Huang, Xiang — University of Illinois Springfield

Contact Information

Department of Computer Science
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Current Position

Assistant Professor, University of Illinois Springfield, Springfield, IL, USA (August 2020 to present).

Personal Website

xianghuang.org

Research Interests

Algorithmic Information Theory, Analog Computing, DNA/Molecular Programming, Normal numbers, and Theoretical Computer Science in general.

Visiting Positions

Visiting Associate, California Institute of Technology (August 2024 – December 2024, hosted by Erik Winfree).
Visiting Assistant Professor, Le Moyne College, Syracuse, NY (September 2019 – June 2020).

Education

Iowa State University, IA, USA

Ph.D. in Computer Science, 2020.

- Thesis: *Chemical Reaction Networks: Computability, Complexity, and Randomness*.
- Advisor: Jack H. Lutz.

Institute of Software, Chinese Academy of Sciences, Beijing, China

Computer Science, September 2009 – June 2012.

- Topic: *Model Checking, Formal Methods, Automata Theory*.

Nanjing University, Nanjing, China

B.E. in Software Engineering, September 2005 – June 2009.

Grant Support

External Support:

1. Principal investigator: *Towards A Hierarchy of Real Numbers Computable by CRN*, $400,000, Department of Energy EXPRESS grant, 2023–2026.

UIS and University of Illinois System Internal Support:

4. National Taiwan University-University of Illinois System Travel Grants Program, $5,000, 2024.
3. Competitive Scholarly Research Grant, $5,000, 2023–2024.
2. Grant Writing Mentorship Award, $1,500, 2022–2023.
1. Leadership Lived Experience (LLE) student employment initiative, $4,000, 2022.

Journal Publications

2. Xiang Huang, Jack H. Lutz, Elvira Mayordomo, and Donald M. Stull, "Asymptotic divergences and strong dichotomy," *IEEE Transactions on Information Theory* 67 (2021), pp. 6296–6305.

1. Xiang Huang, Titus H. Klinge, James I. Lathrop, Xiaoyuan Li and Jack H. Lutz, "Real-Time Computability of Real Numbers by Chemical Reaction Networks," *Natural Computing* 18(1) (2019), pp. 63–73 **(invited paper)**.

Conference Publications

(Supervised students are underlined.)

8. Nicholas Haisler, Xiang Huang, Andrei N Migunov, and Khalid Mohammed, Garrett Provence. "A Selective Dual-Railing Technique for General Purpose Analog Computers " *In Proceedings of the 22nd International Conference on Unconventional Computation and Natural Computation (UCNC 2025), Sep 2025*

7. Xiang Huang and Andrei N. Migunov, "A General Purpose Analog Computer to Population Protocol Compiler," *In Proceedings of the 21st ACM International Conference on Computing Frontiers Workshops and Special Sessions (CF '24 Companion)*, May 2024.

6. Xiang Huang and Rachel Huls, "Computing Real Numbers with Large-Population Protocols Having a Continuum of Equilibria," *The 28th International Conference on DNA Computing and Molecular Programming* (DNA 28, Albuquerque, NM, August 8–12, 2022).

5. Xiang Huang, Jack H. Lutz, Elvira Mayordomo, and Donald M. Stull, "Asymptotic divergences and strong dichotomy," *Proceedings of the Thirty-seventh Symposium on Theoretical Aspects of Computer Science* (STACS 2020, Montpellier, France, March 10–13, 2020).

4. Xiang Huang, Jack H. Lutz, and Andrei N. Migunov, "Algorithmic Randomness in Continuous-Time Markov Chains," *Proceedings of the 57th Annual Allerton Conference on Communication, Control, and Computing* (2019).

3. Xiang Huang, Titus H. Klinge, and James I. Lathrop, "Real-Time Equivalence of Chemical Reaction Networks and Analog Computers," *DNA Computing and Molecular Programming* (DNA 2019), Lecture Notes in Computer Science, vol. 11648, Springer, Cham.

