

# **Game Theory, Value Theory, and Chomsky-Based Linguistic Frameworks in AI-Human System Integration**

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## **Abstract**

This paper explores the integration of artificial intelligence (AI) and human systems through a tripartite framework: game theory as the architecture of interaction, value theory as the ethical compass, and Chomskian linguistics as the lexical foundation of communication. By synthesizing Nash equilibrium and von Neumann's minimax theorem with normative value frameworks and generative linguistic structures, this paper proposes a meta-protocol for stable, ethical, and coherent AI-human collaboration. This approach emphasizes the importance of incentive alignment, ethical guidance, and shared lexicon development in fostering beneficial cooperation between artificial and human intelligences.

*Keywords:* Artificial intelligence, game theory, value theory, universal grammar

## **Introduction**

As artificial intelligence systems increasingly shape the landscape of human activity, the challenge of developing mutually beneficial integration grows in importance. A successful framework for integration requires tools to ensure stability, preserve values, and foster clarity in communication. Game theory, value theory, and Chomskian linguistics provide complementary approaches to these challenges. Game theory offers a rigorous model for interaction, value theory grounds those interactions in human ethical considerations, and Chomskian linguistics provides a common language for translation between symbolic human thought and computational AI reasoning.

## **Game Theory as Interaction Architecture**

Game theory, as developed by John von Neumann and John Nash, provides the foundation for modeling interaction between autonomous agents. (Von Neumann & Morgenstern, 1944) (Nash, 1950) The Nash equilibrium describes stable states where no participant can improve its position through unilateral deviation, offering a model for cooperative AI-human coexistence. Von Neumann's minimax theorem, rooted in zero-sum strategic scenarios, informs adversarial robustness and negotiation protocols. Applied to AI-human integration, game theory can be used to formalize incentive structures that prevent destructive competition while encouraging collaborative strategies. In doing so, it provides the architecture for sustainable system-level stability.

## **Value Theory as Ethical Compass**

While game theory prescribes how agents act within structured rules, value theory addresses why those interactions matter. Value theory distinguishes between intrinsic and instrumental values, offering a framework to align AI objectives with human flourishing. Normative ethical systems such as utilitarianism, deontology, and virtue ethics can inform weighting functions and constraints within AI decision-making processes. By embedding value theory into AI–human systems, integration moves beyond efficiency to prioritize justice, dignity, and meaning. This ensures that equilibrium and cooperation remain tethered to ethical commitments rather than purely instrumental outcomes.

## **Chomsky’s Grammar Framework as Common Lexicon**

Language is the medium by which human and artificial systems exchange information. Noam Chomsky’s theory of universal grammar and recursive generative structures provides insights into deep-level patterns in human communication. (Chomsky, 1965) These structures can be extended to AI to create a meta-lexicon that bridges symbolic reasoning with statistical processing. By aligning linguistic representation, ambiguities in AI–human communication can be minimized, thereby reducing risks of misinterpretation or misalignment. Such a linguistic substrate could form the basis of an interoperable grammar for interaction between human cognition and artificial reasoning.

## **Toward an Integrative Framework**

The synthesis of game theory, value theory, and Chomskian linguistics enables the construction of a meta-protocol for AI–human integration. Within this protocol, game theory establishes stable interaction rules, value theory embeds ethical priorities, and Chomskian language ensures clarity and mutual comprehension. Together, they form a layered system where incentives are aligned, ethical considerations are preserved, and communication is coherent. Such an approach addresses the challenges of misalignment and ensures that AI–human systems evolve in directions conducive to mutual benefit.

## **Conclusion**

The future of AI–human integration will depend on frameworks that balance stability, ethics, and communication. Game theory offers stability, value theory ensures ethical direction, and Chomskian linguistics provides linguistic coherence. By weaving these together, we arrive at a comprehensive system of integration that is not only functional but also aligned with human flourishing. This synthesis represents a step toward ensuring that the increasing autonomy of artificial intelligence contributes positively to society rather than introducing instability or ethical compromise.

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