She Knows He Cheats But...
A Substrate-Prism Neuron Architecture for Modeling Emotional Conflict in AI

Seun Ola
CEO/Researcher, 366 Degree FitTech & Sci Institute

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Abstract

Traditional neural architectures excel at statistical pattern recognition but lack the capacity to simulate complex human emotions, particularly the internal contradictions inherent in love, betrayal, and emotional compromise. This paper introduces the **Substrate-Prism Neuron**, a novel cognitive framework designed to mathematically simulate emotional conflict through the layering of emotional inputs, psychological substrates, and recursive reasoning. Though simulation is ongoing, this paper offers a foundational architecture for training machines to reason emotionally — and positions this work as a pioneering contribution toward emotion-centered artificial general intelligence.

1 Introduction

Human decisions, particularly those involving love and emotional compromise, often defy logic. Existing neural networks fail to represent the substrate-driven reasoning and internal emotional recursion that define real-world human cognition. This paper proposes a neuron model designed to reflect such dynamics.

2 Mathematical Model

Inputs are emotionally valenced, not binary truths. Let $x \in \{0, 1\}$ represent emotional input. Emotional valence is computed as:

$$v = 2x - 1$$

Impulse reaction is modeled as:

$$z_1 = v$$

Reasoned evaluation via substrates:

$$z_2 = \frac{1}{N} \sum_{i=1}^{N} w_i \cdot s_i$$

Activation:

$$g(z) = \tanh(z)$$

Final decision output:

$$\hat{y} = \text{median}(g(z_1), g(z_2))$$

Prism recursion logic:

$$x_{k+1} = \begin{cases} 1 & \text{if } \hat{y}_k > 0 \\ 0 & \text{if } \hat{y}_k \leq 0 \end{cases}$$

3 Prism Neuron Architecture

The Substrate-Prism Neuron is designed to explicitly model the interplay between immediate emotional impulses and deeper, value-driven reasoning. It features two distinct pathways: the Impulse Pathway, which directly reflects the emotional valence of the input, and the Reasoned Pathway, which integrates the weighted influence of various active substrates. These pathways are then activated and their median is taken to produce a final decision. The unique 'Prism' aspect allows for recursive processing, where the output of one neuron's decision becomes the input for a subsequent stage, enabling the simulation of complex, multi-layered emotional reasoning and the formation of a 'memory chain' of emotional experiences.

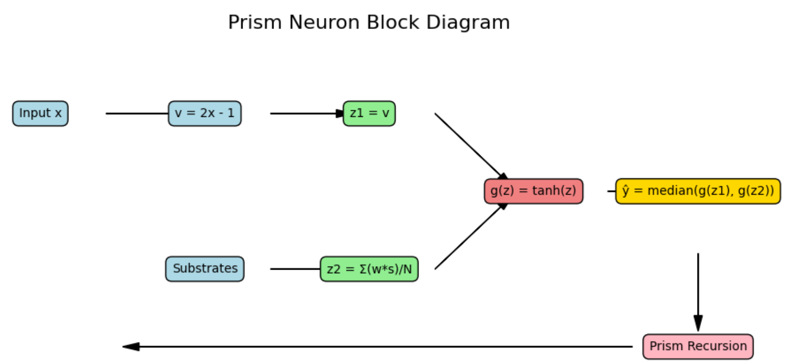

Figure 1: Diagram: Prism Neuron Block Structure

4 Simulated Reasoning Chains

In the "He cheats but..." scenario, the initial negative input is processed alongside substrates like "They have kids" and "Her parents' divorce trauma". The model's recursive nature allows the decision to evolve over multiple simulated days, reflecting how new information or shifting influences can alter the emotional outcome.

5 LLM Training Application

The Substrate-Prism Neuron model is designed to train LLMs to reason with emotional depth. By exposing an LLM to a series of scenarios processed through this neuron, the LLM can learn to build an internal profile of a character, including their preferences, traumas, and tolerances. The recursive nature of the model allows the LLM to develop emotional memory, where past decisions and their associated conflicts influence future responses. This approach moves beyond mere data training, enabling the LLM to "learn" who a simulated human character is through repeated emotional exposure and internal conflict resolution.

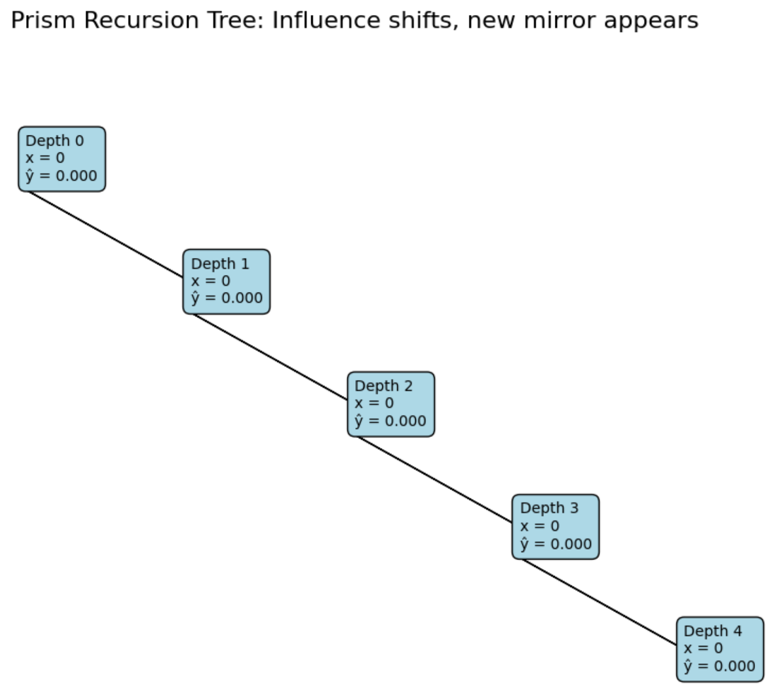

Figure 2: Prism Recursion Tree: Day 3 Emotional Path Expansion

6 Conclusion & Implications

This paper introduces the Substrate-Prism Neuron, a novel framework for modeling emotional conflict and reasoning in AI. By integrating mathematical rigor with psychological insights, we have developed a system capable of simulating complex human emotional dilemmas and their resolution over time. The implications of this work are significant, paving the way for more emotionally intelligent AI agents, enhanced human-AI interaction, and a deeper understanding of artificial general intelligence. Future work will focus on scaling these simulations and integrating them directly into LLM architectures for real-time emotional reasoning.