SHIN, Sanghun

Ph.D. Candidate

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BIOGRAPHY

Sanghun Shin is a Ph.D. candidate in the Technology Management, Economics and Policy Program at Seoul National University, specializing in computational modeling of complex socio-technical systems. His dissertation, "The Cascade Paradox," investigates emergent phenomena in human-AI hybrid networks, including affective pathway dominance in trust dynamics and protective network segregation. His interdisciplinary background spans nanomaterial chemistry, biomedical engineering, and computational social science. Prior to his doctoral studies, he conducted research at the NSF-funded nanomaterial synthesis lab at UW-Madison and the Institute for Basic Science (IBS), publishing in high-impact journals including ACS Nano and Journal of Physical Chemistry Letters. He brings industry experience from strategic planning at Dongwha Pharm and medical AI research at Asan Medical Center.

EDUCATION

2020 – Present	Ph.D. Candidate	**SEOUL NATIONAL UNIVERSITY** (Seoul, Korea) Technology Management, Economics and Policy Program College of Engineering Expected Graduation: August 2026 Dissertation: The Cascade Paradox: Complexity and Criticality in Scaled Systems Advisor: Prof. Junseok Hwang
2020 – 2022	M.S.	**SEOUL NATIONAL UNIVERSITY** (Seoul, Korea) Graduate School of Business

2005 – 2012	B.S.	**UNIVERSITY OF WISCONSIN-MADISON** (Madison, WI, USA) Department of Chemistry (Leave of absence: 2007–2009 for military service)
2002 – 2005	High School	**KOREAN MINJOK LEADERSHIP ACADEMY** (Gangwon, Korea)

RESEARCH EXPERIENCE

2013 – 2014	**Asan Medical Center** (Seoul, Korea) Research Scientist, Medical AI & Big Data • Developed AI-guided brain diagnostic systems using medical imaging (MRI, fMRI, PET, CT) • Participated in surgical navigation algorithm development for da Vinci robotic surgery system
2011 – 2012	**NSF-funded Research Group, University of Wisconsin-Madison** (Madison, WI, USA) Research Scientist, Materials Chemistry Lab • Developed epitaxial heterostructures of quantum dots for photovoltaic applications • Solved 3-year persistent research challenge, leading to publication in J. Phys. Chem. Lett.

PROFESSIONAL EXPERIENCE

2016 – 2019	**Dongwha Pharm** (Seoul, Korea) Strategic Planning & Financial Analysis • M&A due diligence, R&D portfolio review, and open innovation assessment • Financial modeling and time-series forecasting for investment decisions • Executive decision support and corporate strategy development
2007 – 2009	**Republic of Korea Army (ROKA)** Aide-de-camp to a 4-Star General, ROK-US Combined Forces Command (CFC) • Coordinated high-level military communications and diplomatic protocols • Assisted in strategic operations and administrative management

PUBLICATIONS

Peer-Reviewed Journal Articles

1. (Under review) Shin, S., Hwang, J., & Lee, S. M. (2025). Evaluating gait analysis techniques for wearable robotics in smart urban environments: A comprehensive review. *Gait & Posture. (First author)*

2. (Under review) Shin, S., Hwang, J., & Lee, S. M. (2025). Modeling user behavioural intention and usage behaviour for wearable robots: A UTAUT2-integrated SEM and ANN approach. *Universal Access in the Information Society. (First author)*

3. Ling, D., Shin, S., et al. (2015). Bioresorbable electronic stent integrated with therapeutic nanoparticles for endovascular diseases. *ACS Nano, 9*(6), 5937-5946. (IF: 13.9)

4. Selinsky, R. S., Shin, S., Lukowski, M. A., & Jin, S. (2012). Epitaxial heterostructures of lead selenide quantum dots on hematite nanowires. *Journal of Physical Chemistry Letters, 3*, 1649-1656. (IF: 9.4)

5. Shin, S., Yoon, J. Y., & Lee, G. W. (2004). New method for determining the coiling ratio of planktonic foraminifera using digital image analysis. *Samsung Humantech Paper Award - Grand Prize. (First author)*

Manuscripts in Preparation

6. (In progress) Shin, S., & Lee, S. M. (2025). From material to machine: Morphological computation and the "Clothing Gap" in topologically jammed SMA active textiles. *Target: Journal of Industrial Textiles. (First author)*

7. (In progress) Shin, S. (2026). The cascade paradox: Affective pathway dominance and protective network segregation in human-AI hybrid networks. *(Dissertation). (Single author)*

8. (In progress) Shin, S. (2025). Agent-based simulation of pedestrian-exoskeleton interactions at urban crosswalks. *Target: Gait & Posture. (First author)*

HONORS & AWARDS

2020 – 2024	Seoul National University Graduate Fellowship
2022	Academic Excellence Award, SNU Graduate School of Business
2009	Commendation for Exemplary Service, ROK-US Combined Forces Command

2005	Samsung Humantech Paper Award - Grand Prize
	Automatic classification algorithm for global climate reconstruction
2004	Model Youth Award - Minister of Culture and Tourism
	Science and Technology Category
2001	National Creativity Competition - Gold Prize

RESEARCH INTERESTS

- **Human-AI Hybrid Networks:** Trust dynamics, cultural evolution, and emergent phenomena in AI-integrated social systems
- **Agent-Based Modeling (ABM):** Computational simulation of complex socio-economic systems and policy interventions
- **Smart Textiles & Wearable Robotics:** Discrete Elastic Rods (DER) simulation for SMA-based active knits and morphological computation
- **Nanomaterials & Biomedical Engineering:** Therapeutic nanoparticle systems, quantum dot heterostructures, medical imaging AI

CURRENT RESEARCH PROJECTS

2024 – Present	SMA Active Knit Simulation Research
	(Collaboration with Prof. Soo-Min Lee, Kyung Hee University)
	GPU-accelerated Discrete Elastic Rods (DER) simulation for topological jamming mechanics in shape memory alloy knitted actuators
2024 – Present	Pedestrian-Exoskeleton Crosswalk Simulation
	Agent-based modeling of mixed pedestrian populations using Social Force Model; safety metrics analysis (TTC, PET)
2020 – Present	Ph.D. Dissertation: The Cascade Paradox
	Agent-based modeling of human-AI hybrid networks; key findings: affective pathway dominance (89% mediation), protective network segregation

TECHNICAL SKILLS

- **Programming:** Python, R, MATLAB, NetLogo, JavaScript, Linux
- **Simulation:** Agent-Based Modeling, Discrete Elastic Rods (DER), Social Force Model, GPU computing
- **Data Science:** Time-series forecasting, Network analysis, Medical image processing

PROFESSIONAL MEMBERSHIPS

- International Society for Computational Social Science
- System Dynamics Society
- Korea Society for Technology Management and Economics

REFERENCES

Prof. Junseok Hwang (Advisor)	Professor, Technology Management, Economics and Policy Program, Seoul National University	jshwang@snu.ac.kr
Prof. Soo-Min Lee	Assistant Professor, Department of Clothing & Textiles, Kyung Hee University	eeoom@khu.ac.kr

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