

Sepehr (Alireza) Ilami

ilami.a@northeastern.edu |  sepehrilami.com |  LinkedIn |  GitHub |  Google Scholar | Boston, MA

SUMMARY

Background: Ph.D. researcher in Industrial Engineering at Northeastern University exploring how intelligent entities—humans and AI agents—coordinate, cooperate, and influence each other’s decision-making in networked environments; grounding this in AI governance, network science, game theory, and computational social science.

Experience: Designing multi-agent simulation frameworks integrating LLMs with reinforcement learning; studying collective human behavior and mobility dynamics in epidemic contexts; building deep-learning pipelines for medical imaging and trajectory prediction; applying computational and empirical methods to policy-relevant sociotechnical questions.

Research vision: Developing principled governance mechanisms—including adaptive information modulation frameworks—for autonomous AI agents operating in complex, networked social systems.

RESEARCH INTERESTS

Multi-agent AI: LLM agents, AI governance, decentralized coordination, AI strategic behavior, Agentic AI.

Network science: Mobility networks, social influence, risk perception, contagion, sociotechnical systems, information networks.

Application domains: AI policy & governance, platform design, public health, human behavior modeling, autonomous systems, online harms, policy analysis.

TECHNICAL SKILLS

Programming: Python, R, SQL, C++, Java, NetLogo, L^AT_EX, Git.

ML/AI: PyTorch, LangChain, LLM-agent simulation, prompt-based experimentation, fine-tuning, reinforcement learning, NLP, computer vision.

Data/Networks: Pandas, NumPy, NetworkX, panel data, mobility-network construction, graph metrics, spatio-temporal data, large-scale text/social data.

Methods: Agent-based modeling, game-theoretic modeling, causal reasoning, statistical modeling, fixed-effects regression, forecasting, simulation.

Languages: Farsi/Persian (native), English (advanced; IELTS 8/9), Spanish (elementary).

EDUCATION

Northeastern University <i>Ph.D., Industrial Engineering; GPA: 3.77/4.00; Advisor: Prof. Babak Heydari</i>	<i>2023–2027 expected</i> Boston, MA
Northeastern University <i>M.Sc., Industrial Engineering; GPA: 3.70/4.00</i>	<i>2023–2025</i> Boston, MA
Sharif (Aryamehr) University of Technology <i>B.Sc., Computer Engineering; GPA: 3.77/4.00</i>	<i>2018–2023</i> Tehran, Iran

RESEARCH AND PROFESSIONAL EXPERIENCE

Northeastern University <i>Doctoral Researcher, MAGICS Lab and Network Science Institute; Advisor: Prof. Babak Heydari</i>	<i>Sep 2023–Present</i> Boston, MA
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- Designed multi-agent simulation frameworks coupling LLM agents, reinforcement learning, and game-theoretic environments to study coordination, cooperation, strategic behavior, and governance in networked sociotechnical systems.
- Developed adaptive information modulation as a governance mechanism for multi-agent AI systems, separating the agent-interaction network from the information-flow network and training policies that shift agent populations toward cooperative system-level behavior.
- Built LLM-agent and agent-based modeling pipelines for strategic reasoning and Theory-of-Mind transfer; studied whether strategic decision patterns from larger LLMs can be distilled into smaller, more efficient models through targeted fine-tuning.
- Constructed weekly directed mobility networks among 300+ Massachusetts towns from smartphone-derived origin–destination traces; evaluated when network topology improves one-week-ahead COVID-19 forecasting beyond macro incidence and local autoregressive histories.
- Estimated networked risk-perception models using mobility and COVID-era behavioral data from 313 Massachusetts municipalities; separated local case response, network behavioral spillovers, and within-town behavioral inertia with panel-regression designs.
- Studied theoretical and simulation works on network opacity, bounded rationality, and strategic escalation; explored how limited visibility of network structure can alter equilibrium behavior in competitive and coordination settings.
- Developed LLM-based agent-based models for EV-adoption policy analysis, modeling heterogeneous household decisions, policy interventions, behavioral feedback loops, and system-level adoption trajectories.

