YU LUO

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EDUCATION

Columbia University, Graduate School of Arts and Sciences
Doctor of Philosophy, Chemical Engineering 02/2017

Columbia University, Fu Foundation School of Engineering and Applied Science
Master of Science, Chemical Engineering 05/2012
Full GPA (4.13/4)

National University of Singapore, Faculty of Engineering
Bachelor of Engineering, Chemical Engineering 06/2011
First Class Honors

PUBLICATIONS

Published

1. **Yu Luo**, Garud Iyengar, and Venkat Venkatasubramanian. "Soft regulation with crowd recommendation: coordinating self-interested agents in sociotechnical systems under imperfect information." PLoS One 11, no. 3 (2016): e0150343.
2. Venkat Venkatasubramanian, **Yu Luo**, and Jay Sethuraman. "How much inequality in income is fair? A microeconomic game theoretic perspective." Physica A: Statistical Mechanics and its Applications 435 (2015): 120-138. **Featured by the "ScienceDirect Top 25 List of Most Downloaded Articles."**
3. Richard Bookstaber, Paul Glasserman, Garud Iyengar, **Yu Luo**, Venkat Venkatasubramanian, and Zhizun Zhang. "Process systems engineering as a modeling paradigm for analyzing systemic risk in financial networks." The Journal of Investing 24, no. 2: 147-162.

Preprints

4. **Yu Luo**, Garud Iyengar, and Venkat Venkatasubramanian. "Social influence makes self-interested crowds smarter: an optimal control perspective." arXiv preprint arXiv:1611.01558 (2016).
5. Venkat Venkatasubramanian, **Yu Luo**, and Jay Sethuraman. "Game theory, statistical mechanics and income inequality." arXiv preprint arXiv:1406.6620 (2014).

In preparation

6. Garud Iyengar, **Yu Luo**, Shiva Rajgopal, Venkat Venkatasubramanian, and Zhizun Zhang. "Towards a financial statement based approach to modeling systemic risk in insurance and banking." Work presented.
7. **Yu Luo**, Ashutosh Nanda, Shiva Rajgopal, Vinay Ramesh, Zhizun Zhang, Catherine Zhao, and Venkat Venkatasubramanian. "A data-driven early warning system for mining accidents." Work presented.
8. **Yu Luo**, Garud Iyengar, and Venkat Venkatasubramanian. "Making crowds smarter: mathematical principles of creating superior collective intelligence for individuals, organizations, and nations." Book manuscript.

AWARDS AND HONORS

AIChE CAST Division Director's Student Presentation Award (Finalist and Recipient of $500 Travel Grant) 05/2016
ScienceDirect Top 25 List of Most Downloaded Articles (Ranked 5th for Physica A) 06/2015
Undergraduate Degree with First Class Honors 06/2011
Dean's List (3) 08/2007 – 06/2011
Science and Technology Undergraduate Scholarship for International Students 08/2007 – 06/2011

EXPERIENCE

University of Delaware, Chemical & Biomolecular Engineering and Delaware Biotechnology Institute
Postdoctoral Researcher 06/2017 – Present
Co-Advisors: Prof. Kelvin H. Lee and Prof. Babatunde Ogunnaike

- Collaborated with researchers at Johnson & Johnson to develop a multiscale glycosylation model
- Estimated model parameters from experimental data

Columbia University, Chemical Engineering and Center for the Management of Systemic Risk
Postdoctoral Research Scientist 01/2017 – 05/2017
Doctoral Student/Teaching Assistant 09/2011 – 12/2016
Advisor: Prof. Venkat Venkatasubramanian; Co-Advisor: Prof. Garud Iyengar
Dissertation: "Multi-agent control in sociotechnical systems"

- Developed a data-driven early warning system that predicts mining accidents based on historical MSHA data
- Applied process hazard analysis (signed digraph) to identifying vulnerabilities in financial networks
- Worked with Prudential Financial on a financial statement-based risk measure for insurers and banks
- Designed control-theoretic soft feedback mechanisms that could make intelligent crowds "smarter"
- Discovered deep connections through game theory between income inequality and thermodynamics
- Conducted behavioral research experiments on social influence with human subjects
- Implemented an agent-based model to understand high-frequency trading and its effect on market dynamics
- Modeled collective dynamics of multiple interacting and intelligent agents
- Managed website and assisted in organizing three university-level symposia and workshops
- Collaborated with both world-class scholars and executive-level practitioners on systemic risk research
- Led multiple research teams of graduate and undergraduate students
- Guest-lectured graduate and undergraduate courses including "Managing Systemic Risk in Complex Systems"

