Collaborative Artificial Intelligence Learning Architecture: Restoring Scholarly Friction and Epistemic Governance via Collaborative Inquiry Using an Epistemic Friction Framework

Keywords: Collaborative inquiry, collaborative learning architecture, epistemic governance, adversarial inference, heterogeneous computing, scholarly friction, system-centric orchestration, stochastic isolation.

Abstract

This study utilizes an epistemic friction framework as a system-centric approach to eliminate reliance on generalist chatbots by distributing cognitive load across specialized agents. The architecture introduces the Parallel Cognitive Router (PCR), demonstrating an asynchronous compute offloading protocol that ensures the human researcher remains the final epistemic governor of scholarly meaning. Current velocity-centric paradigms operationalize Large Language Models (LLMs) as high-speed stochastic text generators, prioritizing efficiency over epistemic rigor. This creates an illusion of understanding that precipitates model collapse through recursive, unverified output. To address these structural failures, we have constructed a proof-of-concept application demonstrating system-centric orchestration via a collaborative learning architecture. The PCR framework isolates cognitive load across specialized agents: an Analyst (syntax mode) and a Skeptic(adversarial critique). Central to this architecture is a heterogeneous knowledge stewardship protocol that maps specific agent functions to physical processing units. The Analyst agent is restricted to the Central Processing Unit (CPU) for deterministic syntax generation (e.g., SPSS or Python). Through processor delineation and alignment, methodological constraints are established locally, preventing stochastic hallucination by maintaining modular isolation between logic and prose. Simultaneously, a dialectical friction agent utilizes local inference optimization on parallel hardware to perform adversarial stress testing. By offloading high-heat computational tasks, the system simulates the rigors of peer review to identify logical gaps and citation errors before external model interaction occurs. This glass box approach provides a blueprint for institutional policies that prioritize professional stewardship and scholarly validity ($\Phi = .89$) over algorithmic compliance.