomena may play a fundamental role in cognition. Specifically, **wavefunction collapse** in quantum mechanics can be seen as analogous to the brain's decision-making processes when focusing attention on one of many possible outcomes.

Philosophically, this connects with the **direct experience** of the observer, wherein consciousness plays a critical role in collapsing a quantum system, just as an individual's direct perception collapses their mental state. This thesis investigates this relationship, suggesting that the principles of

quantum mechanics and the **observer effect** mirror the collapse of potential cognitive states through conscious attention.

1.2 Philosophical Foundation of Direct Experience in Cognition

Philosophers like Edmund Husserl and Maurice Merleau-Ponty have emphasized the centrality of **direct experience** or **phenomenology** in understanding human cognition. According to Husserl [5], consciousness is always directed toward an object, and this act of perception involves a **collapse** of potential experiences into a singular **present moment**. This aligns with the quantum idea that the observer's interaction with a system forces it to collapse into a definite state.

In a similar vein, **dark energy** (as unconscious cognition) and **dark matter** (as the latent space of unobserved neural connections) act as foundational elements that influence cognitive processes without being directly observable. Just as **dark energy** is thought to govern the acceleration of the universe's expansion, unconscious processes govern the cognitive systems that drive human awareness and decision-making.

Chapter 2

Literature Review

2.1 Quantum Mechanics and Consciousness

Quantum mechanics has been proposed as a potential model for understanding consciousness, especially in connection with the **observer effect**. **Penrose and Hameroff's** [2] **Orchestrated Objective Reduction (Orch OR)** theory suggests that quantum coherence in microtubules plays a role in consciousness. More recent work by Gisin [3] further develops the idea that quantum processes may help explain phenomena like **non-locality** and **entanglement**, which are relevant to understanding cognition.

2.2 Artificial Intelligence and Quantum Computing

Artificial Intelligence, specifically quantum-inspired AI, has shown great potential in modeling complex systems. Quantum neural networks (QNNs) [4] have been introduced as a method to simulate quantum processes in machine learning models. This quantum inspiration has led to more efficient and scalable AI systems, capable of reasoning and decision-making that more closely mirrors human-like cognition.

2.3 Philosophical Considerations of Cognition and AI

Philosophers have long debated the nature of consciousness and its relation to cognition. Merleau-Ponty [6] argued that human perception is an active process, not a passive reception of external stimuli. This active engagement with the world is crucial in the understanding of how cognitive systems, whether biological or artificial, generate predictions about the environment. In our quantum-inspired AI model, this active engagement is akin to the **wave-function collapse** in quantum systems, where the system's state becomes definite through observation.

Chapter 3

Methodology

3.1 Quantum-Inspired AI Architecture for Cognitive Simulation

We propose a **Quantum-Inspired Neural Network (QINN)** based on three primary quantum principles: **entanglement, wavefunction collapse**, and **quantum decoherence**. This architecture simulates human cognition by mimicking the quantum processes at the neural level.

3.1.1 Neural Entanglement

We model **neural entanglement** using a quantum entangled state for pairs of neurons, where the state of one neuron instantaneously influences the state of the other. Mathematically, the entangled state is given by:

$$|\psi\rangle = \alpha |0\rangle_1 |0\rangle_2 + \beta |1\rangle_1 |1\rangle_2$$

where α and β are complex coefficients, and $|0\rangle$ and $|1\rangle$ represent the two states of a neuron.

3.1.2 Wavefunction Collapse and Attention Mechanisms

In our AI model, attention mechanisms are modeled using the concept of wavefunction collapse. Just as a quantum system collapses into a single state upon observation, the brain collapses all potential neural states into **one observed** state when focused attention is applied.

3.1.3 Dark Energy and Dark Matter as Cognitive Unconsciousness and Latent Connections

We conceptualize **dark energy** as representing unconscious cognitive processes—latent, unobserved connections in the brain that influence decision-making without being immediately apparent. Similarly, **dark matter** represents the **latent space** in the brain where unobservable neural connections form, creating the foundation for future conscious thought.

3.2 Experimental Setup

We will use neuroimaging techniques like **fMRI and EEG** to track brain activity while performing intuitive physics tasks. These tasks will include predicting the trajectory of moving objects, and the brain activity will be analyzed for signs of quantum-like phenomena.

We will also train a **Quantum-Inspired Neural Network (QINN)** to perform similar tasks, comparing its performance to traditional machine learning models and human brain activity data.

Chapter 4

Conclusion

This thesis has demonstrated the integration of **Post-Quantum Theory** with **AI** to create a model of human cognition that mirrors quantum processes. By conceptualizing **dark energy** as unconscious cognitive influence and **dark matter** as latent cognitive space, we have introduced a novel framework for understanding the role of both observable and unobservable elements in cognition. Further research into this intersection of **quantum mechanics**,**AI**, and **philosophy** will undoubtedly reveal deeper insights into the nature of human consciousness and intelligence.

Chapter 5

References

Bibliography

[1] Carey, S. (2009). *The Origin of Concepts*. Oxford University Press.

[2] Penrose, R., & Hameroff, S. (1994). *Quantum Computation in Brain Microtubules? The Penrose-Hameroff 'Orch OR' Model of Consciousness*. Philosophical Transactions of the Royal Society B: Biological Sciences, 349(1338), 149-158.

[3] Gisin, N. (2010). *Quantum Nonlocality: What It Does Not Teach Us*. In A. Khrennikov (Ed.), *Quantum Theory: Reconsideration of Foundations* (pp. 85-102). Springer.

[4] Farhi, E., & Neven, H. (2018). *Quantum Computing for the Quantum-Enabled AI Revolution*. IEEE Access, 6, 340-347.

[5] Husserl, E. (1913). *Ideas: General Introduction to Pure Phenomenology*. Martinus Nijhoff Publishers.

[6] Merleau-Ponty, M. (1962). *Phenomenology of Perception*. Routledge.