UC Berkeley School of Information

Research Intern; Supervisor: *Prof. Niloufar Salehi*

Jun 2022–Sep 2022

Berkeley, CA

- Analyzed large-scale Twitter datasets (>10M tweets) using statistics, NLP, and qualitative analysis to characterize online harassment patterns and user trajectories before and after incidents.
- Investigated platform intervention strategies to reduce harmful behavior and improve user experience; synthesized empirical findings into design implications for online communities and moderation systems.

École Polytechnique Fédérale de Lausanne (EPFL)

Research Intern; Supervisor: *Prof. Alexandre Alahi*

Jun 2021–Apr 2022

Lausanne, Switzerland

- Built a unified data-harmonization framework across five autonomous-vehicle trajectory datasets with heterogeneous domains and sensor setups to improve cross-domain generalization for downstream prediction models.
- Explored pedestrian and vehicle trajectory prediction using neural networks, causal inference, theory-driven modeling, and computer-vision techniques in self-driving contexts.

AI-MED

R&D Data Scientist

Aug 2020–Jul 2021

Tehran, Iran

- Developed deep-learning pipelines for CT and X-ray analysis targeting COVID-19 infection detection and lung-cancer screening; reached approximately 93% sensitivity on internal test sets through architecture search and data augmentation.
- Improved model F1-score by approximately 8 percentage points over baseline by designing preprocessing workflows that corrected scanner-specific artifacts and normalized Hounsfield-unit distributions across multi-site data.
- Implemented model-evaluation workflows including cross-validation, calibration, and threshold optimization; contributed to a peer-reviewed Springer Nature book chapter on AI-based COVID-19 diagnosis.

Sharif (Aryamehr) University of Technology

Teaching Assistant, Department of Computer Engineering

2020–2022

Tehran, Iran

- Courses: Scientific and Technical Presentation (Spring 2022, Fall 2021, Spring 2021); Discrete Structures (Spring 2022, Spring 2021); Artificial Intelligence (Spring 2022); Computer Structure and Language (Spring 2021); Linear Algebra (Fall 2020); Advanced Programming (Spring 2020).

PUBLICATIONS

- S. Ilami**, M. Comola, S. Prina, and B. Heydari. “Networked risk perception and behavioral bubbles: the case of a pandemic.” *arXiv preprint*, [arXiv:2606.22599](https://arxiv.org/abs/2606.22599), 2026.
- R. Ebrahimi, **S. Ilami**, B. Heydari, I. Trevino, and M. Franceschetti. “The Architecture of Illusion: Network Opacity and Strategic Escalation.” *arXiv preprint*, [arXiv:2602.10053](https://arxiv.org/abs/2602.10053), 2026. [Under review]
- Q. Chen, **S. Ilami**, N. Lore, and B. Heydari. “Adaptive Information Modulation: Designing Governance Mechanisms for Multi-Agent Artificial Intelligence Systems.” *ASME Journal of Mechanical Design*, 148(4):041708, 2026. [doi:10.1115/1.4070755](https://doi.org/10.1115/1.4070755).
- S. Ilami**, Q. Cao, and B. Heydari. “Network Topology Matters, But Not Always: Mobility Networks in Epidemic Forecasting.” *arXiv preprint*, [arXiv:2510.20025](https://arxiv.org/abs/2510.20025), 2025. [Under review]
- N. Lore, **S. Ilami**, and B. Heydari. “Large Model Strategic Thinking, Small Model Efficiency: Transferring Theory of Mind in Large Language Models.” Accepted at *ASME Open Journal of Engineering*, 2026. [arXiv:2408.05241](https://arxiv.org/abs/2408.05241).
- R. G. Modegh, A. Salimi, **S. Ilami**, et al. “COVID-19 Diagnosis with Artificial Intelligence.” In S. Adibi et al. (eds.), *The Science Behind the COVID Pandemic and Healthcare Technology Solutions*, Springer Nature, 2022. [doi:10.1007/978-3-031-10031-4_17](https://doi.org/10.1007/978-3-031-10031-4_17).

