

YU LUO

110 Morningside Drive, Apt. 63C
New York, NY 10027, United States
(646) 716-1378; gol16cn@gmail.com; <http://www.columbia.edu/~yl2750>

EDUCATION

Columbia University, Graduate School of Arts and Sciences

Doctor of Philosophy, Chemical Engineering, Expected Dec. 2016

Master of Philosophy, Chemical Engineering, May 2015

Columbia University, Fu Foundation School of Engineering and Applied Science

Master of Science, Chemical Engineering, May 2012 (GPA: 4.13/4)

National University of Singapore, Faculty of Engineering

Bachelor of Engineering, Chemical Engineering, Jun. 2011 (First Class Honors)

RESEARCH AND TEACHING EXPERIENCE

Columbia University, Department of Chemical Engineering

Graduate Research Assistant

2011 – Present

Advisor: Prof. Venkat Venkatasubramanian (Co-Advisor: Prof. Garud Iyengar)

Dissertation: “The collective wisdom of learners: coordinating intelligent agents with soft regulation”

- Modeled the collective dynamics of interacting agents through control theory, game theory, and thermodynamics
- Designed coordination mechanisms that improve the collective problem solving of multiple intelligent agents
- Proved mathematically that the proposed “soft regulation” accelerates the learning process of interacting agents
- Designed and conducted behavioral research experiments on Amazon Mechanical Turk with human subjects
- Analyzed multi-agent behavioral data using system identification and optimal control techniques
- Discovered deep connections through game theory between income inequality and thermodynamics
- Ranked 12 countries by income inequality after analyzing their income distribution data from 1920 to 2012

Teaching Assistant

2011 – Present

- Guest-lectured the graduate course “Managing Systemic Risk in Complex Systems”
- Held weekly office hours and recitations for “Thermodynamics” and “Molecular Phenomena”

Columbia Center for the Management of Systemic Risk

Graduate Research Assistant

2012 – Present

Advisor: Prof. Venkat Venkatasubramanian (Co-Advisor: Prof. Garud Iyengar)

- Collaborated with scholars and industry professionals from finance, economics, business, and public health
- Implemented process systems engineering methods to problem solving beyond chemical engineering
- Applied signed digraph as a modeling and fault detection tool for analyzing systemic risk in financial networks
- Led a team of three and collaborated with Prudential on measuring insurers’ systemic risk
- Developed early warning systems for occupational safety and health threats by analyzing regulatory data

PNC Bank

Quantitative Analyst Intern

Sep. – Dec. 2015

Manager: Dr. Brian Burk

- Led a team of three and built a data-driven operational risk model
- Improved the loss distribution by reconciling internal and external loss data

Singapore-MIT Alliance

Undergraduate Research Assistant

2010 – 2011

Advisor: Prof. Wing-Keung Law

- Improved the image processing algorithm for sand sedimentation experiments

AWARDS AND HONORS

AICHE CAST Division Director's Student Presentation Award Finalist with \$500 Travel Grant	May 2016
ScienceDirect Top 25 List of Most Downloaded Articles (Ranked 5 th for Physica A)	Jun. 2015
Undergraduate Degree with First Class Honors	Jun. 2011
Dean's List (3)	2007 – 2011
Science & Technology Undergraduate Scholarship for International Students	2007 – 2011

PUBLICATIONS

In preparation

1. **Yu Luo**, Garud Iyengar, and Venkat Venkatasubramanian. "Finding the optimal social influence for a learning crowd: a control theoretic perspective."

Published

2. **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.
3. 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.
4. Venkat Venkatasubramanian, **Yu Luo**, and Jay Sethuraman. "Game theory, statistical mechanics and income inequality." arXiv preprint arXiv:1406.6620 (2014).
5. 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.

PRESENTATIONS

Oral presentations

1. "The control of self-interested agents: learning from nature's wisdom of crowds." AIChE Annual Meeting, San Francisco CA, Nov. 2016.
2. "Process systems engineering beyond chemical plants: signed diagraph as a modeling tool for analyzing systemic risk in financial networks." AIChE Annual Meeting, San Francisco CA, Nov. 2016
3. "Soft regulation: coordinating distributed self-interested agents in sociotechnical systems." AIChE Annual Meeting, Atlanta GA, Nov. 2014.
4. "Soft regulation: coordinating self-interested agents." Third-Year Chemical Engineering Graduate Student Symposium, Columbia University, New York NY, May 2014.

Poster presentations

5. "Process systems engineering beyond chemical plants: the design and control of complex sociotechnical systems." AIChE Annual Meeting, San Francisco CA, Nov. 2016.

Lectures

6. "Artificial neural networks: introduction and fault diagnosis applications." Managing Systemic Risk in Complex Systems, Mar. 2016.
7. "Introduction to failure mode and effects analysis and probabilistic risk analysis." Managing Systemic Risk in Complex Systems, Feb. 2016.

RESEARCH INTERESTS

1. **Complex Multi-Agent Systems**
Model the collective dynamics of multiple intelligent and interacting agents using quantitative methods
Design distributed coordination for intelligent agents using optimal control methods
Identify individual behavioral models based on empirical data
2. **Process Systems Engineering**
Bring process systems engineering techniques to other complex sociotechnical systems
Develop fault detection, diagnosis, and risk management mechanisms beyond chemical plants
3. **Artificial Intelligence**
Combine process systems engineering and artificial intelligence for data-driven risk management
Use machine learning to analyze behavior data from intelligent agents
Recover systematic and semantic information from analyst reports, regulatory filings, and academic papers

ACTIVITIES

Journal of Computers and Chemical Engineering

Reviewer 2012 – Present
Reviewed fourteen manuscripts on the subjects of fault detection, fault diagnosis, optimization, and risk management

Symposiums on Managing Systemic Risk in Finance, Energy, Environment, and Infrastructure

Volunteer 2014 – 2016
Assisted event logistics, organization, program, and communication

ADDITIONAL INFORMATION

Coursework

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

Modeling Skills

Analytical	Process control, numerical analysis, dynamical systems, statistical mechanics, population game, signed digraph, and multi-agent collective dynamics
Empirical	Agent-based model, chemical process simulation, operational risk, reinforcement learning, artificial neural networks, and evolutionary computation

Technical Expertise

Scripting & Programming	MATLAB, Google Apps Script, SQL, Python, LISP, HTML, and LaTeX
Modeling & Simulation	SimuLink, COMSOL, NetLogo, and Aspen HYSYS
Media	Adobe Photoshop, Adobe Illustrator, Adobe Premiere, and Adobe After Effects

Personal Interests

Digital art, traditional art, graphic design, and musical composition