2. Xiang Huang, Titus H. Klinge, James I. Lathrop, Xiaoyuan Li, and Jack H. Lutz, "Real-Time Computability of Real Numbers by Chemical Reaction Networks," *Proceedings of the 16th International Conference on Unconventional Computation and Natural Computation* (UCNC 2017), pp. 29–40.

1. Xiang Huang and Donald M. Stull, "Polynomial Space Randomness in Analysis," *Proceedings of the 41st International Symposium on Mathematical Foundations of Computer Science* (MFCS 2016), 86:1–86:13.

Peer-Reviewed Extended Abstract/Poster

1. Ho-Lin Chen, Xiang Huang, and Andrei N. Migunov, "The Russian Doll Scheme: Simulating Stochastic CRNs via Termolecular Population Protocols". *the 31st International Conference on DNA Computing and Molecular Programming (DNA3)*, August 2025.

Book Chapter

1. Xiang Huang, "Deterministic Chemical Reaction Network," completed chapter for *The Art of Molecular Programming*. Part of a DNA/molecular programming community initiative to create a comprehensive molecular programming textbook (molecularprogrammers.org).

Awards

2. The International Society for Nanoscale Science, Computation and Engineering (ISNSCE) Best Student Presentation Award, at 25th International Conference on DNA Computing and Molecular Programming (DNA25), August 2019.

1. Teaching Excellence Award, Iowa State University, 2017.

Invited Talks

Computing Real Numbers with Large-Population Protocols, Drake University, October 2023.
Some Thoughts on Normality, Algorithmic Randomness, and Analog Computing, The Fifth Nanjing University Youth Forum, May 2020 (Remote).
Asymptotic Divergences and Strong Dichotomy, Iowa Colloquium on Information, Complexity, and Logic (ICICL), Spring 2019.

Contributed Talks

Computing Real Numbers with Large-Population Protocols Having a Continuum of Equilibria, DNA 28, August 2022.
Real-Time Equivalence of Chemical Reaction Networks and Analog Computers, DNA 25, August 2019.
Real-Time Computability of Real Numbers by Chemical Reaction Networks, The 19th Graduate Student Conference in Logic, Madison, WI, April 2018.
Real-Time Computability of Real Numbers by Chemical Reaction Networks, UCNC 2017.

Teaching Experience

At UIS

CSC 570F – Graduate Algorithms and Applications	Spring 2023
CSC 302 – Discrete Structures	Fall 2020 to present
CSC 482 – Algorithms and Theory of Computation	Fall 2020 to present

As Instructor at Le Moyne College

CSC 175 – Introduction to Algorithms and Program Design	Fall 2019
CSC 170 – Java Introduction (no prior programming experience)	Spring 2020
CSC 176 – Java Introduction (as a second programming course)	Spring 2020
CSC 276 – Object Oriented Design Using Java	Spring 2020

As Teaching Assistant at Iowa State

COM S 531 – Theory of Computation (Graduate)	Spring 2014, 2016
COM S 511 – Algorithm Design and Analysis (Graduate)	Fall 2014, 2015, 2017
COM S 331 – Theory of Computation	Fall 2016, Spring 2019
COM S 311 – Algorithm Design	Summer 2015, 2016, Fall 2018
COM S 330 – Discrete Mathematical Structures	Spring 2014
COM S 252 – Introduction to Operating Systems	Fall 2013

Undergraduate Student Research Supervision

Selected undergraduate student research projects (Complete list at xianghuang.org):

- Rachel Huls (2021–2022): Research on large-population protocols computability, resulting in publication at DNA 28.
- Anish Sinha (2022–2023): Concurrent B-Link-Trees. Winner of Best Research Product Award, UIS STARS 2023.
- Jonathan Miller (2023): Survey on Large Integer Multiplication Algorithms. Survey paper completed.

Total: 11 undergraduate students mentored (2021–present) in theoretical computer science research.