WORKING PAPERS AND RESEARCH IN PROGRESS

Emergent Coordination in Multi-LLM Social Dilemmas

In progress

Extending communication-free LLM-agent coordination experiments from a single guessing game to a modular family of iterative social-dilemma games; studying information architecture as a causal lever for decentralized coordination.

Communication, Belief Dynamics, and Trust Formation in Decentralized Agentic Markets

In progress

Studying how AI agents communicate, form beliefs, build trust, and respond to governance interventions in decentralized market-like environments.

LLM-Based Agent-Based Modeling for EV-Adoption Policy Analysis

In progress

Developing a policy-analysis framework that uses LLM agents to simulate heterogeneous household decisions under subsidies, charging infrastructure, city-fleet policies, and hybrid interventions.

SELECTED RESEARCH PROJECTS

Mobility Networks and Epidemic Forecasting

2024–2026

Built town-level mobility networks from SafeGraph origin–destination aggregates and evaluated when behavioral/network features substitute for or complement outcome histories in short-horizon epidemic forecasting.

- Developed feature sets including centrality, local flow, intra-town mobility, exposure measures, and prevalence-gated interactions.
- Compared macro-only, network-augmented, and autoregressive surveillance regimes; showed that network information is most valuable when granular local histories are unavailable or delayed.

Networked Risk Perception and Behavioral Bubbles

2024–2026

Estimated peer-behavior spillovers in mobility response during COVID-19 using pre-shock mobility networks and town-level panel regressions.

- Separated behavioral spillover channels from network exposure to local cases and within-town inertia; studied the role of mobility-defined and demographic communities.

Adaptive Information Modulation for Multi-Agent AI Governance

2023–2026

Designed simulation-based information policies that dynamically decide which information agents observe in repeated strategic environments.

- Framed information architecture as an intervention layer for governing multi-agent AI systems without directly changing agent objectives or model weights.

TALKS AND POSTERS

- Talk: “When Does Dynamic Behavioral Information Improve Sociotechnical Modeling?” International Conference on Computational Social Science (IC2S2), University of Vermont, Jul 2026.
- Talk: “Mobility Networks Make Up for Missing Local Data in Epidemic Forecasting.” International Conference on Network Science (NetSci), Northeastern University, Jun 2026.
- Poster: “Adaptive Information Modulation: Designing Governance Mechanisms for Multi-Agent AI Systems.” Northeastern College of Engineering Research Expo, Feb 2026.
- Poster: “Integrated Design and Governance of Agentic AI Systems through Adaptive Information Modulation.” Northeastern MIE Research Expo, Dec 2025.
- Talk: “Instigating Cooperation among LLM Agents Using Adaptive Information Modulation.” International Engineering Systems Conference (CESUN), George Mason University, Jun 2025.
- Poster: “Integrating Language Models with Agent-Based Modeling for Policy Analysis.” Northeastern MIE Research Expo, Dec 2024.
- Poster: “Integrating Language Models with Agent-Based Modeling for Policy Analysis.” International Conference on Computational Social Science (IC2S2), University of Pennsylvania, May 2024.

HONORS AND AWARDS

- Ranked 1st, Northeastern Soccer Data Analytics Hackathon, 2026.
- John and Katharine Cipolla Graduate Merit Award, Northeastern University, 2025.
- PhD Network Travel Grant, Northeastern University, 2024 and 2025.
- IC2S2 Travel Grant, University of Pennsylvania, 2024.
- Ranked 101st out of 150,000 (top 0.1%), National University Entrance Exam, Iran, 2018.
- One Silver and two Bronze Medals, Iran Teenagers Math Olympiad, 2012–2015.

SERVICE

- Reviewer, International Conference on Computational Social Science (IC2S2), 2025 and 2026.
- Executive/Scientific Student Staff: ICPC, CSSS, WSS, and DataDays, 2019–2021.

SELECTED COURSEWORK

Sociotechnical Systems
Network Science Data
Game Theory

Computational Urban Science
Research Design for Social Networks
Engineering Probability and Statistics

Advanced Statistical Methods
Artificial Intelligence
System Dynamics

REFERENCES

Available upon request.