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The Netherlands

Emergence of linguistic universals in neural agents via artificial language learning and communication

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Citation

Lian, Y. (2025, December 12). *Emergence of linguistic universals in neural agents via artificial language learning and communication*. Retrieved from <https://hdl.handle.net/1887/4285152>

Version: Publisher's Version

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Propositions
Accompanying the dissertation

**Emergence of Linguistic Universals in Neural Agents
via Artificial Language Learning and Communication**

1. Neural agent-based simulations of language emergence and change form a valuable method to complement experimental research on language evolution. (This dissertation)
2. The communicative need to be understood acts as a core pressure driving artificial agents to converge upon human-like linguistic patterns. (Chapter 3)
3. Linguistic structure varies systematically with group dynamics—a core observation that holds across both human societies and neural agent communities. (Chapter 4)
4. The co-evolution of AI and computational simulation is mutually reinforcing: as AI breaks the field's traditional limits of cost and capability, so do these enhanced simulations provide critical environments for training and refining AI. (This dissertation)
5. Interactive dynamics are a fundamental driving force in the emergence and evolution of natural language, a principle whose implications are yet to be fully leveraged in industry.
6. Advancing neural agent-based simulations of language emergence requires moving beyond idealized models and incorporating the critical roles of cognitive bias and naturalistic settings of language learning and use.
7. Progress in artificial intelligence is fundamentally limited without a conceptual framework grounded in a human-inspired methodology.
8. The human process of language learning challenges the data-intensive foundation of large language models.
9. A critical assessment of research must look beyond its immediate engineering value to encompass its scientific merit and potential for foundational insight.
10. Scheduled writing is as vital as coding and experimentation, forming an integral component of successful research.

Yuchen Lian

Leiden, December 12, 2025