AI Agent Networks and Market-Based Collaboration

Autonomous AI agents are increasingly capable of performing complex tasks, reasoning over subtasks, and collaborating with other agents. However, most existing multi-agent systems rely on predefined workflows or manually designed orchestration logic. This thesis explores the design, simulation, and evaluation of dynamic AI agent networks in which agents can autonomously form workflows, negotiate collaboration, and optionally pay for services provided by other agents. Some related work: [1, 2, 3, 4]

The student will investigate how a decentralized ecosystem of heterogeneous agents can:

- dynamically discover and communicate with one another,
- decompose complex tasks into subtasks,
- negotiate capabilities and pricing,
- exchange services through a marketplace layer, and
- produce emergent workflows without central coordination.

The research includes building a small-scale simulation environment, designing interaction and pricing mechanisms, and analyzing emergent behaviors such as collaboration patterns, market equilibria, and system robustness. This work aims to advance understanding of future AI agent ecosystems, where agents from different organizations autonomously cooperate and compete.

For application please send me an email with title "Master Thesis Application: Agent Network ". Please also attach your resume and transcript of records in the email. An motivation letter is NOT required.

References

[1] Zijun Liu, Yanzhe Zhang, Peng Li, Yang Liu, and Diyi Yang. A dynamic llm-powered agent network for task-oriented agent collaboration. In *First Conference on Language Modeling*, 2024.

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[3] Alexander Sukharevsky, Alexis Krivkovich, Arne Gast, Arsen Storozhev, Dana Maor, Deepak Mahadevan, Lari Hämäläinen, and Sandra Durth. The agentic organization: Contours of the next paradigm for the ai era, September 26 2025. Accessed: 2025-11-24.

[4] Tianbao Xie, Fan Zhou, Zhoujun Cheng, Peng Shi, Luoxuan Weng, Yitao Liu, Toh Jing Hua, Junning Zhao, Qian Liu, Che Liu, et al. Openagents: An open platform for language agents in the wild. *arXiv preprint arXiv:2310.10634*, 2023.