PNC Bank
Quantitative Analyst Intern 08/2015 – 12/2015
Manager: Dr. Brian Burk

- Supervised two graduate students and collaborated with finance professionals at PNC Bank
- Built an operational risk model based on the loss distribution approach

Singapore-MIT Alliance for Research and Technology, Center for Environmental Sensing and Modeling
Undergraduate Research Assistant 05/2010 – 06/2011
Advisor: Prof. Wing-Keung Law

- Improved image processing algorithm and numerical model for sand sedimentation experiments

PRESENTATIONS

1. "A data-driven early warning system for mining accidents." Global Congress on Process Safety, San Antonio TX, 03/2017.
2. "The control of self-interested agents: learning from nature's wisdom of crowds." AIChE Annual Meeting, San Francisco CA, 11/2016. **Finalist and travel grant recipient for the "AIChE CAST Division Director's Student Presentation Award."**
3. "Process systems engineering beyond chemical plants: signed digraph as a modeling tool for analyzing systemic risk in financial networks." AIChE Annual Meeting, San Francisco CA, 11/2016.
4. "Process systems engineering beyond chemical plants: design and control of complex sociotechnical systems." AIChE Annual Meeting, San Francisco CA, 11/2016.
5. "Soft regulation: coordinating distributed self-interested agents in sociotechnical systems." AIChE Annual Meeting, Atlanta GA, 11/2014.
6. "Soft regulation: coordinating self-interested agents." Third-Year Chemical Engineering Graduate Student Symposium, Columbia University, New York NY, 05/2014.

RESEARCH AND TEACHING INTERESTS

1. **Computational Multi-Agent Systems: Collective Dynamics and Control**
   Quantitatively model collective dynamics of multiple intelligent and interacting agents
   Understand role of feedback in multi-agent systems
   Design distributed coordination algorithms for intelligent agents using optimal control methods
   Identify individual behavioral models based on empirical data
   Implement large-scale multi-agent control mechanisms in policymaking

2. **Process Systems Engineering Beyond Chemical Plants**
   Apply process systems engineering techniques to other complex sociotechnical systems
   Create systematic methodologies for design and control of complex systems
   Develop fault detection, diagnosis, and risk management mechanisms in financial and healthcare systems

3. **Artificial Intelligence and Data Science in Chemical Engineering**
   Develop data-driven risk and safety management frameworks
   Use machine learning to analyze human behavioral and market data
   Recover information and knowledge from regulatory filings, financial reports, news, and academic papers
   Introduce artificial intelligence and optimization to process control syllabus

PROFESSIONAL SERVICE

Journal of Computers and Chemical Engineering
Invited Reviewer 12/2012 – Present
Peer-reviewed 20+ manuscripts on fault detection, fault diagnosis, optimization, risk management, and other topics

Columbia University, Center for the Management of Systemic Risk
Webmaster 12/2012 – Present
Assistant – Workshop on Systemic Risk in Insurance 10/2016
Assistant – Symposium on Managing Systemic Risk in Energy, Environment, and Infrastructure 05/2016
Assistant – Symposium on the Management of Systemic Risk in Finance 06/2014
Designed program brochures and other print media, assisted event logistics, and facilitated coordination between schools

ADDITIONAL INFORMATION

Coursework

Chemical Engineering	Advanced process control, statistical mechanics, transport phenomena, thermodynamics, process safety, reaction kinetics, atmospheric science, and polymer science
Computer Science	Artificial intelligence, machine learning, and databases
Mathematics and Economics	Linear programming, deterministic models, partial differential equation, numerical method, game theory, and mechanism design

Technical Expertise

Language	Python, R, MATLAB, JavaScript, SQL, LISP, HTML, and LaTeX
Simulation	SimuLink, COMSOL, NetLogo, and Aspen HYSYS
Media	Adobe Photoshop, Adobe Illustrator, Adobe Premiere, and Adobe After Effects

Artistic Skills

Graphic Design	Vector art, brochure design, and event poster
Traditional Art	Portrait painting, calligraphy, and piano
Creative Art	Musical composition, song writing, and video editing